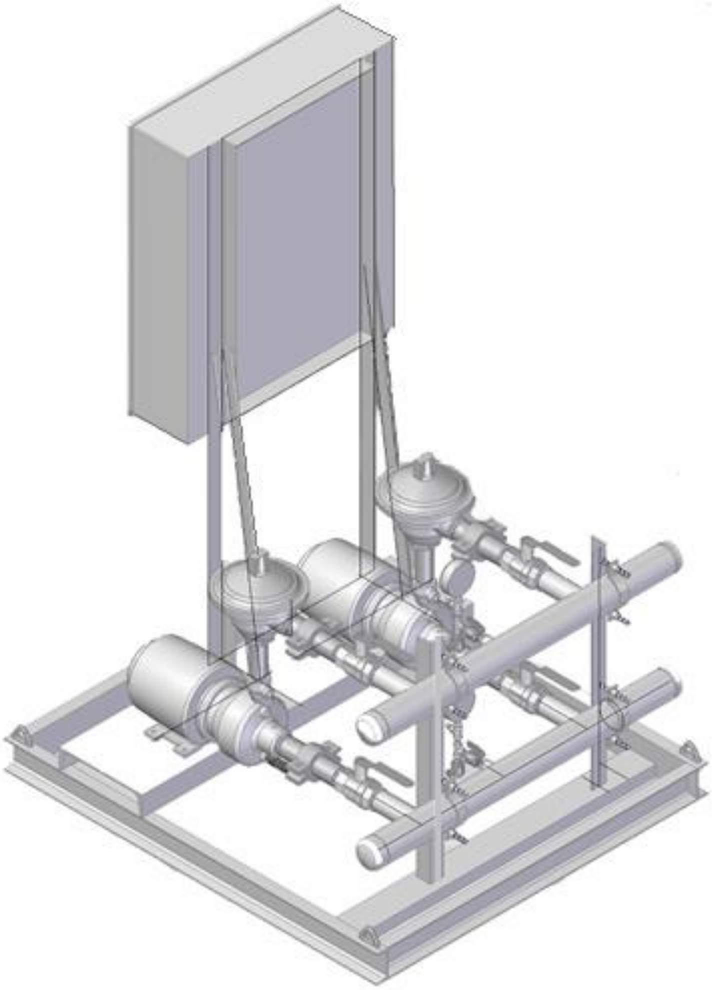
AQUA~FLOPAC™

INSTALLATION, OPERATION & MAINTENANCE FOR

DUPLEX VARIABLE SPEED SYSTEMS



FLO-PAK®

A BUSINESS UNIT OF PATTERSON PUMP COMPANY

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Toccoa, Georgia 30577
Phone: 706-886-2101
www.pattersonpumps.com

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Patterson

Warranty

Patterson Pump Company and Divisions of Patterson Pump Company ("Patterson") warrants, to the extent hereinafter set forth, each new piece of Patterson equipment to be free from defects in material and workmanship under the normal use and service for which it was intended if, and only if, it has been properly installed and operated.

Patterson's obligation under the warranty is limited to replacing or repairing, free of charge, F.O.B. point of manufacture, any defective part or parts of the equipment that were manufactured by Patterson and which are returned to Patterson at Toccoa, Georgia, provided that such part or parts are received at the Patterson factory not later than twelve (12) months after installation or eighteen (18) months after shipment whichever occurs first.

As to a part or parts such as engines, motors and accessories which are furnished by Patterson, but not manufactured by it, same will carry only the warranty of the manufacturer of such part or parts, and this shall be the limit of Patterson's liability with respect to such part or parts. Mechanical seals provided on commercial products (HVAC & Plumbing) are not covered by this warranty.

Purchaser must notify Patterson by registered or certified mail, return receipt requested, of a claimed breach of warranty within thirty (30) days after discovery thereof, but not later than the termination of the guarantee period hereinabove provided; otherwise, such claim shall be deemed waived.

Purchaser assumes all risk and liability whatsoever resulting from the use thereof, whether used singly or in combination with other equipment or machinery.

This warranty shall not apply to any Patterson Equipment, or parts thereof, which have been repaired or altered without Patterson's written consent, outside Patterson's factory, or which have been altered in any way so as in the judgement of Patterson, to affect adversely the performance or reliability of the Patterson equipment, or which have been subject to misuse, negligence or accident, or which have been operated under conditions more severe than, or otherwise exceeding, those set forth in the specifications for such equipment.

THIS WARRANTY IS FURNISHED EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE NOT OTHERWISE SET FORTH IN A WRITING SIGNED BY AN AUTHORIZED REPRESENTATIVE OF PATTERSON.

Patterson shall not be liable for any loss or damage resulting, directly or indirectly, from the use or loss of use of the equipment. Without limiting the generality of the foregoing, this exclusion from liability embraces the Purchaser's expenses for downtime or for making up downtime, and/or damage for which the purchaser may be liable to other persons, and/or damages to property, and/or injury to or death of any persons. Patterson neither assumes nor authorizes any person to assume for it any other liability in connection with the sale or use of the Patterson Equipment.

PATTERSON PUMP COMPANY / **A Gorman-Rupp Company**
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INSTALLATION AND STORAGE REQUIREMENTS FOR PUMP SKID UNIT

INSTALLATION:

1. The skid mounting surface can be a pad, but preferably a footing to support the entire perimeter of each of the skid unit(s). This footing should be designed in accordance with local building codes for the support of similar steel structures.

2. Typically the skid will be fabricated **WITHOUT** anchor bolt holes. Anchoring of the skid is done by placing anchor bolt plates over the bottom of the skid framing member and securing to the footing with expansion or epoxy anchor bolts. The skid is leveled, piping and electrical installation are complete before anchoring. For most installations, a total of eight (8) such anchors are recommended (local authorities may dictate otherwise) for each unit. This would include two (2) anchors down each long side (evenly spaced), with one (2) at each end (evenly spaced). For suggested anchor detail, see sketch attached.

3. After the skid is installed and leveled, but before anchoring, check the doors for fit and ease of movement. The entire package is assembled on a level surface at the factory and checked for proper operation before shipment. Occasionally, when the building is set, the doors do not line- up as they should. This can usually be corrected by shimming to level the skid on the foundation. Some experimenting may be required as each footing will vary slightly and the shim may need to be shifted until satisfactory door alignment is achieved. Once proper alignment is achieved the skid should be anchored down and the interior of the skid filled with concrete over a packed granular fill (gravel). The concrete should be 4"-6" thick and finished with some surface texture. For deckplated skids, the perimeter members of the skid should be grouted.

4. For skids with poured concrete floors, once the floor has cured the baseplate is to be grouted with a non-shrink grout.

5. The field electrician will need to connect the building heater. The field electrician is responsible for grounding the building per local codes.

6. All bolts need to be tightened after shipment. Bolts can become loose due to vibration from traveling and loading and unloading.

7. All valves are to be in the closed position prior to filling the system.

8. All drains in system that are to be field connected need to be routed appropriately by the installing contractor.

9. It is the installing contractor's responsibility to inspect the entire package before receiving the unit. Any damage must be noted in writing on the bill of lading. Pictures should be taken when possible. Failure to do so could result in a denial of a warranty claim.

10. All flexible coupled pumps shall be field aligned once the building has been anchored. Pumps are factory aligned, but vibrations in shipping and flexing of the station during loading and unloading may change the alignment. This shall be done by the installing contractor.

STORAGE:

1. Place on a dry, hard, level surface.

2. Protect from weather and airborne contamination (if not enclosed).

3. Protect from effects of temperature extremes and humidity, to prevent condensation.

4. Protect from physical damage.

5. Maintain corrosion protection on exposed bare metal surfaces.

6. Rotate pump shaft by hand at least once per week. Rotate two revolutions stopping at a point 90 degrees from the initial shaft position.

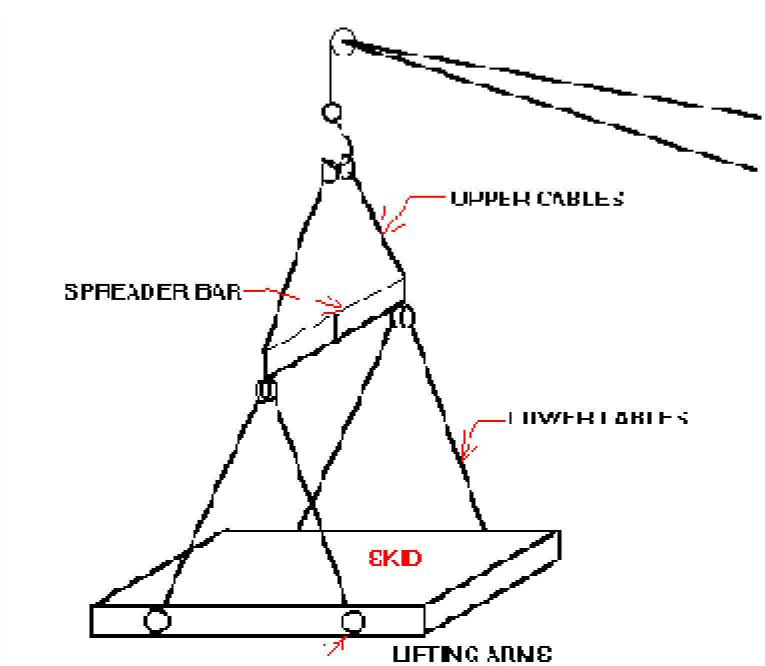
SKID UNLOADING GUIDE

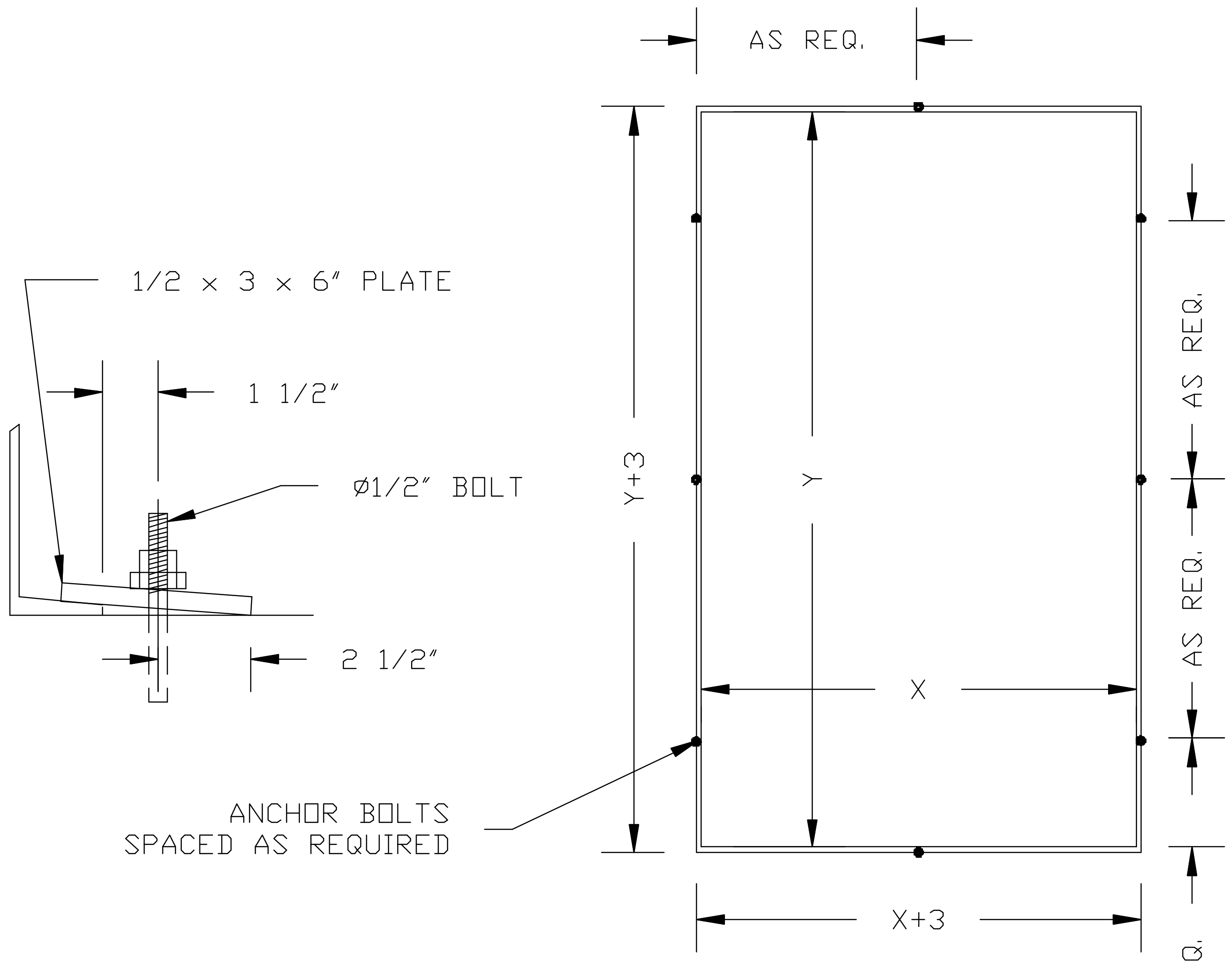
LIFT ARM POSITIONING:

- The skid lifting arms consist of two pipes inserted through two larger Sch 40 pipes that are an integral part of the skid structure. The smaller pipes are approximately 4 FT longer than the skid width and when properly positioned will expand beyond the skid on each side. It is recommended that the lifter cables not be located farther than 6" form the skid structure.
- On larger units, the lifting arms are welded in place and are approximately 8 inches wider than the skid width, 4 inches on each side.
- On small units, four 5/8" eyebolts are used instead of lifting arms.

RIGGING:

- The lower cables attach between the four lift points on the skid and the spreader bar (see sketch). The cables (supplied by the crane operator) should be long enough so that the angle between the cables does not exceed the recommendation of the cable supplier. We have found that an included angle of 40-45 degrees between cables allows for good stability. The longer the cables, the more stable the load.
- The spreader bar (supplied by the crane operator), should be about two feet wider than the skid base. The upper cables should be somewhat longer than the lower cables (approximately 20%). Again, the cable manufacturer's recommendation should be followed.
- Proper rigging of the skid for lifting is the responsibility of the customer. The above rigging suggestions are meant only as a guide and are not to be construed as complete instructions, consequently Patterson Pump Company shall not be responsible for the use or misuse of these suggestions. The customer is encouraged to retain the services of a qualified contractor experienced in the rigging of similar structures.





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PIPE SUPPORTS NOT SHOWN FOR CLARITY.

FLO-PAK
Atlanta Georgia

THIS DRAWING IS CERTIFIED
☒ FOR APPROVAL
NO PRODUCTION WILL START UNTIL APPROVED IN WRITING
☐ FOR CONSTRUCTION
PRODUCTION HAS STARTED ANY CHANGES MAY AFFECT PRICE AND DELIVERY
OUR ORDER NO.: NONE
CUST. ORDER NO.: ________
BY: ________ DATE 00/00/00

JOB TITLE: BOOSTER ANCHOR BOLTS

KEY LEGEND	
KEY	DESCRIPTION

CERTIFIED FOR APPROVAL ONLY _X_
CERTIFIED FOR CONSTRUCTION___

REV	DATE	DESCRIPTION
—	—	—

PROD CODE:	.
CHECKED:	---
DRAWN BY:	J.P.
DATE:	00/00/00
SCALE:	NONE
CAD FILE	DWG\BAB
SHEET:	REV: —

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INSTALLATION, OPERATION & MAINTENANCE MANUAL

Read this entire manual before proceeding.

SECTION I – INTRODUCTION

1-1 This manual provides general instructions for the installation and maintenance of the package pumping unit manufactured by Flo-Pak, Inc. / A Business Unit of Patterson Pump Company, Toccoa, Georgia.

1-2 After carefully uncrating or unpacking, check the equipment against the shipping papers, and inspect for any damage incurred during shipment. Immediately notify the carrier of any damage or shortage found.

1-3 The type and sizing of the unit was built to meet requirements provided by the purchaser. Among the more important requirements are the following:

- Liquid pumped
- Flow in gallons-per-minute
- Temperature of liquid pumped degree Fahrenheit
- Suction condition, pressure or lift
- Discharge pressure
- Power supply characteristics
- Location

1-4 If any of the requirements change after the order was placed, we suggest that each change be reviewed with the factory.

CAUTION: Operation of the package under conditions different from the design requirements may void the warranty!

SECTION II – INSTALLATION

2-1 Location

Select a location for the package which will be clean, well ventilated, properly drained, and provide accessibility for inspection and maintenance. Outdoor installation may require protection from the elements, particularly freezing.

PACKAGE PUMPING SYSTEMS

*** Installation
*** Operation
*** Maintenance

Read the entire manual before attempting to install, operate or repair this equipment.

Properly installed your Flo-Pak package will give you satisfactory and dependable service. We urge that you carefully read these step-by-step instructions to simplify any problems of installation, operation or repair.

Failure to read and comply with installation and operation instruction will void the responsibility of the manufacturer and may also result in bodily injury, as well as property damage.

This manual is intended to be a permanent part of your package installation and should be preserved in a convenient location for ready reference. If these instructions should be come soiled, obtain a new copy from Flo-Pak. Be sure to include the package serial number you request.

2-2 Foundation

Concrete (reinforcement as necessary or required) is most widely used for the foundation. In sufficient mass it provides rigid support which minimizes deflection and vibration. It may be located on soil, structural steel or building floors, provided the combined weight of the package, grout and foundation does not exceed the allowable bearing load of the support. Allowable bearing loads of structural steel and floors can be obtained form engineering handbooks, building codes or local communities which give the recommended allowable bearing loads for different types of soil.

2-3 Before pouring, roughen the top surface to provide a good bond. Ordinarily the proportions used are 1 part cement to 3 parts sand and 4 parts medium aggregate.

2-4 If vibration or noise will be objectionable, as in office building, it may be advisable to use vibration dampeners between the package unit and foundation in conjunction with suction and discharge piping vibration suppressor.

2-5 <u>Mounting</u>

Set the package unit on the foundation base. Level the unit and check the alignment on the bearing frame units; tighten the foundation bolts.

2-6 <u>Alignment Bearing Frame Units Only</u>

Reliable, trouble-free and efficient operation of the unit depends on the correct alignment of the pumps and driver shafts. Misalignment may be the cause of:

a. Noisy pump operation
b. Vibration
c. Premature bearing failure
d. Excessive coupling wear

Note: Complete units are aligned at the factory. Experience has shown that all bases, no matter how rugged or deep in section, will twist during shipment. At the very least, the alignment *<u>must</u>* be checked after mounting.

Factors which may change the alignment of the unit after the initial installation:

a. Settling of the foundation
b. Springing of the base
c. Piping strain
d. Settling of the building
e. Shift of pump driver on the foundation

2-7 <u>Grouting</u>

Grouting compensates for unevenness in the foundation and the base, as well as distributes the weight of the unit uniformly over the foundation. It also helps to prevent the unit from shifting after mounting. It is essential that the unit be expertly grouted by use of non-shrinking grout. Grout the unit as follows:

a. Build a form of plywood or thin planking around the foundation to contain the grout. Support adequately to prevent deformation.

b. Soak the top of the concrete pad thoroughly with water before grouting. Remove all surface water before pouring.

c. A recommended mix of grout satisfactory for most applications is as follows:

    1. One part of normal Portland Cement – 94#
    2. One part of Embeco Cement – 100#
    3. One part of coarse clean sand – 100#
    4. One and one-half parts of ¼” pea gravel (1½ cu. Ft.)
    5. approximately 5 ½ gallons water

d. Pour the grout into the base and, while pouring, tamp liberally in order to fill cavities and prevent air pockets. In order to prevent the base from shifting, grout 4” out from all sides of the base. Slant outside edges of the grout to prevent chipping.

e. Approximately fourteen days after the grout has been poured or when the grout is thoroughly dried, apply an oil base paint to all exposed surfaces of the grout to prevent air and moisture from coming in contact with the grout.

2-8 Piping

The suction and discharge piping should be arranged for the most simple, direct layout and be of sufficient size and internally free of foreign material. The piping must never be pulled into position by the flange bolts. It must be be independently supported and arranged in order to not induce any strain on the package.

Note: Piping should be cleaned and flushed prior to installing the package. A large number of packing, mechanical seals and seizure troubles of the pumps are due to improperly cleaned system.

2-9 Electricity

Connect the power supply to the package conforming to the National Electrical and local codes. Line voltage and wire capacity must match the rating stamped on the control panel nameplate.

a. Only when the coupling halves are disconnected (frame mounted pumps) and the water supply is to the suction of the pumps, momentarily energize the panel and check that rotation of the pumps is correct by setting the hand-off-auto switch into the hand position.

b. If the rotation is inaccurate, correct by changing any two of the three power leads.

SECTION III – LUBRICATION

3-1 Couplings

Couplings with rubber drive parts do not require lubrication; however, most couplings do require some form of lubrication. After completion of installation and alignment, and before operating the unit, lubricate couplings in accordance with the manufacturer's specific instruction contained in the package installation manual.

3-2 Ball Bearings

Reasonable care and proper lubrication of bearings will result in many years of service. The lubricant provides a film between the balls, separator and races, giving low friction and preventing excessive temperature rise and corrosion.

3-3 The normal life of ball bearings is terminated only by fatigue. Improper lubrication practices are the primary cause of failure. Good practice includes the following:

a. Keep lubricant clean; provide and use a dust-tight cover on the storage container.

b. Use the oldest lubricant first.

c. Clean lubrication fittings before re-lubrication.

d. Use clean dispensing equipment.

e. Use the proper amount of lubricant. Too much grease results in churning and unnecessary power consumption, rapid heating to high temperatures which break down the grease.

f. Use the correct lubricant. Grease Lithium Soap Base, meeting National Lubricating Grease Institute Grade 2 specifications. This has a safe operating temperature higher than 300 degrees Fahrenheit.

3-4 **Operating Temperature**

Use of the lubricants and procedures given in this manual will allow safe operation at bearing temperatures to 250 degrees Fahrenheit. Past experience, however, indicates the normal temperature will not exceed 250 degrees if the pumped fluid is well below that temperature.

3-5 A high normal operating temperature is not a sign of bearing failure. Normal temperatures vary with the seasons and the environment and may range from 0 to approximately 200 degrees Fahrenheit. A continuous rise from established normal operating temperature indicates trouble and probable failure of the bearings. Shut down the unit immediately. Disassemble, clean and inspect the bearings. Replace if required.

3-6 **Re-Lubrication**

Grease that has been in service does not “wear away.” It needs replacing only because of contamination by dust, metal particles, moisture or high temperature breakdown.

a. Thoroughly clean greased fitting.
b. Remove grease drain plug on equipment so equipped.
c. Inject clean new grease.

SECTION IV – OPERATION

4-1 When making an initial start, after installation or major maintenance, check the following:

a. Coupling alignment (if frame mounted).
b. Bearing lubricant on pumps and drives.

4-2 Start the package as follows:

1. When possible, turn the pump shaft by hand to make sure parts do not bind.
2. Open suction valves.
3. Start drive in “hand” and check rotation. (Correct as necessary.)
4. With pump running in “hand” regulate system pressure by adjusting the pressure regulating valve. (See data sheet in manual.) Repeat this for all pumps on package.

SECTION V – MAINTENANCE

WARNING – DISCONNECT THE POWER TO ANY ROTATING OR ELECTRICAL COMPONENTS BEFORE STARTING ANY REPAIRS!

5-1 Regular consistent maintenance is the best way to avoid serious trouble which may require taking the unit out of service for extensive repair.

5-2 **Bearings**

It is essential to provide proper lubrication and keep bearings clean. Frequency of lubrication must be determined by experience as it depends upon bearing size, speed, operating conditions and location (environment). Table 1 should be used as a guide for grease re-lubrication.

TABLE 1

Operating Conditions	Lubricate
Normal, 8-hour day operation. Area free of dust and damaging atmosphere.	Every six (6) months.
Severe, 24-hour day operation. Area with moderate dust and/or damaging atmosphere or outdoor service.	Every month.
Light, approximately 10-hour week. Area relatively free of dust and damaging atmosphere.	Every year.

5-3 Alignment – (Bearing frame unit only) – Check alignment yearly.

TABLE 2

Problems	Probable Cause	Remedy
Failure to deliver liquid or sufficient pressure.	Control valve not adjusted correctly.	Adjust control valve. (See valve manual.)
	Incorrect pump rotation.	Change rotation.
	Discharge head too high.	Check that all discharge valves are open and discharge line is free form obstructions. In some cases the installation needs to be altered or pump of suitable rating supplied.
	Impeller passages restricted.	Disassemble the pump and clean the impeller.
	Pump not up to speed.	Check for low motor voltage or motor overload.
	Worn wearing rings.	Replace worn parts.
	Damaged impeller.	Replace or repair impeller.
Overload of driver.	Total head lower than rating	Check suction and discharge pressure and determine the total dynamic head. If TDH is lower than rated, throttle discharge valve to rated TDH.
	Mechanical problem in pump or driver.	See if unit turns freely.
Vibration or noise.	Misalignment bearing (frame units only).	Realign unit.
	Worn ball bearing.	Replace bearings.
	Cracked foundation.	Replace foundation.
All pumps running lag units cycle off and back on again.	Control valve setting and start pressure switch not adjusted correctly in relation to one another.	Readjust.
	Too low setting on start delay timer.	Readjust.

TABLE 2
(Continued)

All pumps running lag units cycle off and back on again.	Package undersized for load.	Verify operating flow and head.
Low suction alarm tripping.	Low suction switch adjusted incorrectly or poorly.	Check adjustment.
	Actual low suction condition.	Check suction pressure with test gauge.
All other alarms.	Switches adjusted incorrectly.	Readjust.
	Actual alarm condition.	Verify and correct.
	Delay timer set too low.	Increase time delay.

5-4 **Spare Parts**

To keep delay to a minimum when package repairs are required, we suggest that the following spare parts be stocked:

Panel

a. Spare set of fuses.
b. Spare timer.
c. Spare relay.
d. Spare system pressure switch and suction pressure switch.

Pumps

a. Spare mechanical seal for each size pump.
b. Spare casing gasket for each size pump.
c. Spare shaft sleeve for each size pump.
d. Spare impeller for each size pump.

5-5 To obtain quick and accurate service when ordering spare parts, provide the following information:

1. Package serial number.
2. The name and number of parts shown on the data provided for the individual component.
3. Quantity required on each item.

Aid may be obtained from the Flo-Pak representative in your area or from the factory.

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A Business Unit of Patterson Pump Company

5/28/04

Patterson

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General Pump Inspection and Maintenance Schedule
Packaged Pump Systems

Any additional inspections, maintenance, or tests required by NFPA- Standards for fire pumps are excluded.
Refer to NFPA Standards for additional requirements for fire pumps.

Actions required only for specific pump types are so noted.
The symbol (■) used in the table below indicates that the action indicated may not be applicable to a specific pump of a particular type.
For more information regarding inspection and maintenance requirements refer to the Patterson O & M manual supplied with the pump.
Contact Patterson Pump Company if assistance is needed to determine the inspection and service requirements for a specific pump.

Inspect (✓) or service (•) at the indicated calendar time or run time interval – whichever comes first	**4 hours**	**Routinely**	**Monthly**	**2000 hours or 3 months**	**4000 hours or 6 months**	**8000 hours or 12 months**
Replenish grease lubricated sleeve bearing grease per the O & M manual using the manual grease lubricator. Perform every 3 months while idle. (vertical wet pit pumps so equipped) ■	•					
Unusual noise		✓				
Unusual vibration		✓				
Unusual temperature		✓				
Leaks in pump or piping		✓				
Pressure gauge readings		✓				
Visual inspection of equipment general condition		✓				
Anytime a pump is opened, inspect the running clearances and restore them to original specifications if the running clearances have doubled (adjust ring clearances if so supplied or install new wear rings)		✓ •				
Anytime a pump is opened, inspect the impeller for corrosion or excessive wear.		✓ •				
Packing box – verify slight leakage (if excessive, adjust gland or seal water valve; replace packing if required) ■		✓ •				
Mechanical seal (should be no leakage) ■		✓				
Drain lines are working properly ■		✓				
Coupling integrity ■		✓				
Drive shaft integrity ■		✓				
Verify proper operation of oil drip lubricator (vertical wet pit pumps so equipped) ■			✓			
Verify proper operation of automatic grease lubricator (vertical wet pit pumps so equipped) ■			✓			
Operate the pump (note – for vertical wet pit pumps first verify proper lubrication)			✓			
Tightness of foundation and hold-down bolts				✓		
Check coupling alignment and integrity (maintain records) ■				✓		
Add grease to pump anti-friction bearings (maintain records) ■				•		
Add grease to universal joint shafting u-joint bearings, anti-friction steady bearings (maintain records) ■				•		
Add grease to coupling (maintain records) ■				•		
Change anti-friction bearing oil (maintain records) ■				•		
Replace packing (all packing; not just the outermost ring) ■					•	
Clean and oil gland bolts (packed pumps) ■					•	
Verify free movement of packing glands (packed pumps) ■					✓	
Universal joint shafting and steady bearings wear check (replace bearings if required) ■					✓ •	
Clean packing box						•
Check and flush seal water and drain piping						•
Perform a comparative field test (flow, pressures, and power) with calibrated instruments. Restore internal running clearances if results are unsatisfactory (install new wear rings).						✓ •
Perform a comparative vibration test						✓
Remove packing and inspect sleeve(s). Replace if worn. (packed pumps) ■						✓ •
Realign coupled pumps (maintain records) ■						•
Remove pump handhole covers and inspect impeller for corrosion and excessive wear (sewage pumps) ■						✓
Remove handhole covers to inspect the wear ring clearances. When the wear ring clearances have doubled, adjust the ring clearances to original specifications if so supplied or install new wear rings (sewage pumps). ■						✓ •
Examine running clearance between propeller and propeller housing. When the running clearance has doubled, repair or replace the housing, housing liner, or propeller as appropriate. (model AFV axial flow pumps) ■						✓ •
Inspect the impeller running clearance. Inspect the impeller housing for excessive wear. If the wear is not excessive, perform impeller adjustment. If the wear is excessive, repair or replace the impeller housing. (open impeller mixed flow pumps, such as models SAF, SAFV, SAFH, or TMF) ■						✓ •
Inspect batteries & battery charger for proper charge.			✓			
Observe operation of fans & dampers such that the fans & dampers operate at set temperature, and damper opens upon operation of the diesel engine.			✓			
Jockey Pump – See manual for specific jockey maintenance requirements.			✓			
Engine Maintenance (Belts / Filters / Oil / Fuel Strainer) [See O&M manual for Engine]			✓ •			
Replace any worn caulk around pipe exits on buildings.					✓	
Building Heater - Inspect for proper operation.					✓	
Inspect operation of all valves in system.					✓	
Lights (Outside, Inside, Emergency) – Inspect for proper operation.					✓	

Issue 020907

Sequence of Operation

Duplex Variable Speed Booster

Rev. 1 02/08/16

Basic Operation

The pumps are started and stopped according to discharge pressure and kw (power).

The “PID Set-point” is the set-point pressure desired to be maintained at the discharge header.

The start and stop pressure set-points for the lead and lag pumps are “deviations” below the “PID Set-point”.

The kw start and stop set-points are based on the horsepower and number of pumps running.

The operator can adjust the speed of the VFDs manually by placing the speed command to manual in the operator interface and altering the pump(s) speed by using the increase and decrease (up and down arrow) buttons.

The lead pump will start after an adjustable time delay when the discharge pressure drops to the start lead pressure set-point.

The lag pump will start after an adjustable time delay when the discharge pressure drops to the start lag pump pressure set-point or when the total kw meets or exceeds the start lag pump set-point or if the optional flow sensor is supplied, when the flow rate meets or exceeds the start lag pump set-point.

Once a pump has started, it will run for an adjustable minimum run time. The factory default minimum run time is set to 10 minutes.

Shutdown will occur in reverse order according to the starting sequence.

The lag pump will stop when the discharge pressure has risen to the stop lag pump set-point, its minimum run timer has expired, the total kw drops to or below the stop lag pump set-point and if the optional flow sensor is supplied, when the flow rate drops to or below the stop lag pump set-point.

The lead pump will stop when the discharge pressure has risen to the stop lead pump set-point, its minimum run timer has expired, the lag pump has stopped, the speed (PID Output) has dropped below an adjustable set-point and there is no flow as sensed by the optional no flow switch.

An optional no-flow switch can be provided to hold the lead pump on as long as there is 5 or more GPM still flowing through the system. This prevents unnecessary “cycling” of the lead pump.

Equal sized pumps are alternated every time all equal pumps have stopped (duty cycle alternation) or after 24 hours whichever occurs first. The hour for which the 24 hour alternation change occurs can be selected by the operator.

Once the system piping has been filled, the operator simply performs the following:
Set the HOA switches in the automatic position.
Set the desired PID pressure setpoint.
Set the starting and stopping set-point pressure deviations of the lead and lag pumps.
Set the starting and stopping kw set-points of the lag pumps.
Set the starting and stopping flow rate set-points of the lag pumps if optional flow sensing is provided.
Set the speed control mode to “Auto”

Safety Startup Mode

In the automatic mode of operation, if the pumps are stopped for certain conditions such as a shutdown alarm or if the system is disabled, the controller contains a routine which will take the system into a safety startup mode once the shutdown alarm condition has been reset or the system has been re-enabled.

Once a shutdown condition has been reset or the system has been re-enabled, the controller compares the current discharge pressure to the goal (final) PID set-point pressure. If the current discharge pressure is not more than 5 PSI (adjustable) below the goal PID set-point, then the goal set-point is moved into the set-point register and normal operation is resumed. If the current discharge pressure is more than 5 PSI (adjustable) below the goal PID set-point, then the current discharge pressure is used as the initial startup set-point.

When the discharge pressure reaches the initial set-point, then 5 psi (adjustable) is added to the set-point after a 10 second (adjustable) time delay. This routine continues until the discharge pressure is within 5 psi (adjustable) of the goal set-point.

Once the discharge pressure is within 5 psi (adjustable) of the goal set-point, the goal set-point is moved into the set-point register and normal operation is resumed.

During the startup mode, if the system fails to maintain any set-point pressure for an adjustable time (default of 5 minutes), the pump is stopped and the system is locked out, requiring a manual reset.

The conditions are as follows:

- Power loss
- Low suction shutdown
- High suction shutdown
- High discharge shutdown
- Discharge pressure transducer failure
- All pumps have failed
- All pump HOA switches are turned off
- System has been disabled (via timeclock enable/disable)
- Goal set-point has been set to “0”
- Irregular Power (Optional)

Low Suction Shutdown

In the event of low suction (supply) pressure, the pumps will be stopped and the Low Suction Pressure alarm will be initiated after an adjustable time delay. The alarm will automatically reset after 10 seconds (adjustable) if configured for auto reset or will require a manual reset if the alarm is configured for manual reset when the pressure rises above the alarm set-point. Once reset, the pumps will be re-enabled.

High Suction Shutdown

In the event of the optional high suction (supply) pressure, the pumps will be stopped and the High Suction Pressure alarm will be initiated after an adjustable time delay. The alarm will automatically reset after 10 seconds (adjustable) if configured for auto reset or will require a manual reset if the alarm is configured for manual reset when the pressure drops below the alarm set-point. Once reset, the pumps will be re-enabled.

Low Discharge Alarm

In the event of a low discharge pressure condition, the Low Discharge Pressure alarm will be initiated after an adjustable time delay. The alarm will automatically reset after 10 seconds (adjustable) if configured for auto reset or will require a manual reset if the alarm is configured for manual reset when the discharge pressure rises above the alarm set-point.

High Discharge Shutdown

In the event of a high discharge pressure condition, the pumps will be stopped and the High Discharge Pressure alarm will be initiated after an adjustable time delay. The alarm will automatically reset after 10 seconds (adjustable) if configured for auto reset or will require a manual reset if the alarm is configured for manual reset when the discharge pressure drops below the alarm set-point. Once the alarm is reset, the pumps will be re-enabled.

Irregular Power (Optional)

In the event of an irregular power condition as sensed by a phase monitor, the pumps will be stopped and the Irregular Power alarm will be initiated. Once the irregular power condition has been corrected, the pumps will be automatically re-enabled and the alarm will be reset.

Discharge Pressure Transducer Failure

In the event of discharge pressure transducer failure, the pumps will be stopped and the PLC will remove this failed sensor from operation. The operator will be able to start the pumps manually in an emergency only using the LOC/REM key on each VFD and adjust the speed(s) manually at each VFD keypad by use of the up and down arrow keys. When the pumps are started in this manner, there are no pump or system shutdown safeties. The operator must monitor the system continuously when operating pumps in the backup start mode to prevent damage to the system, the pumps or other devices connected to the system.

Suction Pressure Transducer Failure

In the event of suction pressure transducer failure, the pumps will be stopped and the PLC will remove this failed sensor from operation. The operator will be able to start the pumps manually in an emergency only using the LOC/REM key on each VFD and adjust the speed(s) manually at each VFD keypad by use of the up and down arrow keys. When the pumps are started in this manner, there are no pump or system shutdown safeties. The operator must monitor the system continuously when operating pumps in the backup start mode to prevent damage to the system, the pumps or other devices connected to the system.

PLC Failure

In the event of programmable logic controller (PLC) failure, the pumps will stop. The operator will be able to start the pumps manually in an emergency only using the LOC/REM key on each VFD and adjust the speed(s) manually at each VFD keypad by use of the up and down arrow keys. When the pumps are started in this manner, there are no pump or system shutdown safeties. The operator must monitor the system continuously when operating pumps in the backup start mode to prevent damage to the system, the pumps or other devices connected to the system.

HMI (Operator Interface) Failure

In the event that the HMI should fail, the PLC will continue to operate the system based on the last states for which the PLC was adjusted via the HMI. For example, if the HOA switches and speed control mode were left in the “auto” position, the PLC will continue to start, stop and regulate the pumps speed as if the HMI had never failed. Should the operator be required to stop the pumps, each VFD can be stopped at the VFD keypad by (1) pressing the LOC/REM key in order to place the VFD in local mode and then to press the “Stop” key, (2) the individual pump MSPs can be opened or (3) the main power disconnect can be opened to de-energize the system.

Pump/VFD Failure

In the event of a VFD fault or if the pump fails to run when called to start, the PLC will ignore the failed pump in the starting/running sequence and will start the remaining pump in its place. The PLC will put the failed pump back into the starting/running sequence once the VFD fault or call to run failure has been cleared.

Operator Interface

The HMI is menu button driven for ease of navigation. Following are some of the main screens.

“Menu” is the starting point for all screens.

“Main” displays the normal operating data screen which includes HOA switches, running lights, pressure, etc.

“Setup Menu” allows the operator adjust start/stop set-points, timers, etc.

“Alarms” displays the alarms screen. The operator can touch an alarm lamp to bring up information about a specific alarm.

Alarms that require a manual reset are reset via the “Manual Reset” button located on the alarms screen.

Communication

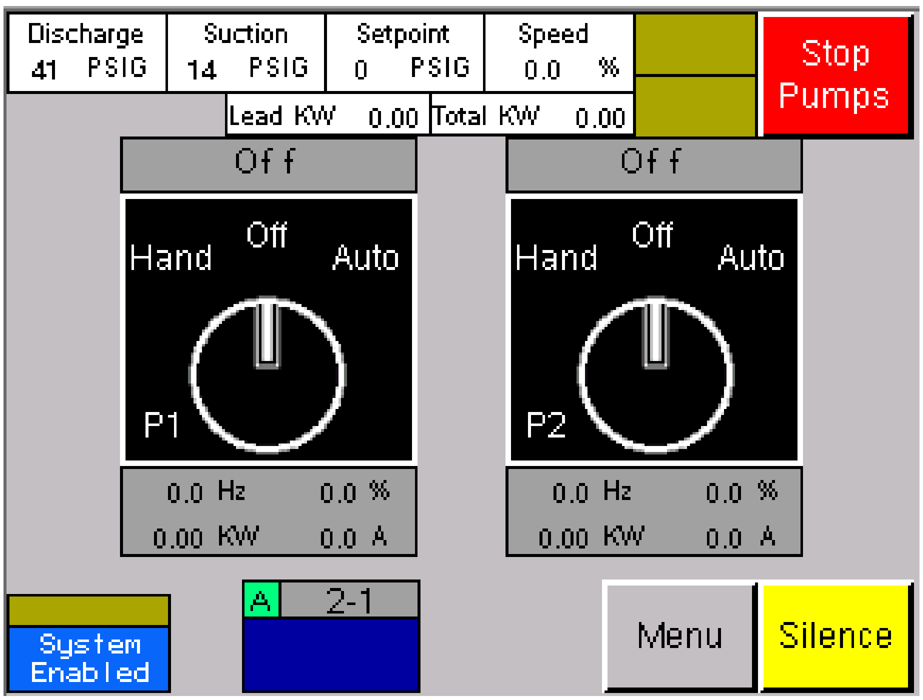
The control panel provides one dry normally open contact for system common alarm.

Generic

Initial Startup Screen

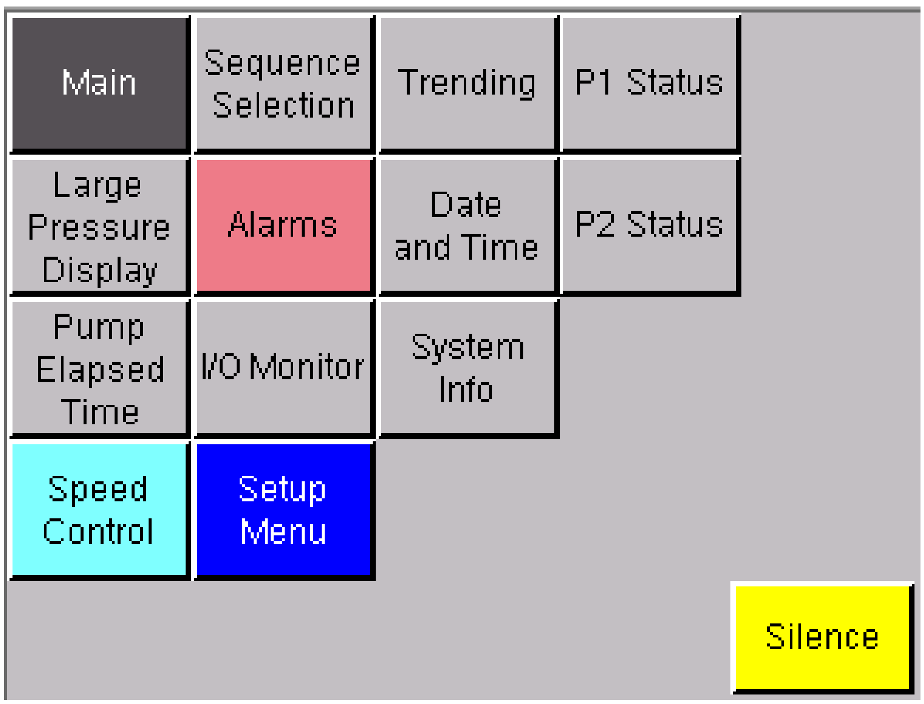
Generic

Main Screen



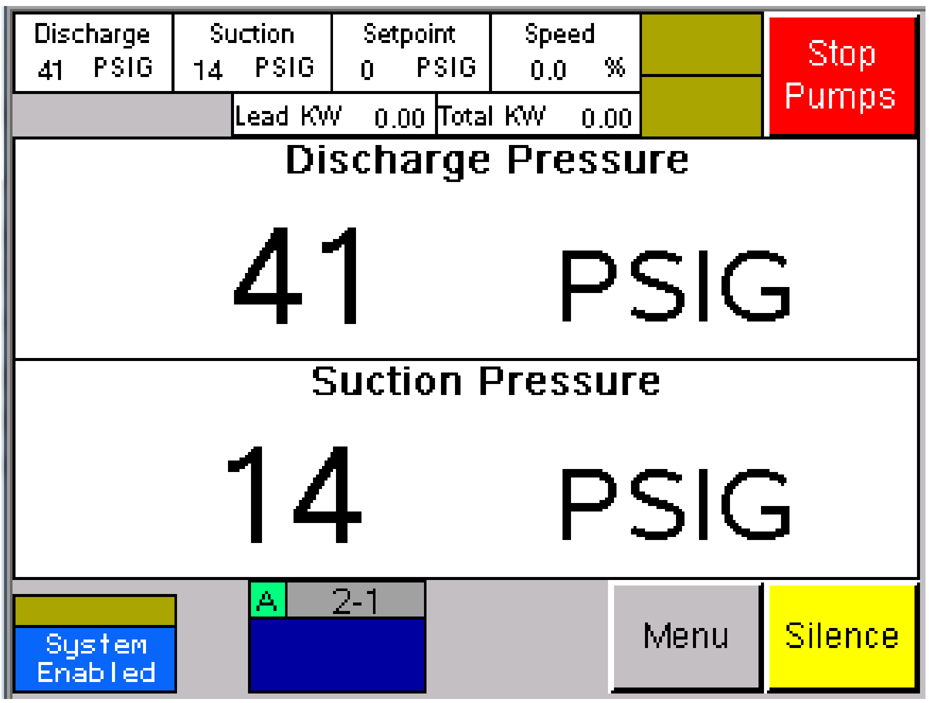
Generic

Menu



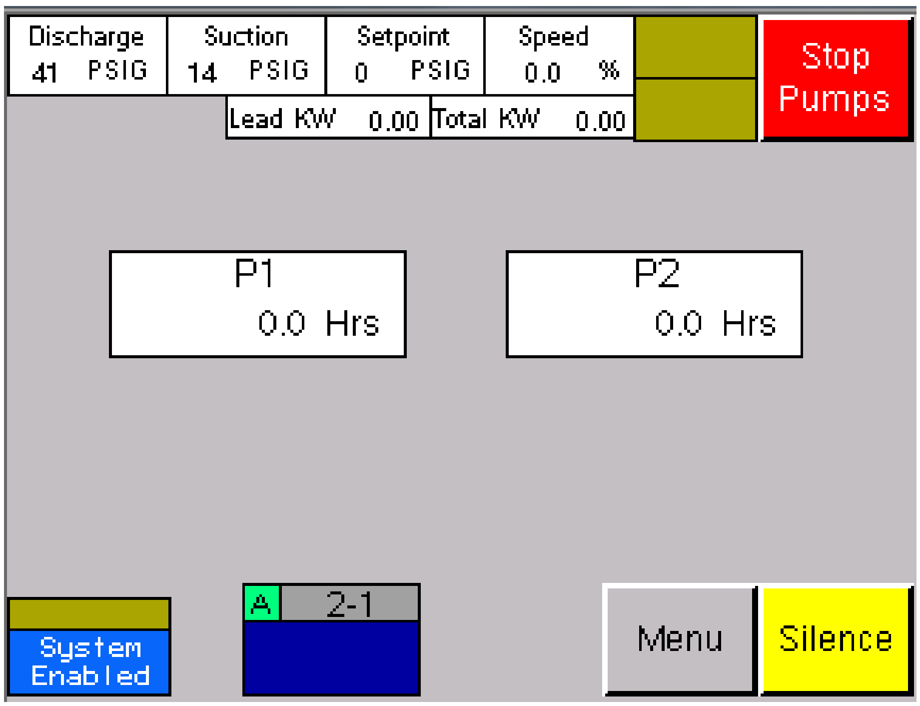
Generic

Large Pressure Display



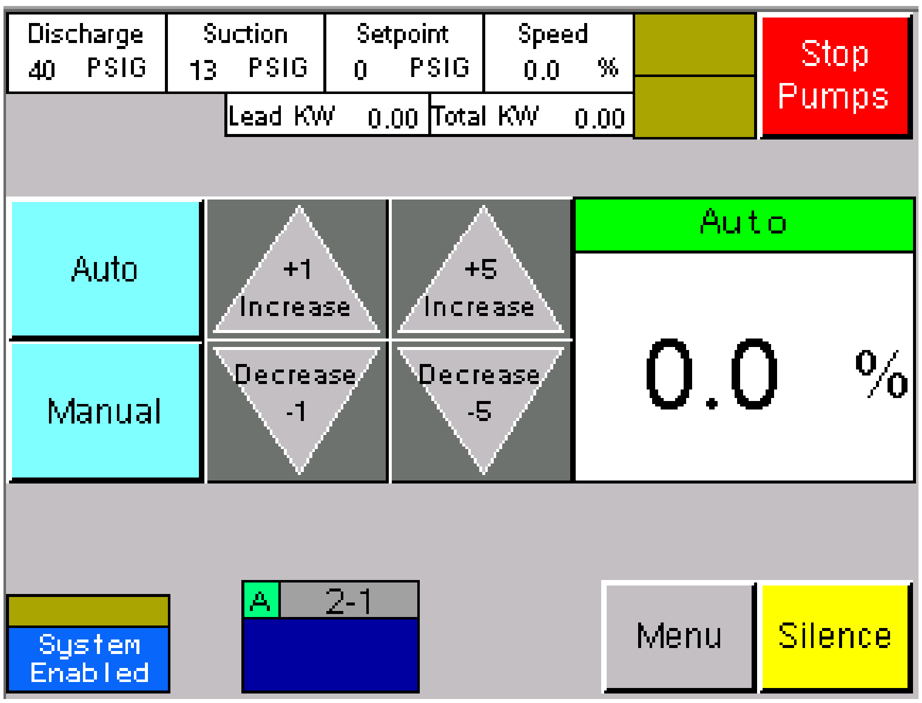
Generic

Pump Run Time



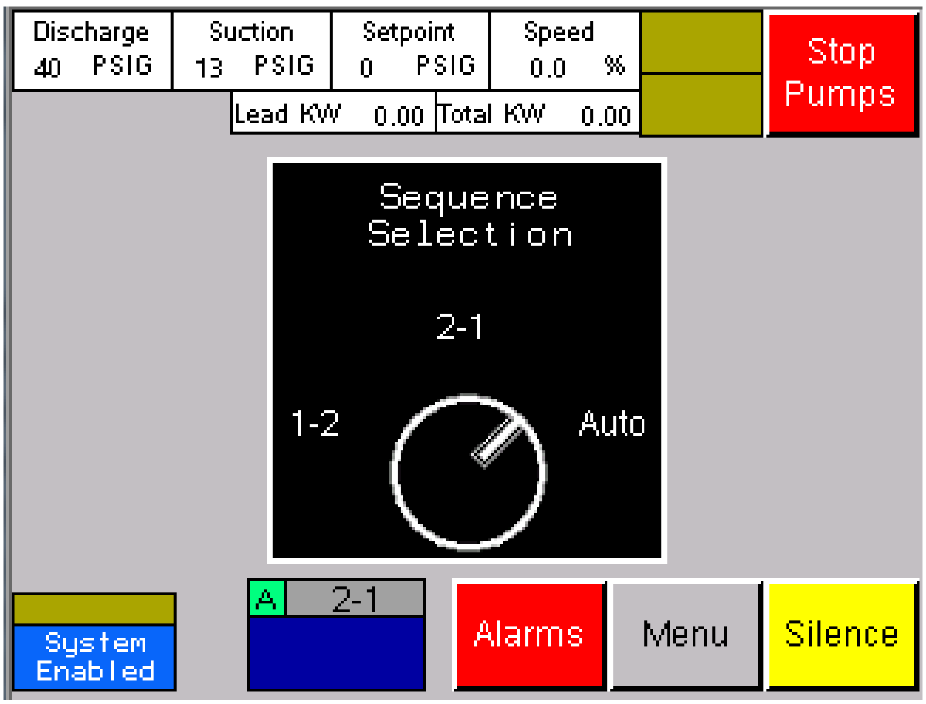
Generic

Speed Control



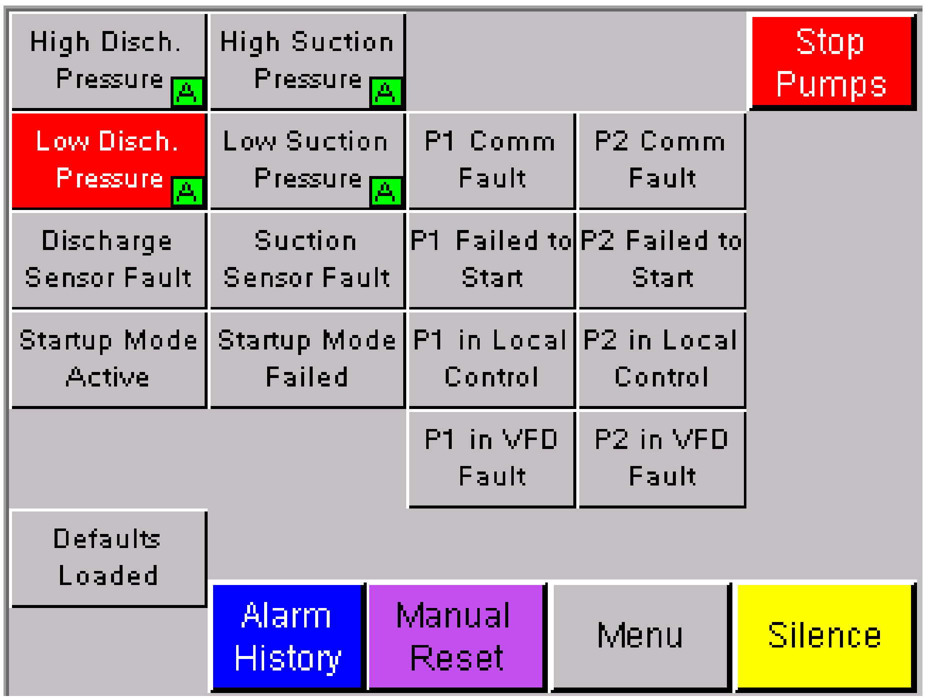
Generic

Sequence Selection



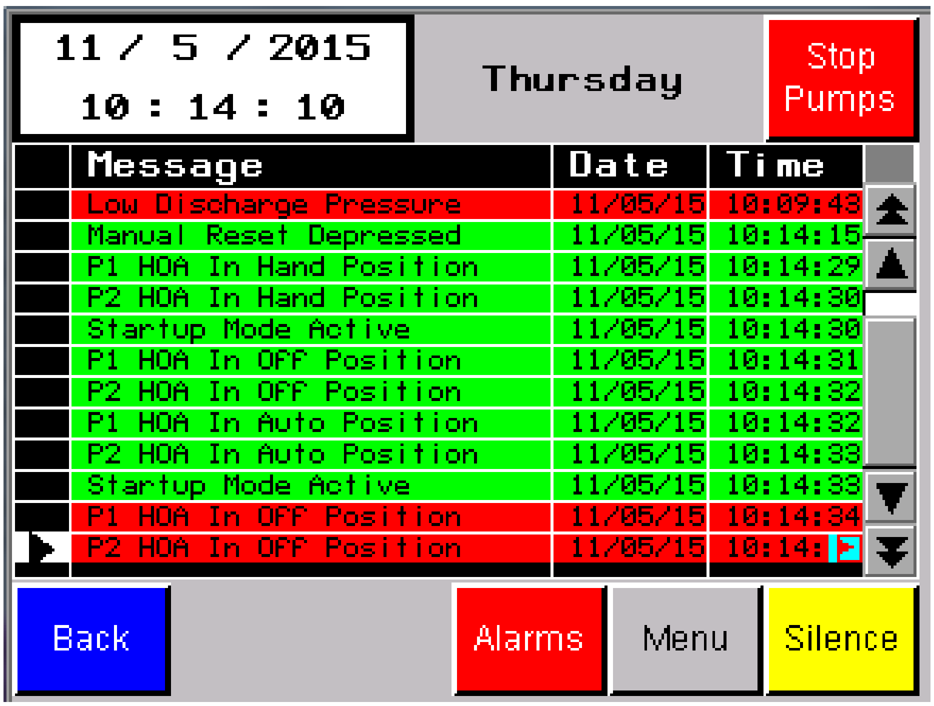
Generic

Alarms



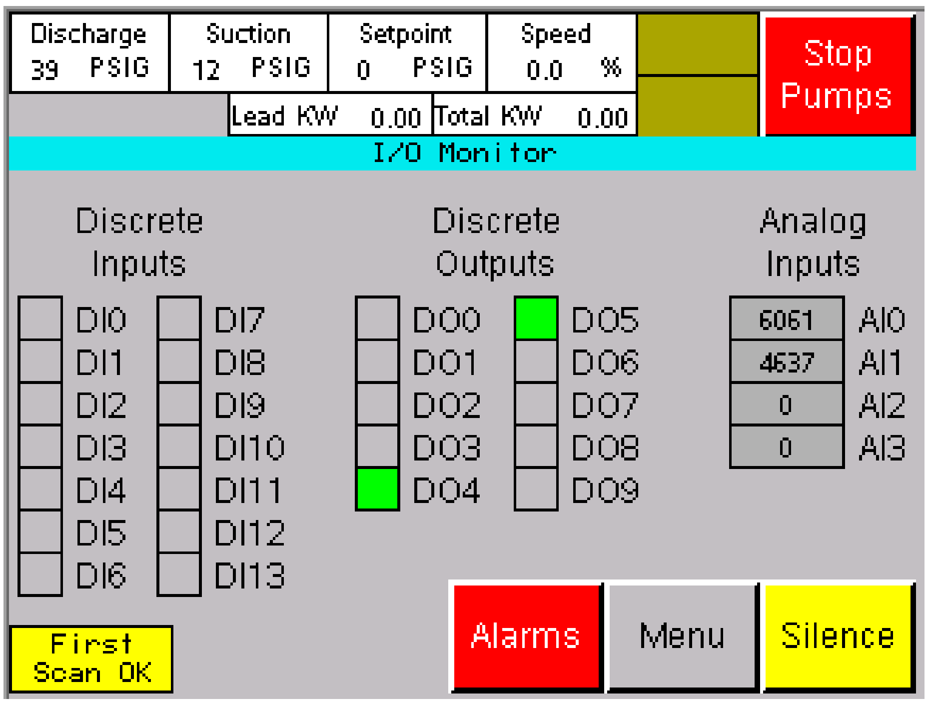
Generic

Alarms History



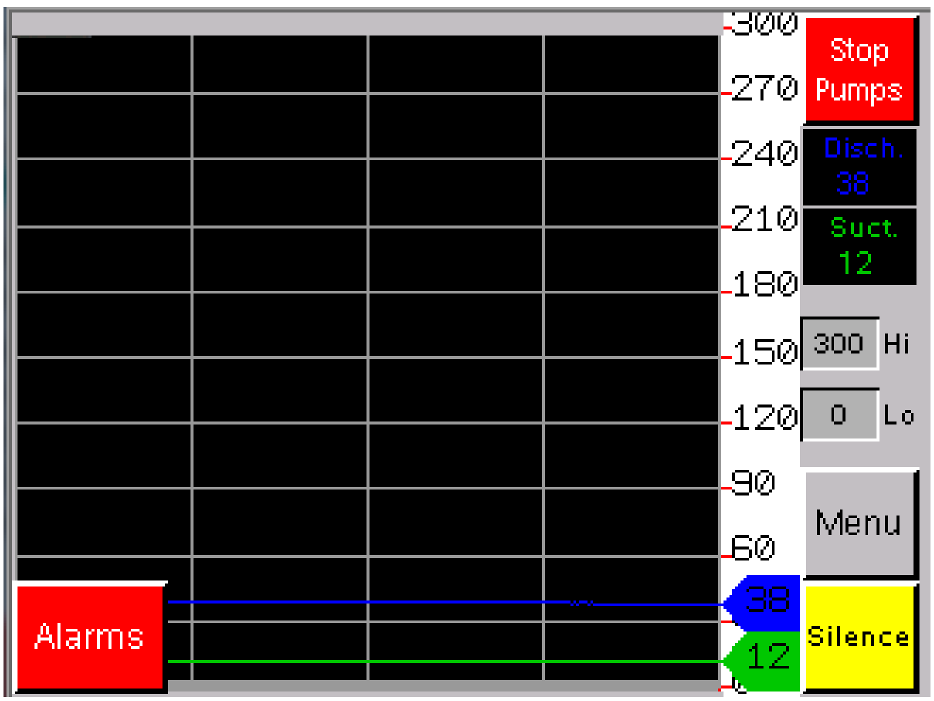
Generic

I/O Monitoring



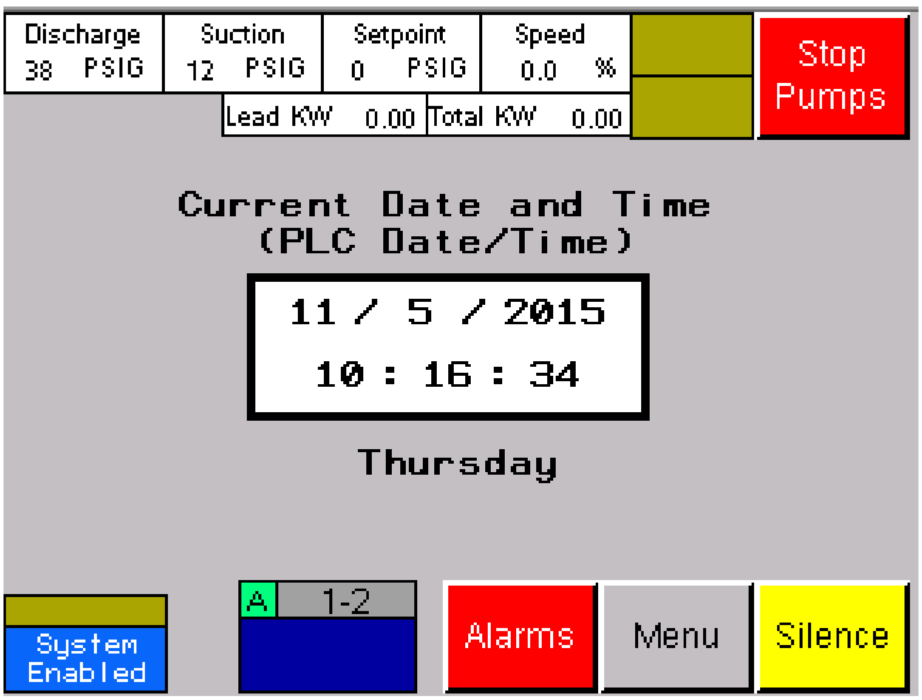
Generic

Pressure Trend Screen



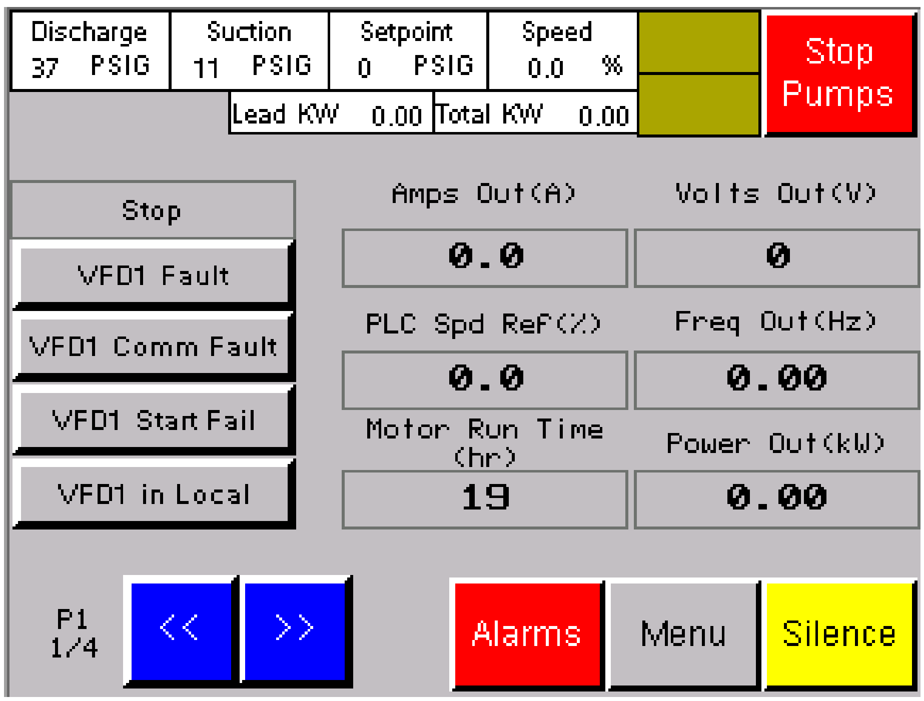
Generic

Date / Time



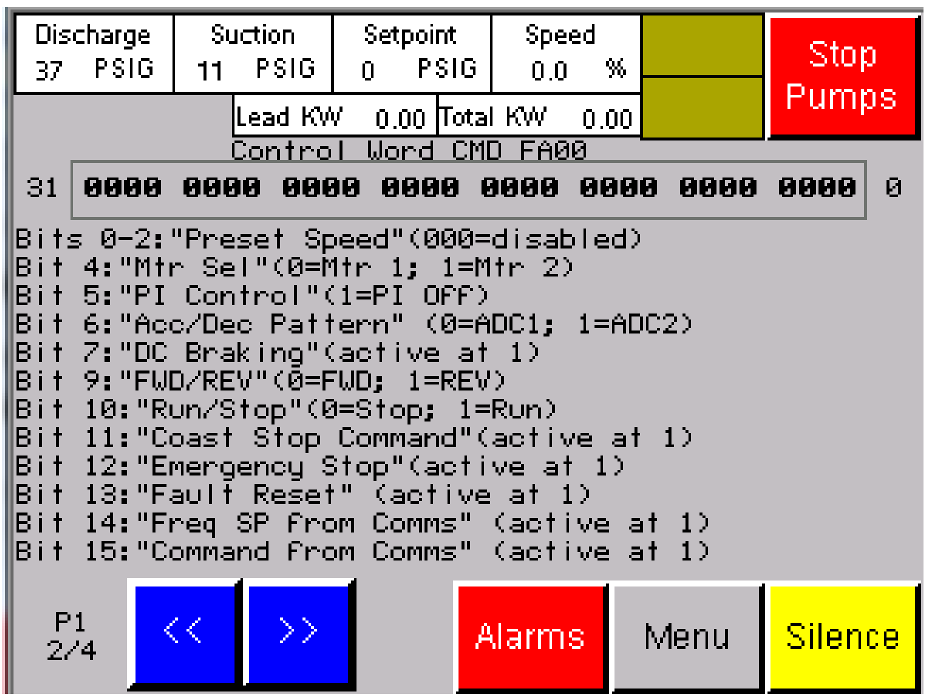
Generic

P1 Status



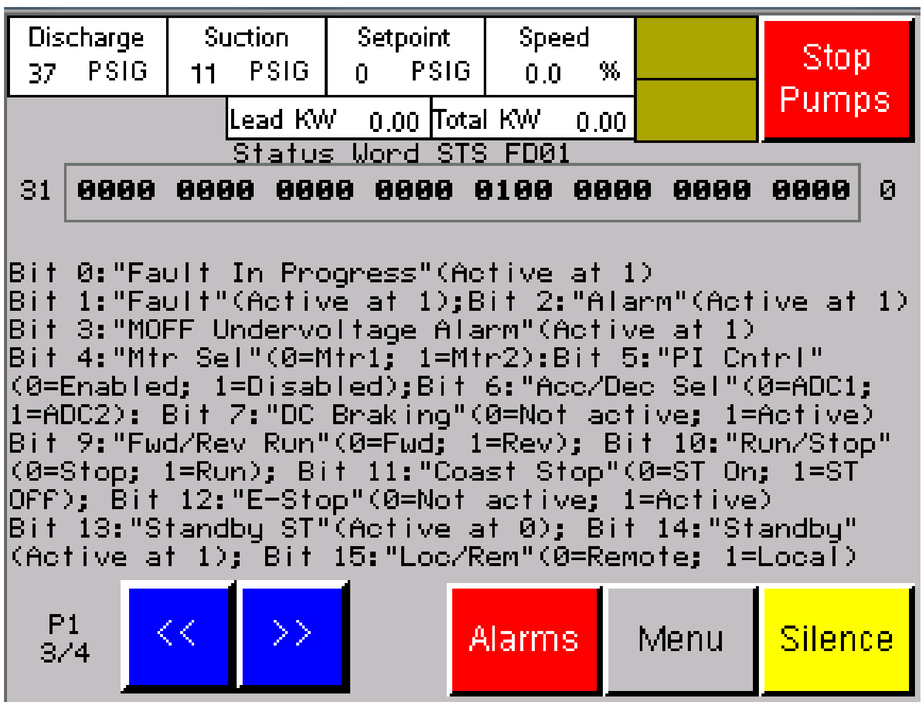
Generic

P1 Status



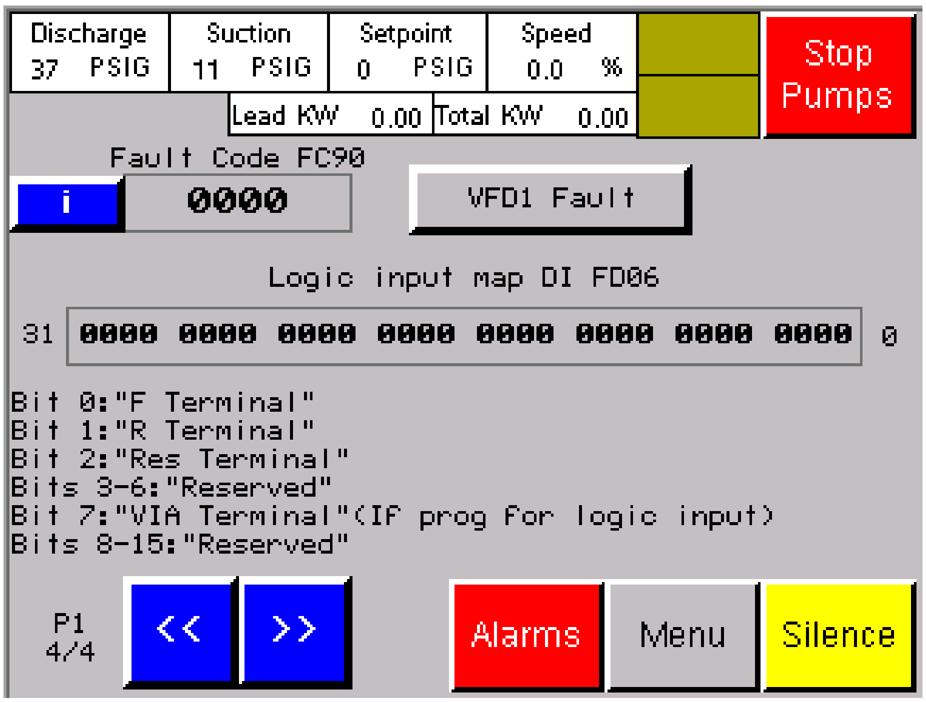
Generic

P1 Status



Generic

P1 Status



Generic

VFD Fault Codes

ATV-212 Fault Codes 1/3

Code	Value	Description
NErr	0	No error
OC1	1	Over-current during acceleration
OC2	2	Over-current during deceleration
OC3	3	Over-current during constant speed ops
OCL	4	Over-current in load at startup
OCA	5	Short circuit in arm
EPHI	8	Input phase failure
EPHO	9	Output phase failure
OP1	10	Overvoltage during acceleration
OP2	11	Overvoltage during deceleration
OP3	12	Overvoltage during constant speed ops
OL1	13	Over-LOAD in inverter
OL2	14	Over-LOAD in motor
OH	16	Overheat trip
E	17	Emergency stop
EEP1	18	EEPROM fault 1 (writing error)
EEP2	19	EEPROM fault 2 (reading error)
EEP3	20	EEPROM fault 3 (internal fault)

<< >> Alarms Menu Silence

Generic

VFD Fault Codes

ATV-212 Fault Codes 2/3

Code	Value	Description
Err2	21	RAM fault
Err3	22	ROM fault
Err4	23	CPU fault
Err5	24	Communication error trip
Err7	26	Current detector fault
Err8	27	Optional circuit board type error
UC	29	Small current trip
UP1	30	Trip due to undervoltage in main circuit
Ot	32	Over-torque trip
EF2	34	Ground fault trip (HW detection)
OC1P	37	Overcurrent flow in element during accel
OC2P	38	Overcurrent flow in element during decel
OC3P	39	Overcurrent flow in element during ops
EtYP	41	Inverter type error
OH2	46	External thermal input
SOUt	47	VIA cable break
E-18	50	Break in analog signal cable
E-19	51	CPU fault

<< >> Alarms Menu Silence

Generic

VFD Fault Codes

ATV-212 Fault Codes 3/3

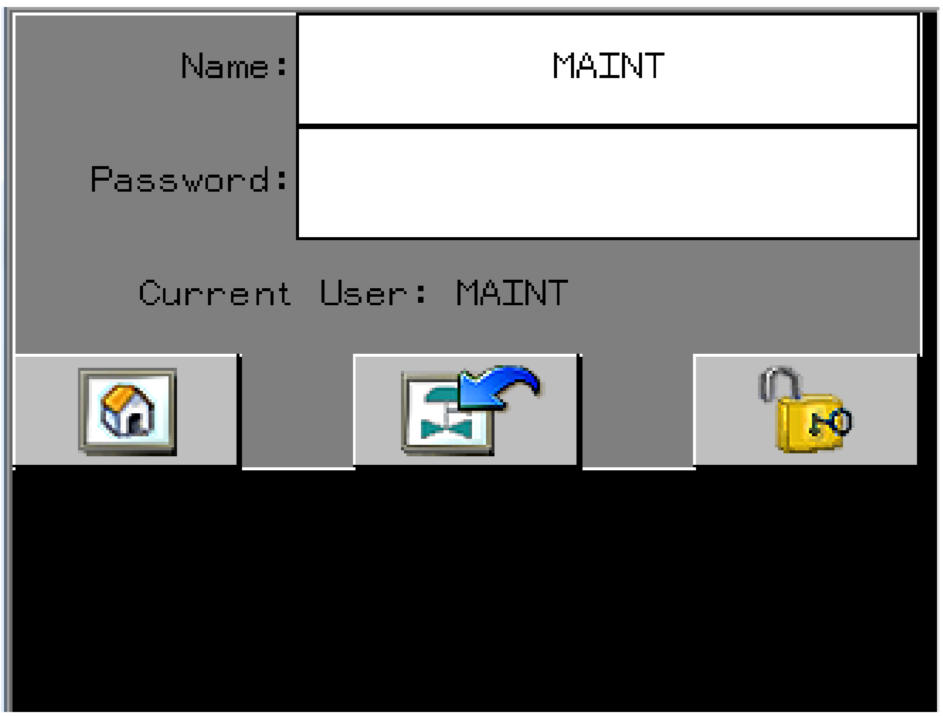
Code	Value	Description
E-20	52	Excess torque boost
E-21	53	CPU fault
Etn1	84	Auto-tuning error

<< >>

Alarms Menu Silence

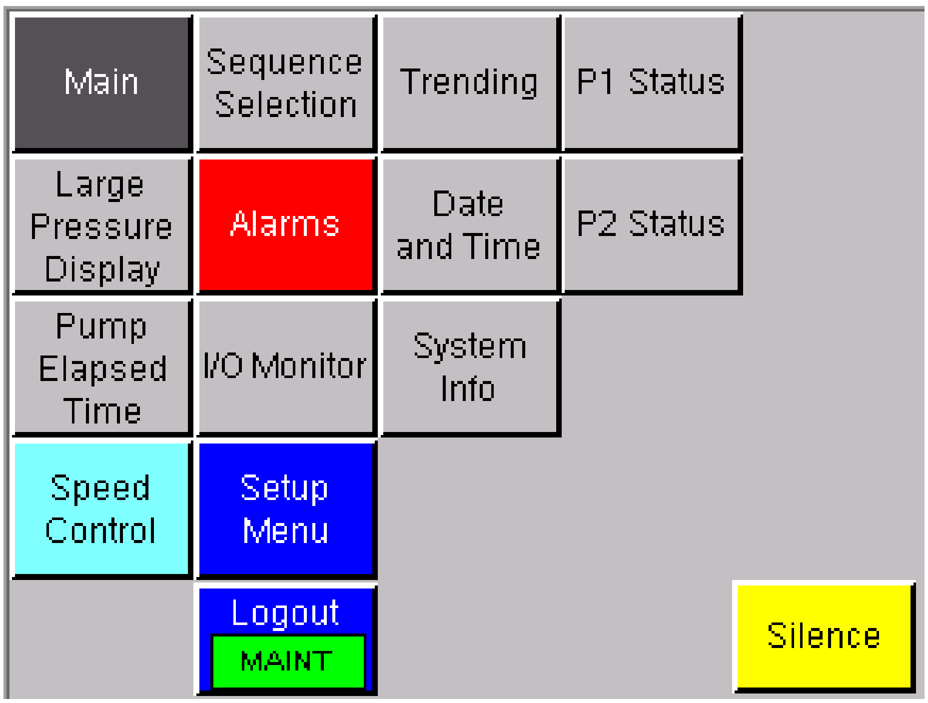
Generic

Login Screen
(Logged in)



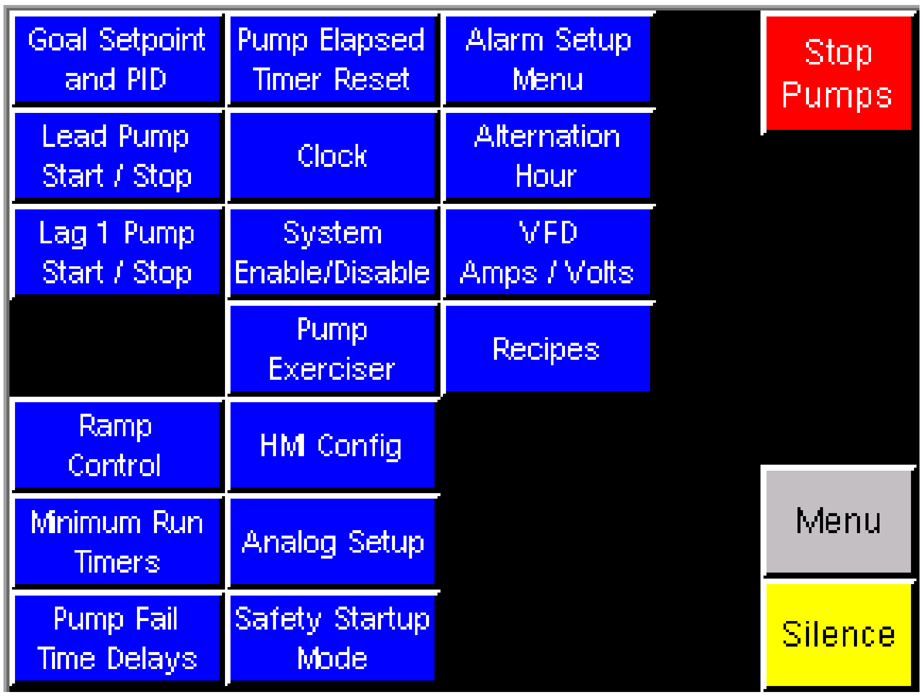
Generic

Menu
(Logged in)



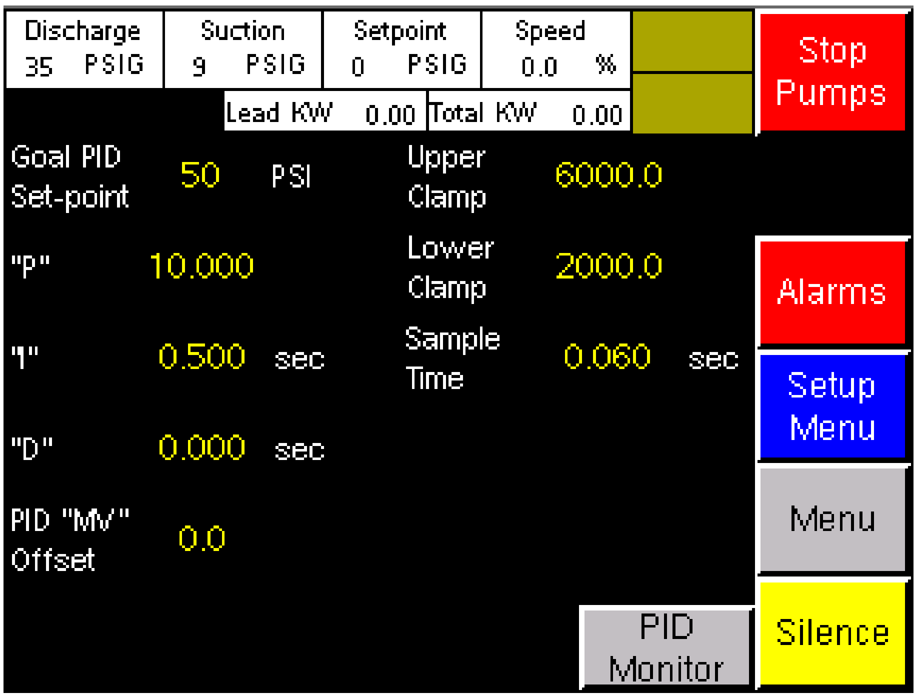
Generic

Setup Menu
(Logged in)



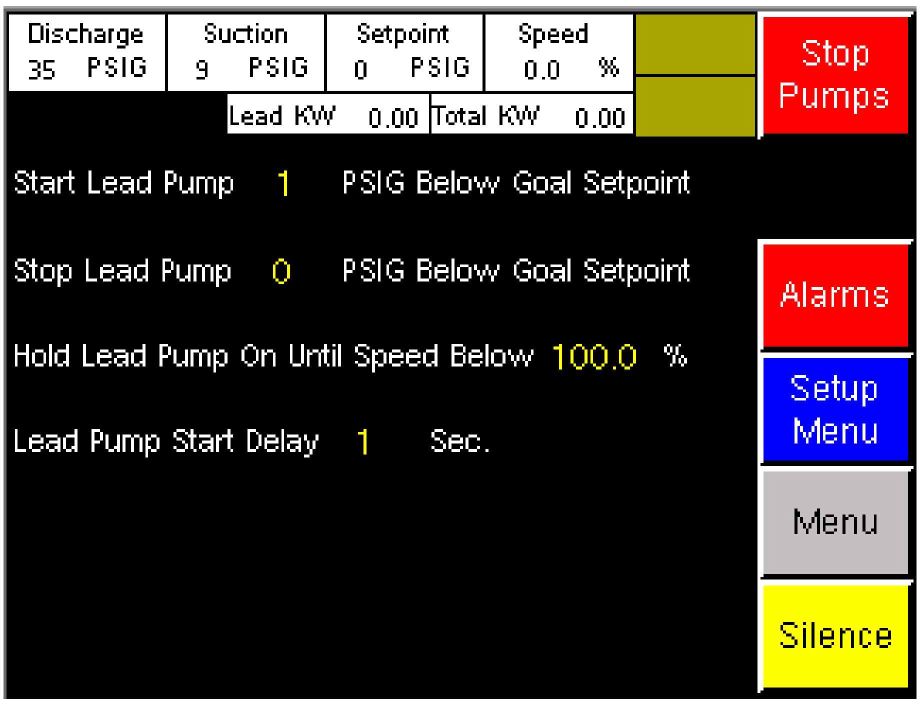
Generic

Setup (PID)



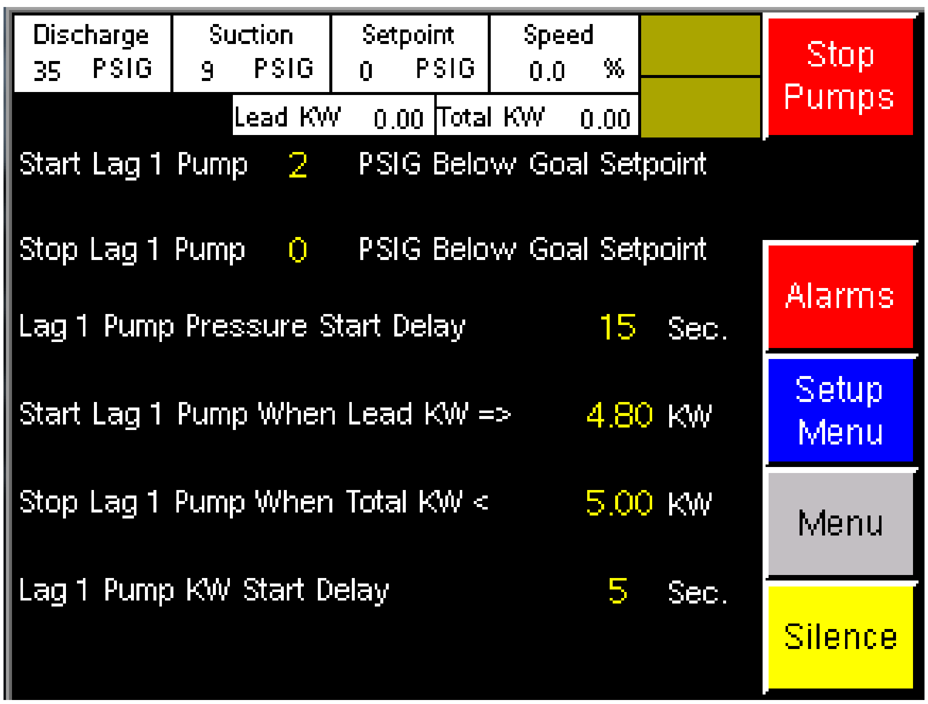
Generic

Setup (Lead Pump)



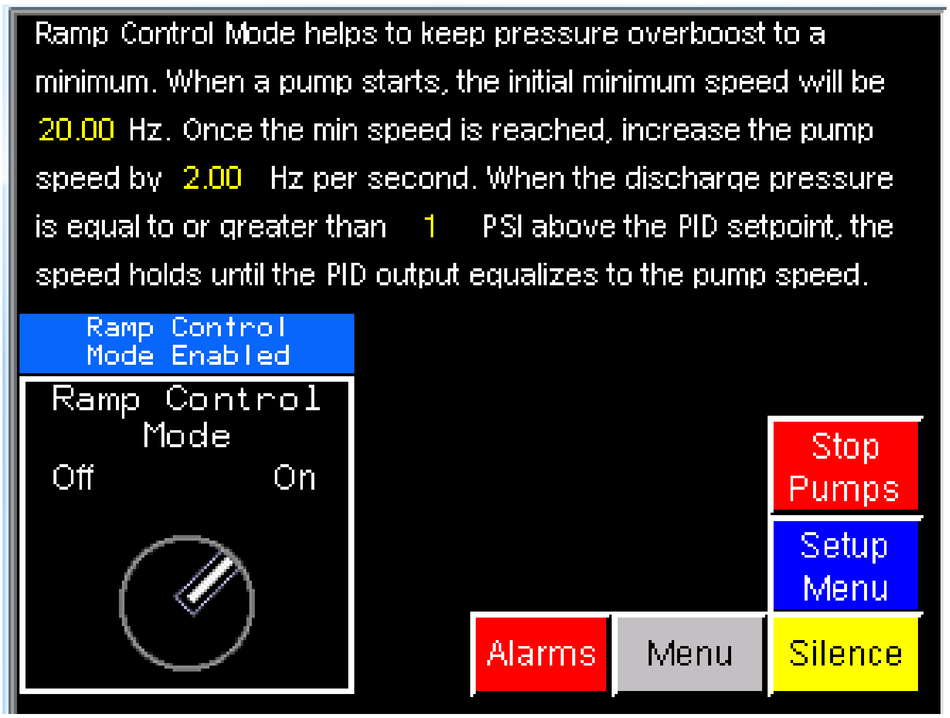
Generic

Setup (Lag Pump)



Generic

Setup (Ramp Control Mode)

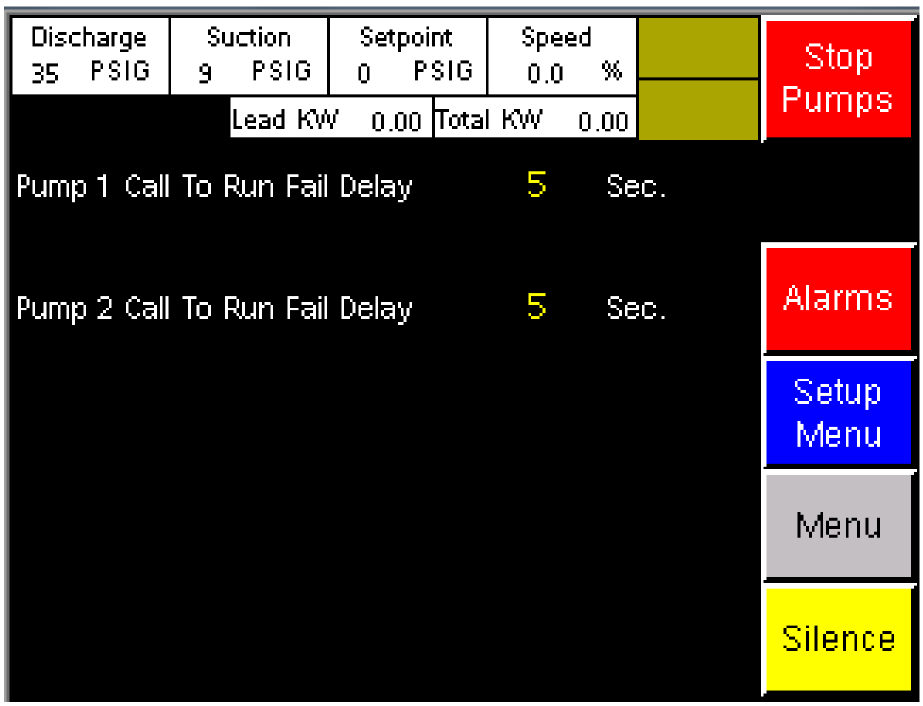


Generic

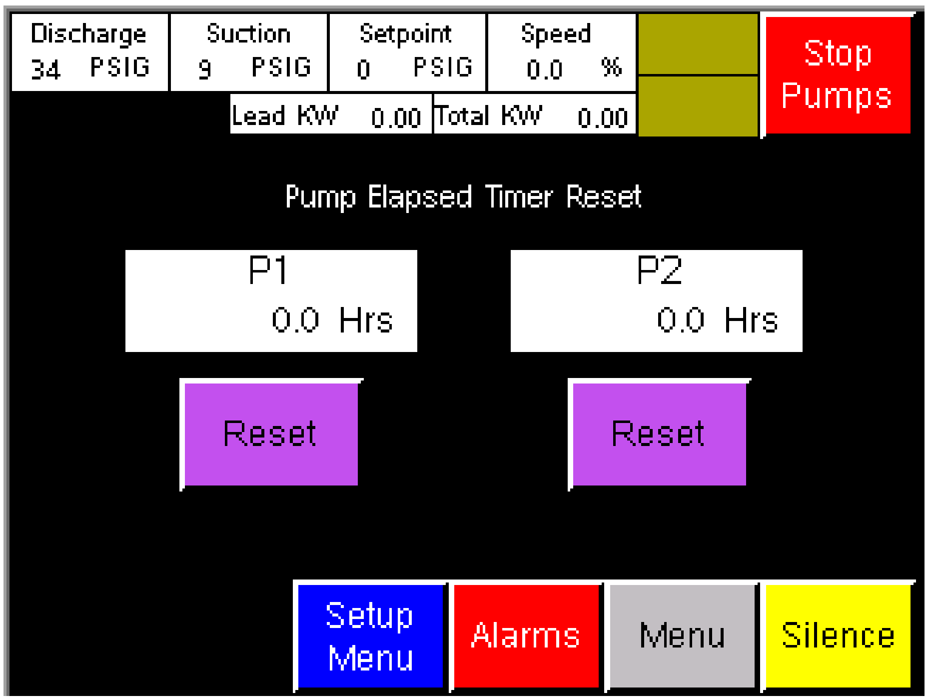
Setup (Pump Minimum Run Time)

Generic

Setup (Pump Call to Run Failure)

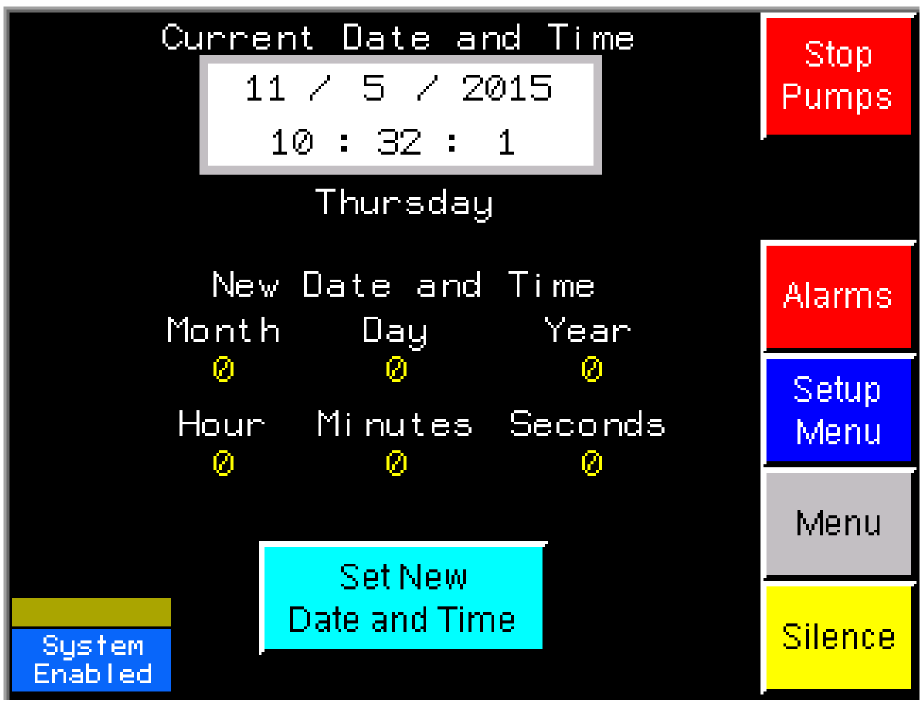


Setup (Pump Elapsed Time Reset)



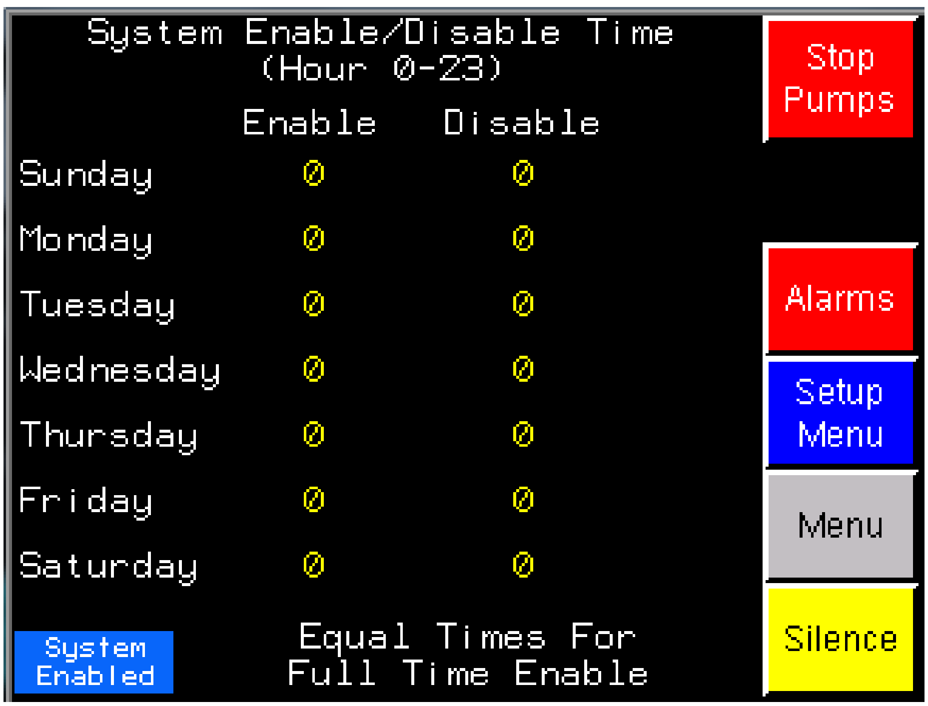
Generic

Setup (Date and Time)

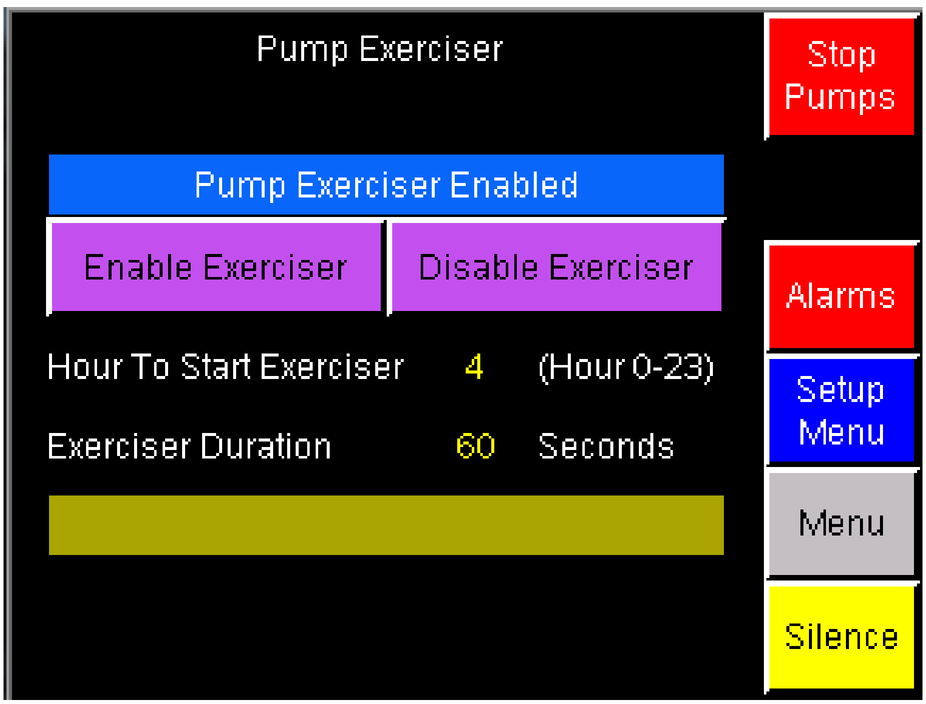


Generic

Setup (System Enable)

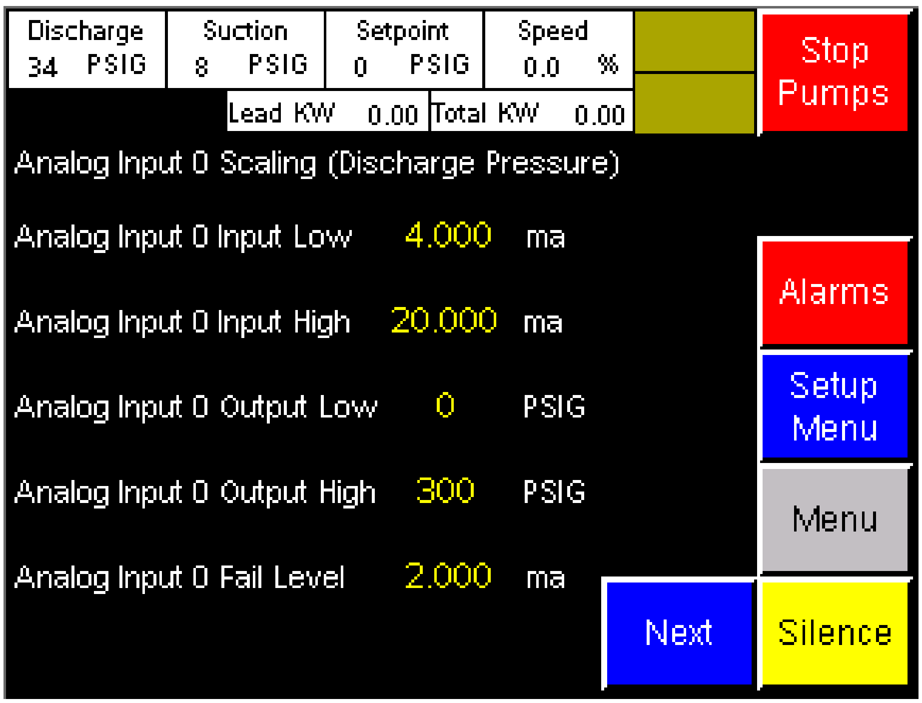


Setup (Pump Exerciser)

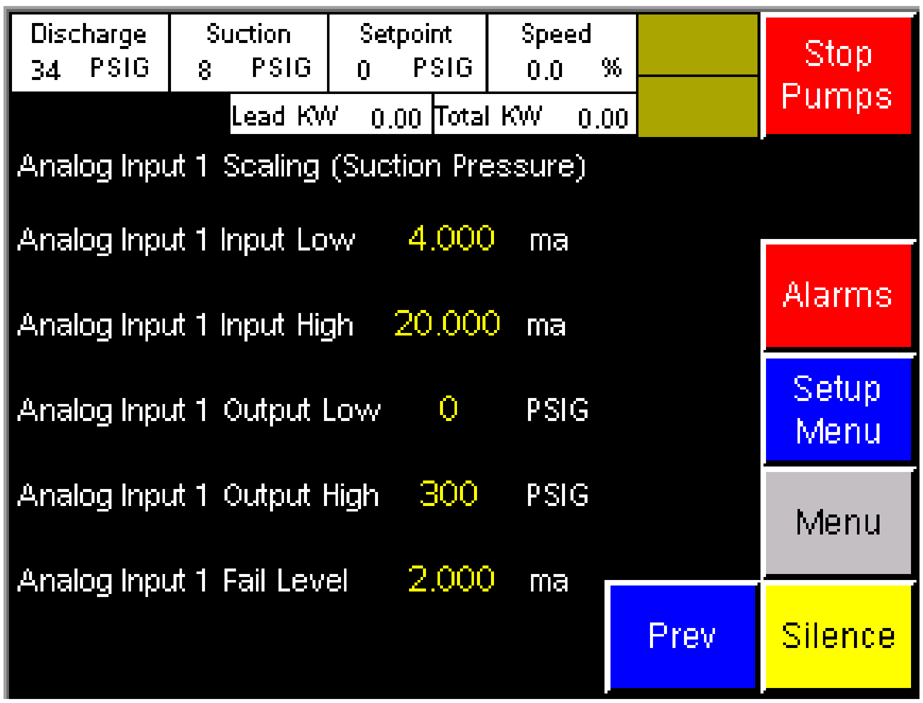


Generic

Setup (Analog Input 0)

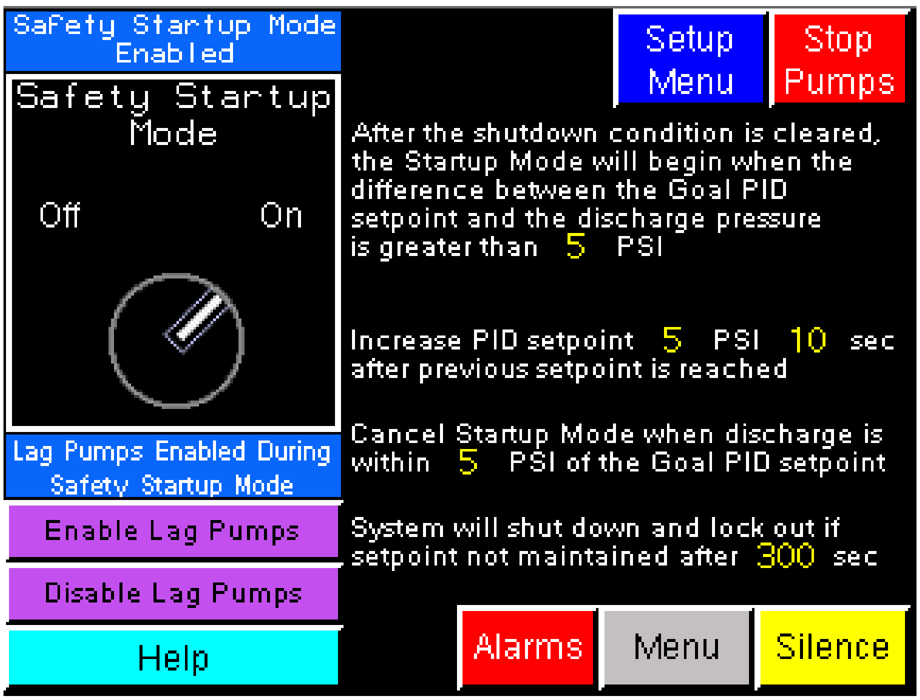


Setup (Analog Input 1)



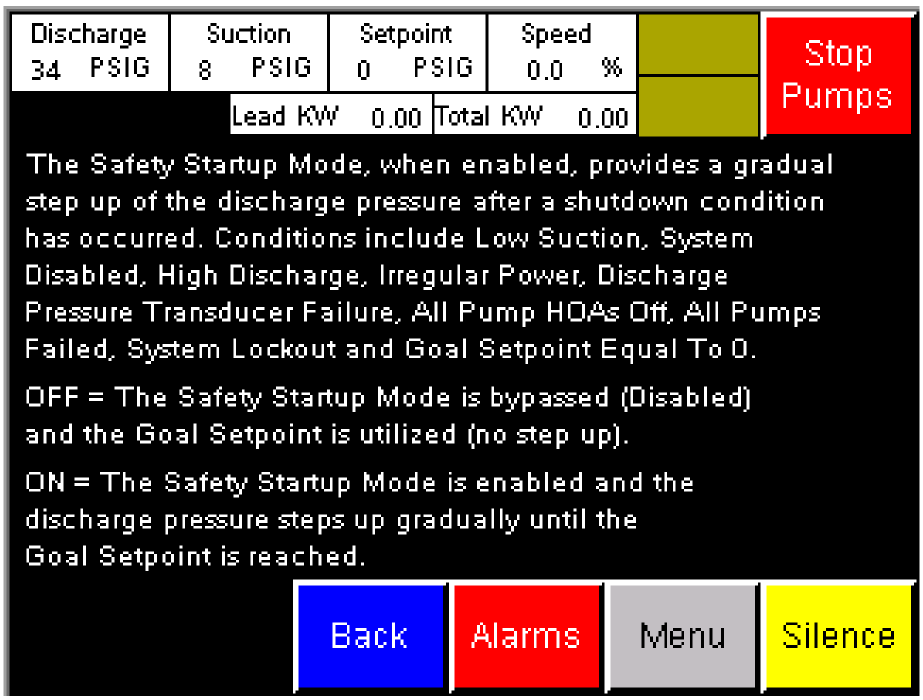
Generic

Setup (Safety Startup Mode)



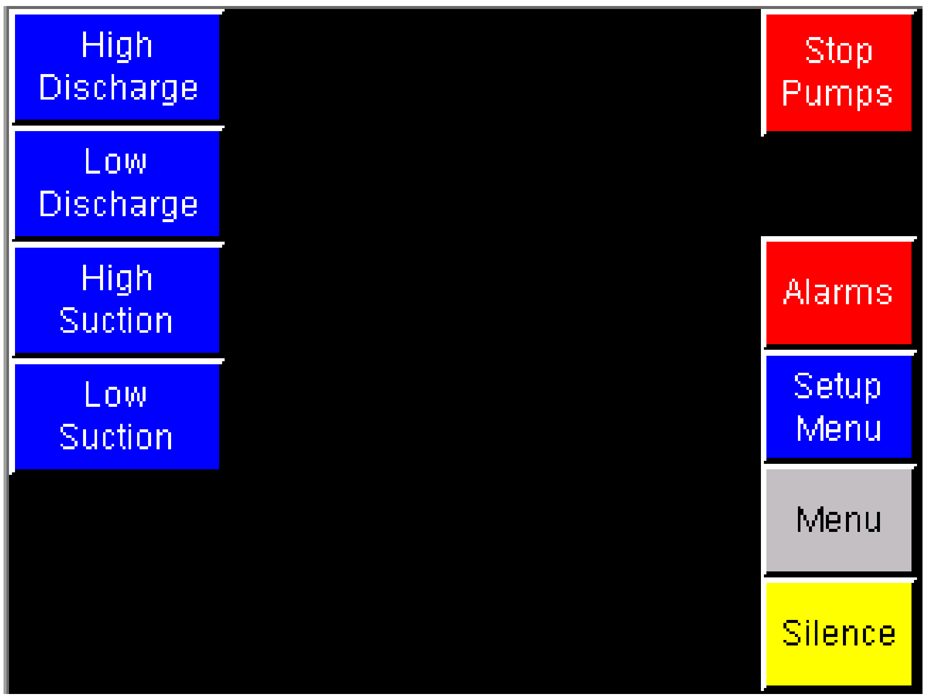
Generic

Setup (Safety Startup Mode Help)



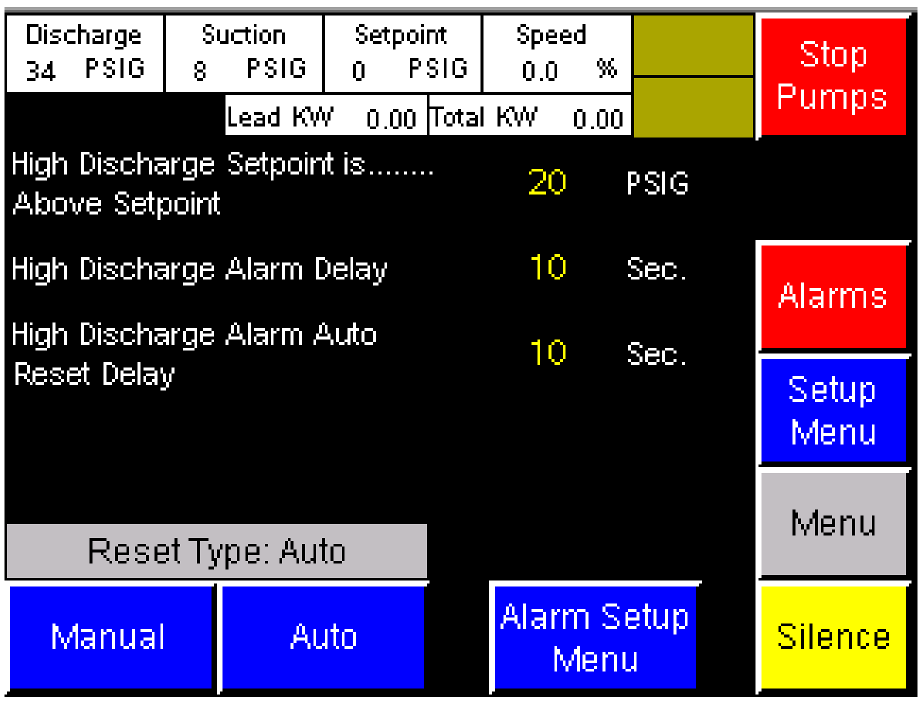
Generic

Setup (Pressure Alarm Setup Menu)



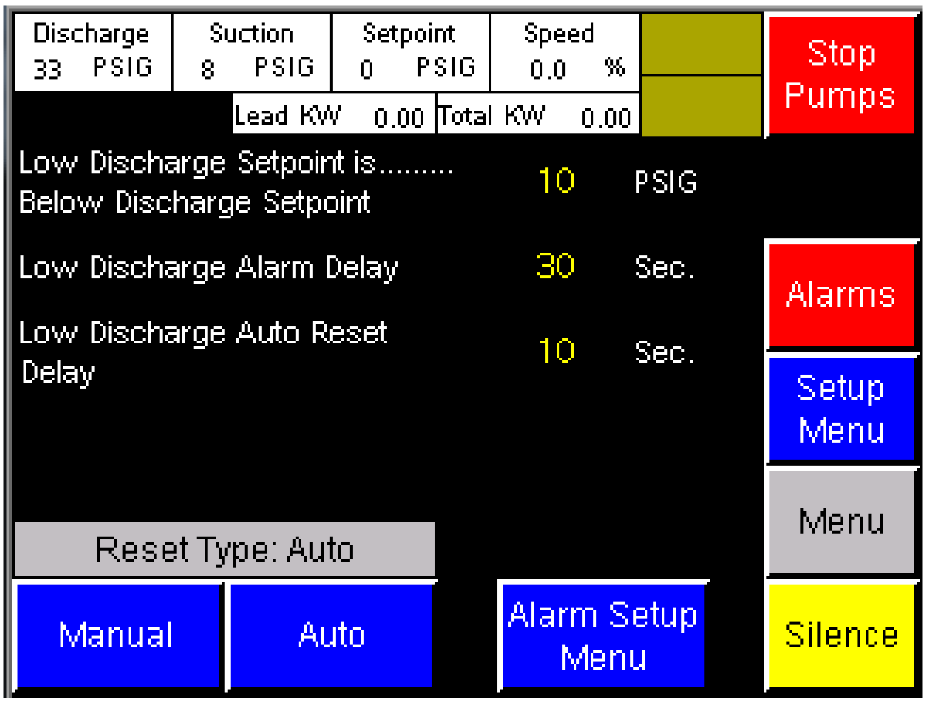
Generic

Setup (High Discharge Alarm Setup)



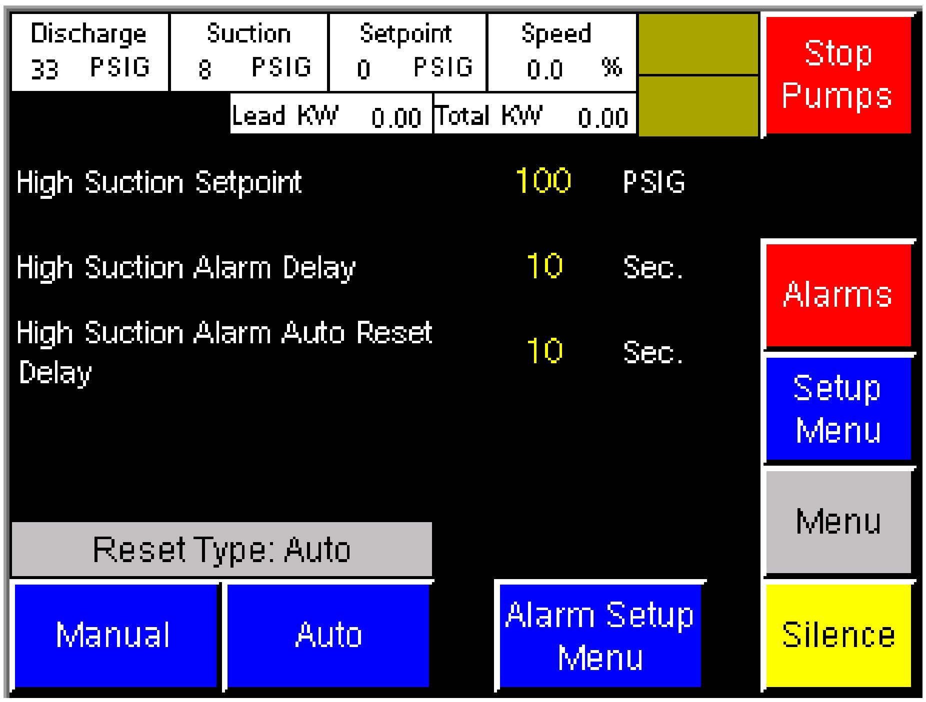
Generic

Setup (Low Discharge Alarm Setup)



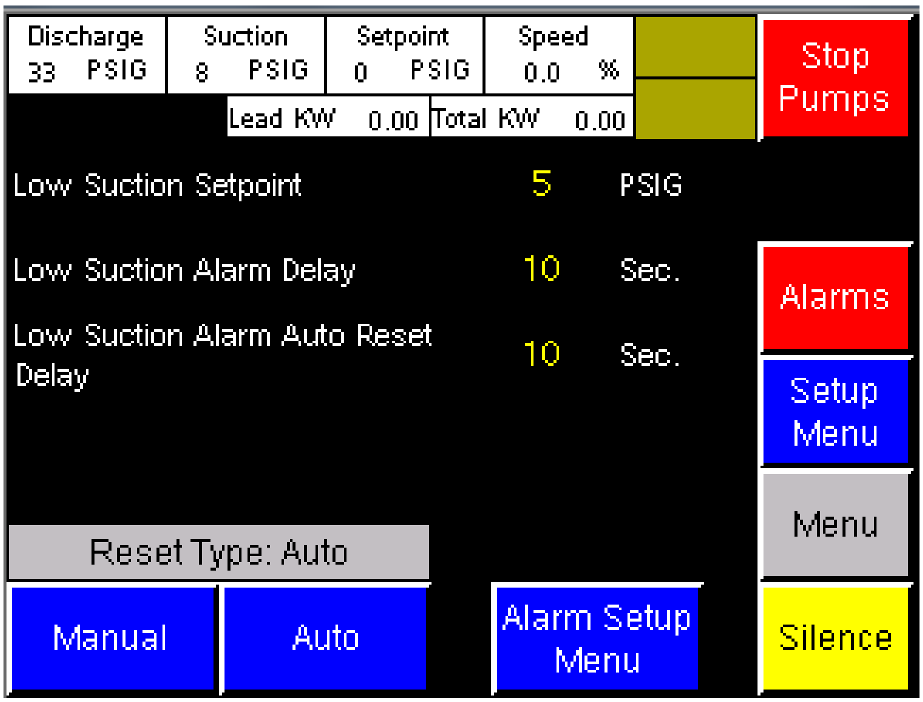
Generic

Setup (High Suction Alarm Setup)



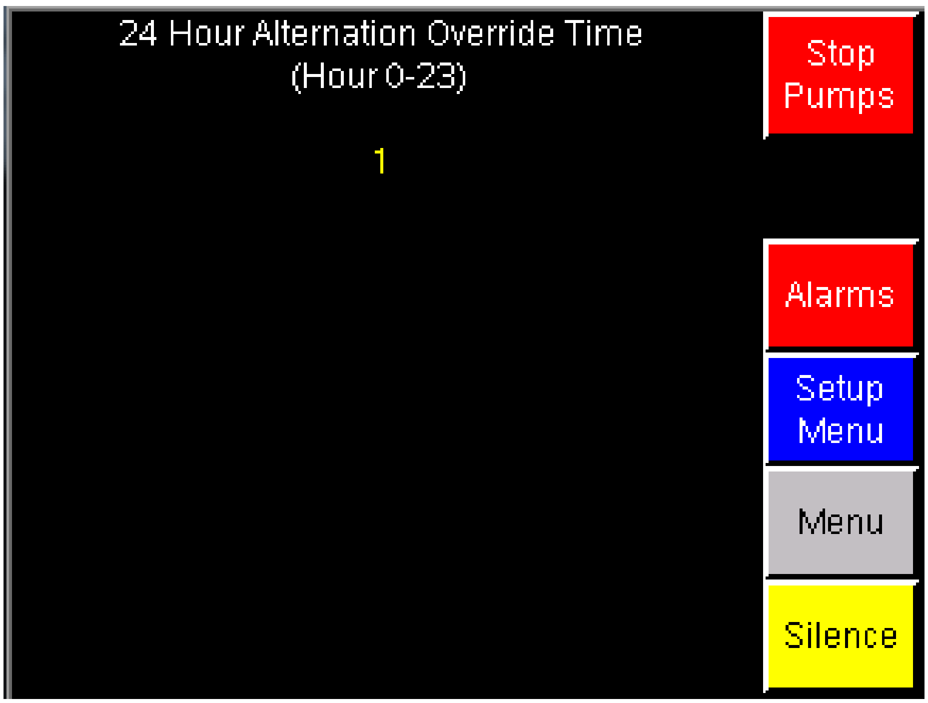
Generic

Setup (Low Suction Alarm Setup)



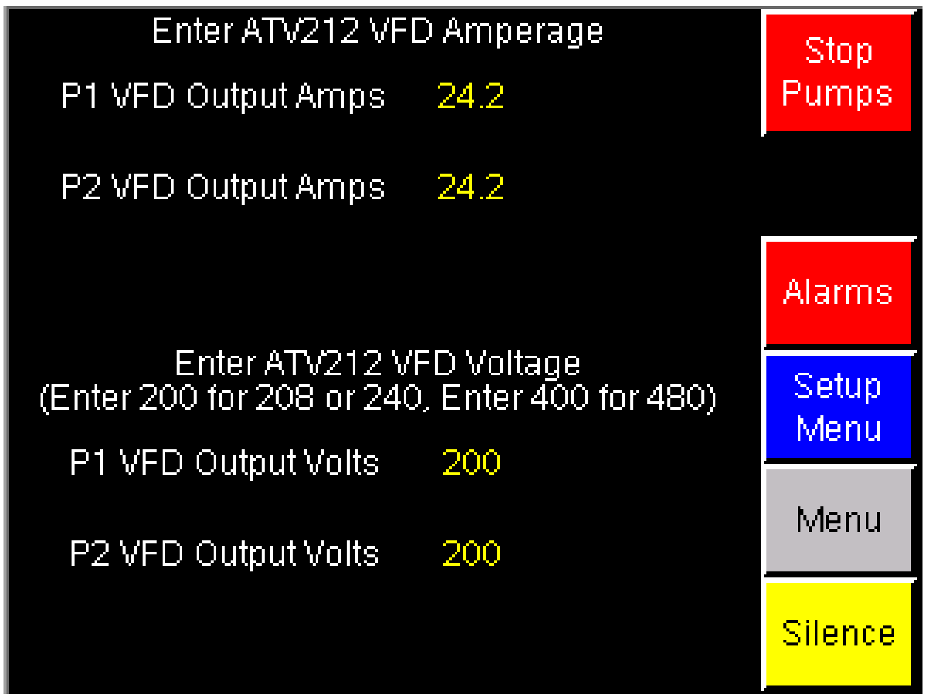
Generic

Setup (24 Hour Alternation Override)



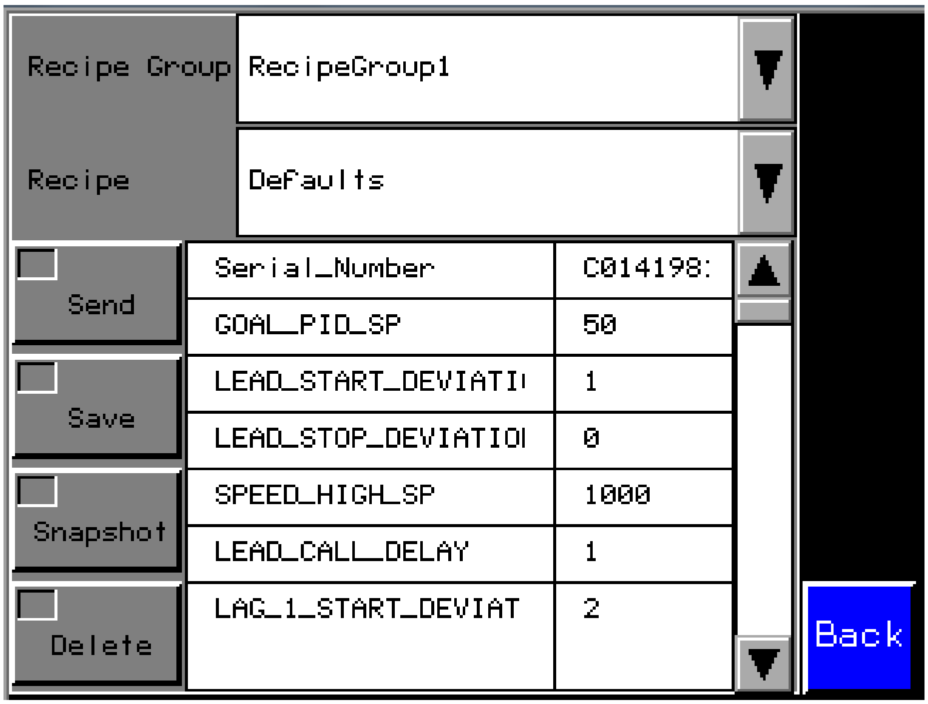
Generic

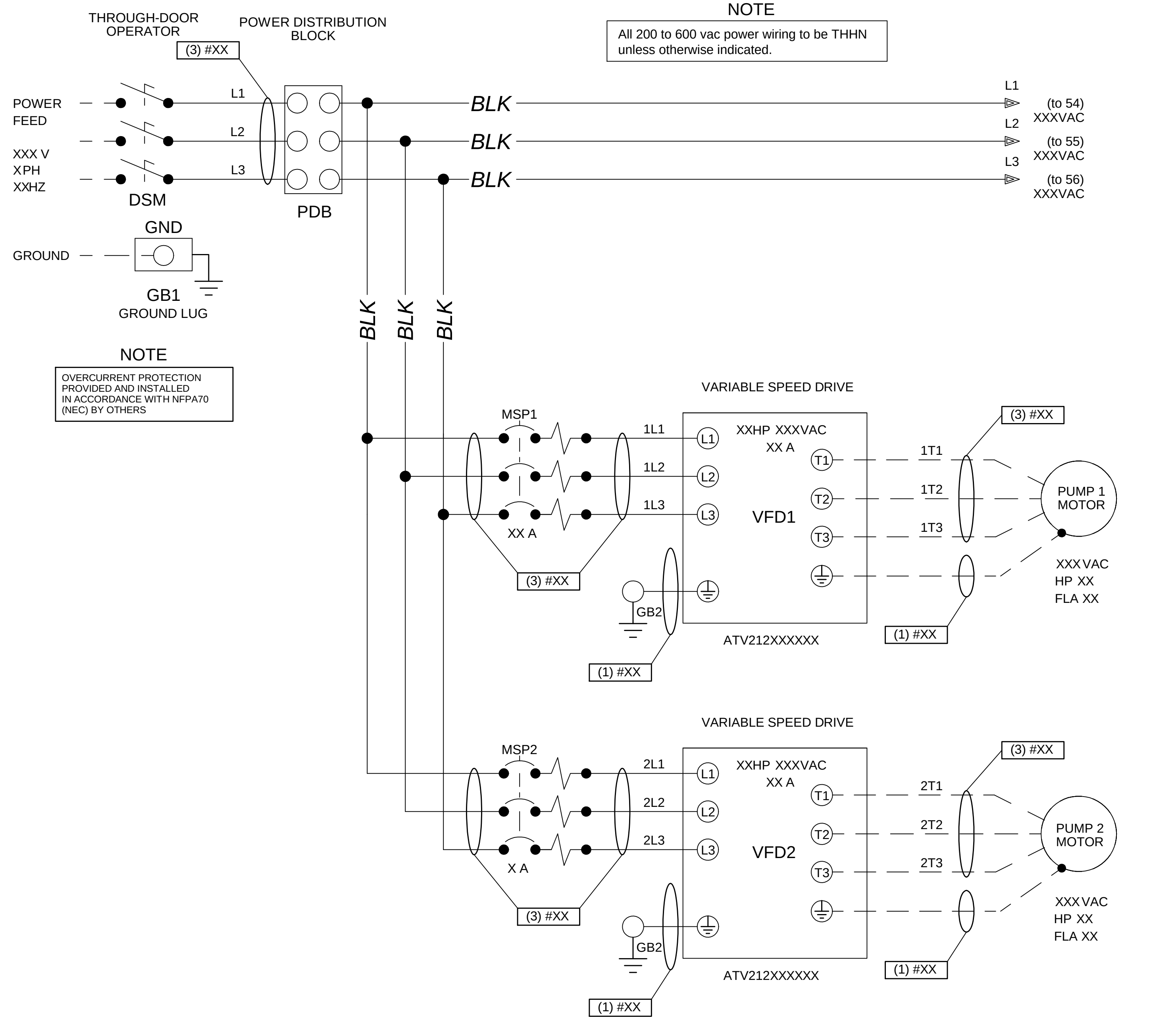
Setup (Pump VFD Amps and Volts Scaling)



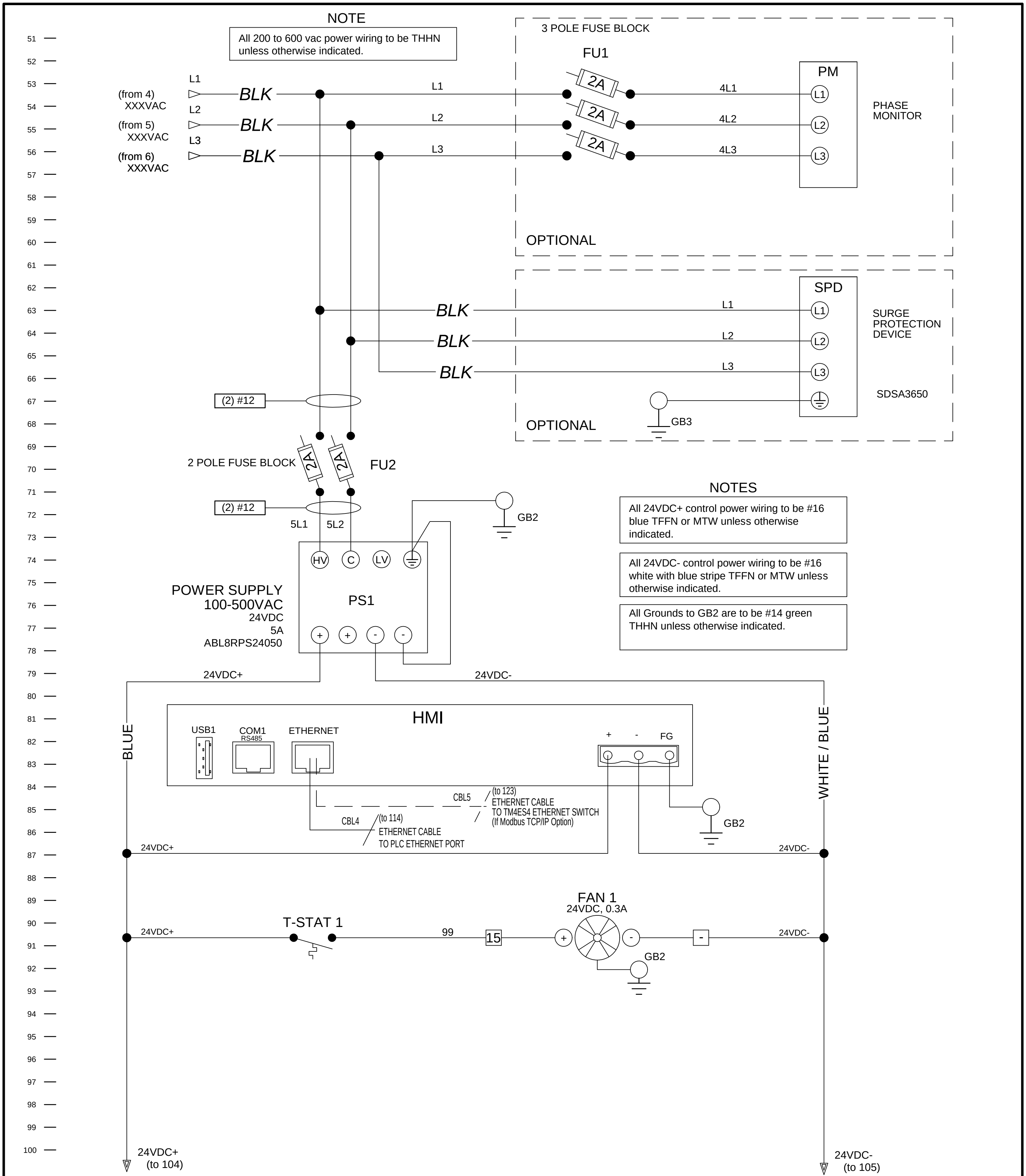
Generic

Setup (Set-point Recipes)

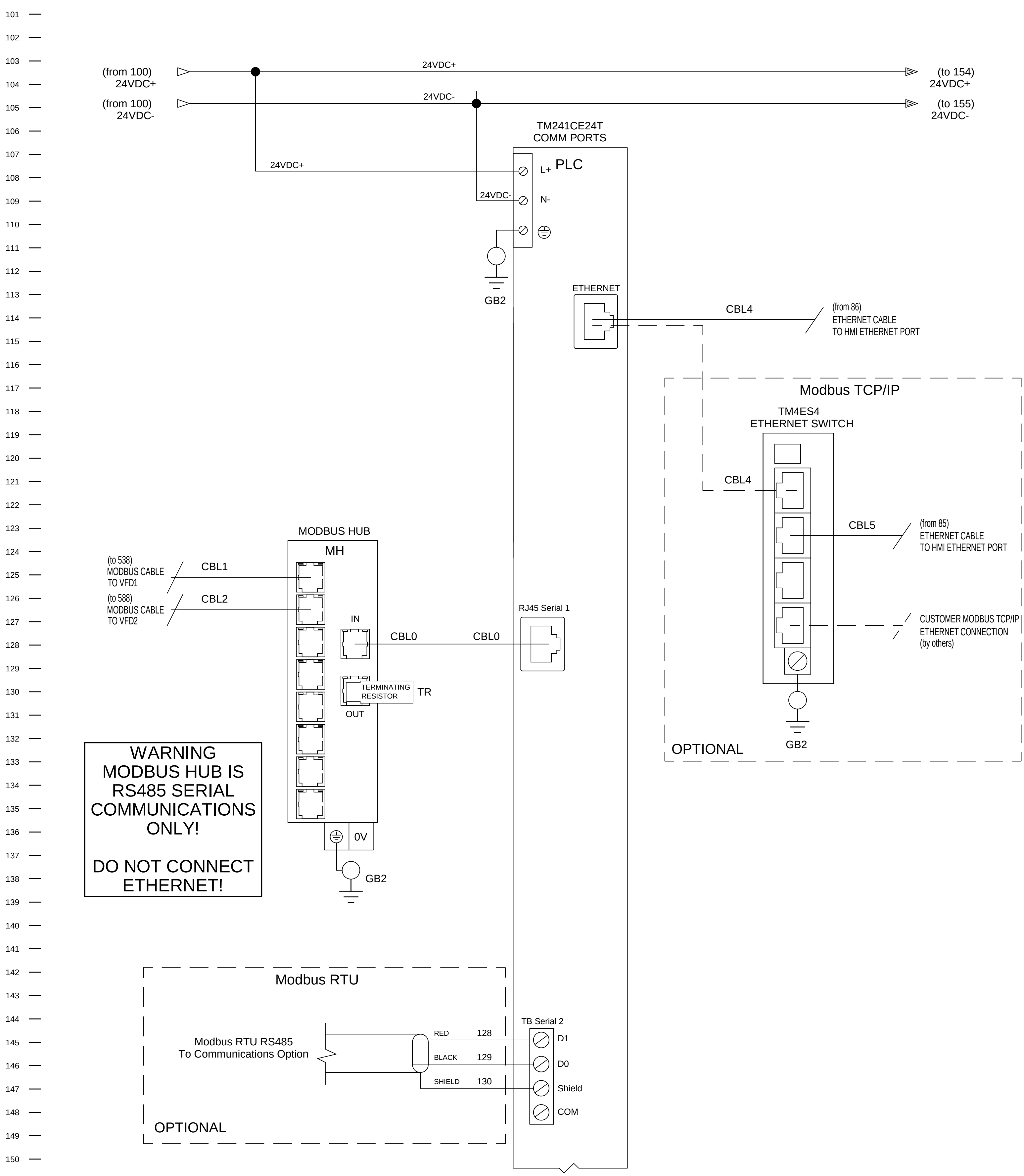




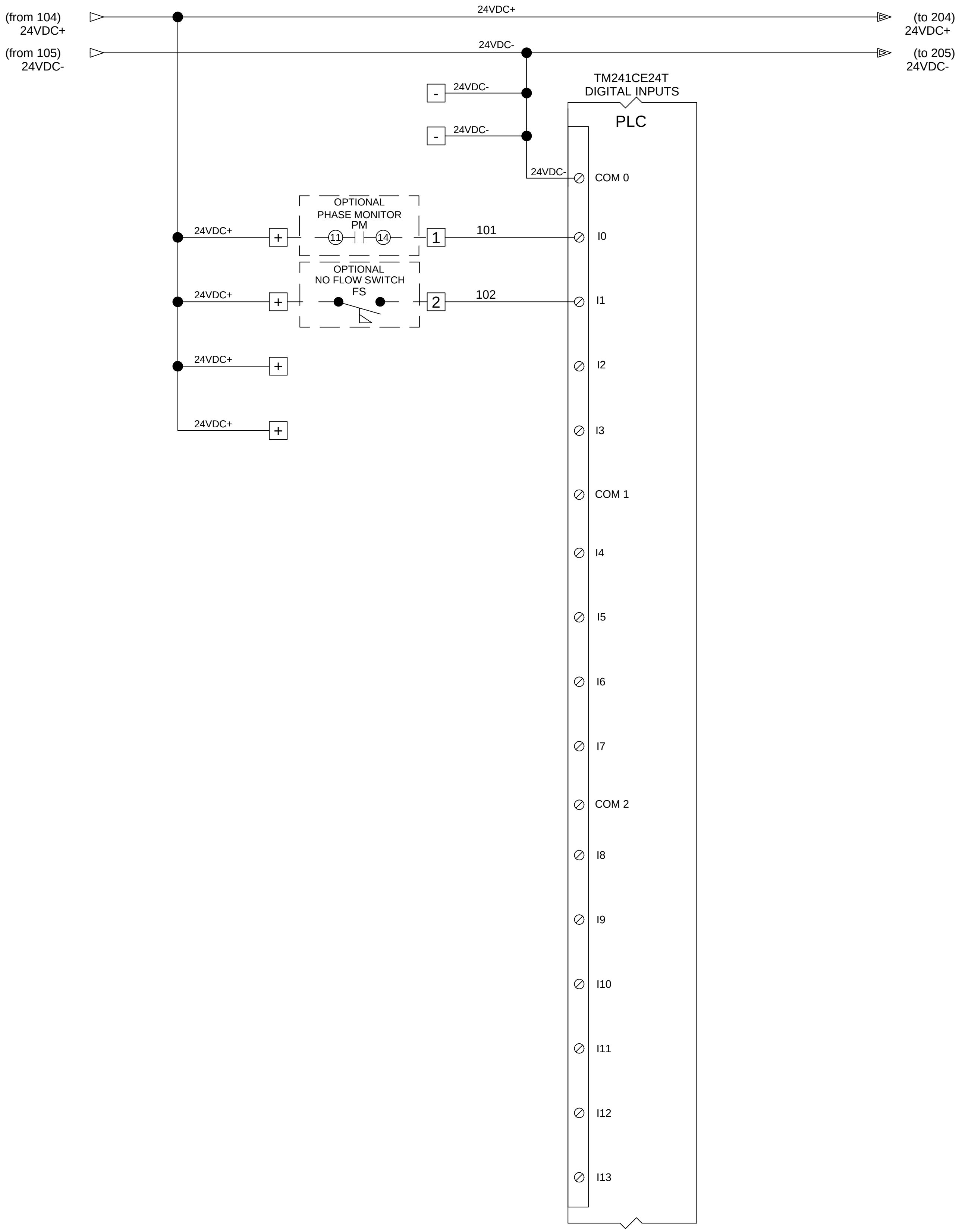
DUPLEX VARIABLE SPEED - AQUA~FLOPAC			Page 1	FLO-PAK INC. A business unit of Patterson Pump Company
PUMP 1	PUMP 2		Power Feed	
HP XX FLA XX MSP XX A	HP XX FLA XX MSP X A		XXX V / XPh / XXHz MCA - XXX	Drawn By: WRW · Date: XX/XX/XXXX Dwg No. VSDupSch · Rev: 0



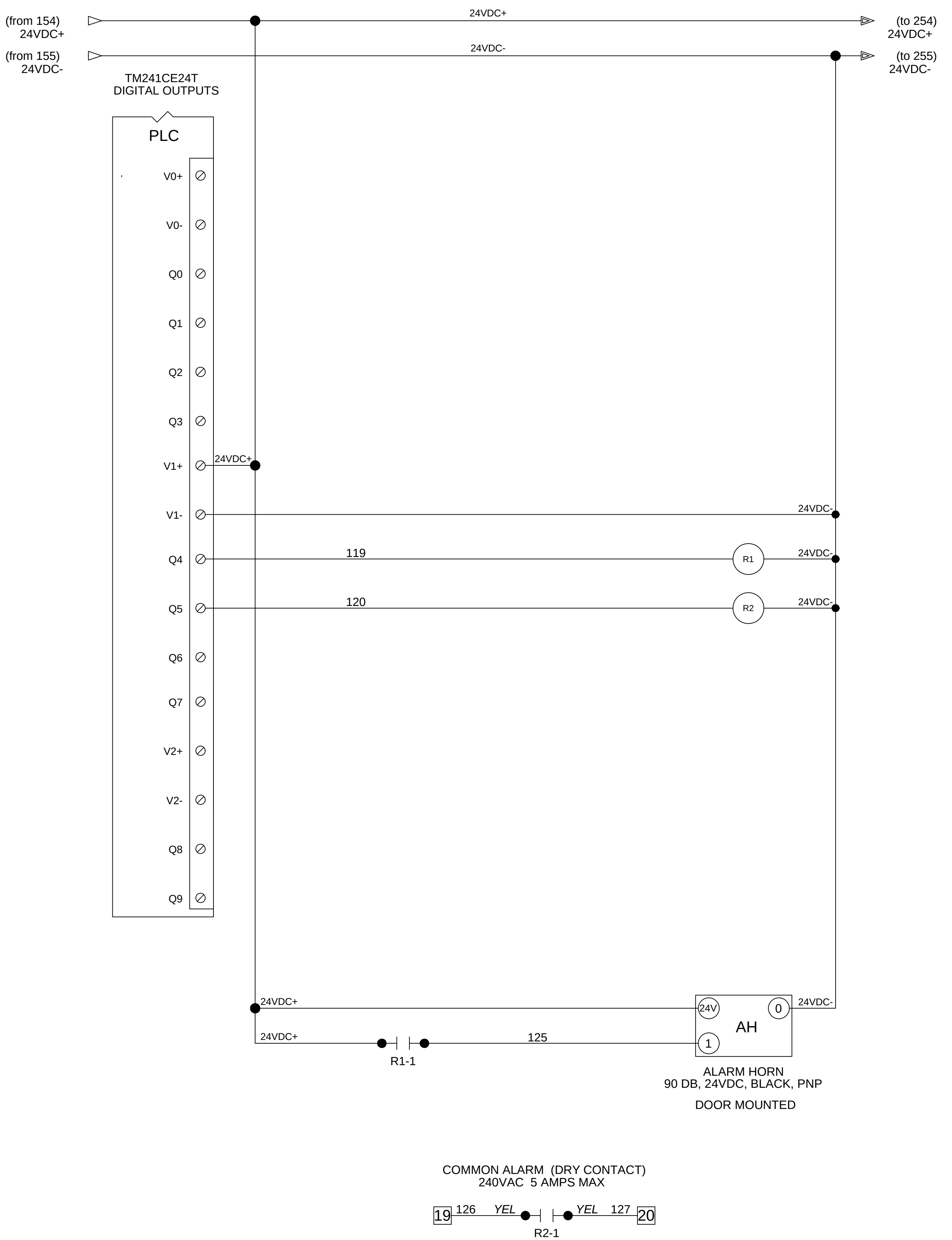
DUPLEX VARIABLE SPEED - AQUA~FLOPAC		Page 2	FLO-PAK INC. A business unit of Patterson Pump Company
			Drawn By: WRW — Date: XX/XX/XXXX
			Dwg No. VSDupSch — Rev: 0



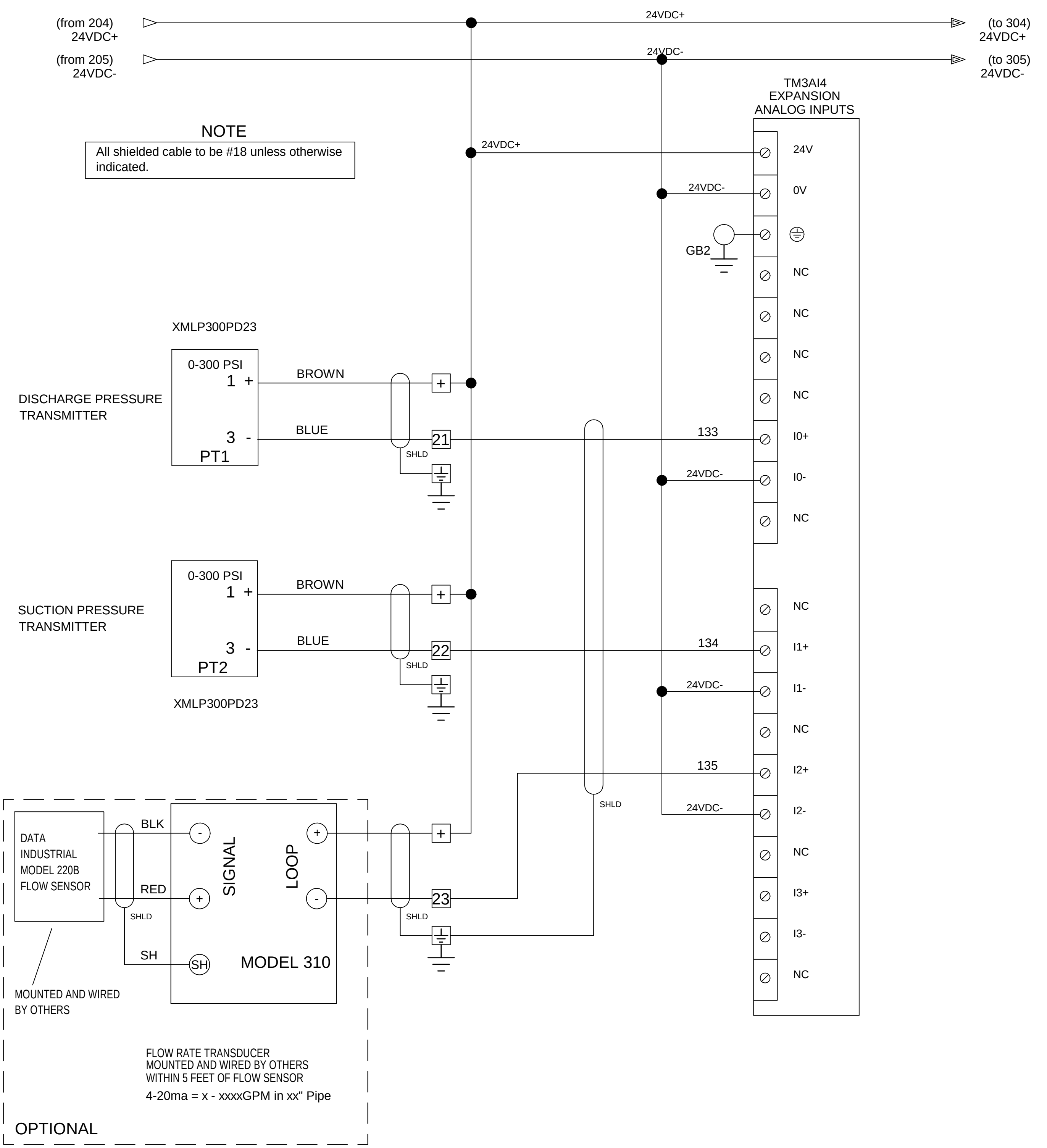
DUPLEX VARIABLE SPEED - AQUA~FLOPAC		Page 3	FLO-PAK INC. A business unit of Patterson Pump Company
			Drawn By: WRW — Date: XX/XX/XXXX
			Dwg No. VSDupSch — Rev: 0



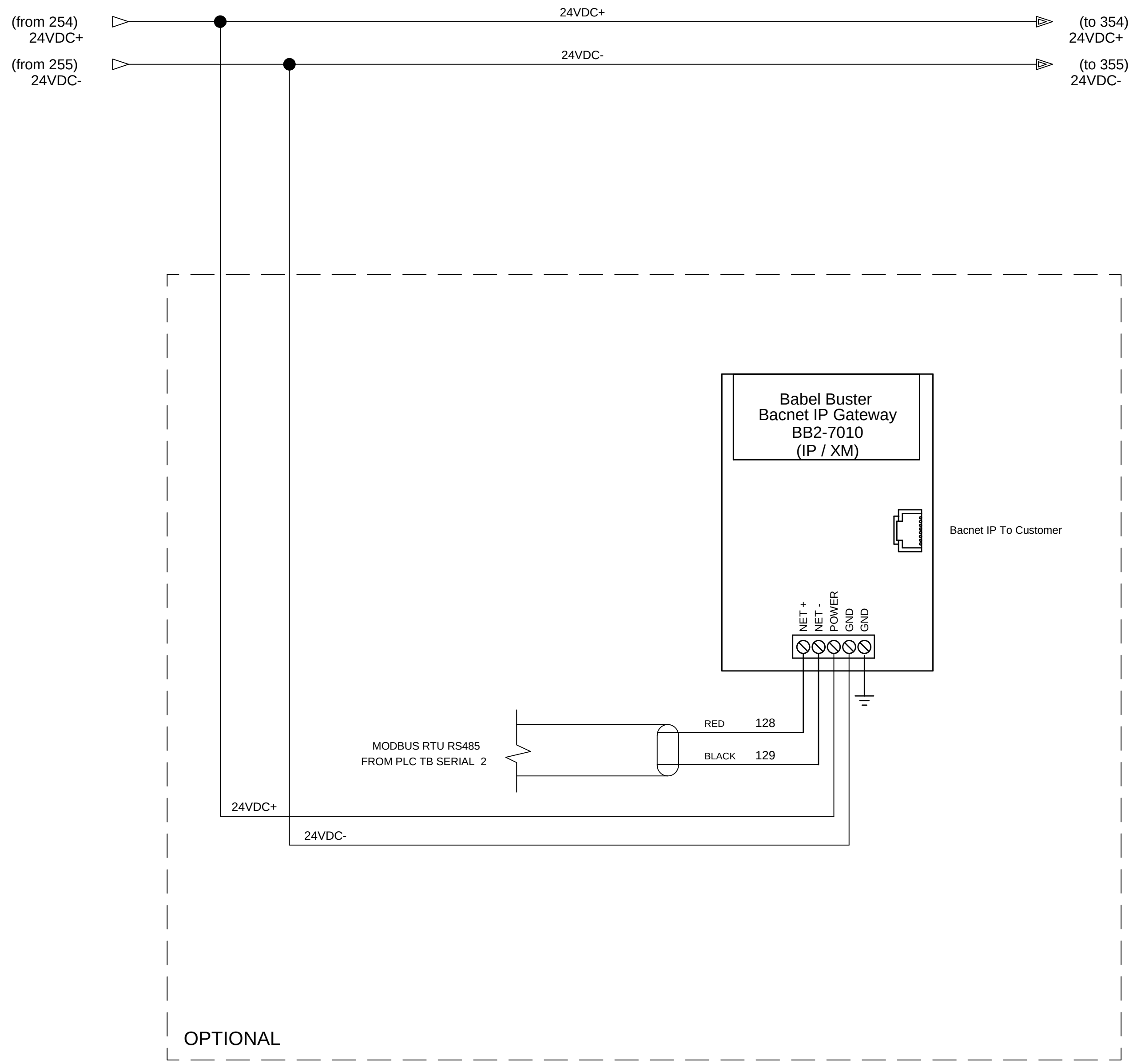
DUPLEX VARIABLE SPEED - AQUA~FLOPAC			Page 4	FLO-PAK INC. A business unit of Patterson Pump Company
				Drawn By: WRW — Date: XX/XX/XXXX
				Dwg No. VSDupSch — Rev: 0



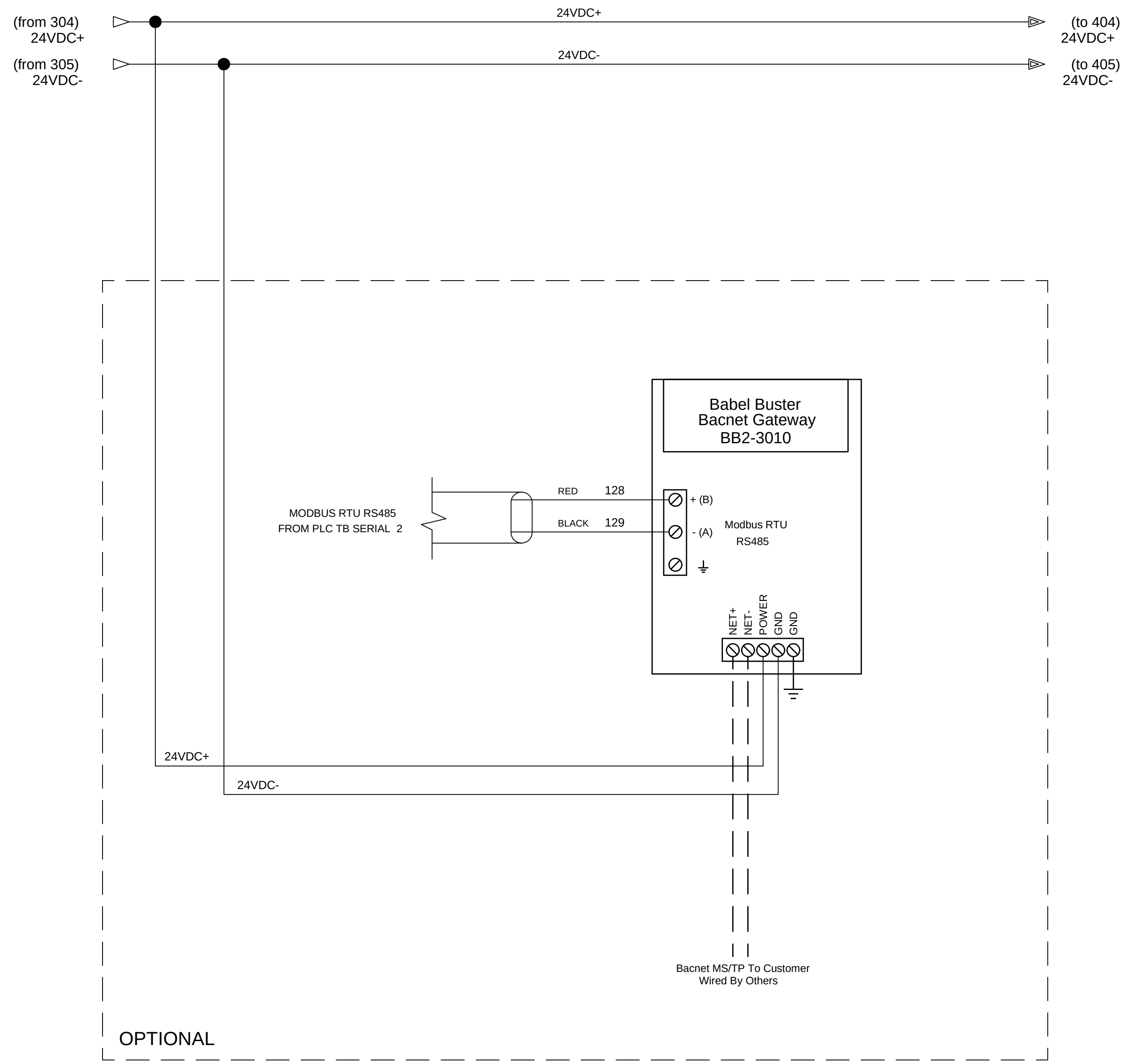
DUPLEX VARIABLE SPEED - AQUA~FLOPAC	Page 5	FLO-PAK INC. A business unit of Patterson Pump Company
		Drawn By: WRW	Date: XX/XX/XXXX
		Dwg No. VSDupSch	Rev: 0



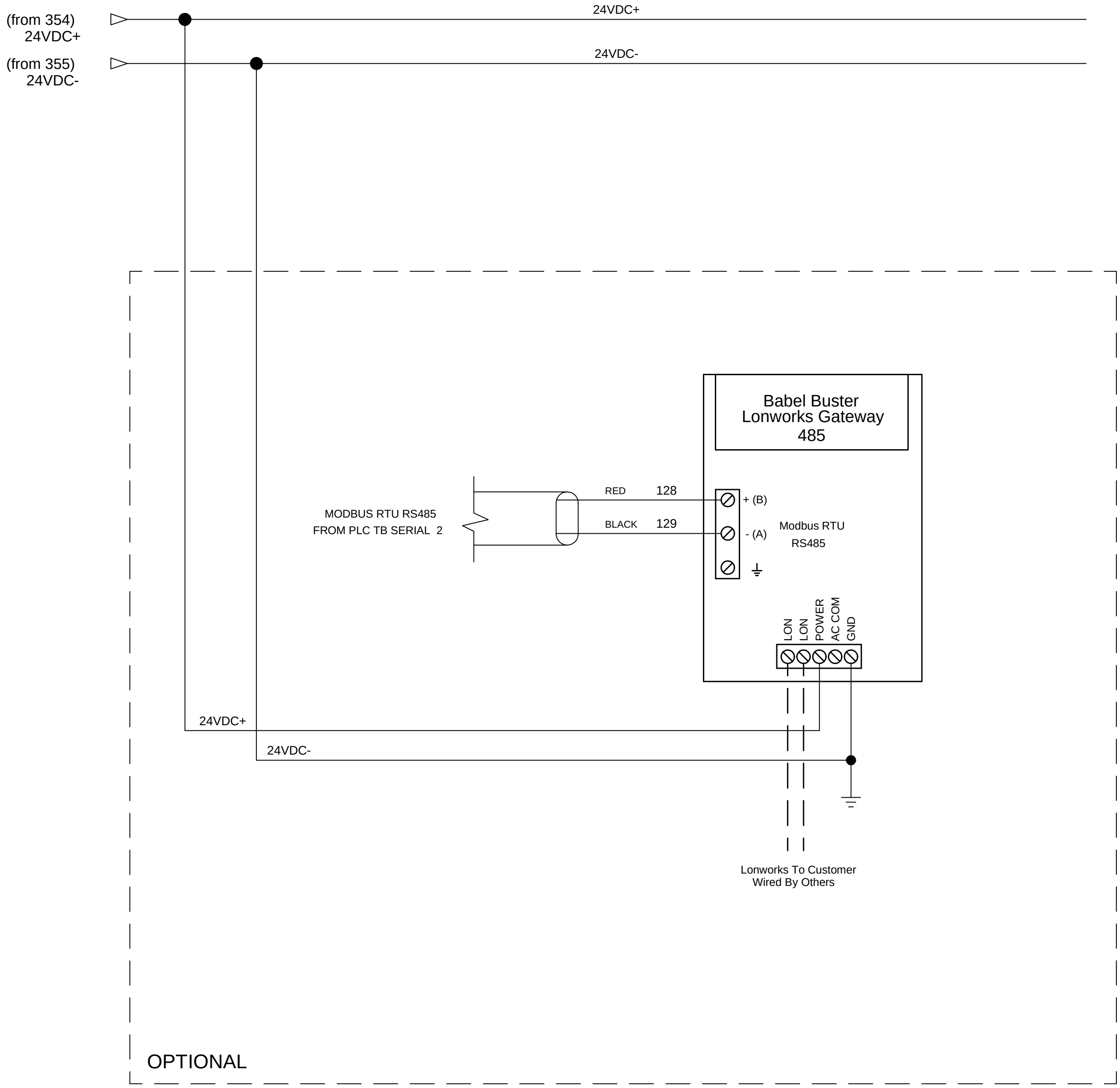
DUPLEX VARIABLE SPEED - AQUA~FLOPAC	Page 6	FLO-PAK INC. A business unit of Patterson Pump Company
		Drawn By: WRW | Date: XX/XX/XXXX
		Dwg No. VSDupSch | Rev: 0



DUPLEX VARIABLE SPEED - AQUA~FLOPAC	Page 7	FLO-PAK INC. A business unit of Patterson Pump Company
		Drawn By: WRW · Date: XX/XX/XXXX
		Dwg No. VSDupSch · Rev: 0

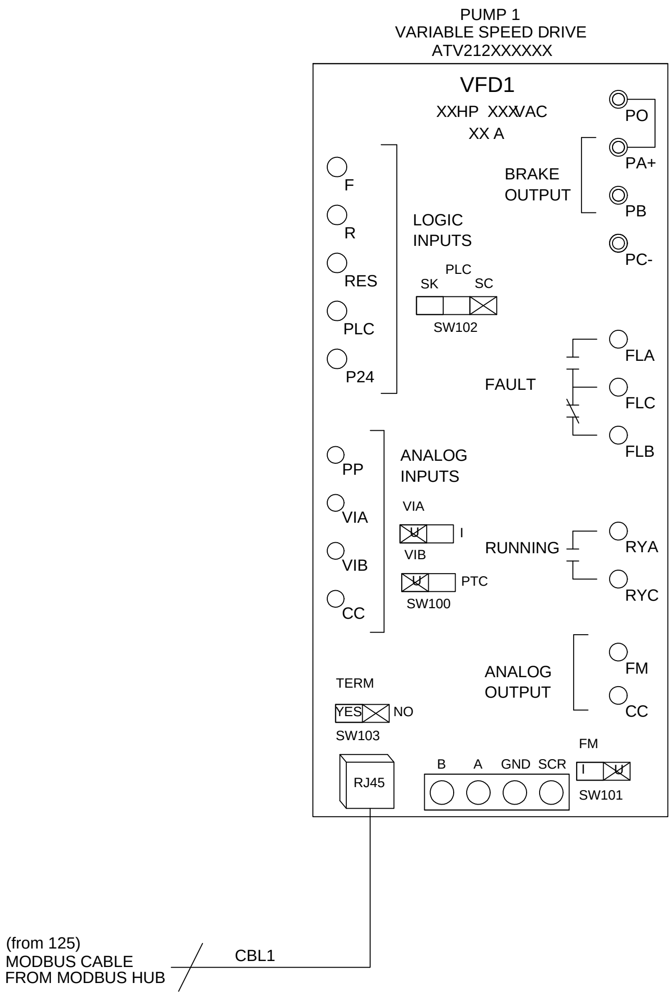


DUPLEX VARIABLE SPEED - AQUA~FLOPAC	Page 8	INC. A business unit of Patterson Pump Company
		Drawn By: WRW — Date: XX/XX/XXXX
		Dwg No. VSDupSch — Rev: 0



DUPLEX VARIABLE SPEED - AQUA~FLOPAC			Page 9	FLO-PAK INC. A business unit of Patterson Pump Company	
				Drawn By: WRW	Date: XX/XX/XXXX
				Dwg No. VSDupSch	Rev: 0

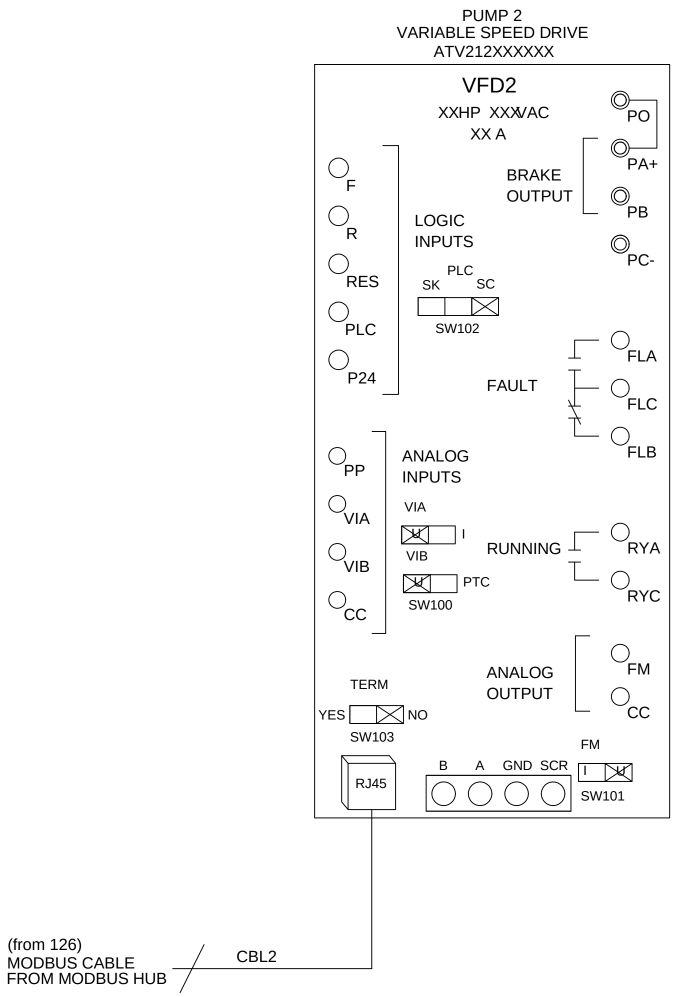
INSTALLED OPTIONS	
	PHASE MONITOR
	SURGE PROTECTION DEVICE
	FLOW SENSOR AND TRANSMITTER
	CONNECTION TO PLC VIA BACNET MS/TP
	CONNECTION TO PLC VIA BACNET IP
	CONNECTION TO PLC VIA MODBUS TCP/IP
	CONNECTION TO PLC VIA MODBUS RTU
	CONNECTION TO PLC VIA LONWORKS
	NO FLOW SWITCH



DUPLEX VARIABLE SPEED - AQUA~FLOPAC			Page 11

FLO-PAK INC.
A business unit of Patterson Pump Company

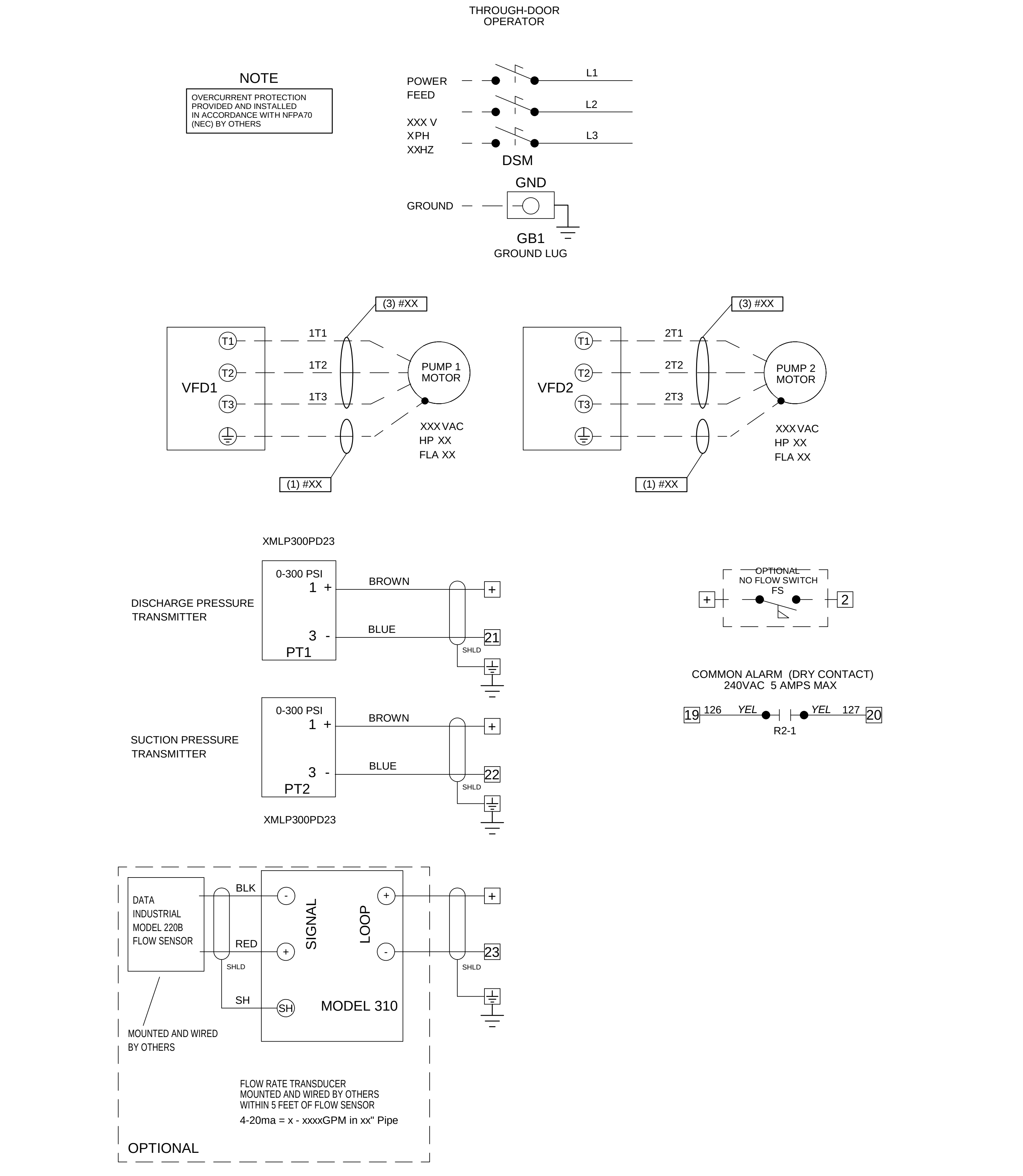
Drawn By:	WRW	Date:	XX/XX/XXXX
Dwg No.	VSDupSch	Rev:	0



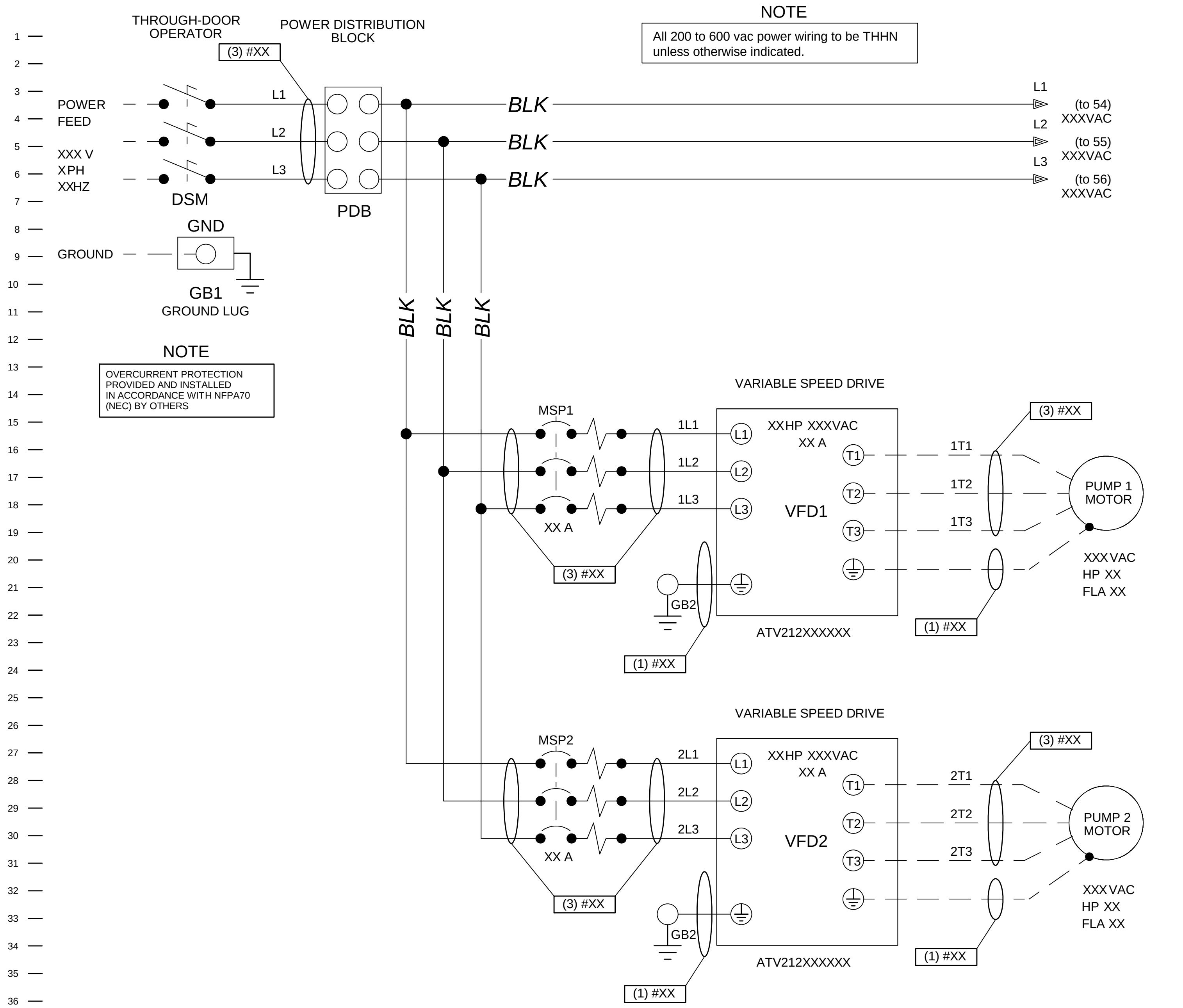
DUPLEX VARIABLE SPEED - AQUA~FLOPAC			Page 12

FLO-PAK INC.
A business unit of Patterson Pump Company

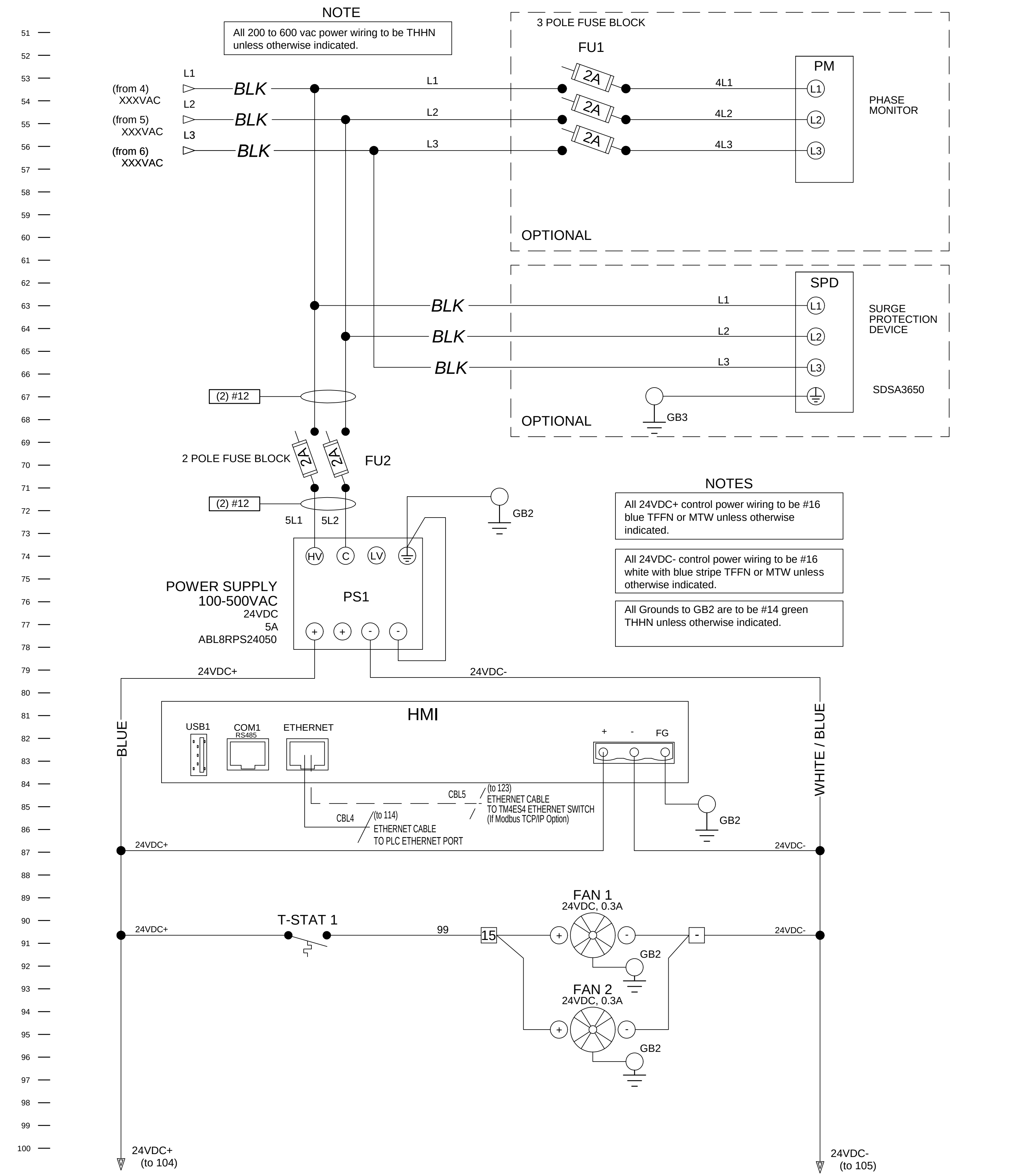
Drawn By:	WRW	Date:	XX/XX/XXXX
Dwg No.	VSDupSch	Rev:	0



DUPLEX VARIABLE SPEED - AQUA~FLOPAC				FLO-PAK INC. A business unit of Patterson Pump Company
PUMP 1	PUMP 2		Power Feed	
HP XX FLA XX MSP XX A	HP XX FLA XX MSP X A		XXX V / XPh / XXHz MCA - XXX	Drawn By: WRW / Date: XX/XX/XXXX Dwg No. VSDupSch / Rev: 0



LE DUPLEX VARIABLE SPEED - AQUA~FLOPAC			Page 1	FLO-PAK INC. A business unit of Patterson Pump Company	
PUMP 1	PUMP 2		Power Feed		
HP XX FLA XX MSP XX A	HP XX FLA XX MSP XX A		XXX V / XPh / XXHz MCA - XXX	Drawn By: WRW Dwg No. VSLEDupSch	Date: XX/XX/XXXX Rev: 0



LE DUPLEX VARIABLE SPEED - AQUA~FLOPAC	Page 2	FLO-PAK INC. A business unit of Patterson Pump Company
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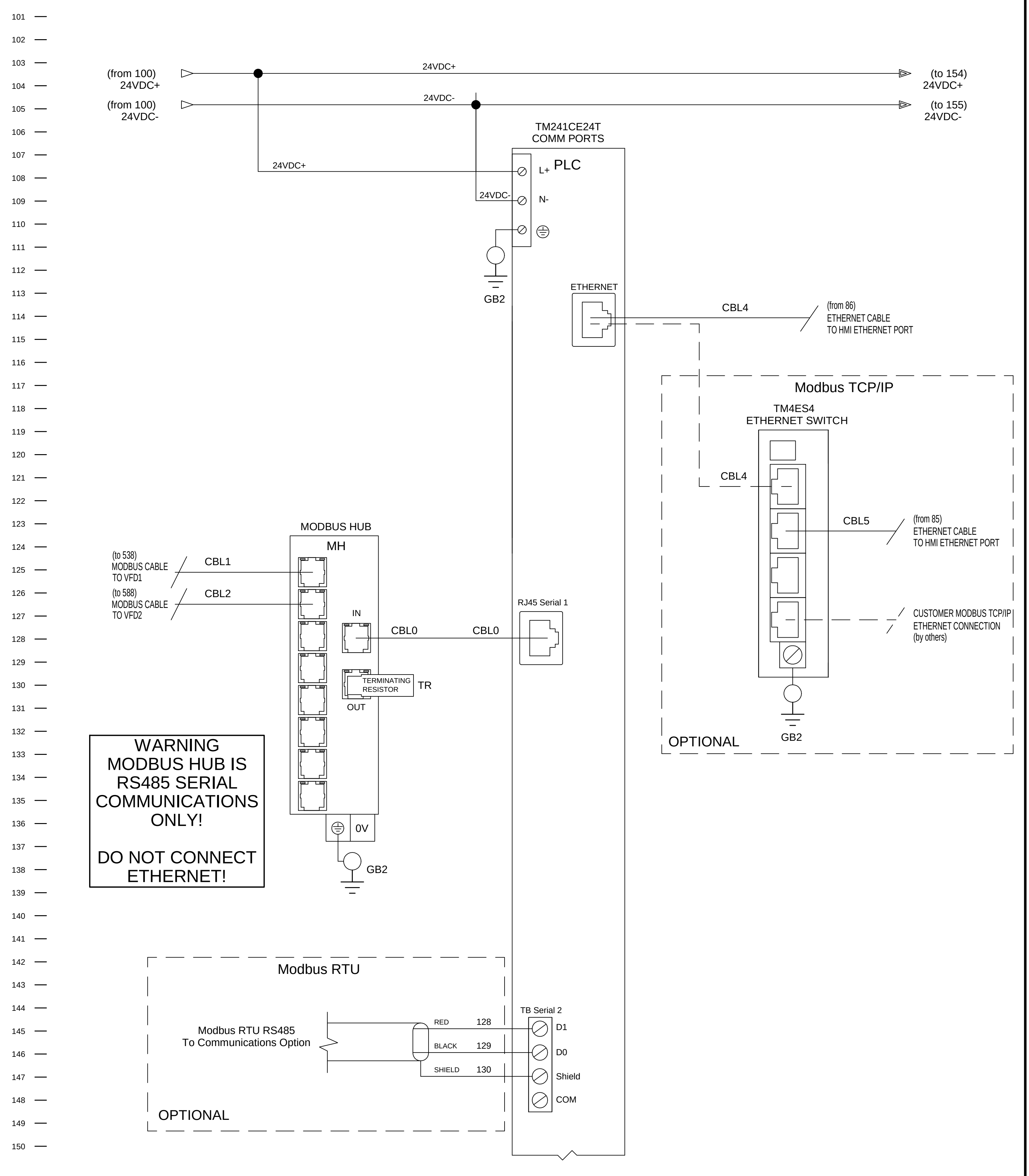
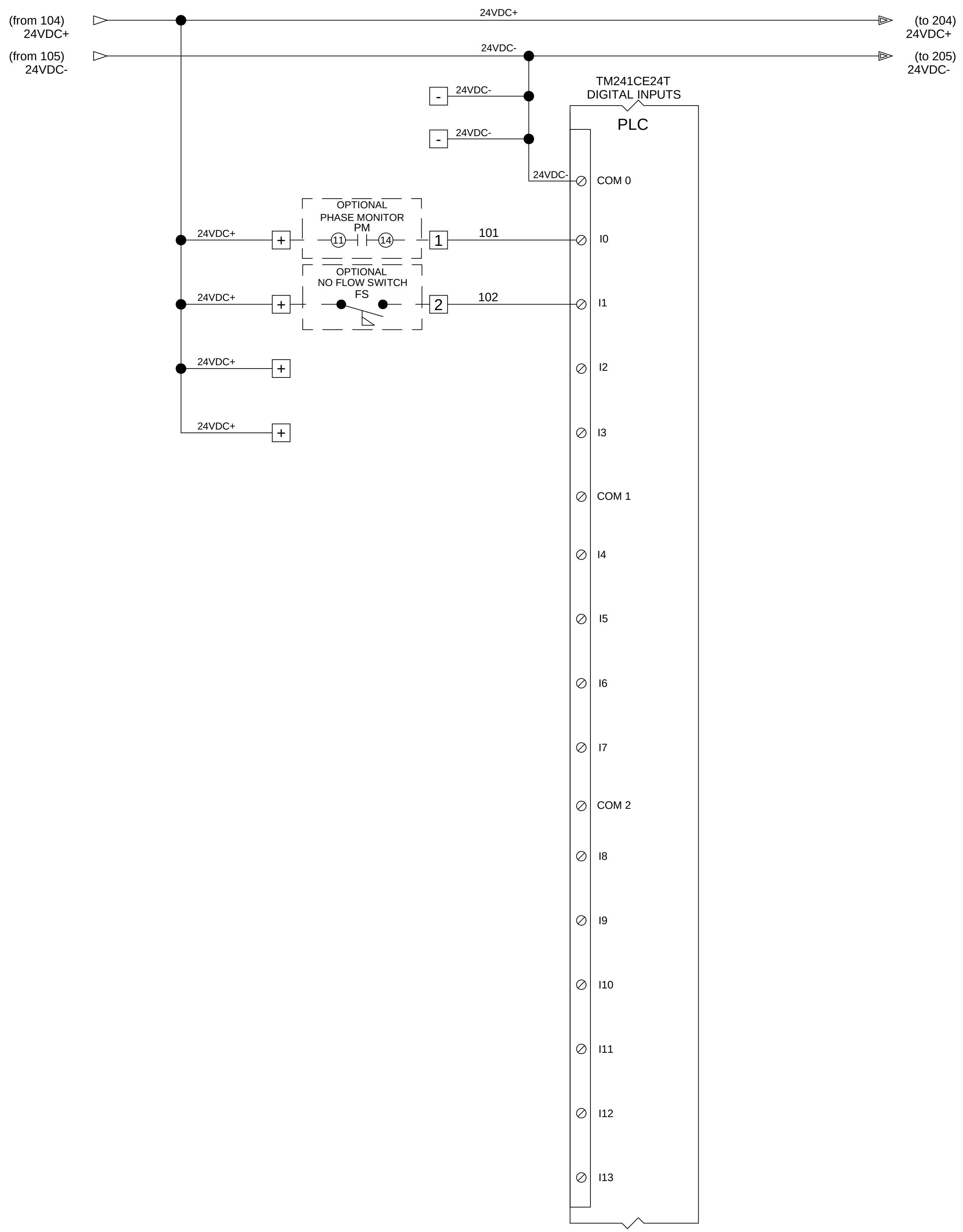
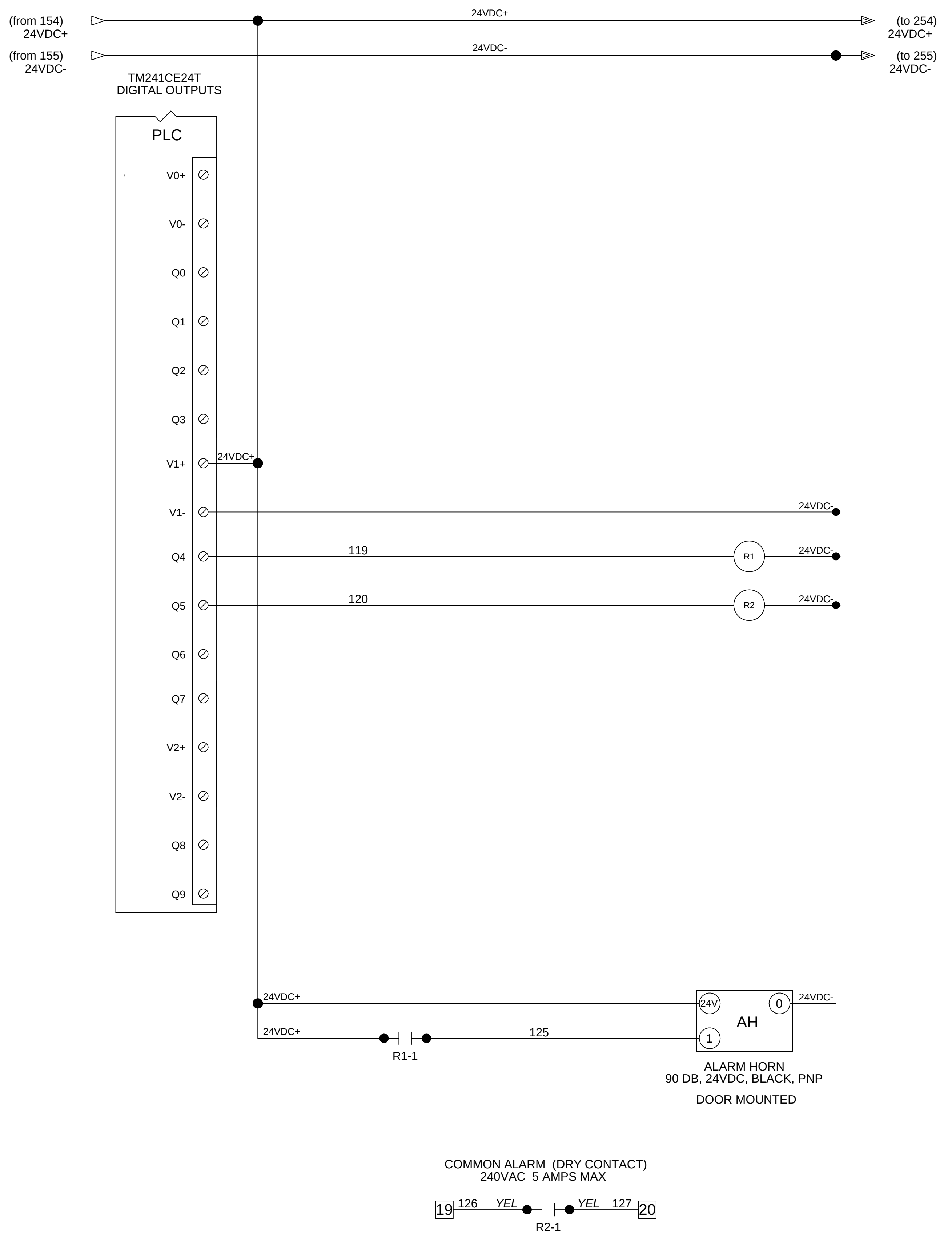
	Dwg No. VSLEDupSch	Rev: 0



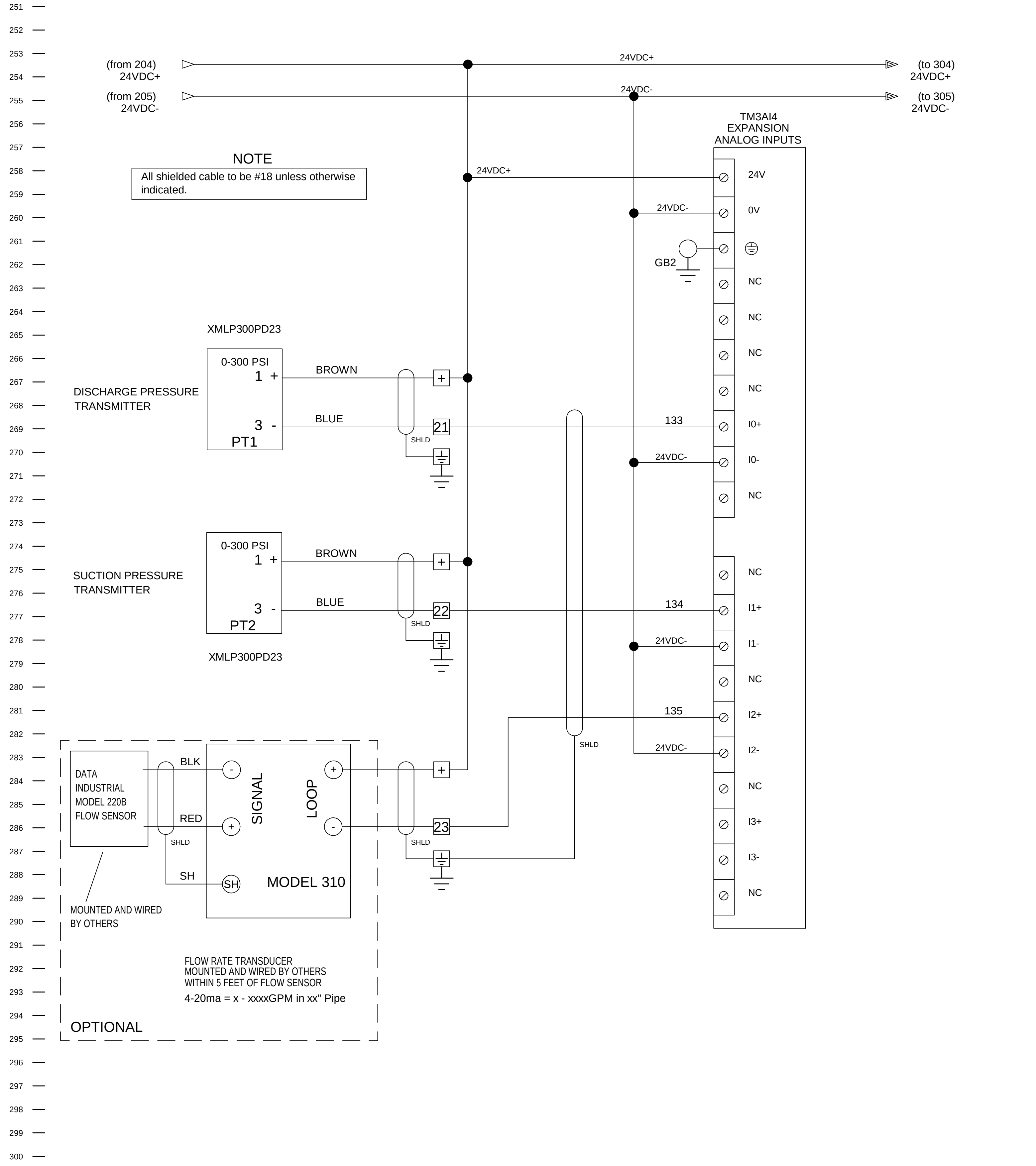
LE DUPLEX VARIABLE SPEED - AQUA~FLOPAC	Page 3	FLO-PAK INC. A business unit of Patterson Pump Company
		Drawn By: WRW	Date: XX/XX/XXXX
		Dwg No. VSLEDupSch	Rev: 0



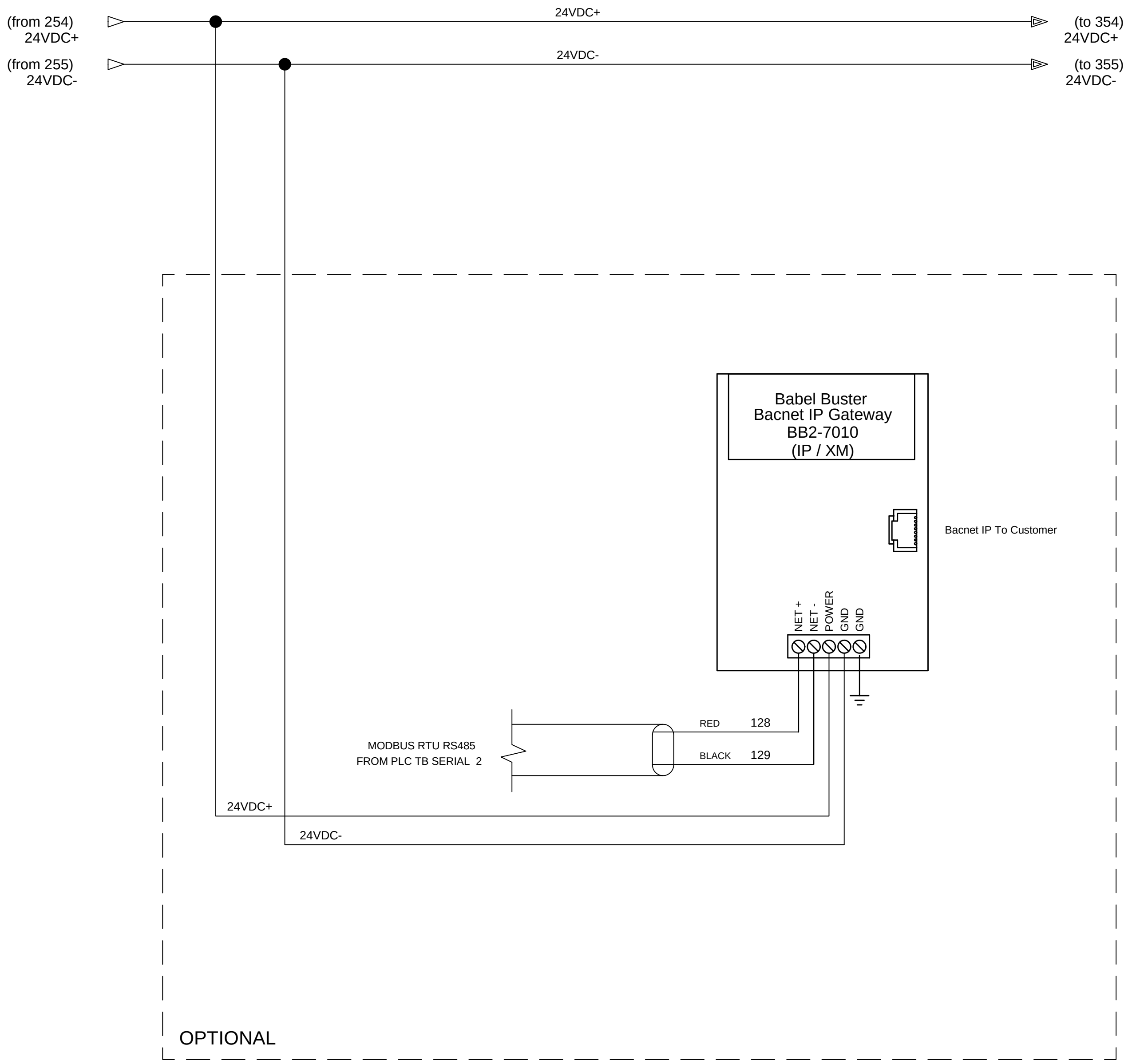
LE DUPLEX VARIABLE SPEED - AQUA~FLOPAC			Page 4	FLO-PAK INC. A business unit of Patterson Pump Company
				Drawn By: WRW — Date: XX/XX/XXXX
				Dwg No. VSLEDupSch — Rev: 0



LE DUPLEX VARIABLE SPEED - AQUA~FLOPAC		Page 5	FLO-PAK INC. A business unit of Patterson Pump Company
			Drawn By: WRW — Date: XX/XX/XXXX
			Dwg No. VSLEDupSch — Rev: 0



LE DUPLEX VARIABLE SPEED - AQUA~FLOPAC	Page 6	FLO-PAK INC. A business unit of Patterson Pump Company
		Drawn By: WRW · Date: XX/XX/XXXX
		Dwg No. VSLEDupSch · Rev: 0



LE DUPLEX VARIABLE SPEED - AQUA~FLOPAC			Page 7	FLO-PAK INC. A business unit of Patterson Pump Company
				Drawn By: WRW — Date: XX/XX/XXXX
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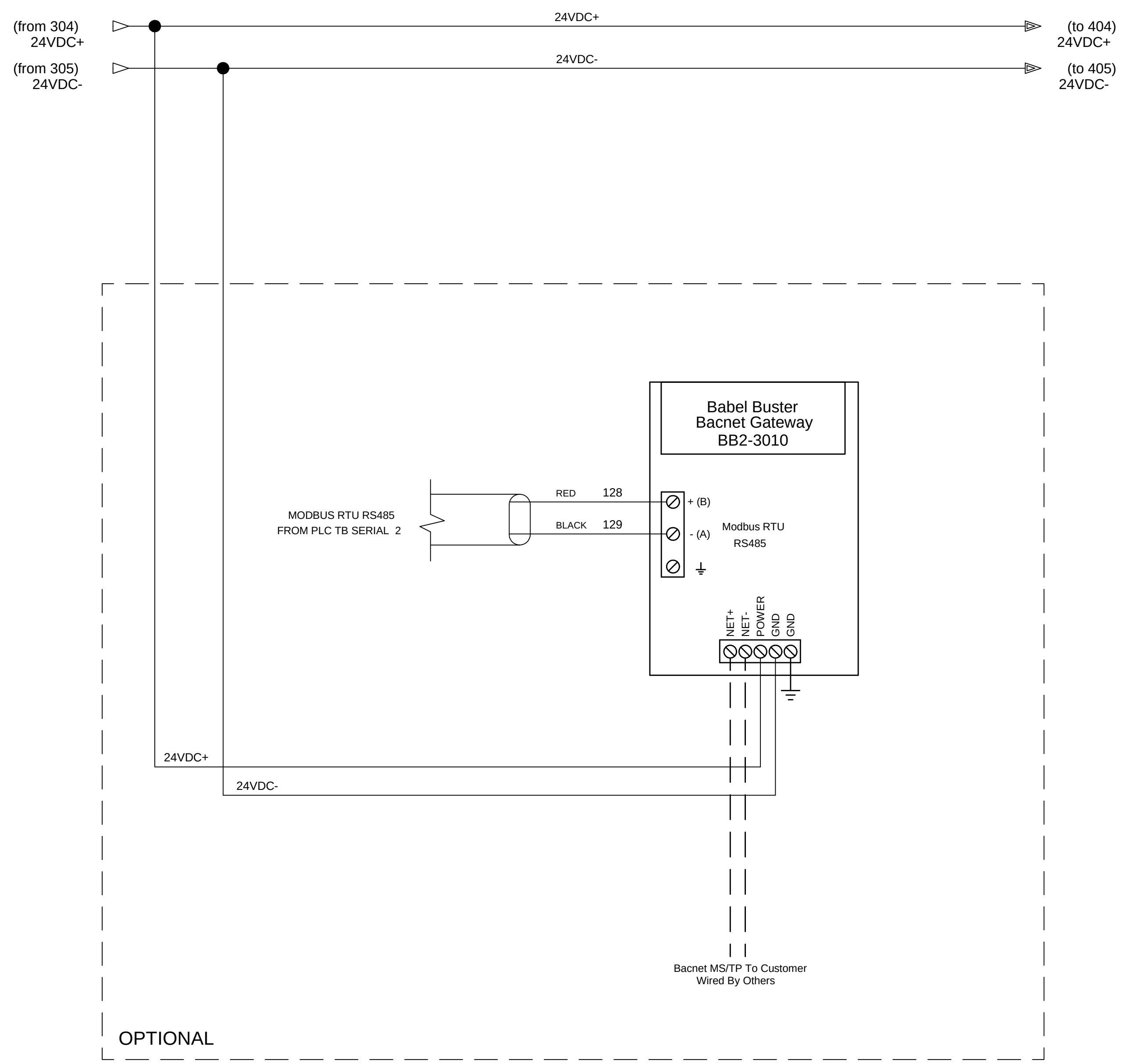
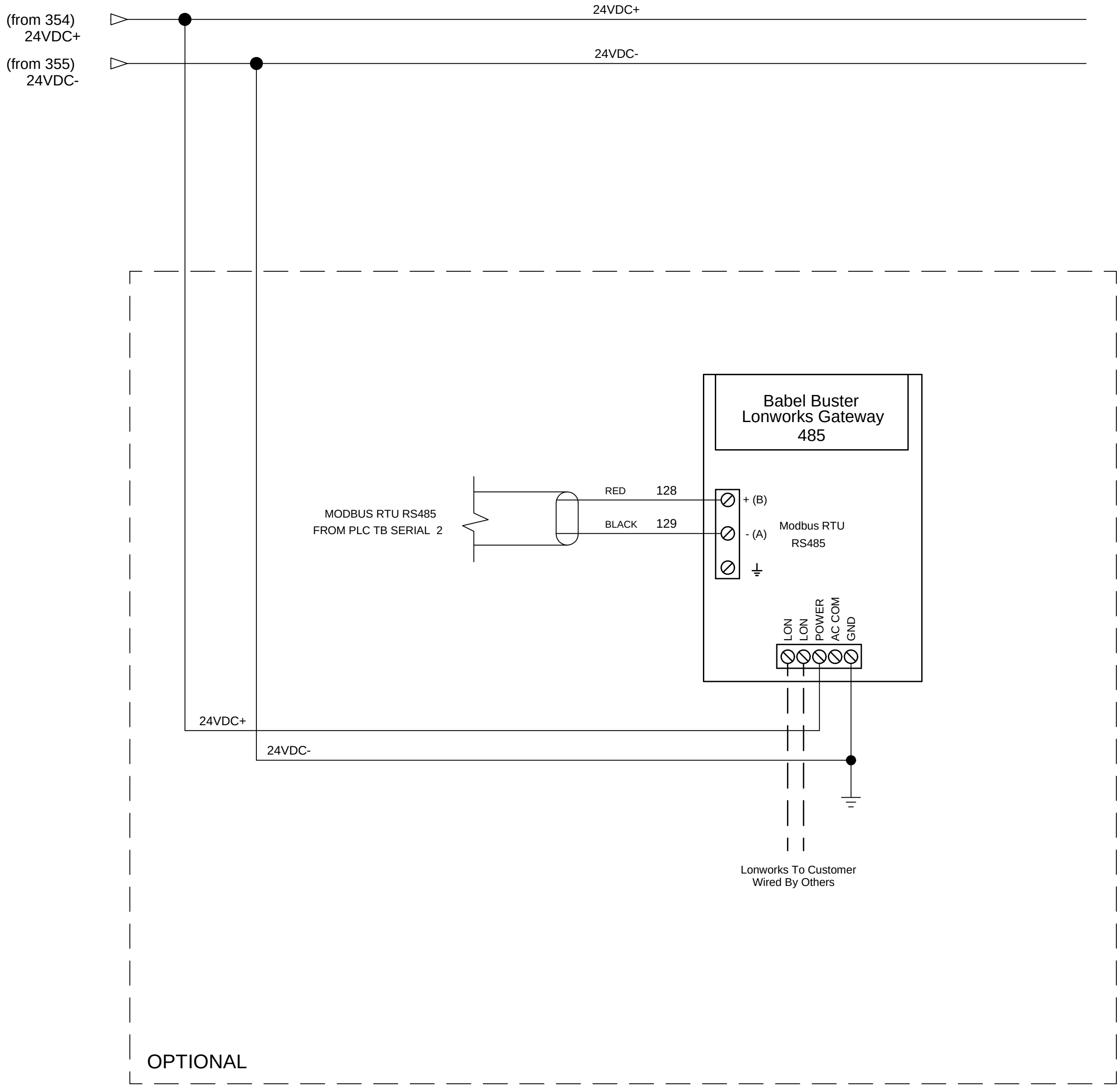
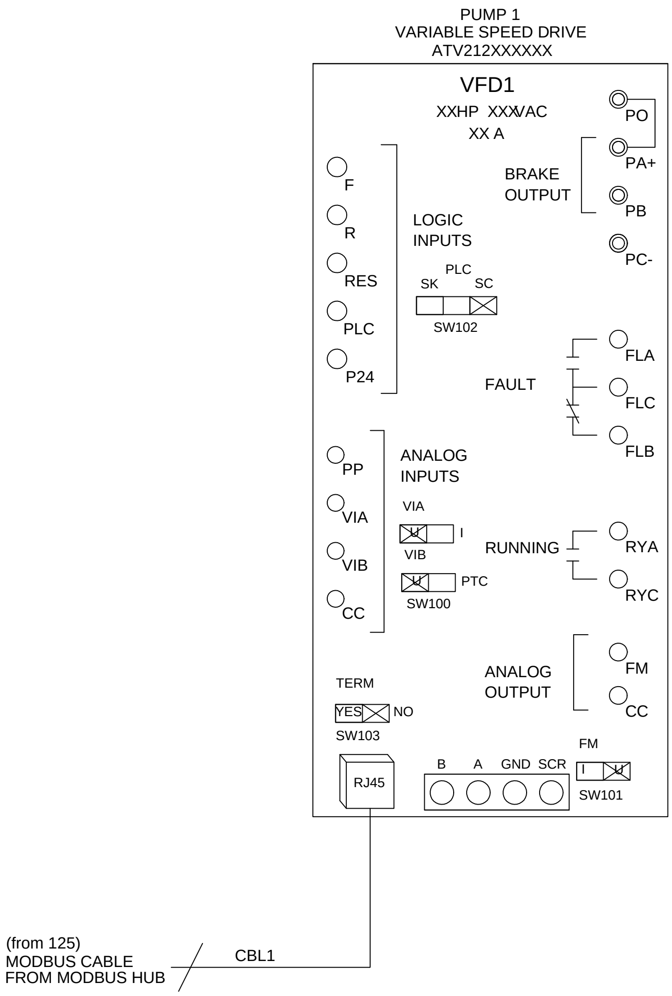


LE DUPLEX VARIABLE SPEED - AQUA~FLOPAC		Page 8	FLO-PAK INC. A business unit of Patterson Pump Company
Drawn By: WRW	Date: XX/XX/XXXX		
Dwg No. VSLEDupSch	Rev: 0		



LE DUPLEX VARIABLE SPEED - AQUA~FLOPAC	Page 9	FLO-PAK INC. A business unit of Patterson Pump Company
		Drawn By: WRW / Date: XX/XX/XXXX
		Dwg No. VSLEDupSch / Rev: 0

INSTALLED OPTIONS	
	PHASE MONITOR
	SURGE PROTECTION DEVICE
	FLOW SENSOR AND TRANSMITTER
	CONNECTION TO PLC VIA BACNET MS/TP
	CONNECTION TO PLC VIA BACNET IP
	CONNECTION TO PLC VIA MODBUS TCP/IP
	CONNECTION TO PLC VIA MODBUS RTU
	CONNECTION TO PLC VIA LONWORKS
	NO FLOW SWITCH



LE DUPLEX VARIABLE SPEED - AQUA~FLOPAC	Page 11	FLO-PAK INC. A business unit of Patterson Pump Company
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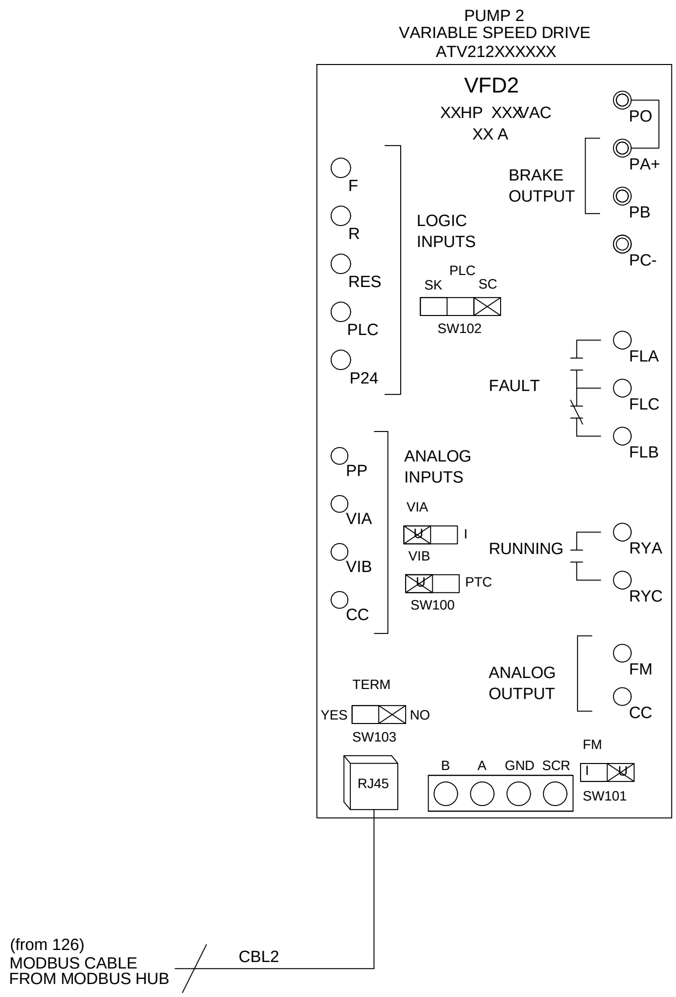
		Dwg No. VSLEDupSch	Rev: 0



LE DUPLEX VARIABLE SPEED - AQUA~FLOPAC	Page 12	FLO-PAK INC. A business unit of Patterson Pump Company
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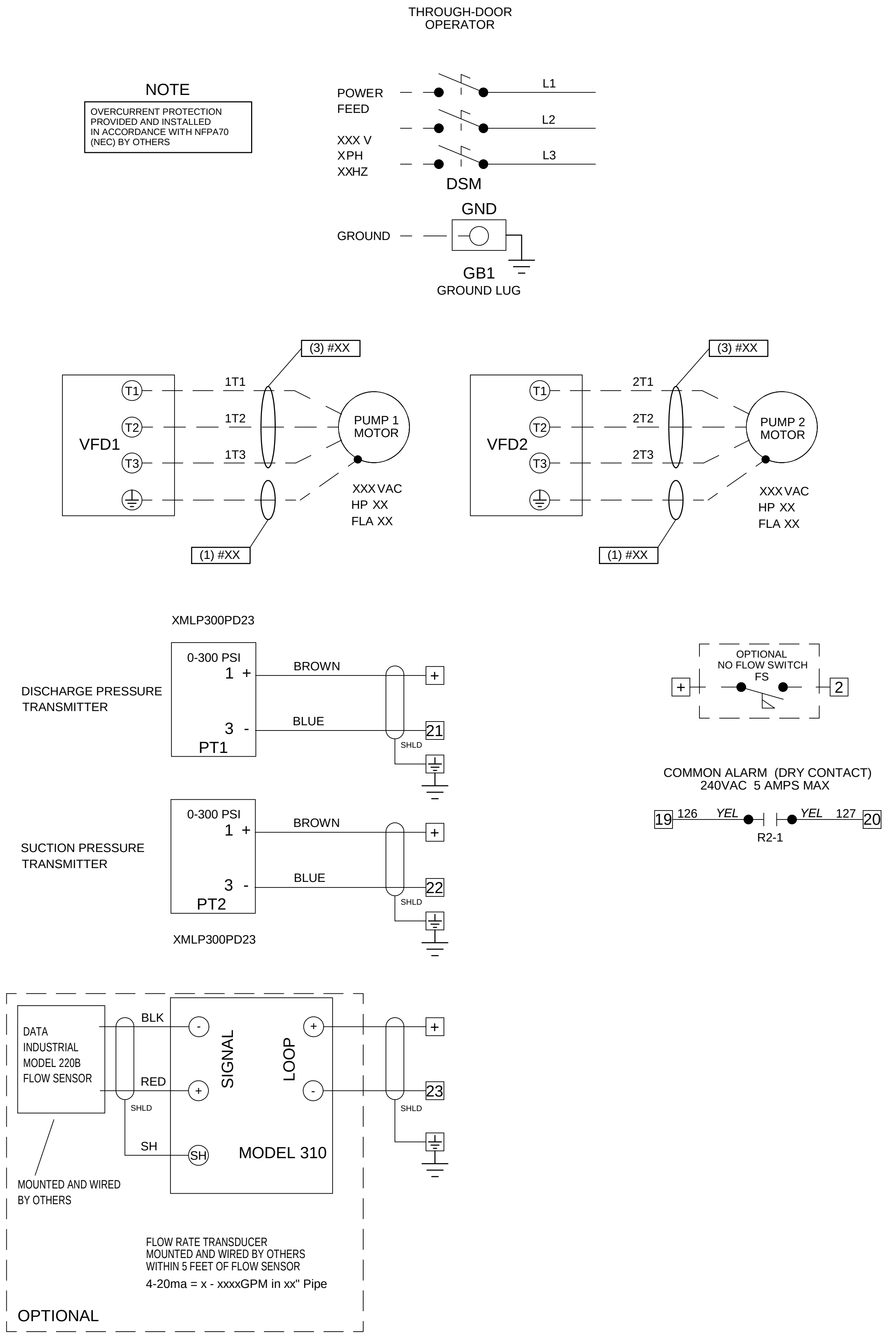
	Dwg No. VSLEDupSch	Rev: 0



LE DUPLEX VARIABLE SPEED - AQUA~FLOPAC				FLO-PAK INC. A business unit of Patterson Pump Company
PUMP 1	PUMP 2		Power Feed	
HP XX FLA XX MSP XX A	HP XX FLA XX MSP XX A		XXX V / XPh / XXHz MCA - XXX	Drawn By: WRW — Date: XX/XX/XXXX Dwg No. VSLEDupSch — Rev: 0

Duplex Amperage Chart

MODEL	208v-3-60hz			230v-3-60hz			460v-3-60hz			380v-3-50hz		
	Pump(s) FLA		System	Pump(s) FLA		System	Pump(s) FLA		System	Pump(s) FLA		System
	P1	P2	MCA	P1	P2	MCA	P1	P2	MCA	P1	P2	MCA
DAP-1-2	7.5	7.5	19	6.8	6.8	17	3.4	3.4	9	4.3	4.3	11
DAP-1-3	10.6	10.6	26	9.6	9.6	23	4.8	4.8	12	6	6	15
DAP-2-3	10.6	10.6	26	9.6	9.6	23	4.8	4.8	12	6	6	15
DAP-1-5	16.7	16.7	40	15.2	15.2	36	7.6	7.6	18	9.6	9.6	23
DAP-2-5	16.7	16.7	40	15.2	15.2	36	7.6	7.6	18	9.6	9.6	23
DAP-2-7	24.2	24.2	56	22	22	51	11	11	26	13.9	13.9	33
DAP-3-5	16.7	16.7	40	15.2	15.2	36	7.6	7.6	18	9.6	9.6	23
DAP-3-7	24.2	24.2	56	22	22	51	11	11	26	13.9	13.9	33
DAP-3-10	30.8	30.8	71	28	28	65	14	14	33	17.7	17.7	41
DAP-3-15	46.2	46.2	106	42	42	96	21	21	48	26.5	26.5	61
DAP-3-20	59.4	59.4	136	54	54	123	27	27	62	34.1	34.1	78
DAP-4-10	30.8	30.8	71	28	28	65	14	14	33	17.7	17.7	41
DAP-4-15	46.2	46.2	106	42	42	96	21	21	48	26.5	26.5	61
DAP-4-20	59.4	59.4	136	54	54	123	27	27	62	34.1	34.1	78
DAP-4-25	74.8	74.8	170	68	68	155	34	34	78	42.9	42.9	98

FLO-PAK™
A business unit of Patterson Pump Company

Pump Emergency Backup (Local) Operation

Duplex Variable Speed Controller
With Internal VFDs

CAUTION

THE BACKUP (LOCAL) VFD STARTING MODE IS FOR EMERGENCY USE ONLY IN THE EVENT OF PLC FAILURE.

WHILE IN THE BACKUP (LOCAL) VFD STARTING MODE, THERE ARE NO PUMP OR SYSTEM SHUTDOWN SAFETIES.

THE SYSTEM MUST BE MONITORED BY THE OPERATOR AT ALL TIMES WHILE OPERATING IN THE BACKUP (LOCAL) VFD STARTING MODE.

TO CHANGE VFD TO BACKUP (LOCAL) MODE, THE FOLLOWING IS PERFORMED AT THE VFD KEYPAD:
- PRESS THE “LOC/REM” BUTTON
- THE LIGHT ABOVE THE “LOC/REM” BUTTON WILL TURN ON ALONG WITH THE LIGHT BETWEEN THE UP AND DOWN ARROWS AND THE LIGHT ABOVE THE “RUN” BUTTON

TO START/STOP VFD WHILE OPERATING IN BACKUP MODE:
- PRESS THE “RUN” BUTTON TO START VFD
- PRESS THE “STOP” BUTTON TO STOP VFD

TO CHANGE VFD SPEED WHILE OPERATING IN BACKUP MODE:
- PRESS THE UP OR DOWN ARROW BUTTONS FOLLOWED BY THE “ENT” KEY

TO RETURN PUMP VFD TO AUTO (PLC) CONTROL MODE THE FOLLOWING IS PERFORMED AT THE VFD KEYPAD:
- PRESS THE “LOC/REM” BUTTON
- THE LIGHT ABOVE THE “LOC/REM” BUTTON WILL TURN OFF ALONG WITH THE LIGHT BETWEEN THE UP AND DOWN ARROWS AND THE LIGHT ABOVE THE “RUN” BUTTON
- THE RESET BUTTON MUST BE PRESSED THREE TIMES.

IN THE EVENT OF COMUNICATIONS LOSS OR PLC FAILURE:

- THE VFD WILL DISPLAY AN ERROR (ERR8)
- THE RESET BUTTON MUST BE PRESSED TWICE
- THE LIGHT BETWEEN THE UP AND DOWN ARROWS AND THE LIGHT ABOVE THE “RUN” BUTTON WILL TURN ON (THE LIGHT ABOVE THE “LOC/REM” BUTTON WILL NOT TURN ON)

TO START/STOP VFD WHILE OPERATING IN BACKUP MODE:

- PRESS THE “RUN” BUTTON TO START VFD
- PRESS THE “STOP” BUTTON TO STOP VFD

TO CHANGE VFD SPEED WHILE OPERATING IN BACKUP MODE:

- PRESS THE UP OR DOWN ARROW BUTTONS FOLLOWED BY THE “ENT” KEY

WHEN COMMUNICATIONS HAVE BEEN RE-ESTABLISHED:

- THE PLC WILL RETURN THE VFD TO REMOTE (AUTO) CONTROL.
- THE LIGHT BETWEEN THE UP AND DOWN ARROWS AND THE LIGHT ABOVE THE “RUN” BUTTON WILL TURN OFF
- THE RESET BUTTON MUST BE PRESSED THREE TIMES.

THE OPERATOR CAN VERIFY THE COMM FAULT STATUS FOR A VFD IN THE HMI (P1 STATUS, P2 STATUS, ETC)

Product data sheet

RM17TG00

phase control relay RM17-T - range 183..528 V AC

Range of product	Zelio Control
Product or component type	Modular measurement and control relays
Relay type	Control relay
Product specific application	For 3-phase supply
Relay name	RM17TG
Relay monitored parameters	Asymmetry Phase failure detection Phase sequence
Switching capacity in VA	1250 VA

Maximum switching voltage	250 V DC 250 V AC
Minimum switching current	10 mA at 5 V DC
[Us] rated supply voltage	208...480 V AC 3 phases
Supply voltage limits	183...528 V AC
Control circuit voltage limits	- 12 %, + 10 % Un
Power consumption in VA	<= 22 VA 400 V AC 50 Hz
Voltage detection threshold	< 100 V for phase failure AC
Control circuit frequency	50...60 Hz +/- 10 %
Output contacts	1 C/O
Nominal output current	5 A
Delay at power up	<= 650 ms
Voltage range	183...528 V
Response time	<= 130 ms in the event of a fault
Marking	CE : 73/23/EEC CE : EMC 89/336/EEC
Overvoltage category	III conforming to IEC 60664-1
Insulation resistance	> 500 MOhm at 500 V DC conforming to IEC 60664-1 > 500 MOhm at 500 V DC conforming to IEC 60255-5
[Ui] rated insulation voltage	400 V conforming to IEC 60664-1
Supply frequency	50/60 Hz +/- 10 %
Operating position	Any position without
Electrical connection	2 conductors cable 0.5...2.5 mm² AWG20...AWG14 solid without cable end conforming to IEC 60947-1 2 conductors cable 0.2...1.5 mm² AWG24...AWG16 flexible with cable end conforming to IEC 60947-1 1 conductor cable 0.5...4 mm² AWG20...AWG11 solid without cable end conforming to IEC 60947-1 1 conductor cable 0.2...2.5 mm² AWG24...AWG12 flexible with cable end conforming to IEC 60947-1
Tightening torque	0.6...1 N.m conforming to IEC 60947-1
Housing material	Self-extinguishing plastic
Status LED	1 LED yellow for relay
Mounting support	35 mm symmetrical DIN rail conforming to EN/IEC 60715
Electrical durability	100000 cycles
Mechanical durability	<= 30000000 cycles
Operating rate	<= 360 operations/hour under full load

Utilisation category	DC-13 conforming to IEC 60947-5-1 DC-12 conforming to IEC 60947-5-1 AC-15 conforming to IEC 60947-5-1 AC-14 conforming to IEC 60947-5-1 AC-13 conforming to IEC 60947-5-1 AC-12 conforming to IEC 60947-5-1
Width	17.5 mm
Product weight	0.13 kg

Environment

Electromagnetic compatibility	Immunity for industrial environments conforming to EN/IEC 61000-6-2 Emission standard for residential, commercial and light-industrial environments conforming to EN/IEC 61000-6-3 Emission standard for industrial environments conforming to EN/IEC 61000-6-4
Standards	EN/IEC 60255-1
Product certifications	CSA C-Tick GL GOST UL
Ambient air temperature for storage	-40...70 °C
Ambient air temperature for operation	-20...50 °C
Relative humidity	95 % at 55 °C conforming to IEC 60068-2-30
Vibration resistance	1 gn (f = 57.6...150 Hz) conforming to IEC 60068-2-6/IEC 60255-21-1 0.35 mm (f = 5...57.6 Hz) conforming to IEC 60068-2-6/IEC 60255-21-1
Shock resistance	15 gn for 11 ms conforming to IEC 60255-21-1
IP degree of protection	IP30 (casing) conforming to IEC 60529 IP20 (terminals) conforming to IEC 60529
Pollution degree	3 conforming to IEC 60664-1
Dielectric test voltage	2 kV 1 min AC 50 Hz
Non-dissipating shock wave	4 kV

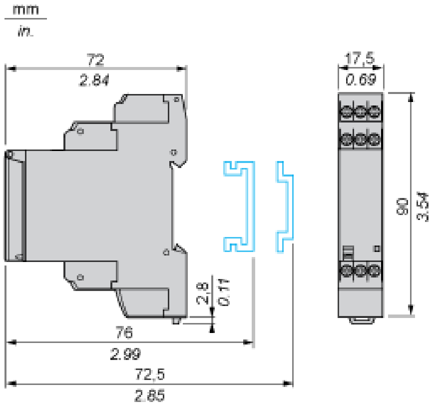
Contractual warranty

Period	18 months

RM17TG00

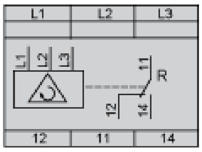
3-Phase Supply Control Relays

Dimensions and Mounting



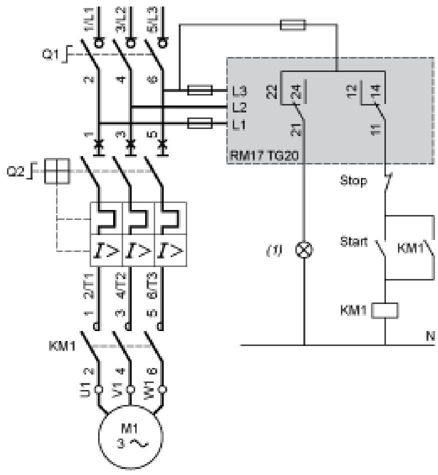
3-Phase Supply Control Relays

Wiring Diagram



Application Scheme

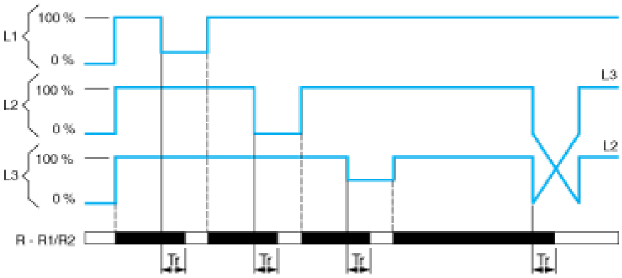
Example



(1) Fault

Function Diagram

Phase Sequence Control and Total Loss of Phase Detection



Tr	Response time on appearance of a fault
L1, L2, L3	Phases of the supply voltage monitored
R - R1/ R2	Output relay(s), depending on the product reference

Relay status: black color = energized.

SDSA3650 Series 001
Secondary Surge Arrester
Apartarrayos secundario
SDSA3650 serie 001
Suppresseur de surtensions secondaires
SDSA3650, série 001

Retain for future use. / Conservar para uso futuro. / À conserver pour usage ultérieur.

INTRODUCTION

The SDSA3650 Secondary Surge Arrester is designed and listed for indoor or outdoor installations and surge protection of three-phase grounded electrical services up to 600 Vac.

NOTE: Do not use on ungrounded systems. Use on solidly grounded systems only.

INTRODUCCIÓN

El apartarrayos secundario SDSA3650 ha sido diseñado y está registrado para ser instalado en interiores o en exteriores y proporcionar protección contra sobretensiones a acometidas eléctricas de tres fases, conectadas a tierra, de hasta 600 V~ (ca).

NOTA: No lo utilice en sistemas no puestos a tierra. Utilícelo sólo en sistemas puestos directamente a tierra.

INTRODUCTION

Le suppresseur de surtensions secondaires SDSA3650 est conçu et répertorié pour les installations intérieures et extérieures et pour la protection contre les surtensions de branchements électriques triphasés mis à la terre jusqu'à 600 Vca.

REMARQUE : Ne pas utiliser sur des systèmes non mis à la terre. À utiliser uniquement dans un système avec mise à la terre directe.

PRECAUTIONS

PRECAUCIONES

PRÉCAUTIONS

⚠ DANGER / PELIGRO / DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma 70E de NFPA.
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo en él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.

El incumplimiento de esta instrucción podrá causar la muerte o lesiones serias.

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Couper l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si cette directive n'est pas respectée, cela entraînera la mort ou des blessures graves.

CAUTION / PRECAUCIÓN / ATTENTION

HAZARD OF EQUIPMENT DAMAGE.

Megger® or hi-potential tests will damage this surge protective device. Turn off all power supplying the equipment and isolate the surge protective device before testing.

Failure to follow this precaution can result in equipment damage.

PELIGRO DE DAÑO AL EQUIPO

Las pruebas de potencial aplicado o con Megger® dañarán el dispositivo de protección contra sobretensiones transitorias. Desenergice el equipo y aísle el dispositivo de protección contra sobretensiones transitorias antes de realizar cualquier prueba.

El incumplimiento de esta instruccion puede causar daño al equipo.

RISQUE DE DOMMAGES MATÉRIELS

Les essais de rupture diélectrique ou avec Megger® endommageront le dispositif de protection contre les surtensions. Coupez l'alimentation de l'appareil et isolez le dispositif de protection contre les surtensions avant de procéder à l'essai.

Si cette directive n'est pas respectée, cela peut entraîner des dommages matériels.

INSTALLATION

1. Turn off all power supplying this equipment before working on or inside equipment.
2. Confirm SDSA is rated for your system by comparing voltage measurements to the Line Voltage (L-L, L-N) on the product label. See Figure 1.

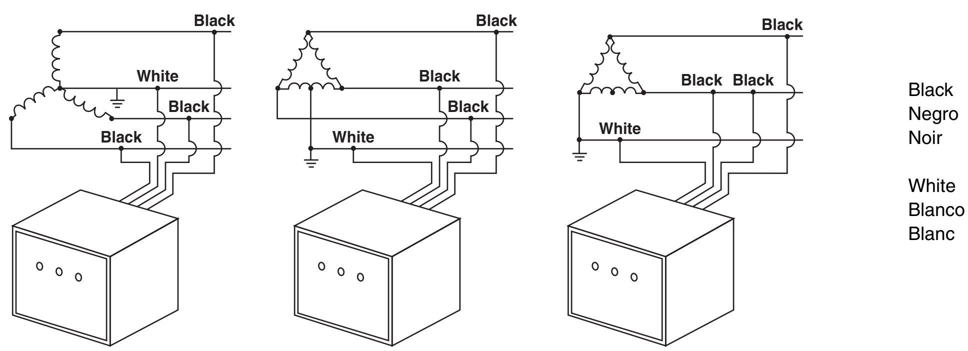
INSTALACIÓN

1. Desenergice el equipo antes de realizar cualquier trabajo en él.
2. Asegúrese de que el SDSA sea adecuado para su sistema comparando las mediciones de tensión en la tensión de línea (L-L, L-N), especificadas en la etiqueta del producto. Vea la figura 1.

INSTALLATION

1. Couper l'alimentation de l'appareil avant d'y travailler.
2. S'assurer que le SDSA est de la valeur nominale convenant à votre système en comparant les mesures de tension à la tension de la ligne (L-L, L-N) sur l'étiquette du produit. Voir la figure 1.

FIG. 1 : Wiring Diagrams / Diagramas de cableado / Schémas de câblage



3-phase 4-wire 208Y/120 Vac
or 480Y/277 Vac
or 600Y/347 Vac

3 fases, 4 hilos de 208Y/120 V~ (ca) o
480Y/277 V~ (ca)
600/347 V~ (ca)

208Y/120 Vca ou
480Y/277 Vca, triphasé à 4-fils
600Y/347 Vca, triphasé á 4-fils

3-phase 4-wire
240/120 Vac

3 fases, 4 hilos
de 240/120 V~ (ca)

240/120 Vca,
triphasé à 4-fils

3-phase 3-wire (corner grounded)
240 Vac or 480 Vac
or 600 Vac

3 fases, 3 hilos (sistema delta puesto a tierra en esquina)
de 240 V~ (ca) o 480 V~ (ca)
600 V~ (ca)

240 Vca ou
480 Vca, triphasé à 3-fils (système delta mis à la terre par le coin)
600 Vca, triphasé á 3-fils

3. Install in accordance with article 280 of the National Electric Code®. See Figure 2.

3. Realice la instalación de acuerdo con lo especificado en el artículo 280 del Código nacional eléctrico de EUA (NEC) y NOM-001. Vea la figura 2.

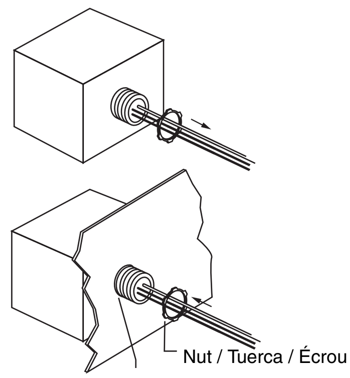
3. Installer conformément à l'article 280 du Code national de l'électricité (NEC; É.-U.). Voir la figure 2.

FIG. 2 : Mounting SDSA Unit / Montaje de la unidad SDSA / Montage de l'unité SDSA

NOTE: The secondary surge arrester must be installed in an accessible location (not within walls).

NOTA: El apartarrayos secundario deberá ser instalado en una ubicació n accesible (no encerrado

REMARQUE : Le suppresseur de surtensions secondaires doit être install é dans un emplacement accessible (non à l'int érieur de cloisons).



0.5 in. [13 mm] knockout (trade size)
Actual hole size .875 in. [22 mm]

Disco removible de 13 mm (0,5 pulg), tamaño comercial
Tamaño real del agujero: 22 mm (0,875 pulg)

Débouchure de 13 mm [0,5 po] (taille commerciale)
Taille réelle du trou : 22 mm [0,875 po]

4. Confirm that the electrical terminals used to attach this device are identified for these conductors.
5. Twist conductors 1/2 turn or more for every 12 inches of length.
6. Keep conductor length as short as possible with no sharp bends.
7. Do not loop or coil wires.
8. Ensure a high quality ground is in place.
9. Install cover and/or close door on equipment.

4. Asegúrese de que las terminales eléctricas utilizadas para conectar este dispositivo hayan sido identificadas para estos conductores.
5. Tuerza los conductores vuelta o más por cada 305 mm (12 pulgadas) de longitud.
6. Mantenga la longitud de los conductores lo más corta posible evitando doblarlos en ángulo recto.
7. No haga bucles o enrolle los cables.
8. Asegúrese de que exista una conexión a tierra de alta calidad.
9. Instale la cubierta y/o cierre la puerta del equipo.

4. S'assurer que les bornes électriques utilisées pour brancher cet appareil sont identifiées pour ces conducteurs.
5. Torsader les conducteurs de 1/2 tour ou plus par 305 mm (12 po) de longueur.
6. Maintenir la longueur des conducteurs aussi courte que possible et sans courbures accentuées.
7. Ne pas faire de boucles et ne pas enrouler les fils.
8. S'assurer qu'une mise à la terre de haute qualité est en place.
9. Installer le couvercle et/ou fermer la porte de l'appareil.

Diagnostic Operation

- LED ON = Normal operation
- LED OFF (one or more) = Fault, check phase voltage, circuit breaker (if used) and connections. If OK, replace unit. See Figure 3.

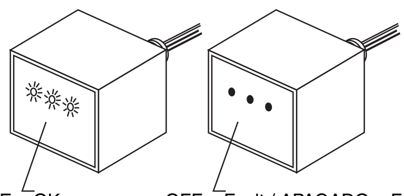
Diagnóstico del funcionamiento del equipo

- LED ENCENDIDO = funcionamiento normal
- LED APAGADO (uno o más) = falla, revise la tensión de fase, los interruptores automáticos (si se utilizan) y las conexiones. Si se muestra OK, vuelva a colocar la unidad. Vea la figura 3.

Fonctionnement du diagnostic

- DÉL ALLUMÉE = Fonctionnement normal
- DÉL ÉTEINTE(S) (une ou plusieurs) = Défaut, vérifier la tension de phase, les disjoncteurs (si utilisés) et les raccordements. Si tout est normal, remplacer l'appareil. Voir la figure 3.

FIG. 3 : Diagnostic Operation / Diagnóstico del funcionamiento del equipo / Fonctionnement du diagnostic



ON = OK / ENCENDIDO = En buen estado / ALLUMÉE = OK

OFF = Fault / APAGADO = Falla / ÉTEINTE = Défaut

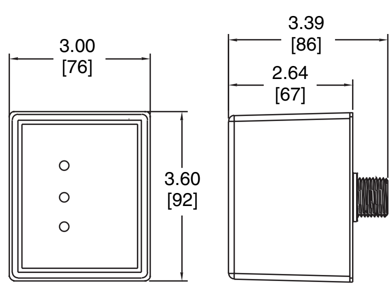
General Specifications

Especificaciones generales

Spécifications générales

Product Catalog No. No. de catálogo del producto N^{o} de catalogue de produit	SDSA3650 SDSA3650 SDSA3650
Max Surge Current Corriente transitoria máx. Courant max. de surtension	40 kA/Phase 40 kA/fase 40 kA/phase
Label Rating and Housing Dimensions Etiqueta de clasificación y dimensiones de la caja Étiquette de classification et dimensions du boîtier	Type 4X, see Figure 4 Tipo 4X, vea la figura 4 Type 4X, voir la figure 4
SCCR Rating Corriente nominal de cortocircuito Courant nominal de court-circuit	200 kA 200 kA 200 kA
Product Weight Peso del producto Poids du produit	1 lb 0,45 kg (1 lb) 0,45 kg (1 lb)
Connection Method Método de conexión Méthode de raccordement	Parallel, #12 AWG Wire Paralelo, conductor sólido de 3,31 mm^2 (12 AWG) En parallèle, fil rigide de calibre 12 AWG
Thermal Fusing Fusión térmica Fusibles thermiques	Yes Sí Oui
Operating Temperature Temp. de funcionamiento Tempér. de fonctionn.	-40° to +160°F (-40° to +70°C) -40° a +160°F (-40° to +70°C) -40° à +160°F (-40° à +70°C)
Operating Frequency Frecuencia de funcionamiento Fréquence de fonctionnement	50/60 Hz 50/60 Hz 50/60 Hz
Diagnostics Diagnóstico Diagnostics	Green Status LEDs LED de estado, verde DÉL d'état verte
Product Standards Normas del producto Normes du produit	UL 1449-2nd Edition 2005, cUL, ANSI/IEEE C62.11 - C22.2 No. 233.1-87 UL 1449-2nd Ed, 2005, cUL, ANSI/IEEE C62.11 - C22.2 No. 233.1-87 UL 1449-2nd Ed, 2005, cUL, ANSI/IEEE C62.11 - C22.2 No. 233.1-87
	Surge Arrester/TVSS Apartarrayos/ TVSS (supresor de sobretensiones transitorias) Suppresseur de surtensions/SST (suppresseur de surtensions transitoires)

FIG. 4 : Dimensions / Dimensiones / Dimensions



Dim. : in. / pulg / po [mm]

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

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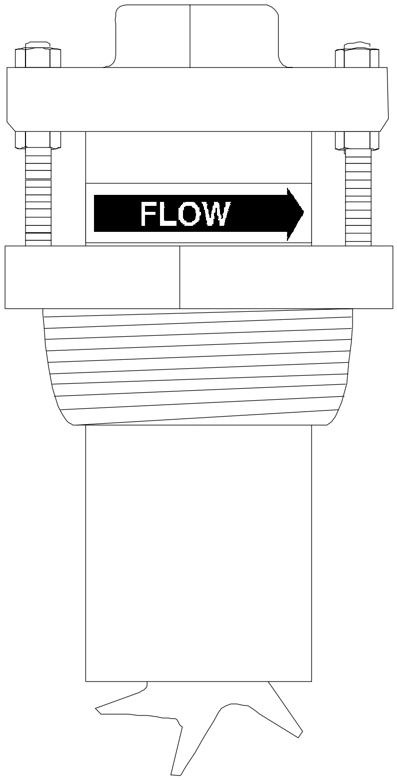


200 Series

Insert Style Flow Sensors

by Data Industrial

Owner's Manual

Introduction

Used in conjunction with any Data Industrial flow monitor or transmitter, Data Industrial non-magnetic flow sensors provide an accurate reading of the rate of liquid flow as well as total accumulated flow. A number of sensor models are offered, which cover applications for a wide range of pipe sizes and pressure/temperature specifications.

The flow sensors generate a frequency which is proportional to flow rate. An internal preamplifier allows the pulse signal to travel up to 2000 feet without further amplification. Power to operate the sensor is provided by the flow monitor. The impeller, shaft, O-rings, and impeller bearings are replaceable in the field.

Data Industrial flow sensors feature a closed, six-bladed impeller design, using a proprietary, non-magnetic sensing technology. The forward-swept impeller shape provides higher, more constant torque than four-bladed impeller designs, and is less prone to fouling by water-borne debris. The forward-curved shape, coupled with the absence of magnetic drag, provides improved operation and repeatability, even at lower flow rates. As the liquid flow turns the impeller, a low impedance 8 VDC signal is transmitted with a frequency proportional to the flow rate.

Sensors of similar type are interchangeable, so there is no need for recalibration after servicing or replacement.

Electronic Types

Data Industrial provides several basic sensor configurations using the same impeller element. This allows for a wide range of applications and pipe sizes. Sensors are normally supplied with 20 feet of Belden Type 9320 (two conductor shielded) cable. Optional sensors designated with the prefix "IR" feature two single conductor 18 AWG stranded copper wire leads 48 inches in length with U.L. Style 1056 direct burial insulation. These IR models are used in below grade applications such as irrigation, municipal, and groundwater monitoring. All 200 series sensor electrical components are self-contained. Pressure/temperature ratings for the various models are contained in the *Specifications* section of this manual. These models can be further described as follows:

"Standard" Sensor
Designed for indoor or protected area applications such as HVAC, pump control, and industrial process monitoring where the flow rates are between 0.5-30 feet/second and temperatures are below 221°F. Standard sensors are supplied with 20 feet of Belden Type 9320 (two conductor shielded) cable.

"IR" Sensor
Designed for below grade applications such as irrigation, municipal, and groundwater monitoring where the flow rates are between 0.5-30 feet/second and temperatures are below 221°F. IR sensors are supplied with two single conductor, 18 AWG stranded copper wire leads 48 inches in length with U.L. Style 1056 direct burial insulation.

Data Industrial

PN# 72020
10/6/97 Rev A

"High Temperature" Sensor

Designed for indoor or protected area applications such as hydronic heating loops, boiler feed, and condensate return line monitoring where the flow rates are between 0.5-30 feet/second and temperatures may be up to 285°F. High Temperature 228 and 250 sensors are supplied with 12 inches of Belden Type 9320 (two conductor shielded) cable inside the electronics housing.

"FM/CSA" Sensor

Designed for indoor or protected area applications where intrinsic safety is required and the flow rates are between 0.5-30 feet/second and temperatures are below 221°F. FM/CSA sensors are supplied with 20 feet of Belden Type 9320 (two conductor shielded) cable. These sensors must be used with an approved safety barrier.

"Magnetic" Sensor

Designed for use with the Series 1400 battery powered flow monitor in above or below or grade applications such as irrigation, municipal, and groundwater monitoring where the flow rates are between 1-30 feet/second and temperatures are below 221°F.

Models 220BR, 220PVS, 225BR, 226BR, 220SS and 226SS

Model 220BR

This Insert style sensor has a 5 1/4" long sleeve length, and uses brass and bronze hardware. It is used in all pipe sizes from 2.5" to 40.0" in diameter. A bronze 2" NPT externally threaded hex adapter is provided. The adapter may be mounted to the pipe using a welded-on threaded fitting such as a Thredolet® or pipe saddle.

Model 220PVS

This insert style sensor has an 8" long sleeve length, and uses PVC and stainless steel hardware. It is used in all pipe sizes from 2.5" to 40.0" in diameter. A PVC 2" NPT externally threaded hex adapter is provided. The adapter may be mounted to the pipe using a pipe saddle.

Model 220SS

This is the same as Model 220BR, except that the sensor, sleeve and hex adapter are made of 300 Series stainless steel.

Models 225BR

This insert style sensor has a 16 3/8" long sleeve length, and uses brass and bronze hardware for hot tap installations. It has a bronze isolation gate valve for applications where the pipe is drained for initial installation but cannot be drained for service.

Models 226BR

This is the same as Model 225BR, except that it has a ball type isolation valve. The ball valve allows for higher pressure use. We recommend this sensor when installation is to be made under pressure, in a true "hot tap" installation. The ball valve cannot be fouled by the tailings from the cutting operation.

200 Series Insert Style Matrix (sizes 2½" and up)

Example: 2 x x x x x - x x x x

STYLE	
Short Insert	20
Hot Tap Insert-Gate Valve	25
Hot Tap Insert-Ball Valve	26
MATERIAL	
Brass	BR
Stainless Steel	SS
PVC Sleeve w/Stainless Steel Trim	PVS
Size	
Insert Style	00
Electronics Housing	
PPS	0
ELECTRONICS	
Standard	0
IR-Irrigation	1
Magnetic	2
FM/CSA Approved	4
High Temperature	8
O-RING	
Viton	0
EPDM	1
Kalrez	2
Food Grade Silicon	3
Neoprene	4
Chemraz	5
Teflon Encapsulated Viton	6
Teflon Encapsulated Silicone	7
Buna N	8
SHAFT	
Zirconia Ceramic	0
Hastalloy C	1
Tungsten Carbide	2
Titanium	3
Monel	5
316 Stainless Steel	6
Tantalum	7
Hipped Zirconia Ceramic	8
IMPELLER	
Nylon	1
Tefzel	2
BEARING	
Pennlon	1
Tefzel	2
Teflon	3

Models 226SS, IR226SS

This is the same as Model 226BR respectively, except that the hot tap hardware, ball valve, and sensor sleeve are made of 300 Series stainless steel.

Model HTT

This is the insertion tool for use with any of the Hot Tap Sensor units. It is used to insert and remove the sensor while under pressure. Generally, only one HTT tool is needed on each job site.

Mechanical Installation

General

The accuracy of flow measurement for all flow measuring devices is highly dependent on proper location of the sensor in the piping system. Irregular flow velocity profiles caused by valves, fittings, pipe bends, etc. can lead to inaccurate overall flow rate indications even though local flow velocity measurement may be accurate. A sensor located in the pipe where it can be affected by air bubbles, floating debris, or sediment may not achieve full accuracy and could be damaged. Data Industrial flow sensors are designed to operate reliably under adverse conditions, but the following recommendations should be followed to ensure maximum system accuracy:

1) Choose a location along the pipe where 10 pipe diameters upstream and 5 pipe diameters downstream of the sensor provide no flow disturbance. Pipe bends, valves, other fittings, pipe enlargements and reductions should not be present in this length of pipe.

2) The preferred location around the circumference of a horizontal pipe is on top. If trapped air or debris will interfere, then the sensor should be located further around the pipe from the top but not more than 45 degrees from top dead center. The sensor should never be located at the bottom of the pipe, as sediment may collect there. Locations off top dead center cause the impeller friction to increase, which may affect performance at low flow rates. Any circumferential location is correct for installation in vertical pipes.

3) An insertion depth of 1 1/2” for pipe sizes 2.5” and larger is required for accurate flow rate calibration. Detailed installation instructions for various sensor mounting configurations on the following pages include methods for ensuring correct insertion depth.

4) Alignment of the sensor to ensure that impeller rotation is parallel to flow is important. Alignment instructions are also included on the following pages.

Installation for 220BR, 220SS

Installation Procedure

The insertion depth and alignment of the sensor assembly are critical to the accuracy of the flow measurement. The Flat End of the sensor tube assembly MUST BE INSTALLED 1-1/2" from the inside wall of the pipe. In order to allow for variations in wall thickness, lining or coatings, the depth adjustment is controlled by the position of the Hex Nuts on the three (3) threaded studs of the Hex Mounting Adapter. The Hex Mounting Adapter is provided with a 2" Male NPT connection.

There are two methods of mounting these Data Industrial sensors in a 2.5” or larger pipe. One is with a 2” NPT threaded pipe saddle. The other is with a welded-on fitting such as a Thredolet®, also tapped for a 2” NPT connection. In either case, cut a 2” hole through a depressurized pipe and then secure the saddle or weld-on fitting to the pipe. (For drilling into a pressurized pipe, see instructions for 225 and 226 sensors.) Install the 2” NPT adapter provided, using a thread sealant to prevent leakage. Tighten as necessary. Data Industrial insert style sensors are calibrated with the sensor inserted 1 1/2” into the pipe flow.

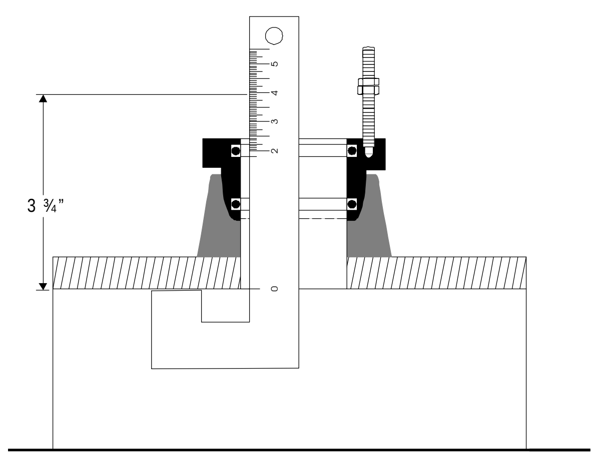
To determine the proper insertion depth, proceed as follows:

1) **Apply Anti-Seize thread lubricant , supplied with the sensor, to the threaded studs of the mounting adaptor.**

2) Determine the height to the upper adjusting nuts on the three 1/4” studs using the insertion depth gauge contained in the 120IK Installation Kit. Set them at 3 3/4" above the inside wall of the pipe.

   Note: ***For 220PVS: Set nuts 6.5" above inside wall of pipe***

Figure 1
Installation for 220BR and 220SS



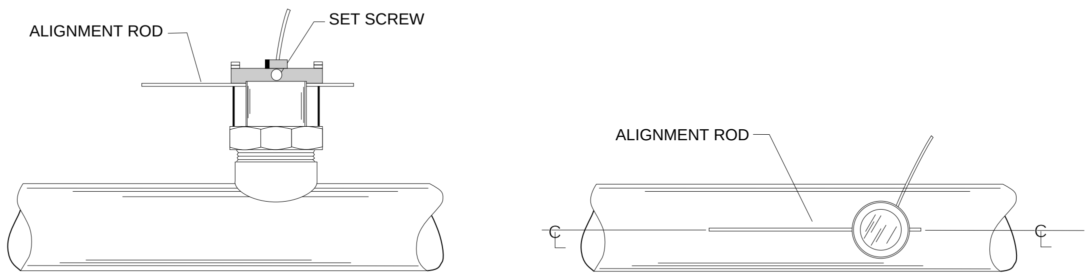
3) Clean O-Rings and flow sensor sleeve, and lightly lubricate O-Rings with silicone grease from the packet provided or some other acceptable lubricant. Take care not to get grease on the impeller or bearing.

4) Insert the flow sensor into the 2” NPT adapter so that the mounting holes in the positioning collar fit over the studs on the adapter. Lower the sensor onto the previously adjusted nuts. Install the lock nuts on top of the positioning collar and tighten. Now tighten the lower jam nuts firmly against the upper adjusting nuts to secure them for future removal of the sensor for inspection or service.

Alignment of Flow Sensor

1) Loosen positioning collar set screws with a 3/32” Allen wrench. Place the alignment rod through the sight holes in the flow sensor. Refer to Figure 2. Using the alignment rod as a guide, align the flow sensor so that the flow label arrow matches pipe flow direction and so that the alignment rod is exactly parallel to the pipe. This procedure aligns the impeller directly into the fluid flow.

Figure 2
Alignment of Flow Sensor in 220BR and 220SS



2) As a backup to the flow arrow label, there is a small hole next to the larger sighting hole of the upstream side. With a 3/32” Allen wrench, tighten positioning collar set screws.

3) Double check that the sighting holes in the sleeve are parallel down the pipe and that the flow arrow label matches pipe liquid flow direction.

4) Cable routing: The positioning collar is threaded for connection of a standard 1/2” electrical conduit (flex cable) or a wire strain relief. Route cable as required. Be sure to leave enough flex in cable or conduit to allow future removal of sensor for service or cleaning if necessary.

Hot Tap Installation for 225BR, 226BR, and 226SS
Data Industrial Series 200 Hot Tap style liquid flow sensors are designed for use in cases where pipelines will be in continuous service and depressurizing or draining the system for installation or service is not practical.

The Series 200 Hot Tap sensors are designed to be installed either in a depressurized pipe by hand or “Hot Tapped” into a pressurized pipeline. Both installation procedures are listed in this Application Note. If there is the slightest possibility that the pipe could be full or pressurized, **FOLLOW THE INSTALLATION FOR PRESSURIZED PIPE.**

Refer to Figure 3 for location or identification of the various parts described in the following procedures.

The insertion depth and alignment of the sensor assembly are critical to the accuracy of the flow measurement. The Flat End of the sensor tube assembly MUST BE INSTALLED 1-1/2" from the inside wall of the pipe. In order to allow for variations in wall thickness, lining or coatings, the depth adjustment is controlled by the position of the Hex Nuts on the three (3) threaded studs of the Hex Mounting Adapter. The Hex Mounting Adapter is provided with a 2" Male NPT connection. Both Gate and Ball Valve units are provided with 2" nipples for mounting onto saddles, weld-o-lets, etc.

Depth setting is accomplished by positioning the hex nuts 14-7/8" minus the thickness of the pipe, from the Outside Diameter of the Pipe. For example, measure the wall thickness of the pipe from the coupon removed when the 1-7/8" hole was cut into the pipe. If the pipe was 1/8" thick, subtract 1/8" from 14-7/8" or position the nuts 14-3/4" from the outside diameter of the pipe. This will allow the 16-3/8" sensor to protrude 1-1/2" into the pipe.

Apply Anti-Seize thread lubricant, supplied with the sensor, to the threaded studs of the mounting adaptor.

The alignment of the impeller with the flow in the pipe is accomplished by aligning the two (2) “sight holes” at the top of the sensor tube assembly with the center line of the pipe.
Make sure the alignment is made to the pipe and not to a wall or surface near the sensor. To adjust, loosen the two (2) set screws in the positioning collar with a 3/32" Allen wrench provided in the Series 200 Hot Tap Installation Kit. Slip one end of the 1/4" x 18" steel rod (also supplied in the installation kit) through the holes in the sensor tube. Rotate the sensor tube until the rod is centered on the pipe. Ensure the flow label “Arrow” on the sensor matches the liquid flow direction. Tighten the positioning collar Allen Screws to lock the sensor tube assembly in position. Note: As a backup to the flow direction arrow label on the tube assembly, there is a smaller hole located beside one of the sighting holes in the tube, to also indicate the upstream side of the tube assembly.

If the pipe is depressurized and drained

1) Drill or cut a 1-7/8" hole in the pipe with a drill or hole saw. Note the pipe wall thickness for use in calculating sensor assembly depth. A location on the top of the pipe is best for overall performance and service life; however, any radial location on the top half of the pipe is acceptable. Allow a minimum of ten (10) pipe diameters upstream and five (5) downstream from the sensor of straight unobstructed pipe to allow full development of the flow profile.

2) Install either a service saddle or welded pipe fitting (2" female NPT) on the outside diameter of the pipe over the 1-7/8" hole.

3) Install the Data Industrial isolation valve and nipple onto the fitting using pipe thread sealant or teflon tape on all threads.

4) Install the Data Industrial Hex Mounting Adapter onto the valve assembly. Use pipe thread sealant on the adapter. Tighten the Hex Adapter so that no stud is aligned with the center-line of the pipe. This could interfere with final sensor alignment. Measure depth and set the height of the nuts of the hex mounting adapter.

5) Open the bleed petcock valve on the Hex Adapter to relieve the pressure as the sensor tube is installed. Carefully hand insert the Data Industrial Hot Tap flow sensor tube into the Hex Mounting Adapter. The sleeve should be inserted past the top two “O”-rings in the adapter (approx. 1 - 1-1/4 inches). **Take care not to push the tube in too far as the impeller could be damaged if it strikes the closed valve.**

6) Even if the sensor is installed with system drained, Data Industrial recommends that a HTT, Hot Tap Insertion/Removal Tool be purchased for future service. This tools allows the sensor tube assembly to be removed from the pipe line without draining the entire loop where the sensor is mounted.

7) In a fully depressurized and drained pipe, the sensor tube assembly may be installed by hand. **Carefully and very slowly** open the isolation valve to relieve any pressure that may have built up. Fully open the isolation valve. Push the sensor tube into the pipe with a slight twisting motion. Guide the sensor collar holes over the three hex adapter studs until the collar rests on the nuts. Hex nuts should have been previously set to the correct height. Install the three (3) lock nuts onto these studs at the top of the positioning collar and securely tighten.

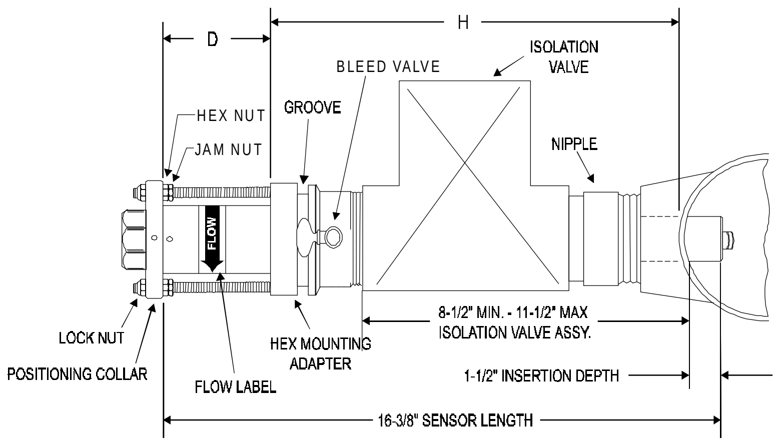
8) Loosen the two set screws in the positioning collar with a 3/32" Allen wrench. Align the sensor sight holes along the pipe axis using the alignment rod provided in the installation kit supplied with the sensor. Ensure that the flow label arrow on the sensor matches the liquid flow direction inside the pipe. Tighten the positioning collar set screws. Note: As a backup to the flow label arrow, there is a small hole located beside one of the sighting holes to also indicate the upstream side of the sensor.

Installation into a pressurized pipeline using Model HTT.

For information on installing hot tap sensor with older 225H consult technical bulliton #41

For pipe sizes 2½” and above; all Data Industrial sensors are inserted 1 1/2” from the inside wall of the pipe. The insertion depth is controlled by the position of the hex nuts on the three threaded rods. The formula below defines the distance between the top of the sensor hex mounting adaptor and the bottom of the positioning collar (the top of the hex nut). Reference Figure 3.

Figure 3



D = 16 3/8” - (H + Pipe Wall Thickness + 1.5 “)

Example: If sensor is installed in a 8”Sch 80 pipe with a pipe wall thickness of .5” and the “H” dimension is 10” then the calculation would be as below:

D = 16 3/8 - (10” + 0.5” + 1.5”)
D = 4 3/8”

1. Set one set of hex/jam nuts so that the distance between the top surface of the hex nut and the top surface of the Hex Mounting Adaptor is equal to the “D” dimension calculated above. Then adjust the other two sets of hex/jam nuts 1½” below the first jam nut to allow clearance for the tool top yoke.
2. Remove the tool split ring and clevis pin and slide tool bottom yoke into the groove on the sensor Hex Mounting Adaptor and secure by replacing the clevis pin and split ring.
3. Mark sleeve 2¾” from impeller end of metal sleeve. This mark is a stopping point to insure that impeller/ bearing is not damaged. Open the bleed petcock valve on the Hex Adapter to relieve the pressure resulting from the sensor tube insertion. Carefully hand insert the Data Industrial Hot Tap flow sensor sleeve assembly into the Hex Mounting Adapter until the mark lines up with the top of the Hex Mounting Adapter. At this point the sleeve will have been inserted past the top two “O”-rings in the adapter (approx. 1 - 1-1/4 inches). Take care not to push the sensor past the mark on the sleeve as the impeller could be damaged if it strikes the closed valve.
4. Fully extend tool by turning drive nut counterclockwise with a 15/16” socket or box wrench (not provided) until drive nut contacts tool and slide the positioning collar into the tool top yoke.
5. Rotate tool so the threaded rod with the adjusted hex/jam nuts is centered in the top yoke of hot tap tool.
6. Rotate sensor sleeve so positioning collar holes align with the threaded rods and flow direction label is in general direction making sure the positioning collar is located in the recessed area of the top yoke. Slide the top yoke of the tool over the positioning collar and secure by tightening the two thumbscrews on the top of the yoke.

7. Close the bleed petcock and slowly open the isolation valve. Slowly turn the 15/16” drive nut clockwise to insert the sensor tube assembly through the valve and into the pipeline. Carefully guide the three (3) threaded studs of the Hex Mounting Adapter through the holes of the sensor positioning collar. Carefully lower the sensor until the Positioning collar contacts the hex nut preset for the correct depth adjustment. Install the three (3) lock nuts onto the threaded rods, tightening only the lock nut on the threaded rod with the preset hex/jam nut; then, bring the two remaining lock nuts down until they just contact the positioning collar. Do not tighten at this time

8. Remove the Model HTT Insertion/Removal Tool, by loosening the two thumbscrews, removing the clevis pin and then sliding the insertion tool off the sensor. Then bring the two remaining sets of hex/jam nuts up to the underside of the positioning collar, and tighten.

9. Align the sensor by first loosening the two set screws in the side of positioning collar with a 3/32" Allen wrench, Then align the sensor sight holes along the pipe axis using the alignment rod provided in the sensor installation kit. Ensure that the flow label arrow on the sensor matches the liquid flow direction inside the pipe. Tighten the positioning collar set screws. Note: As a backup to the flow label arrow, there is a small hole located beside the sight hole on the upstream side of the sensor.

Electrical Installation "Standard" sensors

1) The metal collar on the top of the 220 sensors will accept 1/2" threaded conduit fittings.
2) Route the cable from the sensor to a Data Industrial flow monitor/transmitter. The cable may be extended up to 2000 feet, using 2-conductor shielded 20 AWG or larger stranded copper wire. Be sure to leave enough flexibility in the cable or conduit to allow for future service of sensor, if necessary.
3) When connecting to a Data Industrial flow monitor/transmitter, locate the section of terminal strip on the monitor labeled **“SENSOR INPUT”** or **“SENSOR”**. Connect the red wire to **“ IN”**, "**SIGNAL(+)**" or "**SIGNAL**" terminal and the black wire to **“GND", "SIGNAL(-)”**, or "**COM**" terminal and the shield drain wire (if applicable) to **“SLD”**.
4) When interfacing with other equipment consult manufacture for input designations. The signal wave forms and power requirements are as shown in the Specifications section.

Electrical Installation "IR" sensors

The sensor leads are supplied with watertight caps over the ends.

1) **DO NOT** remove the plastic caps from the sensor leads until ready to splice.
2) Use a **twisted pair** cable suitable for direct burial to connect the sensor to the transmitter, monitor, or controller. Multi-pair telecommunication cable or direct burial cables may be used.
3) Make a water tight splice. Two part epoxy type waterproof kits are recommended. Be sure the epoxy seals the ends of the cable jacket.
4) Make sure the epoxy is hardened before inverting the splice or dropping it in standing water.
5) **DO NOT** make an underground splice unless absolutely necessary.
6) Route the cable from the sensor to a Data Industrial flow monitor/transmitter. The cable may be extended up to 2000 feet, using 2-conductor shielded 20 AWG or larger stranded copper wire. Be sure to leave enough flexibility in the cable or conduit to allow for future service of sensor, if necessary.
7) When connecting to a Data Industrial flow monitor/transmitter, locate the section of terminal strip on the monitor labeled **“SENSOR INPUT”** or **“SENSOR”**. Connect the red wire to **“ IN”**, "**SIGNAL(+)**" or "**SIGNAL**" terminal and the black wire to **“GND", "SIGNAL(-)”**, or "**COM**" terminal and the shield drain wire (if applicable) to **“SLD”**.
8) When interfacing with other equipment, the signal wave forms and power requirements are as shown in the Specifications section.

Electrical Installation "High Temperature" sensors

1) Route a cable from the sensor to a Data Industrial flow monitor/transmitter. The cable may be run up to 2000 feet, using 2-conductor shielded 20 AWG or larger stranded copper wire. Be sure to leave enough flexibility in the cable or conduit to allow for future service of sensor, if necessary.
2) Connect to cable inside sensor electronic housing on 220 Series sensors or attach to the sensor cable on the 225/226 Series and connect with standard wire nuts.
3) When connecting to a Data Industrial flow monitor or transmitter, locate the section of terminal strip on the monitor labeled **"SENSOR INPUT"** or **"SENSOR"**. Connect the red wire to **" IN"**, "**SIGNAL(+)**" or "**SIGNAL**" terminal and the black wire to **"GND", "SIGNAL(-)"**, or "**COM**" terminal and the shield drain wire (if applicable) to **"SLD"**.
4) When interfacing with other equipment, the signal wave forms and power requirements are as shown in the Specifications section.

Electrical Installation "Magnetic" sensors

The magnetic sensor has a custom wire connector that connects to the series 1400 monitor only. The cable may be extended up to 100 feet from the sensor. If extension cables are needed they may be ordered from Data Industrial.

Electrical Installation (FM Sensors)

The Series 200 Sensor is approved, as an entity, as Intrinsically Safe when installed in conformance with Data Industrial installation drawings 06-480-001 or 06-480-002 (samples shown on Page 6) as specified on the blue label identifying an intrinsically safe sensor.

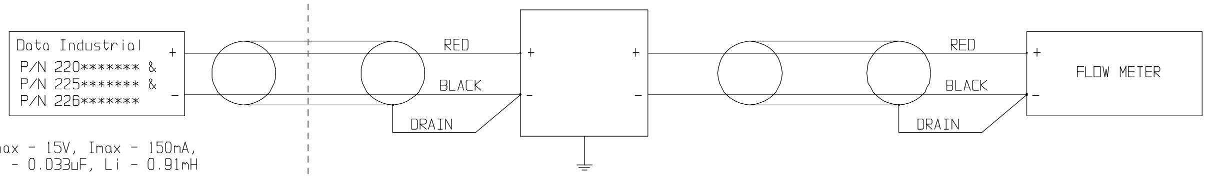
Entity approval implies that only the sensor is approved as intrinsically safe. Unless power supplies, equipment, and instruments connected to the sensor are each rated either explosion-proof or intrinsically safe, these devices cannot be installed in a hazardous area. The referenced installation drawing shows such apparatus located in a non-hazardous location. Proper interfacing between the hazardous and non-hazardous areas must be provided. It is of absolute importance that this interface be constructed and that all wiring be performed by qualified contractors. To ensure the Intrinsic Safety of the installation, the connection of the intrinsically safe sensor to instruments and or power supplies must take place using an approved intrinsically safe barrier located in a non-hazardous area. These barriers, listed below, are readily available from various suppliers.

Manufacturer:	Barrier:
Crouse-Hinds Spec 504	Cat No. SB19140M0715
Measurement Technology Ltd.	MTL 715+ 15 V
R Stahl Intrinspak	9001/01-158-150-10

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	RELEASED ECO 3250		
B	ECO 3263	7-6-94	
C	ECO 3292	12/27/94	

HAZARDOUS LOCATION

NONHAZARDOUS LOCATION



Vmax - 15V, Imax - 150mA,
Ci - 0.033uF, Li - 0.91mH

USABLE IN HAZARDOUS LOCATIONS
CLASS I, DIVISION 1,
GROUPS A, B, C, D

FMRC APPROVED ENTITY
INTRINSIC SAFETY BARRIER

NOTES
1. FMRC APPROVED BARRIER PARAMETERS MUST MEET THE FOLLOWING CONNECTION REQUIREMENTS:
   - Voc OR Vt MUST BE LESS THAN Vmax
   - Isc OR It MUST BE LESS THAN Imax
   - C1 PLUS INTERCONNECTION WIRING MUST BE LESS THAN THE Ca OF THE FMRC APPROVED BARRIER
   - L1 PLUS INTERCONNECTING WIRING MUST BE LESS THAN THE La OF THE FMRC APPROVED BARRIER
2. INSTALLATION SHALL BE IN ACCORD WITH THE MANUFACTURER'S INSTRUCTIONS AND THE NATIONAL ELECTRICAL CODE (ANSI/NFPA 70).
3. FOR GUIDANCE ON INSTALLATION, SEE ANSI/ISA RP12.6 "INSTALLATION OF INTRINSICALLY SAFE INSTRUMENT SYSTEMS IN CLASS I HAZARDOUS LOCATIONS"
4. NO CHANGES TO THIS DRAWING WITHOUT PRIOR WRITTEN AUTHORIZATION FROM FMRC.

DO NOT SCALE DRAWING

DRAWN: BILL HEELAN 04/20/94 DATE
CHECKED DATE
APPROVAL DATE
FMRC APPROVAL DATE

Data Industrial
11 INDUSTRIAL DRIVE
MATTAPOISETT, MA 02739
(508)-758-6390

PROJECT: FM APPROVED SENSORS

PART: INSTALLATION DRAWING FOR FMRC APPV'D 220BR*-, 220SS*-, 225*-, & 226*- SENSORS

SIZE B | FSCM NO. | DWG NO. 06-480-001 | REV C

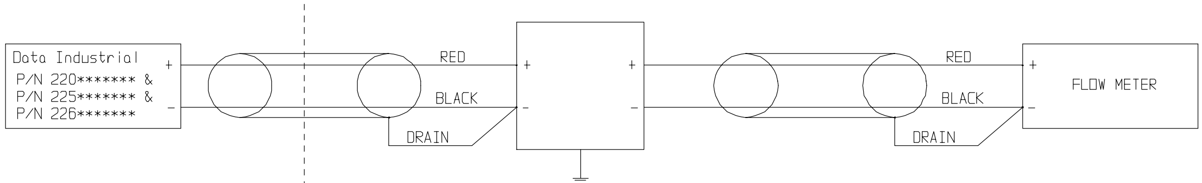
SCALE NONE | SHEET 1 OF 2

THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY TO DATA INDUSTRIAL. NEITHER RECEIPT NOR POSSESSION HEREOF CONFERS ANY RIGHT TO REPRODUCE, USE, OR DISCLOSE, IN WHOLE OR IN PART, ANY SUCH INFORMATION WITHOUT WRITTEN AUTHORIZATION OF DATA INDUSTRIAL

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	RELEASED ECO 3250		
B	ECO 3263	7-6-94	
C	ECO 3292	12/27/94	

HAZARDOUS LOCATION

NONHAZARDOUS LOCATION



USABLE IN HAZARDOUS LOCATIONS
CLASS I, DIVISION 1,
GROUPS A, B, C, D

CSA CERTIFIED
INTRINSIC SAFETY BARRIER

CROUSE-HINDS, SPEC 504, CAT. NO. SB19140M0715
MEASUREMENT TECHNOLOGY LTD. MTL 715+ 15 V,
R. STAHL INTRINSPAK 9001/01-158-150-10

NOTES:
1. INSTALLATION SHALL BE IN ACCORD WITH THE INTRINSIC SAFETY BARRIER MANUFACTURERS INSTRUCTIONS AND CANADIAN ELECTRICAL CODE
2. NO CHANGES TO THIS DRAWING WITHOUT PRIOR WRITTEN AUTHORIZATION FROM CSA

DO NOT SCALE DRAWING

DRAWN: BILL HEELAN 04/20/94 DATE
CHECKED DATE
APPROVAL DATE
FMRC APPROVAL DATE

Data Industrial
11 INDUSTRIAL DRIVE
MATTAPOISETT, MA 02739
(508)-758-6390

PROJECT: CSA CERTIFIED SENSORS

PART: INSTALLATION DRAWING FOR CSA CERTIFIED 220BR*-, 220SS*-, 225*-, & 226*- SENSORS

SIZE B | FSCM NO. | DWG NO. 06-480-001 | REV C

SCALE NONE | SHEET 2 of 2

Calibration

Data Industrial sensors use unique K and offset numbers for calibration. These numbers are derived from calibration runs using NIST traceable instruments. Using both a K and an offset number provides higher accuracy than using a K factor alone. K and offset numbers for each tee configuration are listed in the following tables.

Calibration Tables

The table on pages 11 and 12 provides calibration and operation data for most scheduled pipe sizes from 3” through 18”. For tee-mounted sensors, see the table on page 11.

Description of Column Information for Pipe Sizes 3” through 36”

Column 1	Nominal Pipe Size
Column 2	Pipe O.D. as defined by ASA B36.10 and other standards
Column 3	Pipe I.D. as defined by ASA B36.10 and other standards
Columns 4 and 5	The K value and Offset that should be used in our frequency equation:

$$\text{Freq} = \frac{\text{Gpm}}{\text{K}} - \text{offset}$$

This equation describes the frequency of the output signal of all Data Industrial flow sensors. By substituting the appropriate K and Offset values from the table, the sensor’s output frequency can be calculated for each pipe size. This information is required when calibrating an output board or when using the raw sensor data as direct output to interface with a device that is not a Data Industrial product.

Column 6 — This column indicates the suggested flow range of sensors in each pipe size. Data Industrial sensors will operate both above and below the indicated flow rates. However, good design practice dictates the use of this range for best performance.

Sensors should be sized for flow rather than pipe size. To prevent disturbances to the flow profile always connect the sensor tee to pipe nipples measuring at least 10 pipe diameters in length on the up stream (supply) side and at least 5 pipe diameters in length on the downstream (delivery) side before making the transition in pipe size.

CALIBRATION TABLE FOR PIPE SIZES 3" THROUGH 36"

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Pipe Size	Pipe O.D.	Pipe I.D.	K Value	Offset	Suggested Operating Range (GPM)
3" Sch 10S	3.500"	3.260"	5.009	.090	12-400
Std. Wt., Sch 40	3.5"	3.068"	4.362	.063	12-400
Extra Strong, Sch 80	3.5"	2.900"	3.858	.043	12-400
PVC Class 125	3.5"	3.284"	5.094	.093	12-400
PVC Class 160	3.5"	3.230"	4.902	.085	12-400
PVC Class 200	3.5"	3.166"	4.682	.076	12-400
4" Sch 10S	4.5"	4.260"	9.597	.241	20-600
Std. Wt., Sch 40	4.5"	4.026"	8.34	.229	20-600
Extra Strong, Sch 80	4.5"	3.826"	7.354	.188	20-600
PVC Class 125	4.5"	4.224"	9.396	.240	20-600
PVC Class 160	4.5"	4.154"	9.013	.240	20-600
PVC Class 200	4.5"	4.072"	8.578	.239	20-600
5" Sch 10S	5.563"	5.295"	16.305	.250	30-900
Std. Wt., Sch 40	5.50"	5.047"	14.674	.248	30-900
Extra Strong, Sch 80	5.50"	4.813"	13.165	.246	30-900
6" Sch 10S	6.625"	6.357"	24.089	.260	50-1,500
Std. Wt., Sch 40	6.5"	6.065"	21.574	.257	50-1,500
Extra Strong, Sch 80	6.5"	5.761"	19.457	.254	50-1,500
PVC Class 125	6.625"	6.217"	22.853	.258	50-1,500
PVC Class 160	6.625"	6.115"	21.968	.257	50-1,500
PVC Class 200	6.625"	5.993"	21.068	.256	50-1,500
8" Sch 10S	8.625"	8.329"	43.914	0.286	80-2,500
Sch 20	8.625"	8.125"	41.653	0.283	80-2,500
Sch 30	8.625"	8.071"	41.063	0.283	80-2,500
Std. Wt., Sch 40	8.625"	7.981"	40.086	0.281	80-2,500
Sch 60	8.625"	7.813"	38.288	0.279	80-2,500
Extra Strong, Sch 80	8.625"	7.625"	36.315	0.276	80-2,500
PVC Class 125	8.625"	8.095"	41.324	0.283	80-2,500
PVC Class 160	8.625"	7.961"	39.869	0.281	80-2,500
PVC Class 200	8.625"	7.805"	38.203	0.279	80-2,500
10" Sch 10S	10.75"	10.420"	70.195	0.321	125-4,000
Sch 20	10.75"	10.250"	67.668	0.318	125-4,000
Sch 30	10.75"	10.136"	66.069	0.316	125-4,000
Sch 40, Std.Wt.	10.75"	10.020"	64.532	0.314	125-4,000
Extra Strong, Sch 60	10.75"	9.750"	61.016	0.309	125-4,000
Sch 80	10.75"	9.564"	58.644	0.306	125-4,000
PVC Class 125	10.75"	10.088"	65.431	0.315	125-4,000
PVC Class 160	10.75"	9.924"	63.272	0.312	125-4,000
PVC Class 200	10.75"	9.728"	60.733	0.309	125-4,000
12" Sch 10S	12.75"	12.390"	104.636	0.367	175-5,000
Sch 20	12.75"	12.250"	102.553	0.364	175-5,000
Sch 30	12.75"	12.090"	99.347	0.36	175-5,000
Std. Wt., Sch 40S	12.75"	12.000"	97.576	0.358	175-5,000
Sch 40	12.75"	11.938"	97.369	0.356	175-5,000
Sch 60	12.75"	11.625"	90.441	0.348	175-5,000
Extra Strong	12.75"	11.750"	92.775	0.351	175-5,000
Sch 80	12.74"	11.376"	85.922	0.342	175-5,000
PVC Class 125	12.75"	11.966"	96.912	0.357	175-5,000
PVC Class 160	12.75"	11.770"	93.152	0.352	175-5,000
PVC Class 200	12.75"	11.538"	88.842	0.346	175-5,000

Continued on Next Page

CALIBRATION TABLE FOR PIPE SIZES 3" THROUGH 36"

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Pipe Size	Pipe O.D.	Pipe I.D.	K Value	Offset	Suggested Operating Range (GPM)
14" Sch 10S	14.00"	13.500"	122.307	0.391	200-6,000
Sch 20	14.00"	13.375"	120.216	0.388	200-6,000
Std. Wt., Sch 30	14.00"	13.250"	118.151	0.385	200-6,000
Sch 40	14.00"	13.124"	116.096	0.382	200-6,000
Sch 60	14.00"	12.814"	111.148	0.376	200-6,000
Extra Strong	14.00"	13.00"	114.098	0.33	200-6,000
Sch 80	14.00"	12.50"	106.299	0.369	200-6,000
16" Sch 10S	16.00"	15.500"	159.243	0.44	300-9,000
Sch 20	16.00"	15.375"	156.742	0.436	300-9,000
Std. Wt., Sch 30	16.00"	15.250"	154.267	0.433	300-9,000
Sch 60	16.00"	14.688"	143.456	0.419	300-9,000
Extra Strong, Sch 40	16.00"	15.000"	149.394	0.427	300-9,000
Sch 80	16.00"	14.314"	136.548	0.41	300-9,000
18" Sch 10S	18.00"	17.500"	202.739	0.498	350-10,000
Sch 20	18.00"	17.375"	199.828	0.494	350-10,000
Sch 30	18.00"	17.124"	194.061	0.486	350-10,000
Std. Wt.	18.00"	17.250"	196.943	0.49	350-10,000
Sch 40	18.00"	16.876"	188.464	0.479	350-10,000
Sch 60	18.00"	16.500"	180.171	0.469	350-10,000
Extra Strong	18.00"	17.000"	191.25	0.482	350-10,000
Sch 80	18.00"	16.126"	172.152	0.457	350-10,000
20" Std. Wt., Sch 20	20.00"	19.25"	246.179	0.555	400-12,000
Sch 40	20.00"	18.812"	234.836	0.540	400-12,000
Extra Strong, Sch 30	20.00"	19.000"	239.666	0.547	400-12,000
Sch 80	20.00"	17.938"	213.14	0.511	400-12,000
22" Std. Wt., Sch 20	22.00"	21.25"	301.975	0.621	500-15,000
Extra Strong, Sch 30	22.00"	21.00"	294.642	0.616	500-15,000
Sch 80	22.00"	19.75"	259.513	0.573	500-15,000
24" Std. Wt., Sch 20	24.00"	23.25"	364.331	0.666	600-18,000
Extra Strong	24.00"	23.00"	356.178	0.660	600-18,000
Sch 40	24.00"	22.624"	344.109	0.652	600-18,000
Sch 80	24.00"	21.562"	311.271	0.628	600-18,000
26" Sch 10	26.00"	25.376"	437.809	0.719	700-21,000
Std. Wt.	26.00"	25.25"	433.247	0.716	700-21,000
Sch 20, Extra Strong	26.00"	25.00"	424.274	0.709	700-21,000
28" Sch 10	28.00"	27.376"	513.698	0.774	900-23,000
Std. Wt.	28.00"	27.25"	508.723	0.770	900-23,000
Extra Strong, Sch 20	28.00"	27.00"	498.930	0.763	900-23,000
30" Sch 10	30.00"	29.376"	596.147	0.833	1,000-30,000
Std. Wt.	30.00"	29.25"	590.759	0.829	1,000-30,000
Sch 20, Extra Strong	30.00"	29.00"	580.146	0.822	1,000-30,000
32" Sch 10	32.00"	31.376"	685.156	0.897	1,200-35,000
Std. Wt.	32.00"	31.25"	679.355	0.893	1,200-35,000
Sch 20, Extra Strong	32.00"	31.00"	667.922	0.885	1,200-35,000
Sch 40	32.00"	30.624"	650.919	0.873	1,200-35,000
34" Sch 10	34.00"	33.312"	777.566	0.964	1,300-40,000
Std. Wt.	34.00"	33.25"	774.511	0.962	1,300-40,000
Extra Strong, Sch 20	34.00"	33.00"	762.258	0.953	1,300-40,000
Sch 40	34.00"	32.624"	744.022	0.940	1,300-40,000
36" Sch 10	36.00"	35.376"	882.855	1.040	1,500-45,000
Std. Wt.	36.00"	35.25"	876.227	1.035	1,500-45,000
Sch 20, Extra Strong	36.00"	35.00"	863.154	1.025	1,500-45,000
Sch 40	36.00"	34.50"	837.315	1.007	1,500-45,000

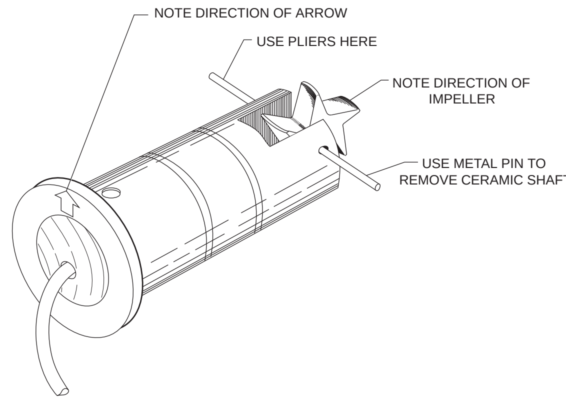
Impeller Assembly and Shaft Replacement

If you are replacing an existing Data Industrial sensor and have already calibrated your flow monitor/transmitter, no calibration changes are necessary. For installation of a new flow monitor or for relocation of a sensor in a new pipe size, please refer to the calibration instructions in flow monitor manual.

1) Depressurize pipe from which sensor is to be removed. If the sensor is one of the 225/IR225 or 226/IR226 series, consult the installation section on Hot Tap Sensors.

NEVER disturb the securing lock nuts with pipe under pressure without hot tap insertion tool Model HTT installed.

Figure 4
Impeller Assembly and Shaft Replacement



2) Remove the three (3) lock nuts that secure the positioning collar to the threaded rods of metal sensor.

NOTE: Before removing lock nuts, record the dimension from top of 2" NPT adapter to the bottom of the positioning collar. This dimension will be required later to reinstall.

3) Remove the sensor from the hex adapter or the tee.

4) Note the impeller blade orientation relative to flow arrows and the alignment hole in metal sensors beside one of the sighting holes. In order to maintain proper calibration, the impeller will have to be reinstalled in the same manner with the impeller blades pointing toward the small alignment hole, and into the flow direction as indicated by the flow arrows.

5) To remove the old impeller blade assembly, push the old shaft out of the sleeve with the new shaft (or small diameter rod) just far enough to grab the end with a pair of pliers and pull the shaft completely out. The impeller assembly will now be free, and will drop out.

6) Inspect the shaft and bearings for wear, and replace as necessary.

7) Refer to Figure 4. To reinstall, position the impeller in the cavity oriented as in Step 4 so that the impeller blades point into the flow direction and toward the small alignment hole located beside one of the sighting holes on metal sensors.

8) Carefully push the shaft through the sleeve and impeller, taking care not to damage bearings. Make sure that the shaft is inserted far enough so that it clears the sleeve on each side of the impeller housing.

NOTE: If shaft is not carefully installed, the bearing can be deformed, preventing free rotation.

9) Inspect the O-rings for damage and replace as necessary. Clean the O-rings and the sleeve and relubricate with silicone grease from the packet provided or some other acceptable lubricant.

10) Install the sensor into the 2" NPT adapter or tee so that alignment hole is facing upstream and flow arrows point in the direction of the actual flow. Since the positioning collar was not loosened during this operation, the studs should all line up perfectly when the sighting holes are parallel to pipe. If this has been accidentally loosened, please refer to the installation instructions for the alignment of the flow sensor unit.

11) Install and tighten the nuts.

12) For metal sensors, double check that the distance from the top of the 2" NPT adapter to the bottom of the positioning collar equals the dimension as measured in Step 2, and holes in sleeve sight exactly down the pipe, the arrows point in direction of flow and alignment holes located beside one sighting hole is pointing towards the source. If not, refer to *Installation* section in this manual.

13) This completes the replacement procedure. The system may now be repressurized and tested.

Troubleshooting (all but 24volt and FM/CSA electronics)

1) Using a voltmeter on the 0-20 VDC scale, connect the voltmeter across the sensor wires which are connected to the sensor input on the barrier strip. The voltage reading should be 8 VDC +/– 0.5 V with no flow in the pipe. If the reading is in range, go to step 2. If not, go to step 3.

2) With the sensor installed in the pipe and flow through the pipe, connect the volt meter across the sensor wires at the sensor input of the barrier strip. The voltage should fall between 4 VDC and 8 VDC. The higher the flow rate, the lower the DC voltage level should drop. It should not drop below 4 VDC as your meter averages the DC level of the square wave signal generated by the sensor.

   If this is correct, the flow sensor should be operational, and the flow monitor should display a flow rate or the transmitter output should change with a change in flow at the sensor. The signal generated by the sensor is a square wave with 5 msec pulses up to 100 Hz (at which time the pulses narrow to a 50% duty cycle), the use of an oscilloscope on the 5 msec time base, 2 VDC/division would indicate that the sensor is operating properly.

3) If the voltage at the sensor input is less than 7 VDC in a No Flow situation or less than 3 VDC in a flow situation, disconnect the sensor from the barrier strip and measure the voltage at the sensor input terminals of the barrier strip again. It should be between 8 VDC and 12 VDC. If the voltage is between 8-12 VDC, the sensor is bad. If the voltage at the sensor input is still below 7 VDC or 3 VDC, the problem may be with the monitor.

4) If you suspect that the sensor is bad, you can test the monitor circuitry by connecting a piece of wire to one of the sensor input terminals and tap the other side of the wire to the other sensor input terminal. Shorting across the sensor input terminals ON and OFF repeatedly allows the display to respond by trying to calculate a flow rate for the frequency of your shorting action. If the display does not show a change from 0.00, it indicates a problem with the monitor.

Troubleshooting 24volt and FM/CSA electronics

1) If the voltage at the sensor input is less than 7 VDC in a No Flow situation, disconnect the sensor from the barrier strip and measure the voltage at the sensor input terminals of the barrier strip again. It should be between 8 VDC and 20 VDC. If the voltage at the sensor input is still below 7 VDC or 3 VDC, the problem may be with the monitor.

2) If you suspect that the sensor is bad, you can test the monitor circuitry by connecting a piece of wire to one of the sensor input terminals and tap the other side of the wire to the other sensor input terminal. Shorting across the sensor input terminals ON and OFF repeatedly allows the display to respond by trying to calculate a flow rate for the frequency of your shorting action. If the display does not show a change from 0.00, it indicates a problem with the monitor.

Specifications

Wetted Materials for all sensors
- (see ordering matrix)

Sensor Sleeve and Hex Adapter for 220BR, 225BR, and 226BR
- Sleeve: Admiralty Brass, UNS C44300; Hex Adapter: Valve Bronze, UNS C83600

Sensor Sleeve and Hex Adapter for 220SS and 226SS
- 300 Series Stainless Steel

Temperature Ratings
- Standard Version:
  221°F (105°C) continuous service
- High Temperature Version:
  285°F (140.6°C) continuous service
  305°F (150°C) peak temperature (limited duration)

Pressure Ratings

	At 100°F	At 300°F
220SS	400 psi	325 psi
220B	400 psi	325 psi
225B	300 psi	210 psi
226B	400 psi	250 psi
226SS	400 psi	300 psi

Recommended Design Flow Range
- 0.5 to 30 ft/sec
- Initial detection below 0.3 ft/sec

Accuracy
- ± 1.0% of full scale over recommended design flow range

Repeatability
- ± 0.3% of full scale over recommended design flow range

Linearity
- ± 0.2% of full scale over recommended design flow range

Transducer Excitation (Std. electronics)
- Typically provided by Data Industrial flow monitor or transmitter. Any alternate supply must be of a resistance-limited type meeting the following constraints:
  - Source current @ 8 Volts: 1 mA minimum, 20mA maximum
  - Short Circuit Current: 200 mA maximum

Transducer Excitation (FM and 24V electronics)
- Quiescent current 600uA@8VDC to 35VDC max.
- Quiescent voltage (V_{high})
  Supply Voltage -(600uA*Supply impedance)
- ON State (V_{Low}) Max. 1.2VDC@40mA current limit (15ohm+0.7VDC)

Output Frequency
- 3.2 Hz to 200 Hz

Output Pulse Width
- 5 msec ±25%

Electrical Cable for Series 200 Sensors
- 22 feet of Belden shielded 2-conductor stranded copper AWG 20 with AWG 22 drain wire provided for connection to display or analog transmitter unit. Rated to 105°C. May be extended to a maximum of 2000 feet with similar cable and insulation appropriate for application.

Electrical Cable for Series IR200 Sensors
- 48 inches of U.L. Style 1056 copper stranded AWG 18 wire w/direct burial insulation. Rated to 105°C.

Warranty

Data Industrial Corporation ("Seller") of 11 Industrial Drive, Mattapoisett, Massachusetts 02739-0740, U.S.A., warrants to the original purchaser of its product that such product manufactured by Data Industrial Corporation shall be free from defects in materials or workmanship when installed, serviced and operated according to Data Industrial corporation instructions or in other such normal use. This warranty is effective for a period of 12 months from the date of installation by the Purchaser or 18 months from the date of shipment by the "Seller" whichever occurs or terminates first. This limited warranty does not cover damage or loss resulting from corrosion or erosion caused by acids or other chemicals or by severe environmental conditions or negligent or improper installation or improper operation, misuse, accident, unauthorized repair or substitution of components other than those provided by the "Seller", and does not cover limited life components such as bearings, shafts, impellers where wear rate is a function of application and environment. Any component not manufactured by the "Seller" but included in its products shall not be covered by this warranty and is sold only under such warranty as the manufacturer may provide.

If Buyer or Purchaser wishes to make a claim hereunder, he shall send written notice of any defect within the warranty period, to "Seller" at the above address. "Seller" may at its sole option instruct Buyer to ship subject part, postage prepaid, to the "Seller" at above address or authorize a representative to inspect the part on site. "Seller" will at its sole option repair or replace any defective product covered by this warranty. If Buyer makes repairs or alterations to any product or part covered by this warranty without "Sellers" prior written approval, this warranty shall be null and void.

The foregoing shall constitute Buyers or Purchasers sole and exclusive remedy against "Seller", and no other remedy, including but not limited to, incidental or consequential damages for personal injury, loss of fluids, gases or other substances or for loss of profits or injury to property or person shall be available to the Buyer or Purchaser. The warranty extended herein shall be in lieu of any other implied warranty of merchantability or fitness for a particular purpose, and seller shall bear no liability for representatives or retail sellers. In no event shall Data Industrial Corporation be liable for any contingent, incidental, or consequential damage or expenses due to partial or complete inoperability of its product.

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Model 310 Loop Powered Analog Output Transmitter Installation Guide

by Data Industrial

Mechanical installation

The Model 310 may be surface mounted onto a panel, attached to DIN rails using adapter clips or wall mounted using two optional enclosures.

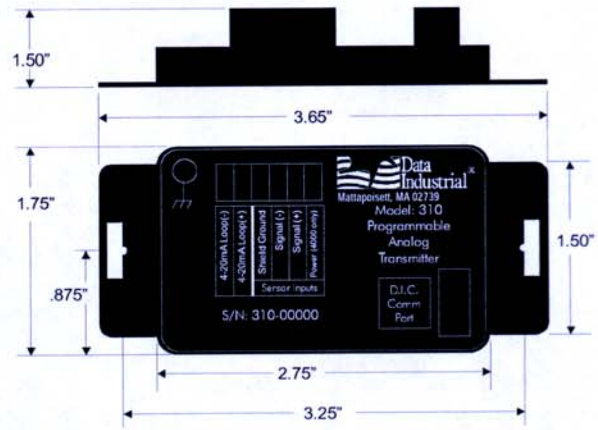
Location

Although the Model 310 is encapsulated, all wiring connections are made to exposed terminals. The unit should be protected from weather and moisture in accordance with electrical codes and standard trade practices.

In any mounting arrangement, the primary concerns are ease of wiring and attachment of the programming cable.

The unit generates very little heat so no consideration need be given to cooling or ventilation.

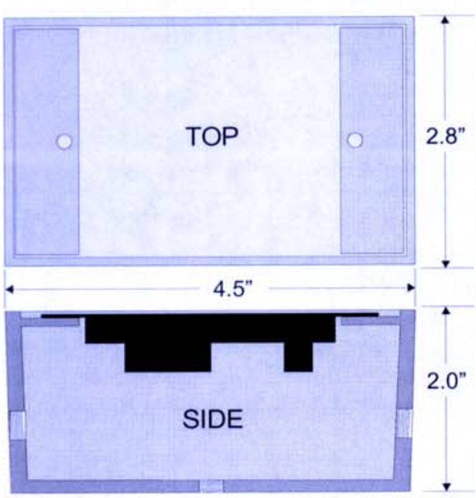
Figure 1: Model 310 Dimensions



Surface Mount Installation

The Model 310 may be mounted to the surface of any panel using double sided adhesive tape or by attaching fasteners through the holes in the mounting flanges of the unit.

Figure 2: 310 Optional Enclosure Dimensions



DIN Rail Mounting

Optional clips snap onto the mounting flanges allowing the Model 310 to be attached to DIN 15, 32, 35 mm DIN rail systems.

Wall Mounting

Optional metal and plastic enclosures are available to mount the Model 310 to a wall when no other enclosure is used. The enclosure is first attached to the wall using fasteners through its mounting holes.

After wiring, the transmitter may be attached to the enclosure with the terminal headers facing in using the slots in the mounting flanges. As an alternate mounting arrangement, the Model 310 may be fastened to the box cover using double-sided adhesive tape.

PN# 72019
03/20/03

DATA INDUSTRIAL CORPORATION 11 Industrial Drive, P.O. Box 740 Mattapoisett, MA 02739-0740 USA
Phone: (508) 758-6390 FAX: (508) 758-4057 email: sales@dataindustrial.com

Model 310 Electrical Installation

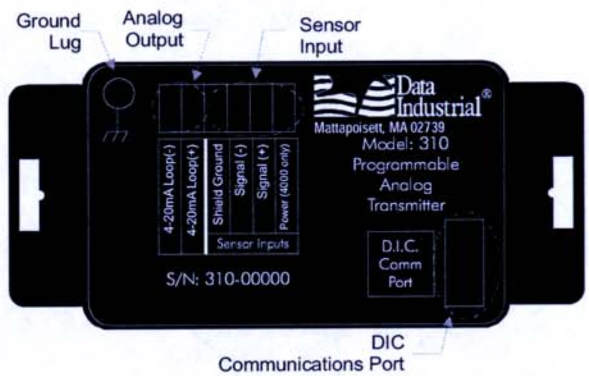
Per standard wiring practices, the loop power must be off before making any wire connections. The terminal strips have removable plug-in connectors to make wiring easier.

1. Refer to Figure 3 for terminal connections.
2. As shown in figure 4, connect loop power supply positive (+) to Model 310 terminal marked 4-20mA loop (+).
3. Connect terminal marked 4-20mA loop (-) of Model 310 to positive (+) analog terminal of input device (Chart Recorder, PLC, etc.).
4. Connect negative (-) analog terminal of input device to loop power supply negative (-).
5. **If Wiring a Series 200 sensor**, connect the red wire (signal) to Signal (+) terminal, black wire (common) to Signal (-) terminal and the shield to Shield Ground terminal (Disregard shield for the IR sensors).

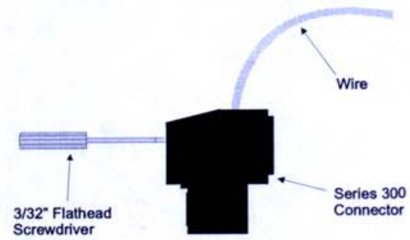
   If Wiring a Series 4000 sensor, connect the clear wire (signal) to Signal (+) terminal, black wire (common) to Signal (-) terminal, shield wire to Shield Ground terminal, and red wire (power) to Power (4000 only) terminal.

   If wiring to a sine wave output sensor consult factory.
6. For maximum EMI Protection, connect Model 310 ground lug to panel ground. **See Note #1**
7. Ensure that all connections are tight, then plug connector into header.

Figure 3: Model 310 Terminal Locations

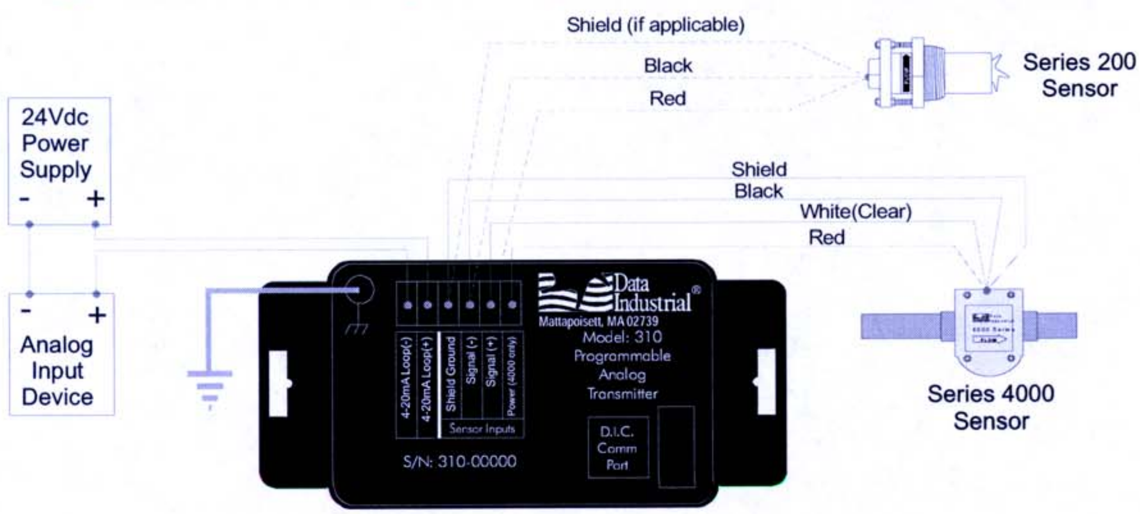


Side View - Typical 300 Series Removable Connector Wiring



Note #1:
Included with every Model 310 is a 310IK kit containing a screw, lock washer and ground lead to connect the Model 310 to Earth Ground. This will help prevent electrical interference from affecting the Model 310's normal operation.

Figure 4: Model 310 Wiring to Analog Loop and Series 200 or Series 4000



Communications cable wiring

Field calibration requires a Data Industrial A310 Programming kit (consisting of a custom cable and software) and a PC running Windows® 9x, ME, NT, 2000 or XP. In order to program the Model 310 it must be connected to Loop-Power and the A301 cable must be connected between the Model 310 Comm port connector and an available DB9 COM port on a computer.

Location of the DIC Communication Port

Note:
The Data Industrial A301 Cable will work with all 300 Series products. However the older version of the cable (A300) does not have sufficient bandwidth to work with the newer 340 Series Transmitters or SDI Flow Sensors.

Data Industrial provides free programming software updates via the Internet for all of 300 Series devices. Go to www.dataindustrial.com for these updates.

Programming Software Installation

Floppy Installation

Place the software installation Disk 1 into the floppy drive and run the setup.exe program to install.

CDROM Installation

Place the software CD into the CDROM drive and it should autostart. Click programming software, then click the Model 310 and the software installation will begin.

Web Installation

The Installation software can be found at the Data Industrial web site (www.dataindustrial.com) in the support section.

Model 310 Programming

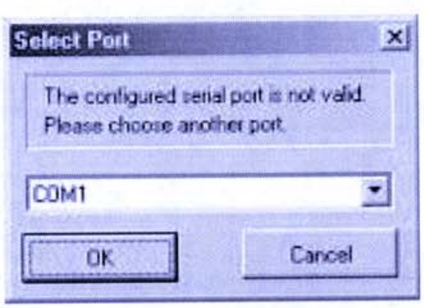
Programming the Model 310 is accomplished by installing the Data Industrial programming software on a computer and entering data on templates of the Windows® based program.

1. Install the 310 PC Interface Software into the computer.

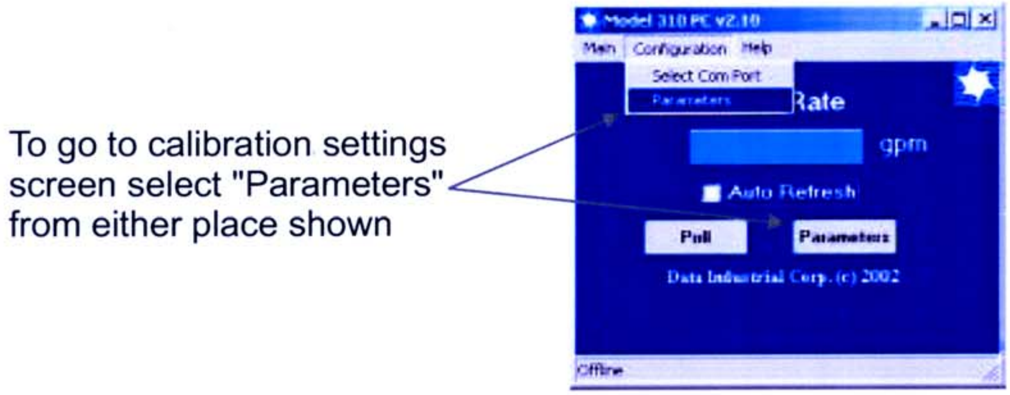
2. Connect the computer to the Model 310 transmitter using the Data Industrial A301 communications cable. Plug A301 cable to the socket labeled "D.I.C Comm Port" taking care to properly align the tab on the plug and socket to maintain polarity then plug the DB9 connector of the Data Industrial A301 communications cable to an avaliable PC com port that has the Model 310 software installed.

3. Connect the Model 310 transmitter to a powered 4-20mA loop. (if setting up in the office a 9-24VDC power source can be used to simulate the loop).

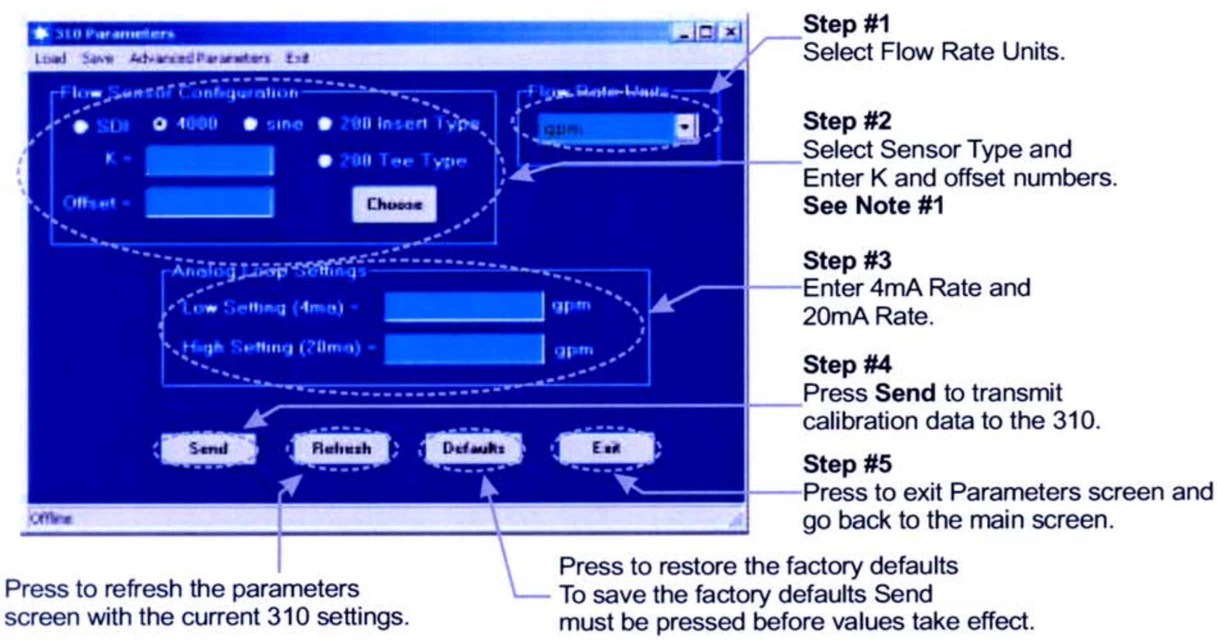
4. Open the interface software and select the appropriate COM PORT as shown in the dialog box below.



5. Open the Parameters Screen as shown below.



6. Program using diagram below as a reference.



Note #1

Sdi - If the SDI sensor type is selected the required K and offset values can be found the the SDI owners manual.

4000 - If the 4000 sensor type is selected, click the choose button and select the sensor from the pull down box that appears.

Sine - Provided for connection to sensors which have a sine wave output. Please consult sensor manufacturer for the calibration settings.

200 Insert Type - If the 200 Insert Sensor type is selected the required K and offset can be found the the 200 owners manual or if the manual is not handy the calculate button can be pushed and an inside pipe diameter can be entered and once calculate is pressed a K and offset will automatically be entered in.

200 Tee Type - If the 200 tee type is selected, click the choose button and select the sensor from the pull down box that appears.

Model 310 Specifications

Power Requirements:
Loop Input Voltage 9-35VDC

Input Frequency:
0.4 to 10 KHz

Load Resistance
Max 750Ω@24VDC

Output Response Time
Varies with filter

Temperature (operating):
-29°C to 70°C
-20°F to 158°F

Temperature (storage):
-40°C to 85°C
-40°F to 185°F

Accuracy
± 0.04% of reading over entire span

Linearity
0.1% of full scale

Warranty

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The foregoing shall constitute Buyers or Purchasers sole and exclusive remedy against "Seller", and no other remedy, including but not limited to, incidental or consequential damages for personal injury, loss of fluids, gases or other substances or for loss of profits or injury to property or person shall be available to the Buyer or Purchaser. The warranty extended herein shall be in lieu of any other implied warranty of merchantability or fitness for a particular purpose, and seller shall bear no liability for representatives or retail sellers. In no event shall Data Industrial Corporation be liable for any contingent, incidental, or consequential damage or expenses due to partial or complete inoperability of its product.

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VSR
VANE TYPE WATERFLOW ALARM SWITCH WITH RETARD

UL, CUL and CSFM Listed, FM Approved, LPCB Approved, For CE Marked (EN12259-5) / VdS Approved model use VSR-EU
Service Pressure: 450 PSI (31 BAR) - UL
Flow Sensitivity Range for Signal:
4-10 GPM (15-38 LPM) - UL
Maximum Surge: 18 FPS (5.5 m/s)
Contact Ratings: Two sets of SPDT (Form C)
10.0 Amps at 125/250VAC
2.0 Amps at 30VDC Resistive
10 mAmps min. at 24VDC
Conduit Entrances: Two knockouts provided for 1/2" conduit.
Individual switch compartments suitable for dissimilar voltages.
Environmental Specifications:
- NEMA 4/IP54 Rated Enclosure suitable for indoor or outdoor use with factory installed gasket and die-cast housing when used with appropriate conduit fitting.
- Temperature Range: 40°F - 120°F, (4.5°C - 49°C) - UL
- Non-corrosive sleeve factory installed in saddle.

Service Use:

Automatic Sprinkler	NFPA-13
One or two family dwelling	NFPA-13D
Residential occupancy up to four stories	NFPA-13R
National Fire Alarm Code	NFPA-72

Specifications subject to change without notice.

Ordering Information			
Nominal Pipe Size		Model	Part Number
2"	DN50	VSR-2	1144402
2 1/2"	DN65	VSR-2 1/2	1144425
3"	DN80	VSR-3	1144403
3 1/2"	-	VSR-3 1/2	1144435
4"	DN100	VSR-4	1144404
5"	-	VSR-5	1144405
6"	DN150	VSR-6	1144406
8"	DN200	VSR-8	1144408

Optional: Cover Tamper Switch Kit, stock no. 0090148
Replaceable Components: Retard/Switch Assembly, stock no. 1029030

⚠ WARNING

- Installation must be performed by qualified personnel and in accordance with all national and local codes and ordinances.
- Shock hazard. Disconnect power source before servicing. Serious injury or death could result.
- Risk of explosion. Not for use in hazardous locations. Serious injury or death could result.

CAUTION

Waterflow switches that are monitoring wet pipe sprinkler systems shall not be used as the sole initiating device to discharge AFFF, deluge, or chemical suppression systems. Waterflow switches used for this application may result in unintended discharges caused by surges, trapped air, or short retard times.

General Information

The Model VSR is a vane type waterflow switch for use on wet sprinkler systems. It is UL Listed and FM Approved for use on steel pipe; schedules 10 through 40, sizes 2" thru 8" (50 mm thru 200 mm). LPC approved sizes are 2" thru 8" (50 mm thru 200 mm). See Ordering Information chart.

The VSR may also be used as a sectional waterflow detector on large systems. The VSR contains two single pole, double throw, snap action switches and an adjustable, instantly recycling pneumatic retard. The switches are actuated when a flow of 10 GPM (38 LPM) or more occurs downstream of the device. The flow condition must exist for a period of time necessary to overcome the selected retard period.

Enclosure

The VSR switches and retard device are enclosed in a general purpose, die-cast housing. The cover is held in place with two tamper resistant screws which require a special key for removal. A field installable cover tamper switch is available as an option which may be used to indicate unauthorized removal of the cover. See bulletin number 5401103 for installation instructions of this switch.

Installation (see Fig. 1)

These devices may be mounted on horizontal or vertical pipe. On horizontal pipe they shall be installed on the top side of the pipe where they will be accessible. The device should not be installed within 6" (15 cm) of a fitting which changes the direction of the waterflow or within 24" (60 cm) of a valve or drain.

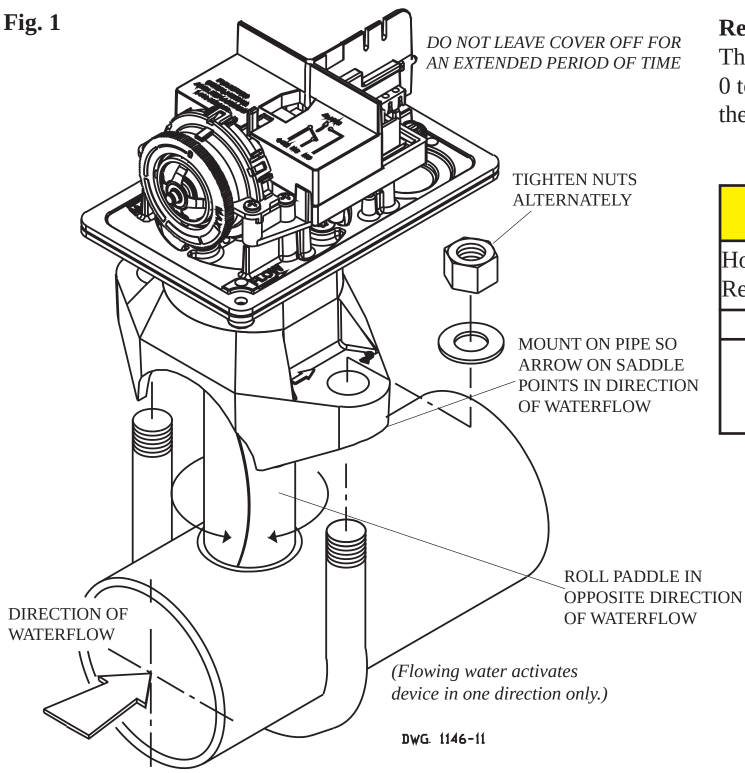
NOTE*:* Do not leave cover off for an extended period of time.

Drain the system and drill a hole in the pipe using a hole saw in a slow speed drill (see Fig. 1). Clean the inside pipe of all growth or other material for a distance equal to the pipe diameter on either side of the hole. Roll the vane so that it may be inserted into the hole; do not bend or crease it. Insert the vane so that the arrow on the saddle points in the direction of the waterflow. Take care not to damage the non-corrosive bushing in the saddle. The bushing should fit inside the hole in the pipe. Install the saddle strap and tighten nuts alternately to required torque (see the chart in Fig. 1). The vane must not rub the inside of the pipe or bind in any way.

⚠ CAUTION

Do not trim the paddle. Failure to follow these instructions may prevent the device from operating and will void the warranty.

Fig. 1

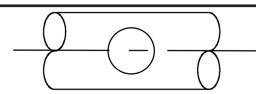
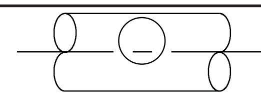


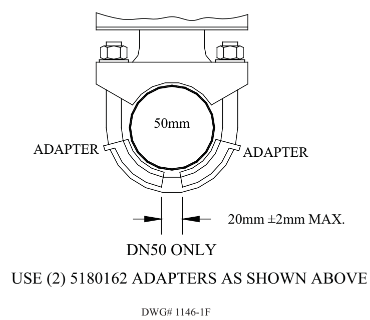
Retard Adjustment

The delay can be adjusted by rotating the retard adjustment knob from 0 to the max setting (60-90 seconds). The time delay should be set at the minimum required to prevent false alarms

CAUTION

Hole must be drilled perpendicular to the pipe and vertically centered. Refer to the Compatible Pipe/Installation Requirements chart for size.

Correct	Incorrect
	



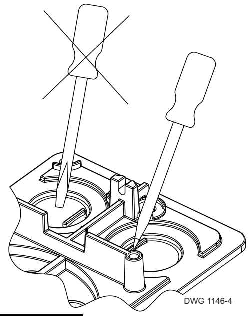
Compatible Pipe/ Installation Requirements

Model	Nominal Pipe Size		Nominal Pipe O.D.		Pipe Wall Thickness								Hole Size		U-Bolt Nuts Torque	
					Schedule 10 (UL)		Schedule 40 (UL)		BS-1387 (LPC)		DN (VDS)					
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	ft-lb	n-m
VSR-2	2	DN50	2.375	60.3	0.109	2.77	0.154	3.91	0.142	3.6	0.091	2.3	1.25 + .125/-.062	33.0 ± 2.0	20	27
VSR-2 1/2	2.5	-	2.875	73.0	0.120	3.05	0.203	5.16	-	-	-	-				
VSR-2 1/2	-	DN65	3.000	76.1	-	-	-	-	0.142	3.6	0.102	2.6				
VSR-3	3	DN80	3.500	88.9	0.120	3.05	0.216	5.49	0.157	4.0	0.114	2.9	2.00 ± .125	50.8 ± 2.0		
VSR-3 1/2	3.5	-	4.000	101.6	0.120	3.05	0.226	5.74	-	-	-	-				
VSR-4	4	DN100	4.500	114.3	0.120	3.05	0.237	6.02	0.177	4.5	0.126	3.2				
VSR-5	5	-	5.563	141.3	0.134	3.40	0.258	6.55	-	-	-	-				
VSR-6	6	DN150	6.625	168.3	0.134	3.40	0.280	7.11	0.197	5.0	0.157	4.0				
VSR-8	8	DN200	8.625	219.1	0.148	3.76	0.322	8.18	0.248	6.3	0.177	4.5				

NOTE: For copper or plastic pipe use Model VSR-CF.

VSR
VANE TYPE WATERFLOW ALARM SWITCH WITH RETARD

Fig. 2
To remove knockouts: Place screwdriver at inside edge of knockouts, not in the center.



NOTICE
Do not drill into the base as this creates metal shavings which can create electrical hazards and damage the device. Drilling voids the warranty.

Fig. 3
Break out thin section of cover when wiring both switches from one conduit entrance.

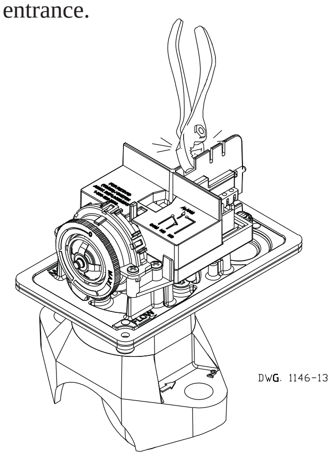
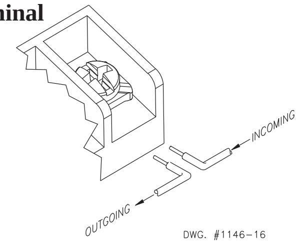


Fig. 4 Switch Terminal Connections Clamping Plate Terminal



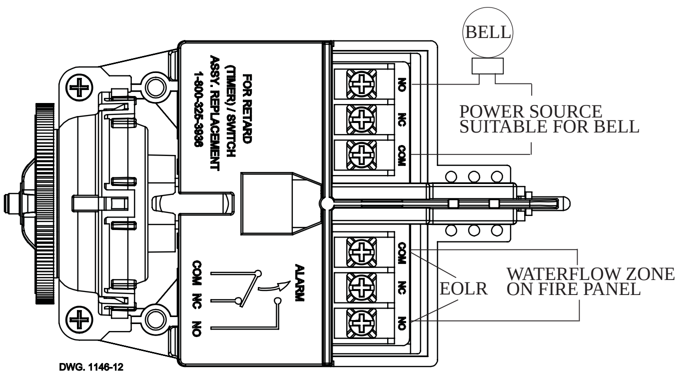
⚠WARNING

An uninsulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire become dislodged from under the terminal. Failure to sever the wire may render the device inoperable risking severe property damage and loss of life.

Do not strip wire beyond 3/8" of length or expose an uninsulated conductor beyond the edge of the terminal block. When using stranded wire, capture all strands under the clamping plate.

Fig. 5 Typical Electrical Connections

Notes:
1. The Model VSR has two switches, one can be used to operate a central station, proprietary or remote signaling unit, while the other contact is used to operate a local audible or visual annunciator.
2. A condition of LPC Approval of this product is that the electrical entry must be sealed to exclude moisture.
3. For supervised circuits, see "Switch Terminal Connections" drawing and warning note (Fig. 4).



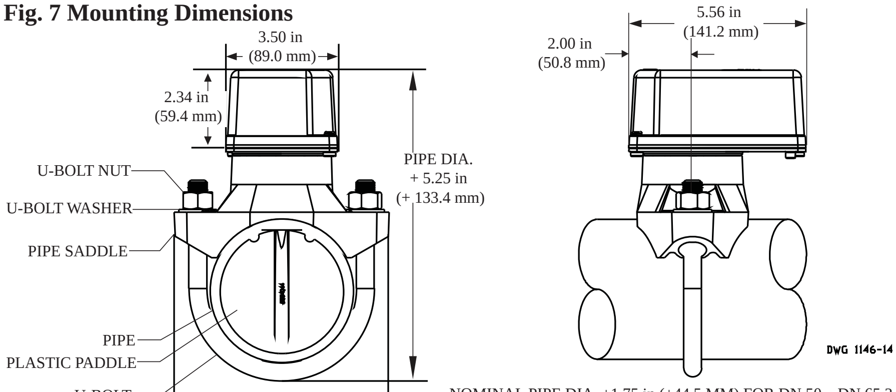
Testing

The frequency of inspection and testing for the Model VSR and its associated protective monitoring system shall be in accordance with applicable NFPA Codes and Standards and/or the authority having jurisdiction (manufacturer recommends quarterly or more frequently).

If provided, the inspector's test valve shall always be used for test purposes. If there are no provisions for testing the operation of the flow detection device on the system, application of the VSR is not recommended or advisable.
A minimum flow of 10 GPM (38 LPM) is required to activate this device.

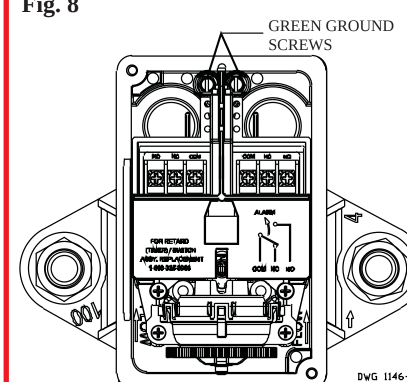
NOTICE Advise the person responsible for testing of the fire protection system that this system must be tested in accordance with the testing instructions.

Fig. 7 Mounting Dimensions



NOMINAL PIPE DIA. +1.75 in (+44.5 MM) FOR DN 50 – DN 65 2–2.5 in
NOMINAL PIPE DIA. +2.125 in (+54.0 MM) FOR DN 80 – DN 200 3–8 in

Fig. 8



Maintenance

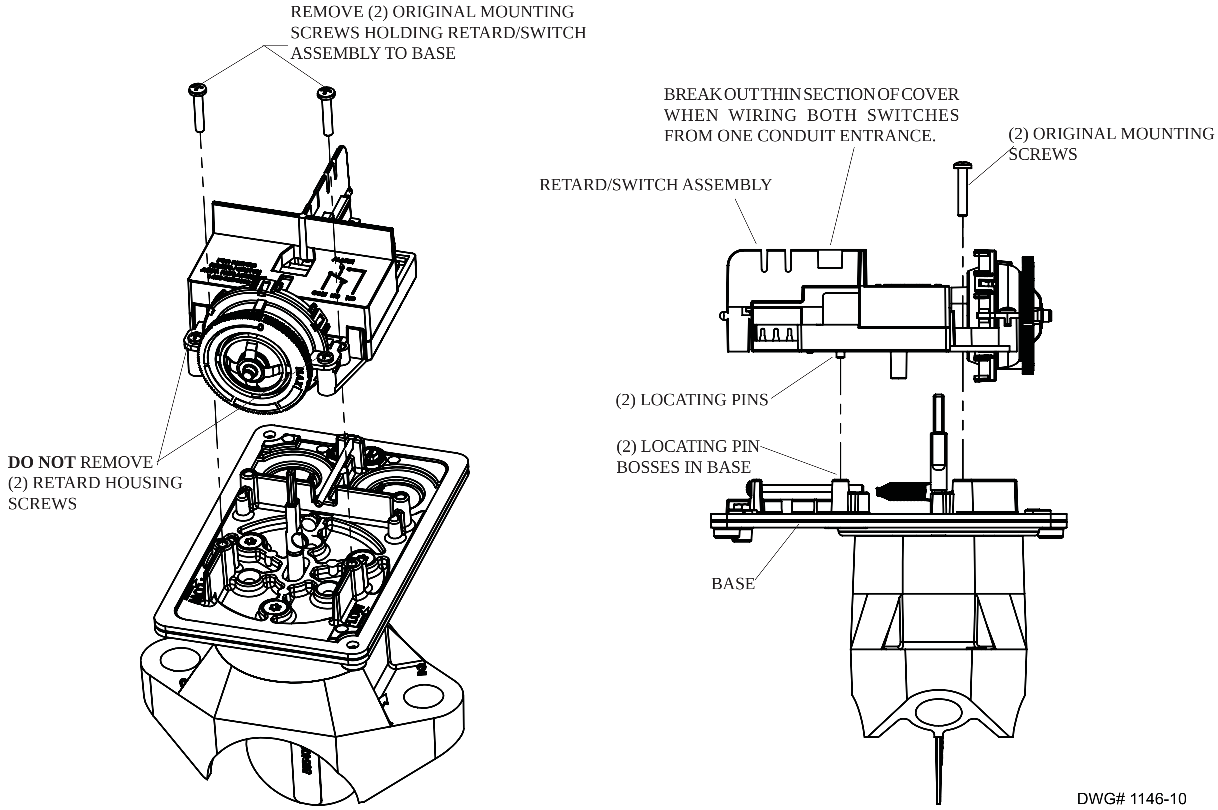
Inspect detectors monthly. If leaks are found, replace the detector. The VSR waterflow switch should provide years of trouble-free service. The retard and switch assembly are easily field replaceable. In the unlikely event that either component does not perform properly, please order replacement retard switch assembly stock #1029030 (see Fig. 6). There is no maintenance required, only periodic testing and inspection.

Retard/Switch Assembly Replacement (See Fig. 6)

NOTICE The Retard/Switch Assembly is field-replaceable without draining the system or removing the waterflow switch from the pipe

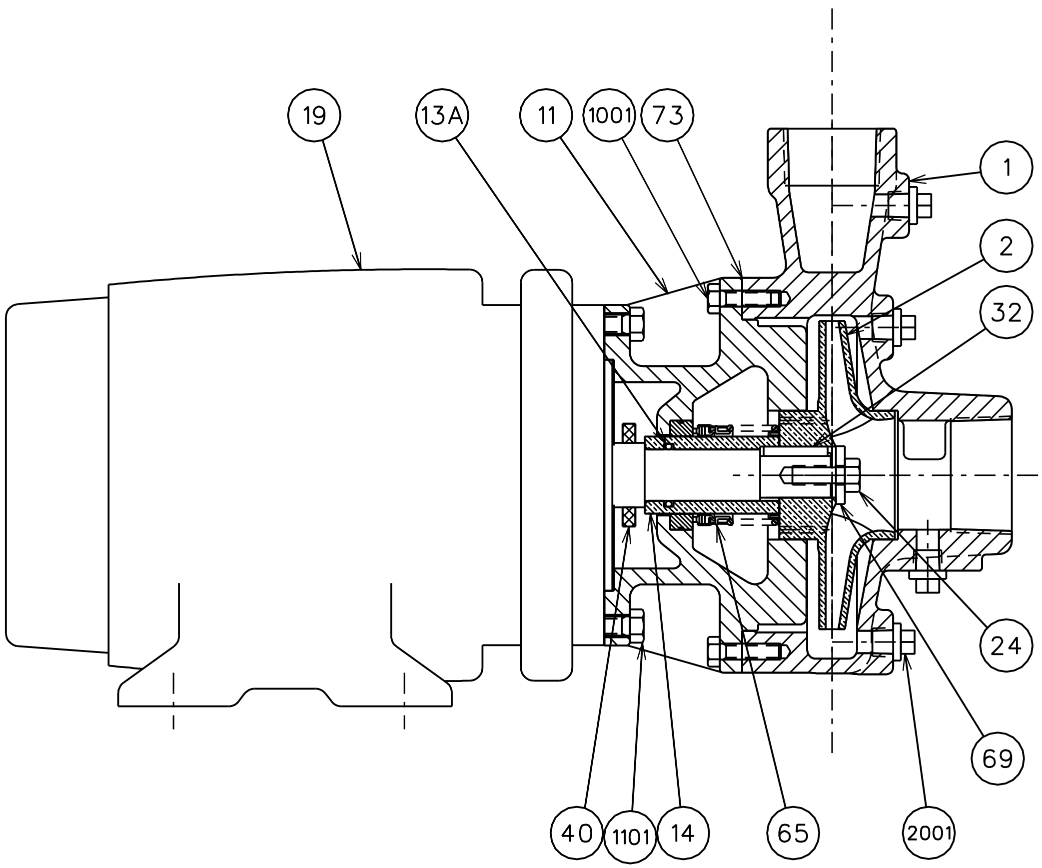
1. Make sure the fire alarm zone or circuit connected to the waterflow switch is bypassed or otherwise taken out of service.
2. Disconnect the power source for local bell (if applicable).
3. Identify and remove all wires from the waterflow switch.
4. Remove the (2) mounting screws holding retard/switch assembly to the base. **Do not** remove the (2) retard housing screws.
5. Remove the retard assembly by lifting it straight up over the tripstem.
6. Install the new retard assembly. Make sure the locating pins on the retard/switch assembly fit into the locating pin bosses on the base.
7. Re-install the (2) original mounting screws.
8. Reconnect all wires. Perform a flow test and place the system back in service.

Fig. 6



Removal of Waterflow Switch

- To prevent accidental water damage, all control valves should be shut tight and the system completely drained before waterflow detectors are removed or replaced.
- Turn off electrical power to the detector, then disconnect wiring.
- Loosen nuts and remove U-bolts.
- Gently lift the saddle far enough to get your fingers under it. With your fingers, roll the vane so it will fit through the hole while continuing to lift the waterflow detector saddle.
- Lift detector clear of pipe.



NOTE: SOME FEATURES SHOWN ROTATED FOR CLARITY

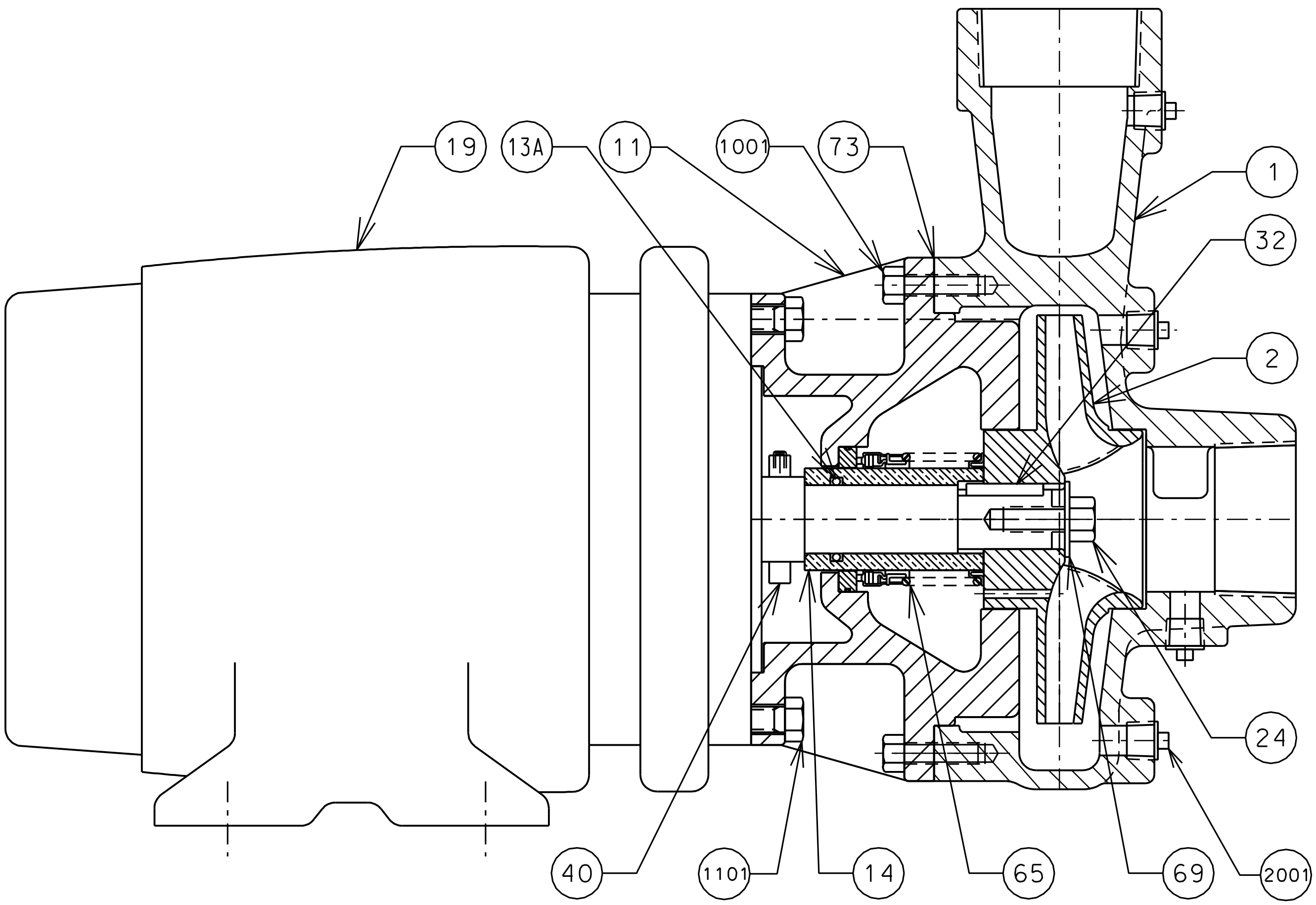
ITEM	DESCRIPTION
1	CASING
2	IMPELLER
11	VOLUTE COVER
13A	SHAFT SLEEVE O-RING
14	SHAFT SLEEVE
19	MOTOR
24	IMPELLER SCREW
32	IMPELLER KEY
40	DEFLECTOR
65	MECHANICAL SEAL
69	IMPELLER WASHER
73	GASKET
1001	CASING BOLT
1101	VOLUTE COVER BOLT
2001	PIPE PLUG

PATTERSON PUMP COMPANY

A SUBSIDIARY OF THE GORMAN-RUPP COMPANY

ASSEMBLY SECTION
FOR
2 X $1\frac{1}{2}$ X 6 HES PUMP

DWG. NO. B05-83429	REV.
DRAWN SPENCER	DATE 3-12-02
SCALE NONE	APPRVD. EJC



NOTE: SOME FEATURES SHOWN ROTATED FOR CLARITY

ITEM	DESCRIPTION
1	CASING
2	IMPELLER
11	VOLUTE COVER
13A	SHAFT SLEEVE O-RING
14	SHAFT SLEEVE
19	MOTOR
24	IMPELLER SCREW
32	IMPELLER KEY
40	DEFLECTOR
65	MECHANICAL SEAL
69	IMPELLER WASHER
73	GASKET
1001	CASING BOLT
1101	VOLUTE COVER BOLT
2001	PIPE PLUG

PATTERSON PUMP COMPANY
A SUBSIDIARY OF THE GORMAN-RUPP COMPANY

ASSEMBLY SECTION
for
2X2X6 HES

DWG. NO. B05-82811		REV.
DRAWN L HOWARD	DATE 2-8-02	
SCALE NONE	APPRVD. EJC	

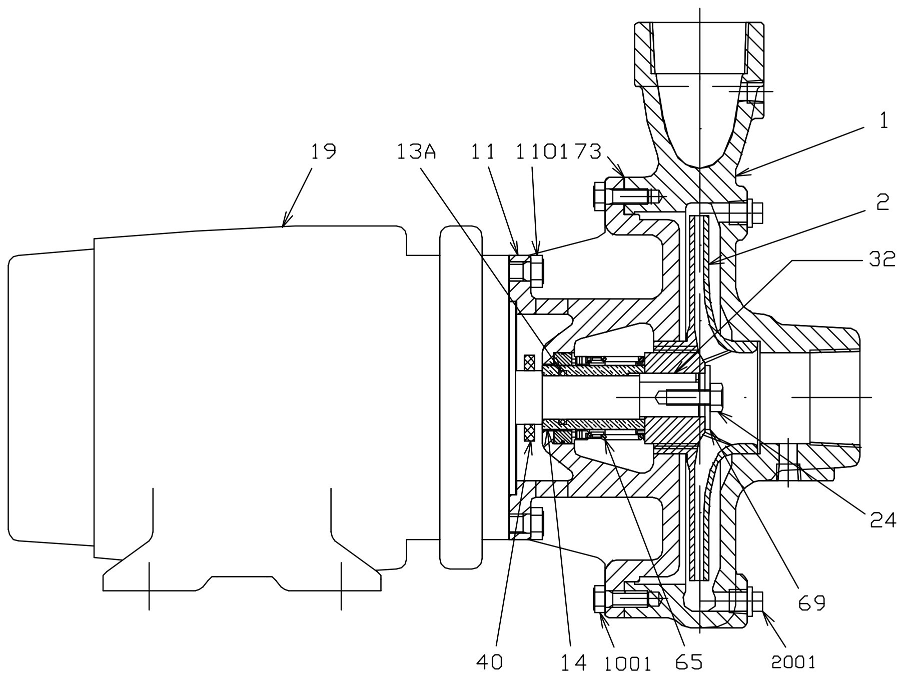
Patterson
Toccoa, Georgia
U.S.A.

2 x 2 x 8 HES END SUCTION PUMP

SECTION H

PAGE 10

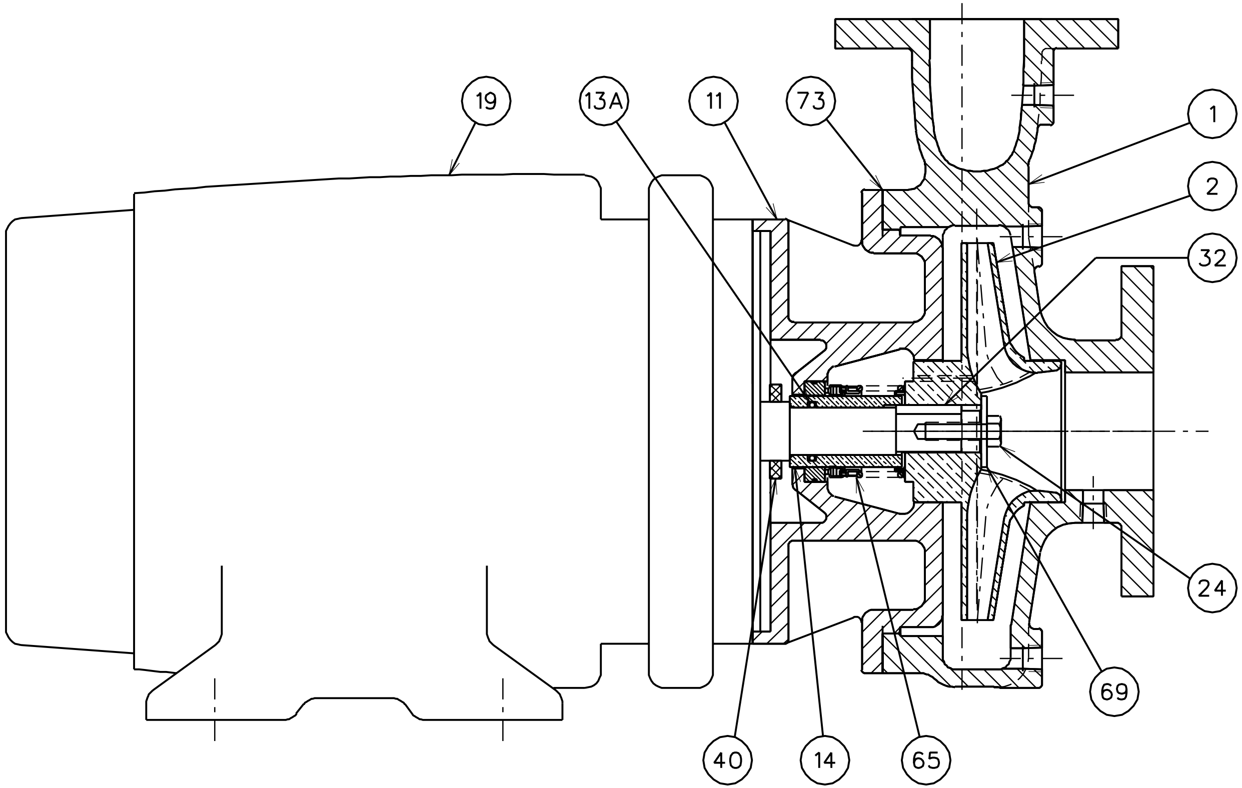
DATE: JUNE 7, 2002



FEATURES:

- REGISTERED FITS AT THE VOLUTE COVER AND VOLUTE MAINTAIN PUMP ALIGNMENT
- DYNAMICALLY BALANCED IMPELLER
- HYDROSTATICALLY TESTED TO 1 1/2 TIMES SHUT-OFF
- FITTED WITH SHAFT SLEEVE AND SELF FLUSHING MECHANICAL SEAL
- O-RING SEAL UNDER SHAFT SLEEVE
- BACK PULL-OUT DESIGN ALLOWS REMOVAL OF ROTATING ELEMENT WITHOUT DISTURBING SUCTION AND DISCHARGE CONNECTIONS

ITEM	DESCRIPTION	MATERIAL
1	CASING	Cast Iron - ASTM A48-CL40
2	IMPELLER	Bronze - B584-875
11	VOLUTE COVER	Cast Iron - ASTM A48-CL35
13A	SHAFT SLEEVE O-RING	Nitrile
14	SHAFT SLEEVE	Bronze - B505-954
19	MOTOR	Manufacturers Standard
24	IMPELLER SCREW	Stainless Steel - ASTM F593 GR 1 Type 304
32	IMPELLER KEY	Stainless Steel - ASTM Type 304
40	DEFLECTOR	Neoprene
65	MECHANICAL SEAL	Carbon vs. Silicon Carbide
69	IMPELLER WASHER	Stainless Steel - AISI 416
73	GASKET	Vellumold
1001	CASING BOLT	Steel - SAE J429 GR 2
1101	VOLUTE COVER BOLT	Steel - SAE J429 GR 2
2001	PIPE PLUG	Cast Iron



ITEM	DESCRIPTION
1	CASING
2	IMPELLER
11	VOLUTE COVER
13A	SHAFT SLEEVE O-RING
14	SHAFT SLEEVE
19	MOTOR
24	IMPELLER SCREW
32	IMPELLER KEY
40	DEFLECTOR
65	MECHANICAL SEAL
69	IMPELLER WASHER
73	GASKET

NOTE: SOME FEATURES SHOWN ROTATED FOR CLARITY

PATTERSON PUMP COMPANY
A SUBSIDIARY OF THE GORMAN-RUPP COMPANY

ASSEMBLY SECTION
FOR
$2\frac{1}{2}$ X 2 X 8 HES PUMP

DWG. NO. B05-83431		REV.	
DRAWN SPENCER		DATE 3-12-02	
SCALE NONE		APPRVD. EJC	

Altivar 212

Variable speed drives for asynchronous motors

Programming Manual

09/2011

S1A53838

www.schneider-electric.com

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

Table of Contents

Safety Information

Important Information

NOTICE

Please read these instructions carefully and examine the equipment in order to familiarize yourself with the device before installing, operating or carrying out any maintenance work on it.

The following special messages that you will come across in this document or on the device are designed to warn you about potential risks or draw your attention to information that will clarify or simplify a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER
DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death or serious injury.

⚠ WARNING
WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

⚠ CAUTION
CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

CAUTION
CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result** in equipment damage.

PLEASE NOTE

The word "drive" as used in this manual refers to the controller portion of the adjustable speed drive as defined by NEC.

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this product.

About the Book

At a Glance

Document scope

The purpose of this document is to:
- help you to set-up the drive,
- show you how to program the drive,
- show you the different menus, modes and parameters,
- help you in maintenance and diagnostics.

Validity note

This documentation is valid for the Altivar 212 drive.

Related documents

Title of Documentation	Reference Number
ATV212 Quick Start	S1A53825
ATV212 Installation manual	S1A53832
ATV212 Modbus manual	S1A53844
ATV212 BACnet manual	S1A53845
ATV212 Metasys N2 manual	S1A53846
ATV212 Apogée FLN P1 manual	S1A53847
ATV212 LonWorks manual	S1A53848
Multiloader manual	BBV48778
SoMove Mobile manual	S1A51444
ATV212 other option manuals: see www.schneider-electric.com	

You can download the latest versions of these technical publications and other technical information from our website at www.schneider-electric.com.

Product related information

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Read and understand this manual before installing or operating the drive. Installation, adjustment, repair, and maintenance must be performed by qualified personnel.
- The user is responsible for compliance with all international and national electrical code requirements with respect to grounding of all equipment.
- Many parts of this drive, including the printed circuit boards, operate at the line voltage. DO NOT TOUCH. Use only electrically insulated tools.
- DO NOT touch unshielded components or terminal strip screw connections with voltage present.
- DO NOT short across terminals PA/+ and PC/– or across the DC bus capacitors.
- Before servicing the drive:
  - Disconnect all power, including external control power that may be present.
  - Place a “DO NOT TURN ON” label on all power disconnects.
  - Lock all power disconnects in the open position.
  - WAIT 15 MINUTES to allow the DC bus capacitors to discharge.
  - Measure the voltage of the DC bus between the PA/+ and PC/– terminals to ensure that the voltage is less than 42 Vdc.
  - If the DC bus capacitors do not discharge completely, contact your local Schneider Electric representative. Do not repair or operate the drive.
- Install and close all covers before applying power or starting and stopping the drive.

Failure to follow these instructions will result in death or serious injury.

DANGER

UNINTENDED EQUIPMENT OPERATION

- Prevent accidental grounding of logic inputs configured for sink logic. Accidental grounding can result in unintended activation of drive functions.
- Protect the signal conductors against damage that could result in unintentional conductor grounding.

Failure to follow these instructions will result in death or serious injury.

WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link (1).

Failure to follow these instructions can result in death, serious injury, or equipment damage.

(1) For additional information, refer to NEMA ICS 1.1 (latest edition), “Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control” and to NEMA ICS 7.1 (latest edition), “Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems.”

General Overview

I

What's in this Part?

This part contains the following chapters:

Setup

1

What's in this Chapter?

This chapter contains the following topics:

Steps for setting-up the drive

INSTALLATION

1. Please, refer to the installation manual..

PROGRAMMING

Tips:

- Before beginning programming, complete the customer setting tables, page 171.
- Perform an auto-tuning operation to optimize performance, page 71.
- If you get lost, return to the factory settings, page 62.

2. Apply input power to the drive, but do not give a run command.

3. Configure

- ☐ the nominal frequency of the motor [Parameter reset] (tYP) = [50 Hz reset] (1) if this is not 50Hz,
- ☐ the motor parameters, page 66, only if the factory configuration of the drive is not suitable,
- ☐ the application functions in the Drive Control Parameters section, page 77 and the I/O Control Parameters section, page 89, only if the factory configuration of the drive is not suitable.

4. Adjust the application parameters

- ☐ [Acceleration time 1] (ACC), page 83 and [Deceleration time 1] (dEC), page 83.
- ☐ [Low limit frequency] (LL), page 82 and [Upper limit freq] (UL), page 82.
- ☐ [Motor thermal prot.] (tHr), page 70.

5. Start the drive

Overview

2

What's in this Chapter?

This chapter contains the following topics:

Factory configuration

Drive factory settings

The Altivar 212 is factory-set for the most common operating conditions:

- [Mot cont. mode sel.] (Pt): [Variable torque] (Pt = 1). See page 67.
- [Upper limit freq] (UL) = 50.0 Hz. See page 82.
- [Low limit frequency] (LL) = 0.0 Hz. See page 82.
- [Switch. freq. level] (F300): depending on drive rating (see page 85)
- [Auto ramp] (AU1) = [Enable] (AU1 = 1). See page 85.

Parameter which depends on Macro Programming [Auto set function] (AU4) = 0 (see page 63):

- Command reference: logic inputs ([Command mode sel] (CMOd) = 0). See page 77.
- Speed reference: analog input VIA = 0–10 V or 0–20 mA ([Frequency mode sel] (FMOd) = 1, (F201)= 0). See [Frequency mode sel] (FMOd) page 77 and Analog Input Speed Reference page 106.
- F: run forward (F111= 2). See [LI F selection] page 90.
- R: preset speed 1 (F112= 6). See [LI R selection] page 90.
- RES: clear detected fault (F113= 10). See [LI RES selection] page 90.
- Drive ready for operation (F110= 1). See [Logic Funct 2 active] page 112.

If the above values are compatible with the application, the drive can be used without changing the settings.

Preliminary recommendations

CAUTION

INCOMPATIBLE LINE VOLTAGE

Before turning on and configuring the drive, ensure that the line voltage is compatible with the supply voltage range shown on the drive nameplate. The drive may be damaged if the line voltage is not compatible.

Failure to follow these instructions can result in equipment damage.

Power switching via line contactor

CAUTION

RISK OF DAMAGE TO THE DRIVE

- Avoid operating the contactor frequently.
- Power cycling must be MORE than 60 seconds.

Failure to follow these instructions can result in equipment damage.

User adjustment and extension of functions

- The display unit and buttons can be used to modify the settings and to extend the functions described in the following pages.
- **Return to factory settings** is made easy by the [Parameter reset] (tYP) (see page 62).

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

Check that changes made to the settings during operation do not present any danger.

We recommend stopping the drive before making any changes.

Failure to follow these instructions will result in death or serious injury.

Test on a low power motor or without a motor

- In factory settings mode, [Output phase loss] (F605) (page 129) is active F605 = 3. To check the drive in a test or maintenance environment without having to switch to a motor with the same rating as the drive (particularly useful in the case of high power drives), set F605 to 0.
- Set [Mot cont. mode sel.] (Pt) = [Constant V/Hz] (0) (see page 67).

CAUTION

UNINTENDED EQUIPMENT OPERATION

Motor thermal protection will not be provided by the drive if the motor 's nominal current is 20% lower than that of the drive. Find an alternative source of thermal protection.

Failure to follow these instructions can result in equipment damage.

Using motors in parallel

- Set [Mot cont. mode sel.] (Pt) = [Constant V/Hz] (0) (see page 67).

CAUTION

RISK OF DAMAGE TO THE MOTOR

Motor thermal protection is no longer provided by the drive. Provide an alternative means of thermal protection.

Failure to follow these instructions can result in equipment damage.

Using in single phase supply

- Set [Input phase loss] (F608) to Disabled 0 (see page 127).

CAUTION

RISK OF DAMAGE TO THE DRIVE

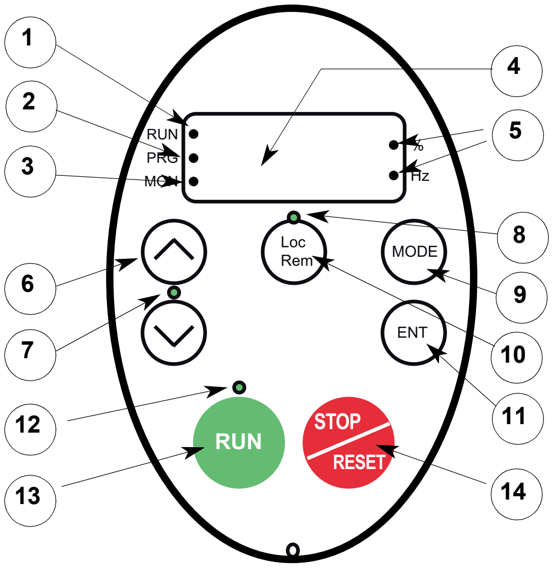
Using ATV212 in single phase supply is only allowed in training mode with motor and without load.

Failure to follow these instructions can result in equipment damage.

Embedded display terminal

This section describes the features of the integrated display terminal.

Embedded display terminal features



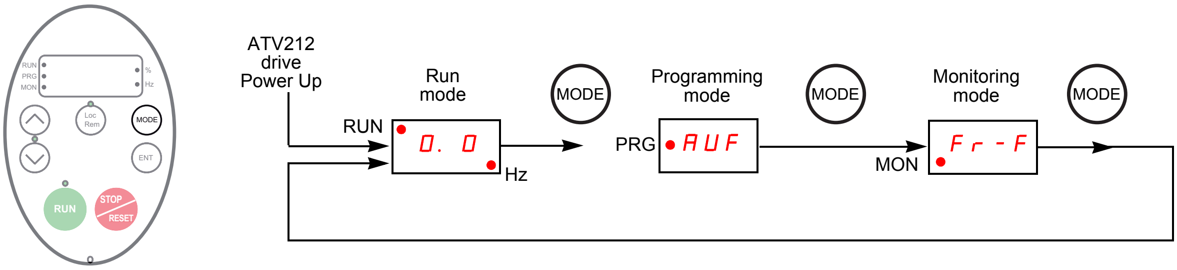
	LED/Key	Characteristics
1	Display RUN LED	Illuminates when a run command is applied to the drive. Flashes when there is a speed reference present with a Run command.
2	Display PRG LED	Illuminates when Programming mode is active. Flashes in AUF, GrU modes
3	Display MON LED	Illuminates when Monitoring mode is active. Flashes in detected fault history display mode
4	Display unit	4 digits, 7 segments
5	Display unit LED	The % LED illuminates when a displayed numeric value is a percentage. The Hz LED illuminates when a displayed numeric value is in hertz.
6	UP/DOWN keys	Depending on the mode, you can use the arrows to: Navigate between the menus Change a value Change the speed reference when the UP/DOWN LED (7) is illuminated
7	UP/DOWN LED	Illuminates when the navigation arrows are controlling the speed reference
8	Loc/Rem LED	Illuminates when Local mode is selected
9	MODE	Press to select the embedded display terminal mode. Run mode (default on power-up) Programming mode Monitoring mode Can also be used to go back to the previous menu.
10	Loc/Rem	Switches between Local and Remote modes
11	ENT	Press to display a parameter's value or to save a changed value.
12	RUN LED	Illuminates when the Run key is enabled
13	RUN	Pressing this key when the RUN LED is illuminated starts the drive.
14	STOP	Stop/reset key. In Local mode, pressing the STOP key causes the drive to stop based on the setting of parameter [Loc. mot stop mode] (F721). In Remote mode, pressing the STOP key causes the drive to stop based on the setting of parameter [Ext. fault stop Mode] (F603). The display will indicate a flashing "E". If [HMI reset button] (F735) is set to 0, pressing the stop key twice will reset the drive, if the detected fault condition has been cleared.

An optional graphic display option (VW3A1101) is also available.

Embedded display terminal modes

The Altivar 212 embedded display terminal has three modes of operation: Monitoring, Run and Programming.

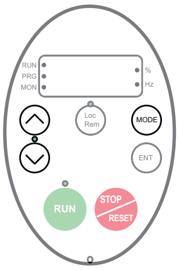
The drive powers up in the Run mode. To select a different mode, use the MODE key as illustrated below.

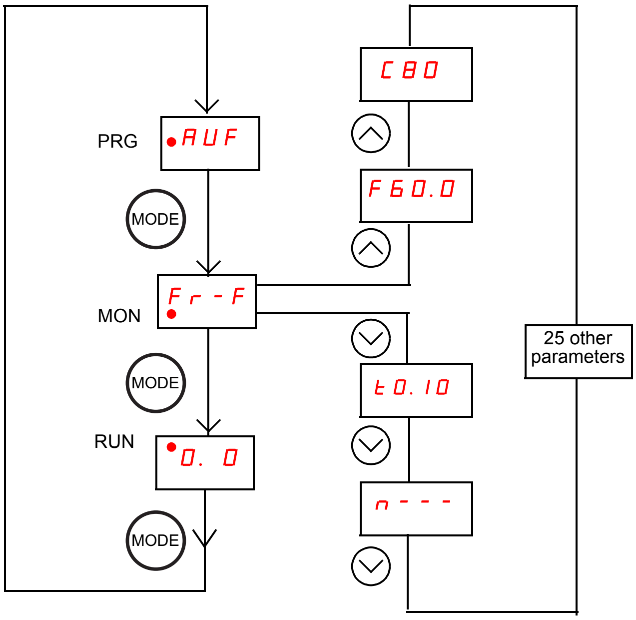


The red LED in left side of the display indicates the current mode selected, RUN for Run mode, PRG for Programming mode and MON for Monitoring mode.

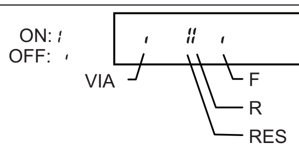
Monitoring Mode

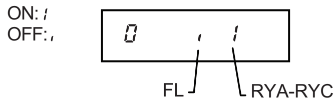
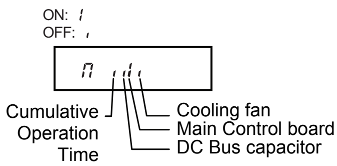
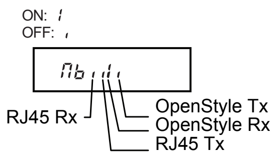
The Monitoring mode displays drive operational data in real time. To access the Monitoring mode, press the MODE key until the MON LED is illuminated. Then use the UP and DOWN keys to view up to 30 different types of data.





Monitoring Mode Displays

Display example	Display on graphic terminal	Description
Fr-F	[Direction]	Fr-F = [Forward] Fr-r = [Reverse]
F60. 0	[Speed reference]	Command frequency to drive, displayed either as Hz or in custom unit set by parameter [Customized freq val] (F702)
C 80	[Motor current]	The average of the 3 phases of motor current displayed either as amperes or as a percentage of the drive's nameplate-rated output current. Select % or A with parameter [Unit value selection] (F701).
Y 100	[Line voltage]	The average of the 3 phases of line to line input voltages displayed either in volts or as a percentage of the drive's rated input voltage (200 V for 208/240 V models - 400 V for 480 V models). Select % or volts with parameter [Unit value selection] (F701).
P 100	[Motor voltage]	The average of the 3 phases of line to line output voltages displayed either in volts or as a percentage of the drive's rated output voltage (200 V for 208/240 V models - 400 V for 480 V models). Select % or volts with parameter [Unit value selection] (F701).
q 60	[Motor torque %]	Estimated motor torque as a percentage of the motor's rated torque
c 90	[Torque current]	The average of the 3 phases of torque-producing motor current displayed either as amperes or as a percentage of the motor's rated torque-producing current. Select % or A with parameter [Unit value selection] (F701).
L 70	[Drive load %]	The motor current as a percentage of the drive's rated output current, which may be reduced from the drive's nameplate current rating by adjustments in switching frequency.
h 80	[Input power KW]	drive input power displayed in accordance with parameter [Power cons. unit] (F749).
H 75	[Output power KW]	drive output power displayed in accordance with parameter [Power cons. unit] (F749).
o60. 0	[Motor frequency]	Motor operating frequency, displayed either as Hz or in custom unit set by parameter [Customized freq val] (F702)
. . I I	[Logic input map]	 The bar representing VIA is displayed only if F109 = 1 or 2

Display example	Display on graphic terminal	Description
0. 1	[Relay map]	
u101	[CPU CTRL ver.]	CTRL version 101
uc01	[CPU MMI ver.]	MMI version 1.0
uE01	[Memory ver.]	Version of memory
d50.0	[PID feedback]	Level of PID feedback, displayed either as Hz or in custom unit set by parameter [Customized freq val] (F702)
b70.0	[PID computed ref.] speed reference	Speed reference command to drive as computed by the PID function, displayed either as Hz or in custom unit set by parameter [Customized freq val] (F702)
h85	[Total input power]	Accumulated input power consumed by the drive displayed in kWh
H75	[Total motor power]	Accumulated output power supplied by the drive displayed in kWh
A16.5	[Drive out. rat. cur. A]	Drive nameplate rated output current in amperes
1500	[Motor speed rpm]	Motor speed in rpm
n50	[Comm. counter 2]	Displays the counter numbers of communication through the network
n50	[Comm. counter 1]	Displays the counter numbers of communication only at normal state in every communication through the network
nErr	[Past fault] Examples: - 1 blink Err5 - 2 blink Err5 - 3 blink CFI2 - 4 blink nErr	The most recent detected fault stored in the detected fault history. If the drive is in a detected fault state, this is not the active detected fault. A detected fault is stored in the detected fault history after it is cleared by clear detected fault action. Press ENT to review drive state at time of detected fault. See "Detected fault Display and History" on page 21 and "Diagnostics and troubleshooting" on page 149 for more detail. There are 4 detected faults recorded. The detected fault 4 is cleared when a new detected fault appears.
n. . . 1	[Drive service alarm]	
nb	[Mdb com stat]	
t0.10	[Drive run time 100h]	Cumulative drive run time. 0.01 = 1 hour. 1.00 = 100 hours

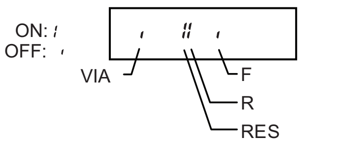
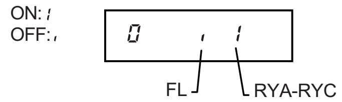
Detected fault display and history

When the drive detected faults, the graphic terminal displays a code. To review data about drive operation at the time of the detected fault, press the MODE key to enter the Monitoring mode. Then use the Up/Down keys to scroll through the data listed in table page 20.

Up to five detected faults can be displayed on the graphic terminal in Monitoring mode: the present detected fault (if the drive is in a detected fault state) and the previous four detected fault codes. To review drive operation data recorded at the time of detected fault for a previous detected fault, press ENT when the code for the detected fault is displayed. See table below for the available information.

When a detected fault is cleared or power is cycled to the drive, the present detected fault becomes Past detected fault 1.

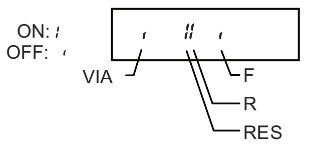
Detected fault History

Display	Display on graphic terminal	Description
n 2	[Comm. counter 1]	Number of times in succession that this particular detected fault has occurred
o60. 0	[Motor frequency]	Motor operating frequency, displayed either as Hz or in custom unit set by parameter [Customized freq val] (F702)
Fr-F	[Direction]	Fr-F = [Forward] Fr-r = [Reverse]
F60. 0	[Speed reference]	Command frequency to drive, displayed either as Hz or in custom unit set by parameter [Customized freq val] (F702)
C80	[Motor current]	The average of the 3 phases of motor current displayed either as A or as a percentage of the drive's nameplate-rated output current. Select % or A with parameter [Unit value selection] (F701).
Y100	[Line voltage]	The average of the 3 phases of line to line input voltages displayed either in volts or as a percentage of the drive's rated input voltage (200 V for 208/240 V models - 400 V for 480V models). Select % or volts with parameter [Unit value selection] (F701).
P100	[Motor voltage]	The average of the 3 phases of line to line output voltages displayed either in volts or as a percentage of the drive's rated output voltage (200 V for 208/240 V models - 400 V for 480 V models). Select % or volts with parameter [Unit value selection] (F701).
. . I I	[LOGIC INPUT MAP] Logic input map	 The bar representing VIA is displayed only if F109 = 1 or 2
0. I	[Relay map]	
t0. 10	[Drive run time 100h]	Cumulative drive run time. 0.01 = 1 hour. 1.00 = 100 hours

I/O Map

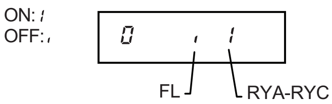
In both the monitoring mode and the detected fault history, it is possible to view the state of the logic inputs and the relay outputs. See previous tables on pages 20 and 21.

Logic Input Map



The ON or OFF status of each logic input is displayed in bits. VIA is included in this display if parameter F109 is set to either 1 or 2.

Relay Output Map



The ON or OFF status of each relay output is displayed in bits.

Run Mode

To access the Run mode, press the MODE key until the drive operating frequency, a detected fault code, or a pre-alarm code is displayed.

See Diagnostics and troubleshooting beginning on page 149 for the detected fault and pre-alarm codes.

Changing the Display in Run Mode

Motor operating frequency is the default value displayed on the graphic terminal in Run mode. This displayed value can be changed by setting parameter [Displayed param.] (F710). See page 120 for a list of the display choices.

The displayed value can be expressed as a percentage of the drive rating, or in amperes or volts, as appropriate for the value displayed. The units can be changed by setting parameter [Unit value selection] (F701) (see page 120).

In addition, the resolution of the speed reference and output frequency displays can be adjusted by setting parameters [Loc. speed ref. step] (F707) and [Display ref. resol.] (F708) (see pages 77 and 120).

Programming Mode

Use this mode to program the drive.

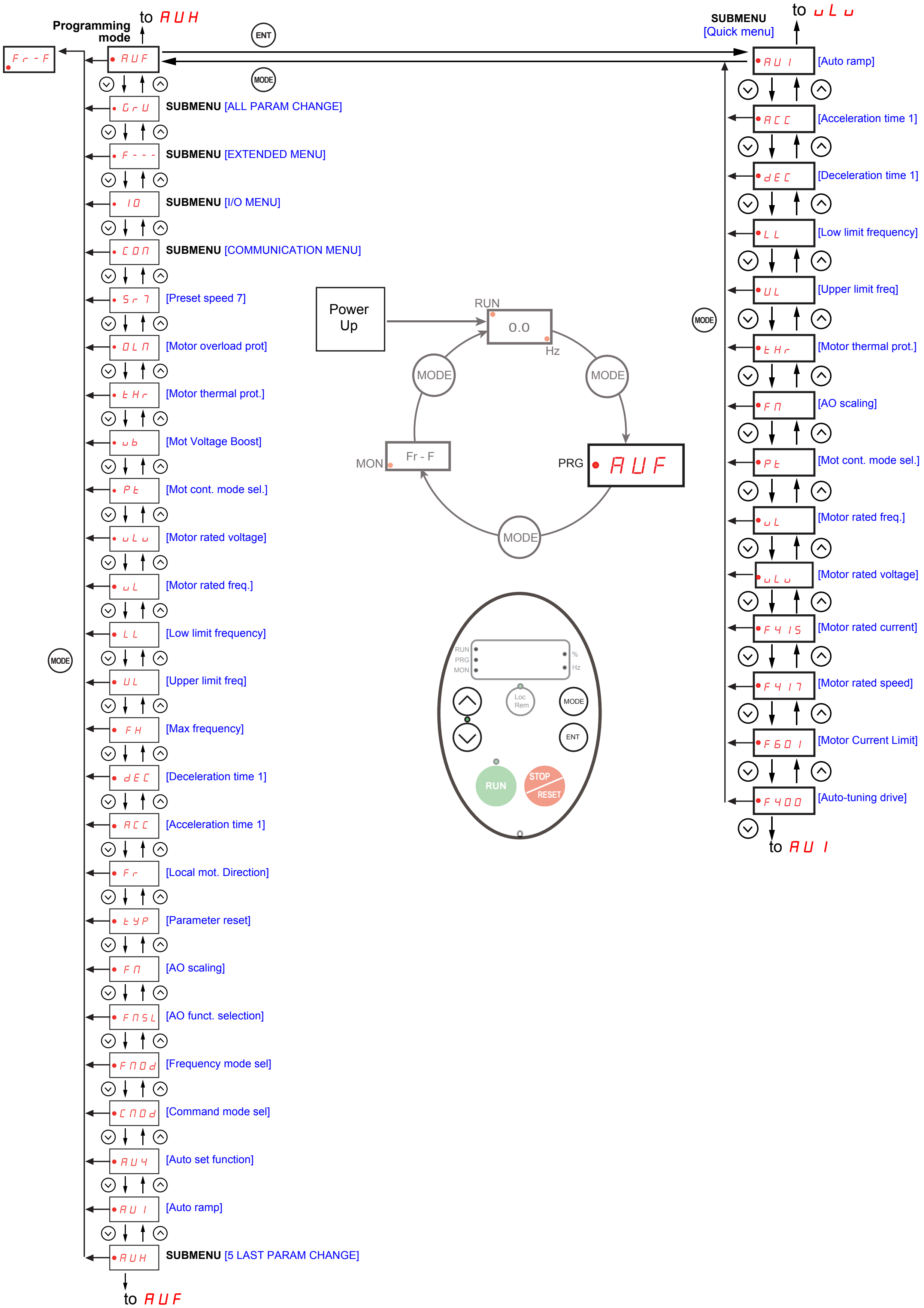
To access the Programming mode, use the MODE key until the PRG indicator LED on the display is illuminated.

See Menu Navigation page 24.

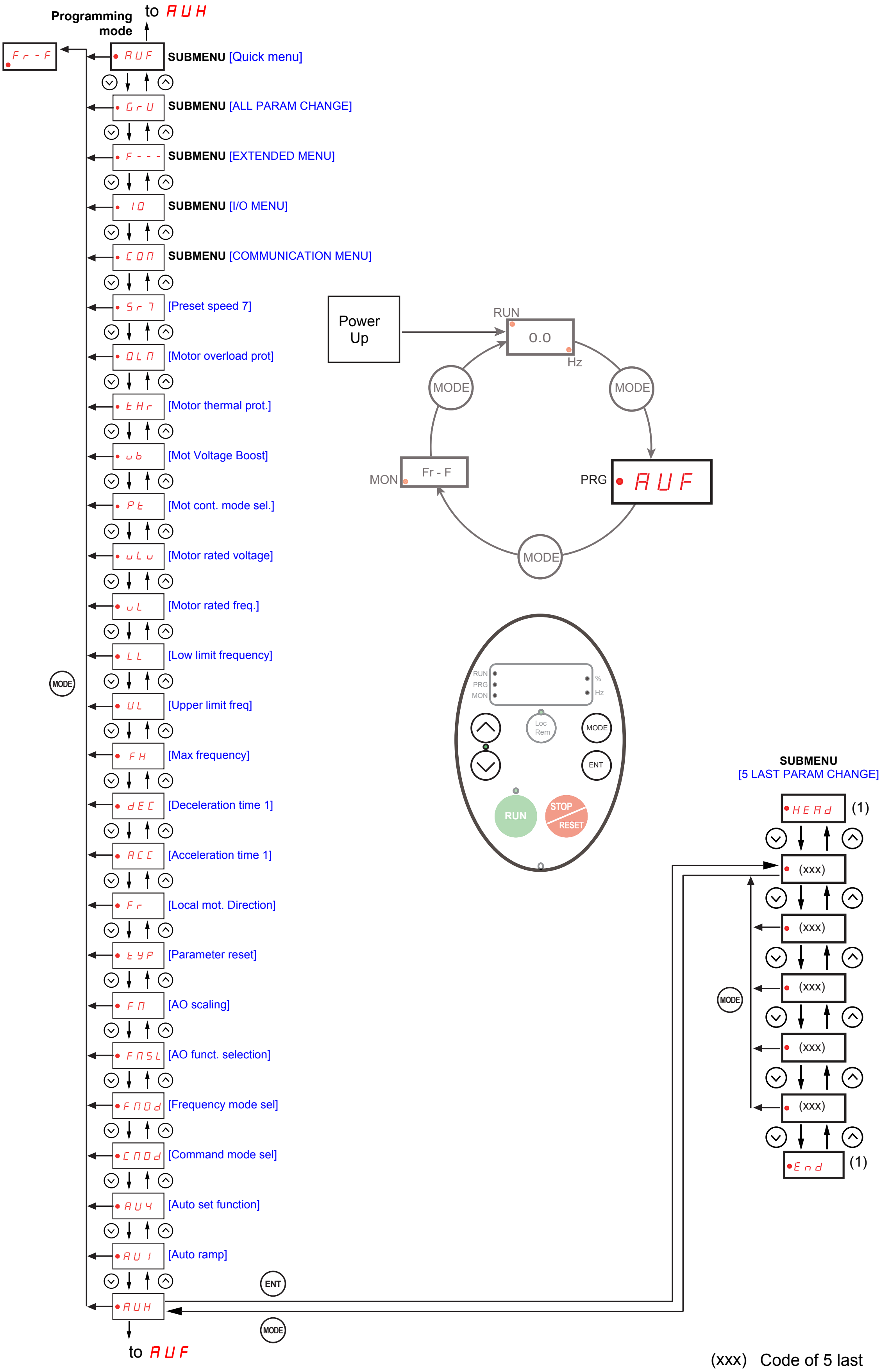
Menu Navigation

Menu navigation diagrams below illustrate how to navigate through the programming menus and submenus.

AUH [Quick menu] submenu



AUF [5 LAST PARAM CHANGE] submenu

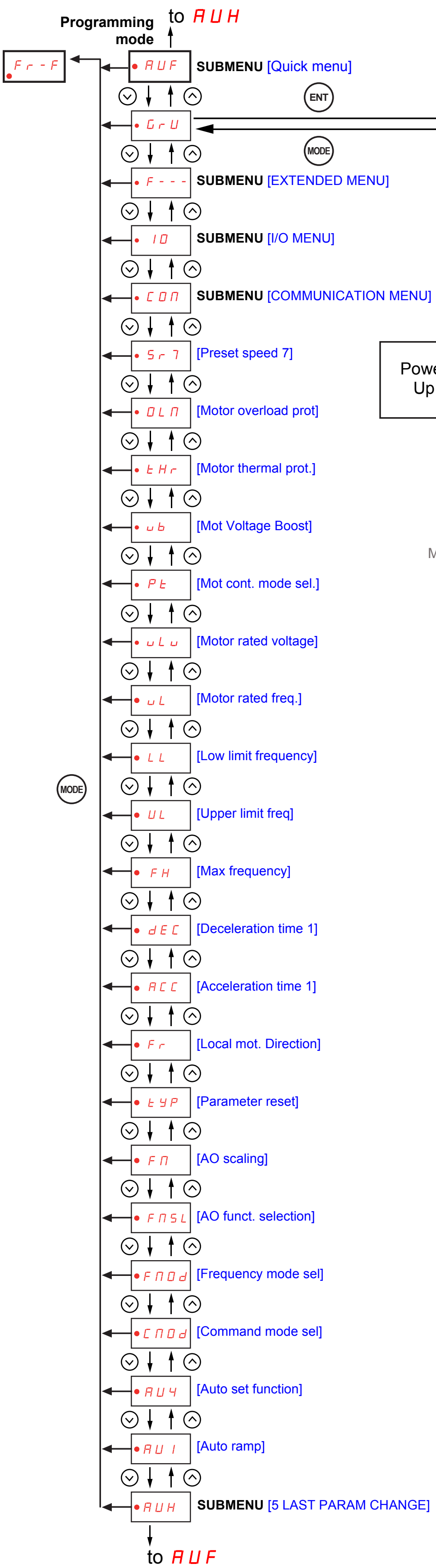


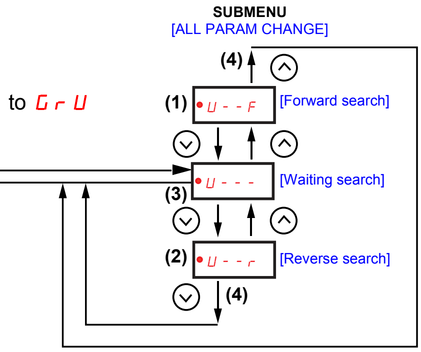
(xxx) Code of 5 last parameters

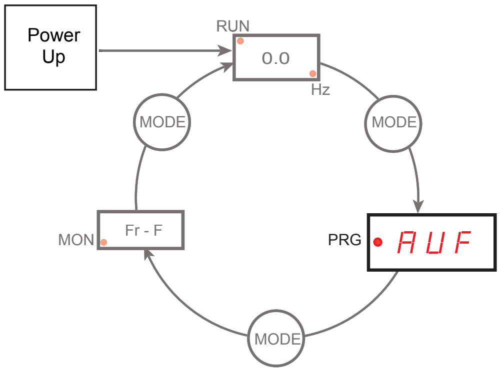
Note: If no parameter has been changed, AU1 is selected.

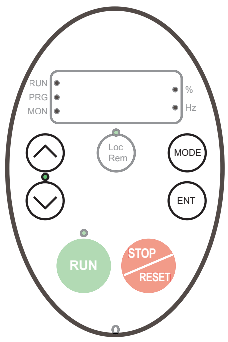
(1) Flashes three times then displays previous parameter.

GrU [ALL PARAM CHANGE] submenu









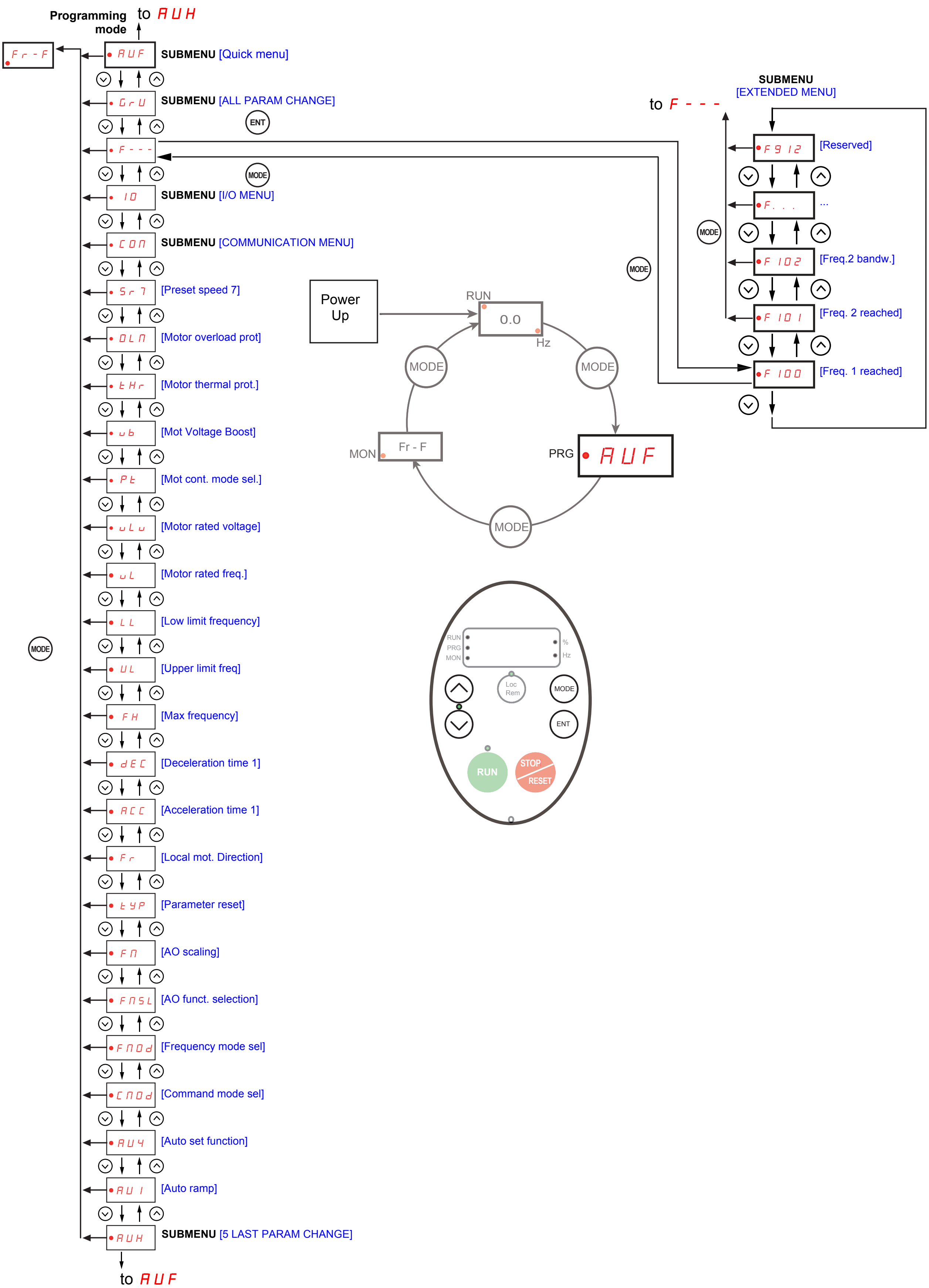
(1) Pressing the UP key searches the parameter list starting with the first one changed.

(2) Pressing the DOWN key searches the parameter list starting with the last one changed.

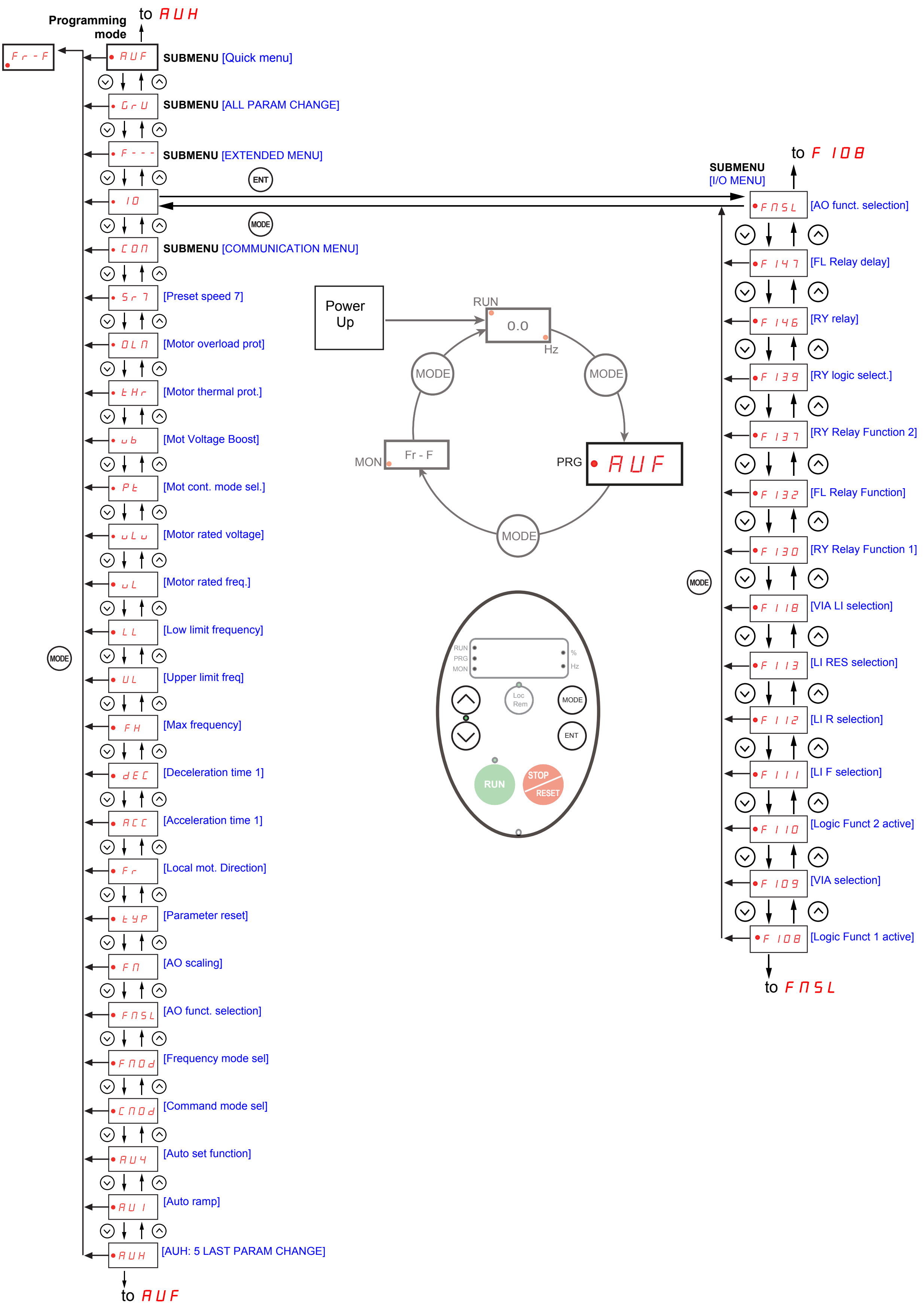
(3) The number of parameters displayed within the GrU menu depends upon how many have been altered from their factory settings.

(4) When all the changed parameters have been displayed, the display returns to GrU.

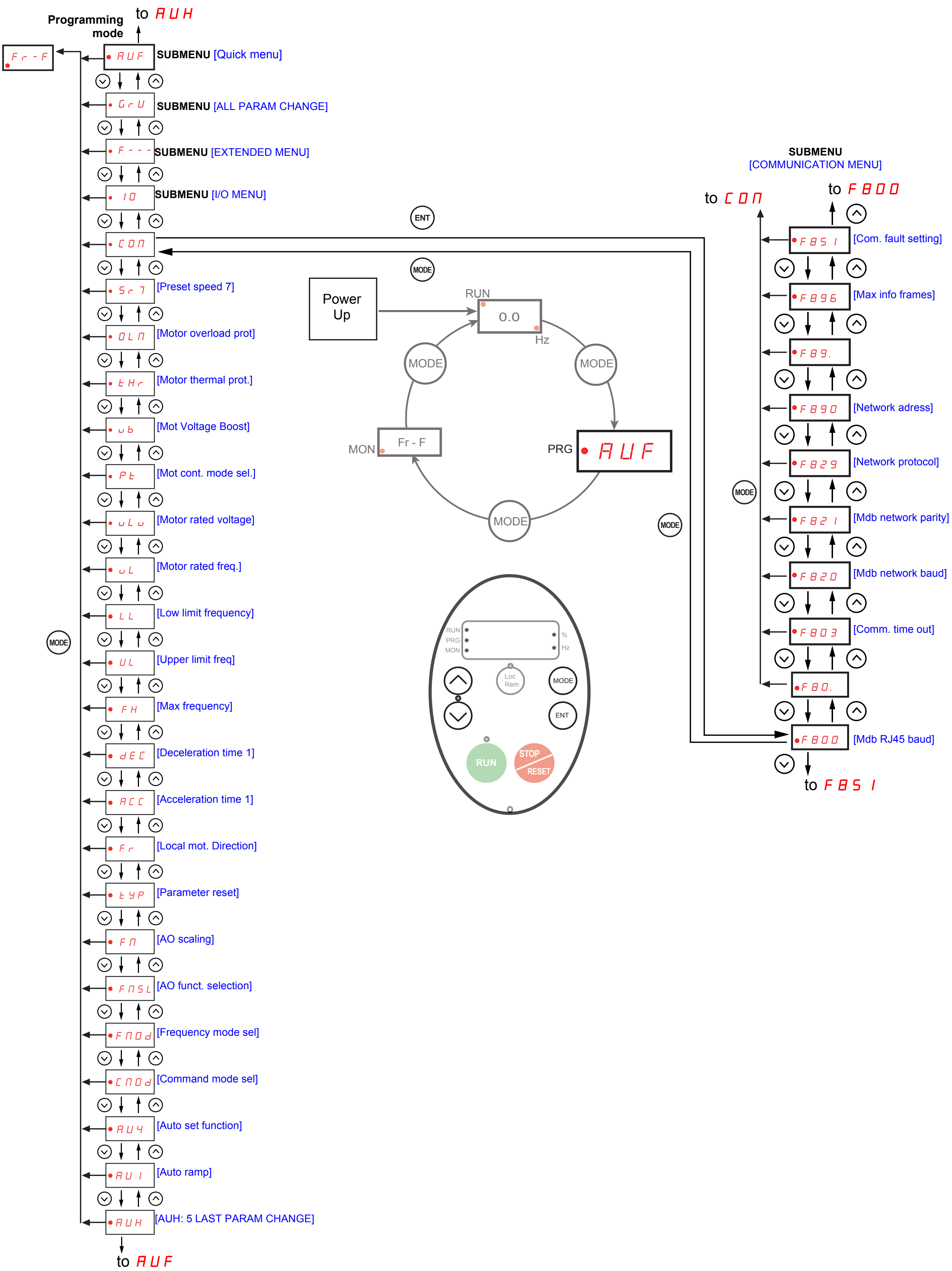
F - - - [EXTENDED MENU] submenu



I O [I/O MENU] submenu



CОn [COMMUNICATION MENU] submenu



Submenus

The ATV212 drive features 6 submenus (see diagrams starting on page 24) that are designed to reduce the time and effort required to program application parameters. Parameters can be modified within these submenus.

AUH [5 LAST PARAM CHANGE]

The AUH submenu displays, in reverse chronological order, the last 5 parameters that have been changed from their factory settings. Each time the AUH submenu is accessed, it searches for the latest parameters changed from their factory settings. If every parameter is at its factory settings, no display is generated.
Parameter Lock F700 is not displayed in the AUH menu, even if its value has been changed (see page 64).

AUF [QUICK MENU]

The AUF submenu provides ready access to the ten basic parameters commonly used in programming the drive. In many cases, programming the ATV212 drive is complete when these 10 parameters have been properly set (see chapter Quick Menu page 55).

GrU [ALL PARAM CHANGE]

The GrU submenu displays every parameter that has been changed from its factory settings. Each time the GrU submenu is accessed, its content is refreshed with the latest list of parameters changed from their factory settings. If every parameter is at its factory setting, no display is generated.
Parameters Fn and F470 – F473 are not displayed in the GrU menu, even if their values have been changed.

F--- [EXTENDED MENU]

The extended parameter submenu provides access to parameters used for special settings and applications.

IO [I/O MENU]

The IO submenu provides access to parameters used for input/output setting.

COM [COMMUNICATION MENU]

The COM submenu provides access to parameters used for the communication setting.

Graphic display option

⚠ WARNING

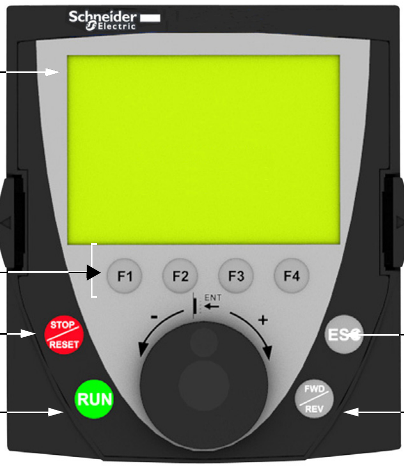
LOSS OF CONTROL

- Do not use the ATV21 and ATV12 terminal display (VW3A21101 and VW3A1006).
- Only VW3A1101 is compatible with ATV212.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Description of the graphic display option

With the graphic display option, which works with FLASH V1.1IE29 or higher, it is possible to display more text information than can be shown on the integrated display terminal.



1 Graphic display

2 Function keys
F1, F2 and F3: not assigned
F4: Loc/Rem

3 STOP/RESET key

4 RUN key

7 ESC key: Press to select the graphic display mode.
- Run mode (default on power-up)
- Programming mode
- Monitoring mode
Can also be used to go back to the previous menu.
Also corresponds to the MODE button of the embedded HMI

6 FWD/REV key: Press to reverse the direction of rotation of the motor

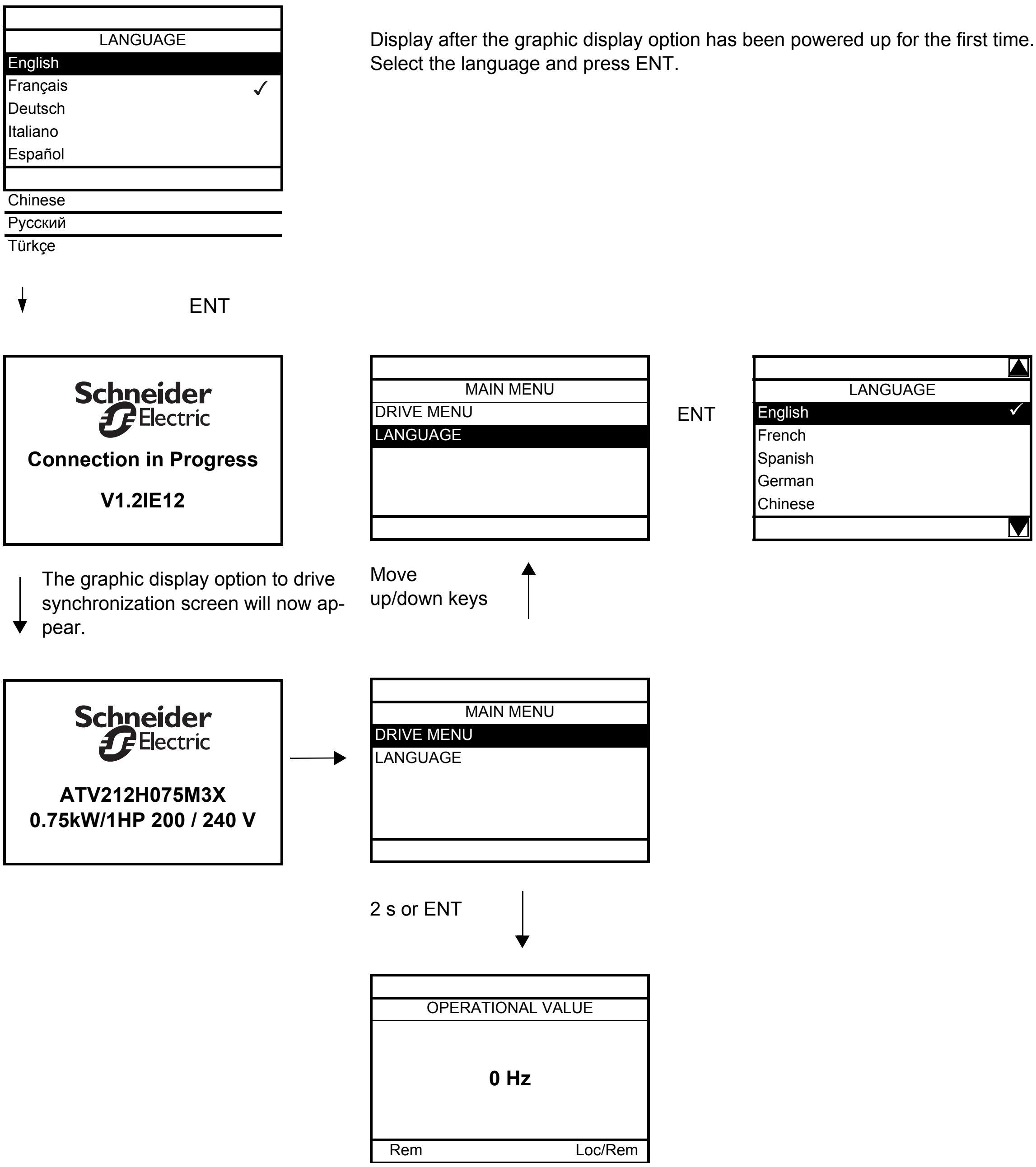
5 Jog dial:

- Press (ENT):
  - To save the current value
  - To enter the selected menu or parameter
- Turn +/-:
  - To increment or decrement a value
  - To go to the next or previous line
  - To increase or decrease the reference if control via the graphic display option is activated

Note: Keys **3**, **4**, **5** and **6** can be used to control the drive directly, if control via the graphic display option is activated.

Powering up the drive with graphic display option for the first time

When powering up the graphic display option for the first time, the user has to select the required language.



Finding a parameter in this document

The following assistance with finding explanations on a parameter is provided:

- With the integrated display terminal and the optional graphic display terminal : Direct use of the parameter code index, page 171, to find the page giving details of the displayed parameter.
- With the graphic display option: The parameter code and the name are displayed.

Example: ACC

AUF: QUICK MENU	
vLv: Motor rated voltage	
AU1: Auto ramp	
ACC: Acceleration time 1	
DEC:Deceleration time 1	
LL: Low limit frequency	
Rem	Loc/Rem

Then use the parameter code index, page 171, to find the page giving details of the displayed parameter.

Detected fault screens

Example: Output phase loss fault

EPHO: Output phase loss fault	
Loss of one or more output phases. Determine the cause of the missing output phase and rectify the problem. Set parameter F605 to 0.	
Rem	Loc/Rem

This screen is displayed the detected fault type and diagnostic information related to the detected fault. Then use the alarm code table page 150 for more information.

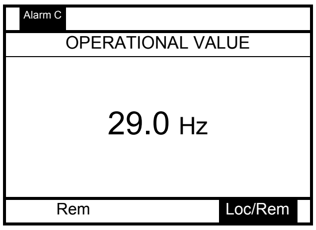
Line undervoltage

OPERATIONAL VALUE	
MOFF: Line Undervolt fault	
Rem	Loc/Rem

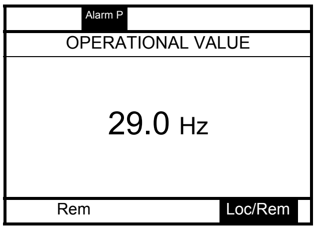
Pre-alarms screens

Here some type of screens:

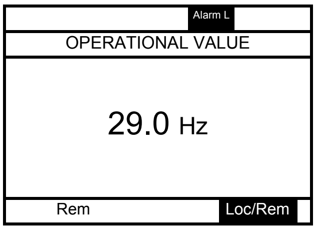
Current Limit pre-alarm



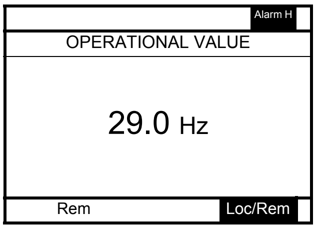
DC bus overvoltage pre-alarm



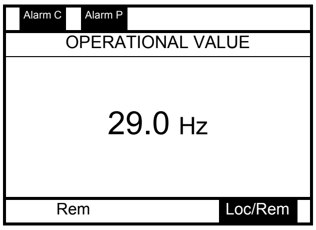
Motor overload pre-alarm



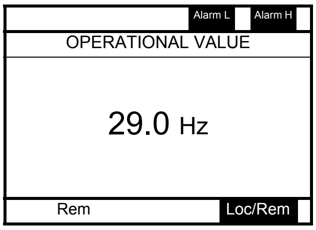
Drive overheating pre-alarm



Current Limit and DC bus overvoltage pre-alarm



Motor overload and drive overheating pre-alarm

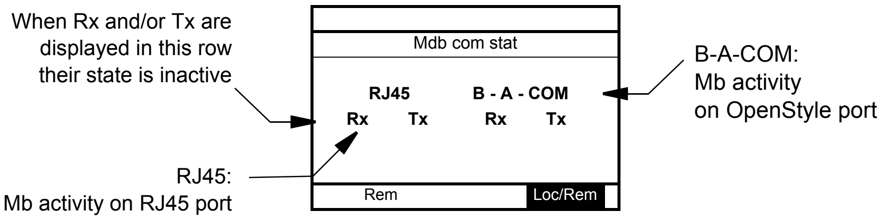


Modbus communication status

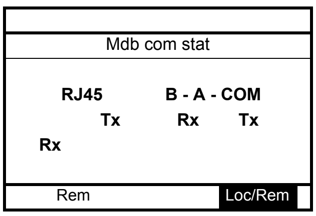
[Mdb com stat] (Πb ıııı) parameter display

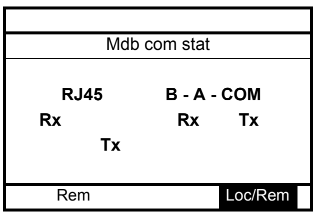
This parameter is able to check the modbus communication on RJ45 and OpenStyle port.

Without Communication

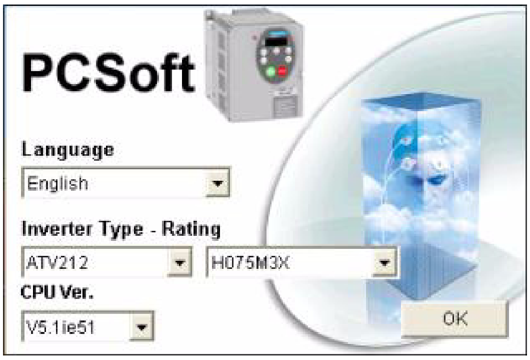


Example : With Communication on RJ45 port





PCSoft software workshop

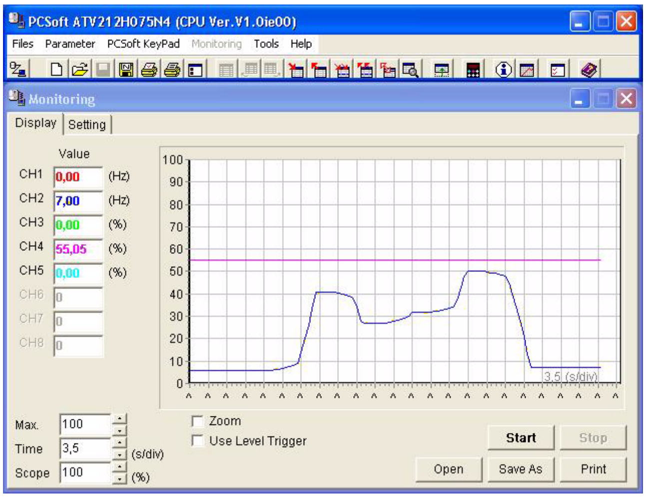


Description

This PC software workshop is a user-friendly tool for setting up Altivar 212 drives.

It includes different functions such as:

- Configuration preparation
- Setup
- Maintenance



It can be downloaded free of charge from the internet at www.schneider-electric.com.

Connection

The PCSoft software workshop must be connected directly to the Modbus port on the drive using the PC serial port connection kit, reference VW3A8106 or by USB cable reference TCSMCNAM3M002P, or by bluetooth (see catalog on www.schneider-electric.com).

Structure of the parameter tables

The parameter tables contained in the descriptions of the various menus are organized as follows.

Example:

Code	Name / Description	Adjustment range	Factory setting
F400	**[Auto-tuning drive]** Auto tuning enable	-	0
0	**[Disabled]**		
1	**[Initialize constant]**: Application of individual settings of Auto Torque Boost [Auto Torque Boost] (F402)		
2	**[Complete tune]**: complete auto tuning. Parameter F400 is reset to "0" after the auto tuning is performed.		

Value of parameter on graphic display option

Parameter value on embedded display

Name of parameter on graphic display option and description if needed.

Parameter code on 4-digit 7-segment display

Note: The text in square brackets **[ ]** indicates what you will see on the graphic display option.

Parameters that cannot be changed while the drive is running

The table below lists the parameters that cannot be changed unless the drive is stopped.

Code	Description
AU1	[Auto ramp]
AU4	[Auto set function]
CMOd	[Command mode sel]
FMOd	[Frequency mode sel]
tYP	[Parameter reset]
FH	[Max frequency]
UL	[Upper limit freq]v
uLu	[Motor rated voltage]
Pt	[Mot cont. mode sel.]
F108	[Logic Funct 1 active]
F109	[VIA selection]
F110	[Logic Funct 2 active]
F111	[LI F selection]
F112	[LI R selection]
F113	[LI RES selection]
F118	[VIA LI selection]
F130	[RY Relay Function 1]
F132	[FL Relay Function]
F137	[RY Relay Function 2]
F139	[RY logic select.]
F170	[Mot 2 rated Freq.]
F171	[Motor 2 rated Volt]
F300	[Switch. freq. level]
F301	[Catch on fly]
F302	[Supply loss behav.]
F303	[Number auto reset]
F305	[Overvoltage fault]
F307	[Mot volt limitation]
F311	[Motor direction]
F316	[Switch. freq. mode]
F400	[Auto-tuning drive]
F415	[Motor rated current]
F416	[Mot no-load current]
F417	[Motor rated speed]
F418	[Frequency loop gain]
F419	[Freq. loop stability]
F480	[No load cur. coef]
F481	[In noise comp. filter]
F482	[In noise Inhibit filter]
F483	[In noise inhibit gain]
F484	[Pwr supply adj. gain]
F485	[Stall control coef. 1]
F492	[Stall control coef. 2]
F494	[Mot. adj coefficient]
F495	[Motor voltage coef.]
F496	[PWM adj. coef.]
F601	[Motor Current Limit]
F603	[fault stop Mode]
F605	[Output phase loss]
F608	[Input phase loss]
F613	[Short circuit det.]
F626	[Overvoltage level]
F627	[Undervolt detect.]
F732	[Loc/rem key]

Common control schemes

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Read and understand the instructions in "before you begin" chapter, before performing the procedure in this section.

Failure to follow these instructions will result in death or serious injury.

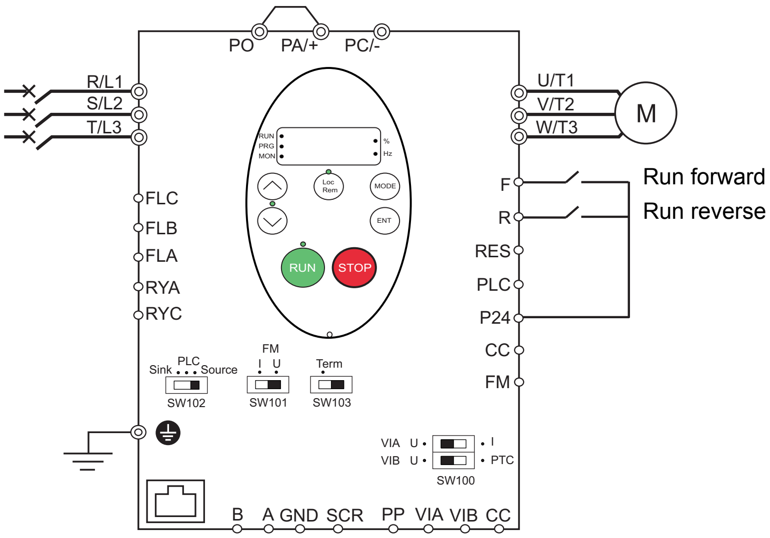
DANGER

UNINTENDED EQUIPMENT OPERATION

- To modify the setting of the switches, the product must be switched off.
- Do not change the setting of switch SW102 unless your system is properly wired.

Failure to follow these instructions will result in death or serious injury.

2-wire control

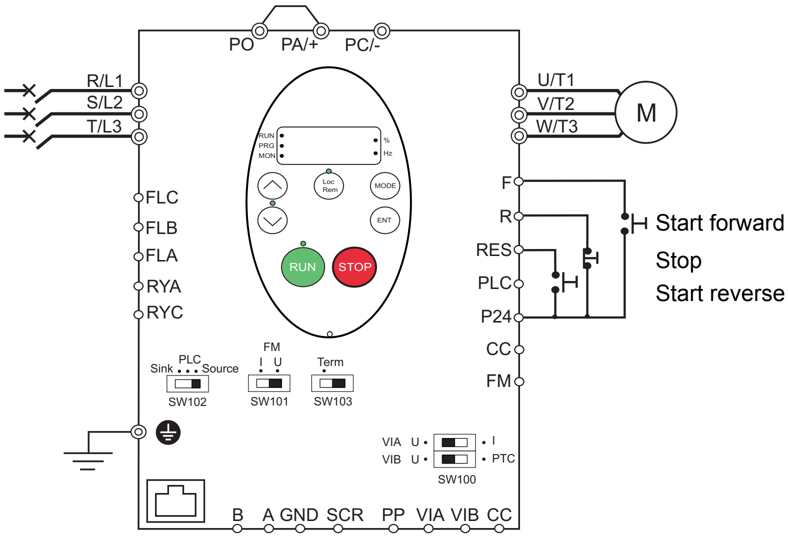


1. Wire the logic inputs as indicated in the above figure.
2. Set switch SW102 to source.
3. Program common parameters of ATV212 (see Quick Menu page 55).
4. Program specific parameters for 2-wire control as indicated in the following table:

Parameter	Page	Setting	Factory value
CMOd [Command mode sel]	77	0 [Logic inputs]	0
F111 [LI F selection]	90	2 [forward]	2
F112 [LI R selection]	90	3 [reverse]	6

Note: If F111 and F112 are switched simultaneously, the drive will go at 0 speed.

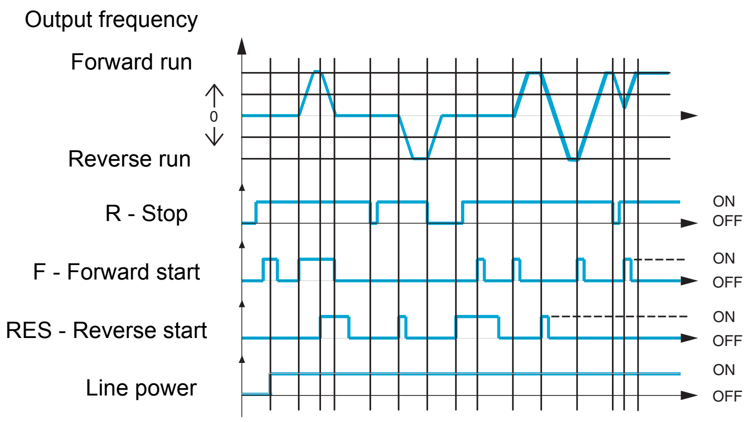
3-wire control



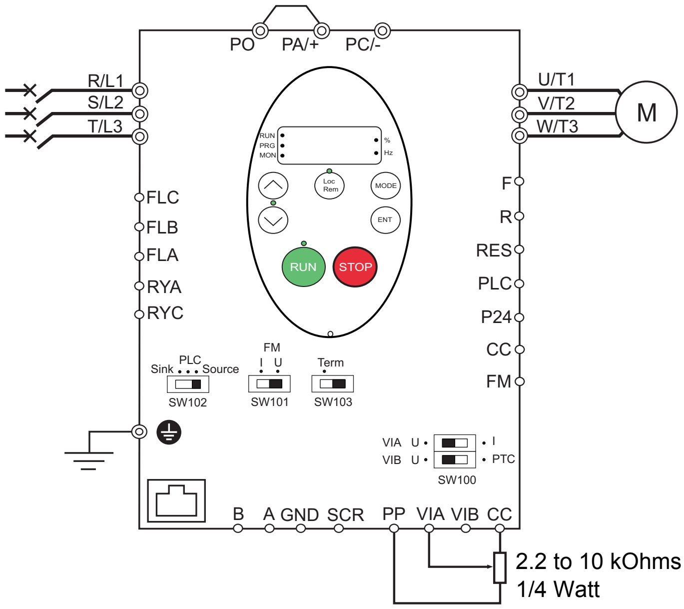
1. Wire the logic inputs as indicated in the above figure.
2. Set switch SW102 to source.
3. Program common parameters of ATV212 (see Quick Menu page 55).
4. Program specific parameters for 3-wire control as indicated in the following table:

Parameter	Page	Setting	Factory value
CMOd [Command mode sel]	77	0 [Logic inputs]	0
F111 [LI F selection]	90	2 [forward]	2
F112 [LI R selection]	90	49 [3-wire]	6
F113 [LI RES selection]	90	3 [reverse]	10

3 wire control timing diagram



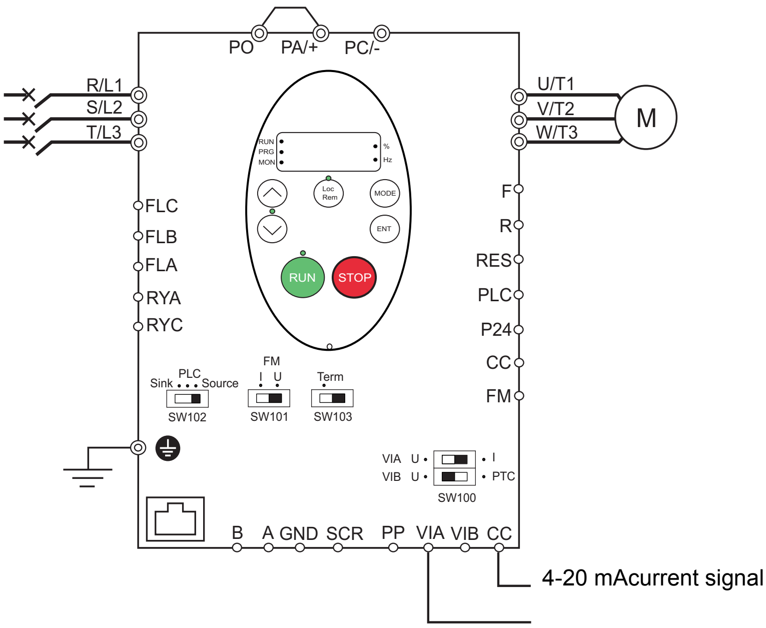
External speed control potentiometer



1. Wire the analog input as indicated in the above figure.
2. Set switch SW100 to V (voltage).
3. Program common parameters of ATV212 (see Quick Menu page 55).
4. Program specific parameters for external speed control potentiometer as indicated in the following table:

Parameter	Page	Setting	Factory value
F M O d [Frequency mode sel]	77	1 [Ref source VIA]	1
F 1 0 9 [VIA selection]	90	0 [AI]	0
F 2 0 0 [Auto/man speed ref]	108	0 [Enable]	0

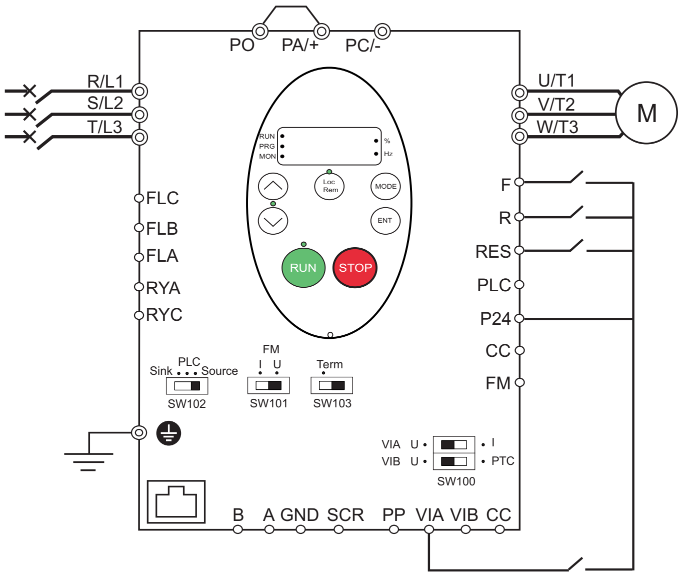
4-20 mA speed control



1. Wire the analog input as indicated in the above figure.
2. Set switch SW100 to I (current).
3. Program common parameters of ATV212 (see Quick Menu page 55).
4. Program specific parameters for 4-20 mA speed control as indicated in the following table:

Parameter	Page	Setting	Factory value
FMOd [Frequency mode sel]	77	1 [Ref source VIA]	1
F109 [VIA selection]	90	0 [AI]	0
F200 [Auto/man speed ref]	108	0 [Enable]	0
F201 [VIA ref point 1]	106	20 %	0 %

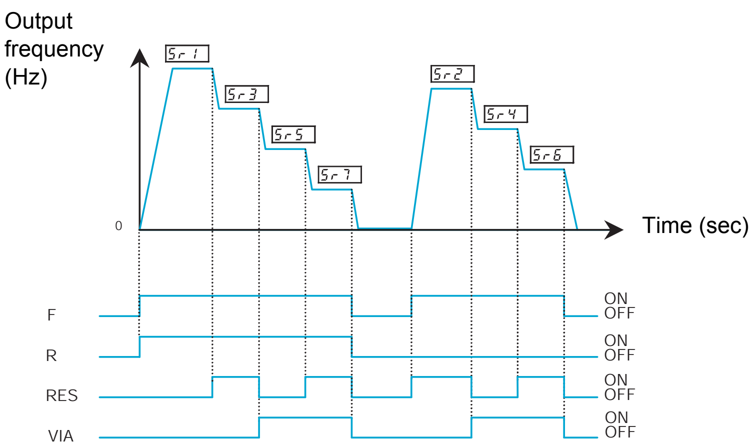
Preset speeds (up to seven)



1. Wire the logic and analog inputs as indicated in the above figure.
2. Set switch SW102 to source.
3. Program common parameters of ATV212 (see Quick Menu page 55).
4. Program specific parameters for preset speed as indicated in the following table:

Parameter	Page	Setting	Factory value
F109 [VIA selection]	90	2 [LI source]	0
F111 [LI F selection]	90	2 [forward]	2
F112 [LI R selection]	90	6 [PS1]	6
F113 [LI RES selection]	90	7 [PS2]	10
F118 [VIA LI selection]	90	8 [PS3]	7
Sr1 [Preset speed 1]	112	-	15.0
Sr2 [Preset speed 2]	112	-	20.0
Sr3 [Preset speed 3]	112	-	25.0
Sr4 [Preset speed 4]	112	-	30.0
Sr5 [Preset speed 5]	112	-	35.0
Sr6 [Preset speed 6]	112	-	40.0
Sr7 [Preset speed 7]	112	-	45.0

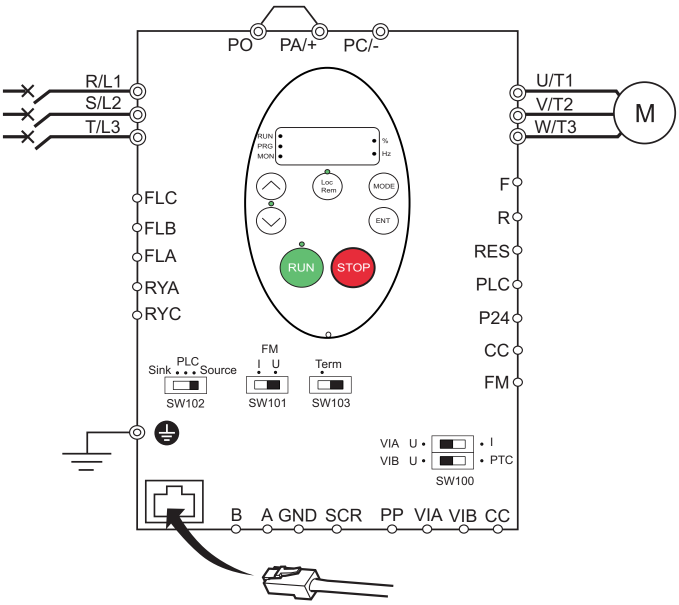
Example of 7-step preset speed operation:



See page 112 for additionnal information.

Serial communication

RJ45 connection



Port open style connection

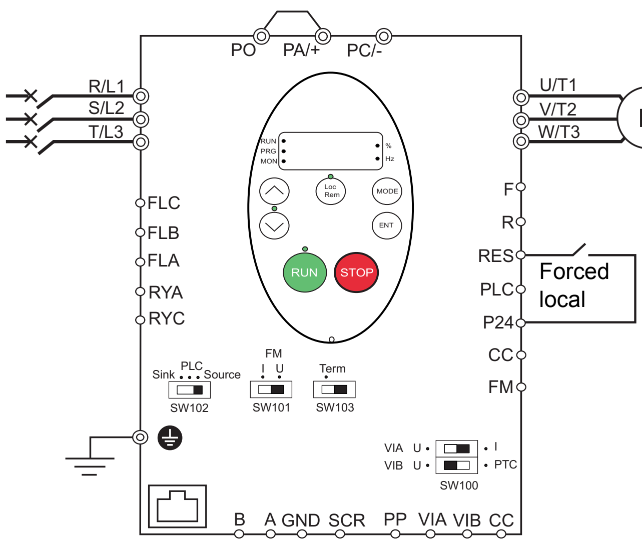
Contact	Signal
B	+
A	-
GND	GND
SCR	Screen

- Cable sheath should be peeled off by about 10 mm.
- For wiring work, use a fat blade screwdriver with a 0.6 mm thick and 3.5 mm width blade.
- Tightening torque for the terminal block is 0.5 to 0.6 Nm.

1. For Modbus serial communication, plug the network cable into RJ45 connector on the main control board. Connection can also be carried out using the «open style» port.
2. Program common parameters of ATV212 (see Quick Menu page 55).
3. Program specific parameters for serial communication as indicated in the following table:

Parameter	Page	Setting	Factory value
CMOd [Command mode sel]	77	2 [Communication]	0
FMOd [Frequency mode sel]	77	4 [Serial com ref.]	1
F807 [Com channel choice]	139		1

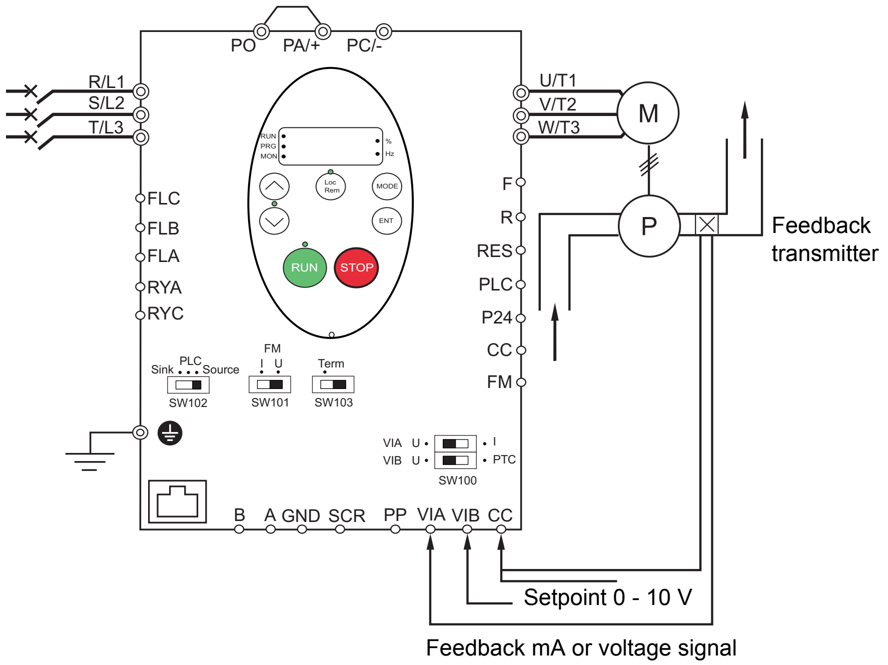
Forced local



1. Wire the logic input as indicated in the above figure.
2. Set switch SW102 to source.
3. Program common parameters of ATV212 (see Quick Menu page 55).
4. Program specific parameter for forced local as indicated in the following table:

Parameter	Page	Setting	Factory value
F113 [LI RES selection]	90	48 [forced local]	10

PID control



1. Wire analog inputs as indicated in the above figure.
2. Set switch SW102 to source.
3. If the feedback is a milliamp signal, set switch SW100 to the I (current) position. If the feedback is a voltage signal, set switch SW100 to the V (voltage) position.
4. Program common parameters of ATV212 (see Quick Menu page 55).
5. Program specific parameters for PID control as indicated in the following table:

Parameter	Page	Setting	Factory value
FMOd [Frequency mode sel]	77	2 [Communication]	1
F109 [VIA selection]	90	0 [AI]	0
F200 [Auto/man speed ref]	108	0 [Enable]	0
F360 [PID control enable]	110	1 [PID by VIA]	0
F359 [PID ctrl wait time]	111	In accordance with the application	0 s
F362 [PID Prop Gain]	110		0.30 %
F363 [PID Integral Gain]	110		0.20
F366 [PID Derivative Gain]	111		0.00
F380 [PID reverse error]	111		0
F391 [Stop on LL hyst]	111		0.2 Hz
F392 [PID wake up (thres)]	111		0.0 Hz
F393 [PID wake up, feedb]	111		0.0 Hz

Drive Operation

Local and Remote Modes of Operation

Overview

The ATV212 drive has two modes of operation, local and remote.

In local mode, the ATV212 drive can be operated only from the embedded display terminal or graphic display option:

- Use the RUN and STOP keys for command control
- Use the UP and DOWN keys for speed control

In remote mode, the ATV212 drive is operated from a combination of the command and speed reference sources defined by programming parameters [Frequency mode sel] (F M O d) and [Command mode sel] (C M O d) (see page 77).

Command Sources

The command source [Command mode sel] (C M O d) choices are:

- External signals to the control terminal logic inputs F, R, RES and VIA
- Serial communication control (Modbus®, Metasys® N2, Apogee® FLN P1, BACnet, or LonWorks®)
- Embedded display terminal RUN and STOP keys or graphic display option

Speed Reference Sources

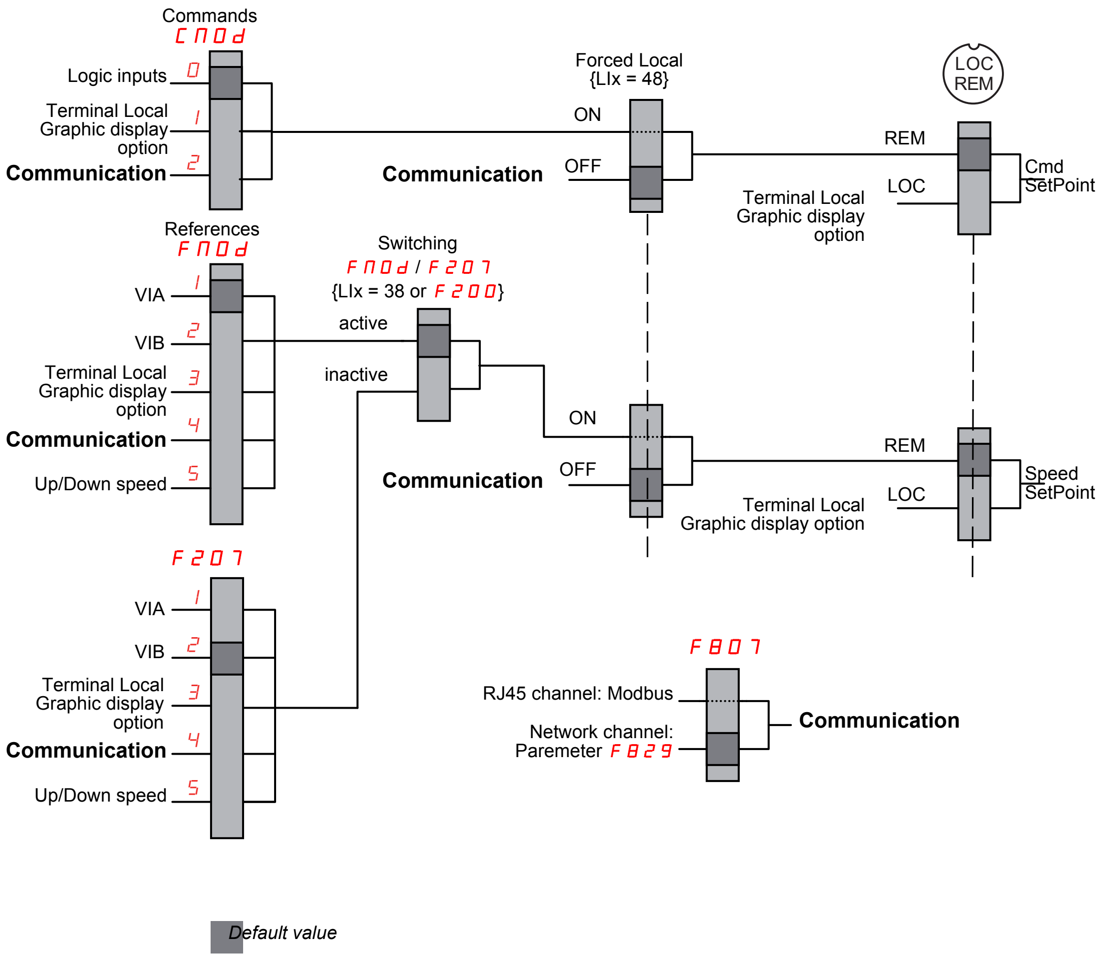
The speed reference source [Frequency mode sel] (F M O d) choices are:

- External signals to the control terminal analog inputs VIA or VIB
- (4–20 mA, 0–10 Vdc),
- External signals to the control terminal logic inputs assigned to +/- Speed
- Serial communication control (Modbus®, Metasys® N2, Apogee FLN P1®, BACnet, or LonWorks®)
- Embedded display terminal UP and DOWN keys or graphic display option

Command Mode Selection and Priorities

The diagram below illustrates the control inputs and selection logic which determine the source of the drive's start/stop and speed reference commands.

Command and Reference Switching



Parameters [Command mode sel] (CMOd) and [Frequency mode sel] (FMOd) are the first layers of logic used by the drive to determine its command CMOd and speed reference FMOd source.

[Remote spd ref 2] (F207) is a secondary speed reference source that may override the source selected by FMOd (see page 77).

The speed reference source identified by F207 takes control if either:

- A logic input assigned to function 38 (frequency reference source switching) is enabled, or
- Parameter [Auto/man speed ref] (F200) is set to 1 and the drive's output frequency is equal to or less than 1 Hz (see page 108).

If a serial communication link is established, it can take control of the ATV212 drive, overriding inputs identified by CMOd, FMOd, and F207. Control is restored to CMOd, FMOd, and F207 only if:

- The serial communication link relinquishes control, or
- A logic input assigned to function 48 (forced local) is enabled.

The final layer of logic used by the drive to determine its command source is the LOC/REM key on the graphic display option.

When the drive and embedded HMI is set to local mode (by pressing the LOC/REM key, lighting the local mode LED), the drive responds only to commands from the embedded and graphic display option.

Selecting Local or Remote mode

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

- Know the state of the frequency and run commands from the remote source before exiting the local mode.
- Upon entering the remote mode, the drive will respond to the most recent command from the remote source, even if it was received before entering or while in the local mode.

Failure to follow these instructions will result in death or serious injury.

Switching between local and remote mode is achieved with the LOC/REM key on the drive's embedded display terminal or with F4 key on the graphic display option.

The LOC/REM key can be disabled by setting parameter [Loc/rem key] (F732) to 1 (see page 80).

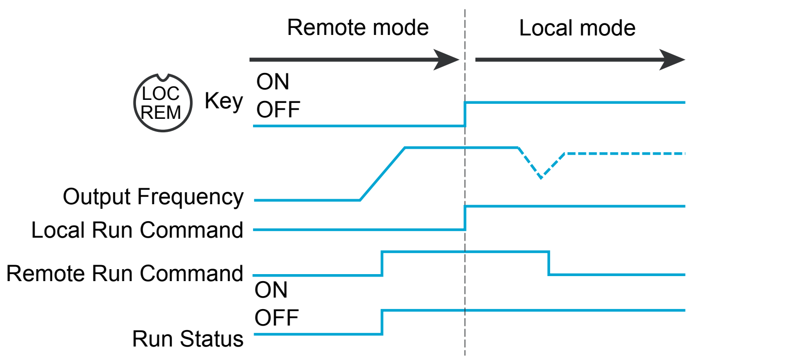
When parameter [Switch rem/Local] (F295) is set to 1 (factory setting), a bumpless tranfer of motor operation is achieved when switching from remote to local mode (see page 78).

For example, if the bumpless transfert feature is active and if the motor is running at full speed with the drive in remote mode, the motor will still run at full speed after the drive is transferred to local mode.

Conversely, when switching from local to remote mode, the run and speed command is not transferred to the remote mode. Upon entering the remote mode, the drive will operate on the run and speed command set by the remote source even if it was received before entering or while in the local mode.

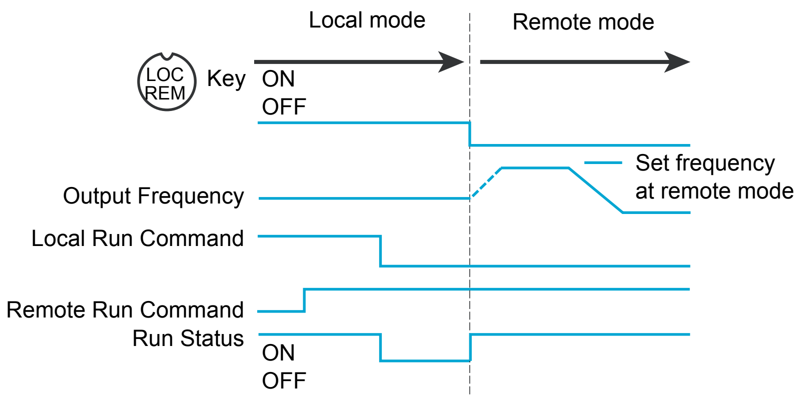
The diagram below is an example timing diagram.

Switching Between Local and Remote Mode



The remote run command and frequency command are transferred to the local mode when the LOC/REM key is pressed.

In this example, the run command and frequency command from the remote mode are copied to the local mode, and the motor continues to run.



When switching from the local mode to the remote mode, the run command and frequency command are determined by the setting in the remote mode.

In this example, when the LOC/REM button is pressed, the motor in started.
This is due to the application of a remote run command when the drive exits the local mode and enters the remote mode.

Local Mode

When the ATV212 drive is in local mode, the LED above the LOC/REM key is illuminated.

On the graphic display option:

AUF: QUICK MENU
LL: Low Limit frequency
DEC: Deceleration time 1
ACC: Acceleration time 1
AU1: Auto ramp
vLv: Motor rated voltage
Loc Ref loc Cmd loc Loc/Rem

Starting and Stopping the Motor in Local Mode

Start and stop the motor with the RUN and STOP keys on the graphic/embeded display terminals.

The setting of parameter [Loc. mot stop mode] (F721) determines how the motor stops when the drive is in local mode (see page 78):

- If F721 is set to 0 (factory setting), the motor will stop on a ramp, based on the time value set in parameter [Deceleration time 1] (dEC) or parameter [Deceleration time 2] (F501).
- If F721 is set to 1, power will be removed from the motor when the STOP key is pressed, allowing the motor to coast to a stop with the ramp-down time determined by inertia and friction.

Use of the RUN and STOP keys in local mode can be disabled using parameter [Run/stop key] (F733) (see page 80).

Adjusting Motor Speed in Local Mode

Set the motor speed using the UP and DOWN keys on the graphic/embeded display terminals. Motor speed can be adjusted while the drive is operating.

Normally, motor frequency changes by 0.1 Hz each time the UP or DOWN key is pressed. This rate of speed change can be altered by entering a new frequency step change into parameter [Loc. speed ref. step] (F707) (see page 77).

If the ENT key is pressed after the motor speed has been adjusted, that speed setpoint value will be entered into parameter FC. The next time the drive is started in the local mode, it will accelerate the motor directly to the speed setpoint memorized by [Local speed ref.] (FC) (see page 77).

Selecting Motor Rotation Direction in Local Mode

Motor rotation direction is set by parameter [Local mot. direction] (Fr) (see page 77). The four selections are:

- 0: Forward only (factory setting)
- 1: Reverse only
- 2: Forward, with reverse selectable from the graphic/embeded display terminals (1)
- 3: Reverse, with forward selectable from the graphic/embeded display terminals (1)

(1) If Fr is set to either 2 or 3, motor rotation can be set to forward by pressing the UP key while holding the ENT key. Reverse can be set by pressing the DOWN key while holding the ENT key.

Motor rotation is indicated on the embedded display terminal as Fr-F for forward and as Fr-r for reverse.

The ability to run in the Forward or Reverse direction can be set with parameter [Motor direction] (F311) (see page 86).

Resetting drive detected fault in Local Mode

It is not possible to clear a drive detected fault if the cause of the detected fault persists. Be certain to diagnose and rectify the cause of the detected fault before attempting a drive reset.

With the STOP Key

To clear a drive detected fault in local mode:

1. Press the STOP key. See Fault detection codes that can be cleared with the automatic restart function after the cause has disappeared on page 124 for a list of detected faults that can be cleared with the STOP key. If it is possible to reset the drive, the embedded display terminal will display CLr.

2. To clear the detected fault, press the STOP key a second time.

3. If the cause of the detected fault is still present, the CLr display will not appear. Diagnose and clear the detected fault before attempting to reset the drive.

Use of the STOP key as a clear detected fault can be set with parameter [HMI reset button] (F735) (see page 80).

In the event of an OL1 or OL2 detected fault, the following time periods are necessary before a clear detected fault is possible:

- OL1 (drive overload)—about 30 seconds after the detected fault has occured
- OL2 (motor overload)—about 120 seconds after the detected fault has occured

By Cycling Line Power

A drive detected fault can also be cleared by removing and restoring line power. Be certain that the cause of the detected fault is no longer present and leave power removed long enough for all of the LEDs on the face of the drive to extinguish.

Cycling power to clear a detected fault can cause the detected fault history to be lost. Refer to parameter [Drive Fault Memory] (F602) on page 127.

Logic Input Functions Active in Local Mode

The logic input functions listed in the table below are active, even if [Command mode sel] (CMOd) is set to 1 (embedded display terminal control). See table on page 90 for logic input function settings.

Logic Input Function No.	Description
1 54	[Run permissive] [Inverse Run permissive]
10 55	[Fault reset] [Inv fault reset]
11 45	[Ext Fault] [Inv Ext. fault]
16	[Run reset]
38	[Frequency source]
41	[(+) speed]
42	[(-) speed]
43	[+/- clear]
44	[+/- SPD, FLT CLR]
46	[Ext. Th fault]
47	[Inv Ext. Th fault]
51	[Reset kWh]
52	[Forced mode]
53	[Fire mode]
62	[RY on]
64	[Cancel HMI cmd]

Remote Mode

When the ATV212 drive is in the remote mode, the LOC/REM LED is off.

Starting and Stopping the Motor in Remote Mode

The diagram on page 46 illustrates the start/stop command source when the drive is in remote mode.

With Logic Input Terminals

Use the logic input terminals F, R, RES, or VIA to start the drive if parameter [Command mode sel] (CMOd) is set to [Logic Inputs] (0) (factory setting).

With the display terminals

The drive responds to commands from the embedded display terminal or graphic display option, just as in local mode, if parameter [Command mode sel] (CMOd) is set to [HMI] (1).

With Serial Communication

The drive responds to commands sent over the serial communication link (Modbus®, Metasys® N2, Apogee® FLN, BACnet or LonWorks®) if parameter [Command mode sel] (CMOd) is set to [Communication] (2).

The drive responds to commands sent over the RJ45 communication port if parameter [Com channel choice] (F807) is set to 0. Other protocols are available when F807 is set to 1 on open style port.

With the graphic/embeded display terminals STOP Key

The graphic/embeded display terminals STOP key is active when the drive is in remote mode. Pressing the STOP key causes the drive to stop according to the setting of parameters [Ext. fault stop Mode] (F603), [DC brk time ext flt] (F604), and [DC braking current] (F251) (see page 115 and page 88) . After the drive has come to a stop, the graphic/embeded display terminals display E and the fault relay is activated.

Adjusting the Motor Speed in Remote Mode

The diagram on page 46 illustrates the speed reference source when the drive is in remote mode.

By Analog Input VIA

A 0–10 Vdc or 4–20 mA signal connected to VIA and CC can be used to adjust the motor speed if:

- Parameter [Frequency mode sel] (FMOd) is set to 1 (factory setting).
- Alternate speed reference source parameter [Remote spd ref 2] (F207) has not been enabled (see page 78).

The analog signal type depends on the setting of switch SW100 and parameters F109, F201–F204, and F470–F471.

By Analog Input VIB

A 0–10 Vdc signal connected to VIB and CC can be used to adjust the motor speed if:

- Parameter [Frequency mode sel] (FMOd) is set to 2.
- Alternate speed reference source parameter [Remote spd ref 2] (F207) has not been enabled.

The control that VIB has over motor speed depends on the setting of switch SW100 and parameters F210–F213, F472–F473, and F645.

By display terminal Control

Control of the motor speed is enabled, if:

- Parameter [Frequency mode sel] (F M O d) is set to 3.
- Alternate speed reference source parameter [Remote spd ref 2] (F 2 0 7) has not been enabled.

By Serial communication control

Serial communication control (Modbus, Metasys N2, Apogee FLN, BACnet or LonWorks) of the motor speed is enabled, if:

- Parameter [Com channel choice] (F 8 0 7) is set to 0 (only for Modbus on RJ45 port),
- Parameter [Com channel choice] (F 8 0 7) is set to 1,
- Parameter [Frequency mode sel] (F M O d) is set to 4.
- Alternate speed reference source parameter [Remote spd ref 2] (F 2 0 7) has not been enabled.

By +/- Motor Speed Control

+/- Motor speed control is enabled, if:

- Parameter [Frequency mode sel] (F M O d) is set to 5,
- Alternate speed reference source parameter [Remote spd ref 2] (F 2 0 7) has not been enabled.

Selecting Motor Rotation Direction in Remote Mode

The diagram on page 46 illustrates the motor rotation command source when the drive is in remote mode.

With Logic Input Terminals

Use the logic input terminals F, R, RES, or VIA to select motor rotation direction if parameter [Command mode sel] (C M O d) is set to 0 (factory setting).

With the embedded display terminal or graphic display option

Motor rotation direction can be set by pressing the display terminal UP and ENT keys if:

- Parameter [Command mode sel] (C M O d) is set to 1,
- Serial communication control has not been established.
- Parameter [Local mot. direction] (F r) is set to either 2 or 3.

With Serial Communication

The drive responds to commands sent over the serial communication link (Modbus, Metasys N2, Apogee FLN, BACnet or LonWorks) if Parameter [Command mode sel] (C M O d) is set to 2.

Resetting drive detected faults in Remote Mode

The diagram on page 46 illustrates the clear detected fault command source when the drive is in remote mode.

It is not possible to clear a drive detected fault if the cause of the detected fault persists. Be certain to diagnose and rectify the cause of the detected fault before attempting to reset the drive.

See Automatically Resettable detected faults on page 124 for a list of detected faults that can be cleared in remote mode.

With the Logic Input Terminals

Use the logic input terminals F, R, RES, or VIA to clear a drive detected fault if parameter [Command mode sel] (C M O d) is set to 0 (factory setting).

With the graphic/embeded display terminals

The STOP key can be used to clear a drive detected fault if parameter [Command mode sel] (C M O d) is set to 1.

To clear a drive detected fault, press the STOP key. If it is possible to reset the drive, it will display C L r. To clear the detected fault, press the STOP key a second time.

If the cause of the interruption is still present, the C L r display will not appear. Diagnose and clear the detected fault before attempting to reset the drive.

The use of the STOP key as a clear detected fault can be managed by parameter [HMI reset button] (F 7 3 5).

With Serial Communication

A drive detected fault can be cleared over the serial communication link (Modbus, Metasys N2, Apogee FLN, BACnet or LonWorks) if parameter [Command mode sel] (CMOd) is set to 2.

In the event of an OL 1 or OL 2 detected fault, the following time periods needs to pass before a clear detected fault is possible:

- OL 1 (drive overload) - about 30 seconds after the occurrence of the event.
- OL 2 (motor overload) - about 120 seconds after the occurrence of the event.

By Cycling Line Power

A drive detected fault can also be cleared by removing and restoring line power. Be certain that the cause of the detected fault is no longer present and leave power removed long enough for all of the LEDs on the face of the drive to go out.

Cycling power to clear a detected fault can cause the detected fault history to be lost. Refer to parameter F602 on page 127 for drive fault memory options.

Programming

II

What's in this Part?

This part contains the following chapters:

Quick Menu

3

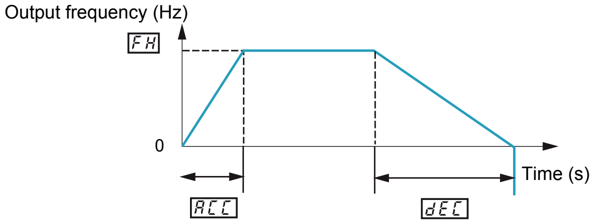
What's in this Chapter?

This chapter contains the following topics:

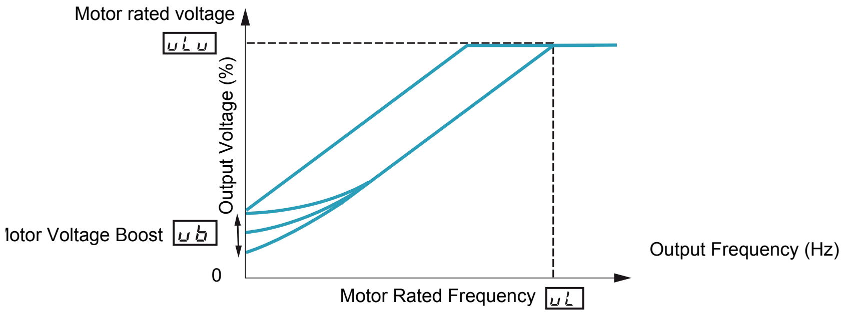
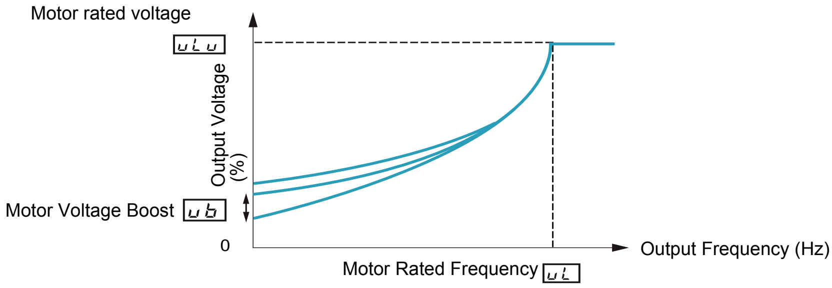
Quick menu

The AUF submenu provides ready access to the ten basic parameters commonly used in programming the drive.

In many cases, programming the ATV212 drive is complete when these 10 parameters and motor parameters have been properly set. .

Code	Name / Description	Adjustment range	Factory setting
AU1	**[Auto ramp]** Automatic ramp adaptation	-	1
0 1 2	**[Disabled]** **[Enable]**: [Acceleration time 1] (ACC) and [Deceleration time 1] (dEC) **[ACC only]**: [Acceleration time 1] (ACC) only		
	If parameter AU1 is set to 1 or 2, the drive will monitor its own loading level and optimize the acceleration and deceleration ramps. The acceleration and deceleration AU1 = 1 only rates will be automatically adjusted between 1/8 to 8 times the settings of ACC and dEC, depending on the drive's current rating and the load level on the motor. ACC and dEC should be appropriately set for an average load in the application. If the load on the motor increases rapidly during ramp up or ramp down, the auto ramp adaptation feature may not help to prevent the drive from experiencing an overcurrent or overvoltage. If the application requires a consistent acceleration and deceleration time, set AU1 to 0, and set ACC and dEC manually as needed. The manual acceleration and deceleration times can still be overridden by the [Motor Current Limit] (F601) (see page 69) and [Overvoltage fault] (F305) (see page 128) and [Overvoltage level] (F626) (see page 128) functions.		
ACC	**[Acceleration time 1]**	0.0 to 3200 s	According to drive rating (1)
	The setting of parameter ACC determines the slope of the acceleration ramp and the time it takes for the output frequency of the drive to increase from 0 Hz to the setting of [Max frequency] (FH) (see page 82). If parameter [Auto ramp] (AU1) is set to 1 or 2, the acceleration ramp may be increased or decreased from the setting of ACC, depending on the amount of load on the motor during ramp up. If two different acceleration rates are needed, see parameter [Acceleration time 2] (F500) on page 83. 		
dEC	**[Deceleration time 1]**	0.0 to 3200 s	According to drive rating (1)
	The setting of parameter dEC determines the slope of the deceleration ramp and the time it takes for the output frequency of the drive to decrease from the setting of [Max frequency] (FH) to 0 Hz. If parameter [Auto ramp] (AU1) is set to 1 or 2, the deceleration ramp may be increased or decreased from the setting of dEC, depending on the amount of load on the motor during ramp down. See diagram above. If two different deceleration rates are needed, see parameter [Deceleration time 2] (F501) on page 83.		
LL	**[Low limit frequency]**	0.0 to **[Upper limit freq]** (UL) Hz	0.0 Hz
	Parameter LL sets the minimum frequency that can be commanded to the drive by the local or remote speed reference source.		
UL	**[Upper limit freq]**	0.5 to **[Max frequency]** (FH) Hz	50.0 Hz
	Parameter UL sets the maximum frequency that can be commanded to the drive by the local or remote speed reference source. The top end of its range is limited by the setting of [Max frequency] (FH).		

(1) See table page 167

Code	Name / Description	Adjustment range	Factory setting
tHr	**[Motor thermal prot.]** Motor Rated Current Overload Setting Set parameter tHr to the motor's rated current as indicated on the motor nameplate for the selected operating voltage. If parameter [Unit value selection] (F701) is set to 1 (see page 120), parameter tHr will be adjusted in amperes. If parameter F701 is set to 0, parameter tHr will be adjusted in percentage. In this case, divide the motor rated current by the drive rated current (as listed on its nameplate) and set parameter tHr to the resulting percentage. The setting of parameter [Switch. freq. level] (F300) does not change the drive's rated current for the sake of this calculation (see page 85).	10 to 100% of the drive's output current rating	100%
FM	**[AO scaling]** Analog output scaling Parameter FM is used to match the FM terminal output signal with the input requirements of the attached panel meter by adjusting the slope and bias of the analog output signal. Before adjusting FM, set FMSL to either 15 or 17. As you adjust the value of FM, monitor the display on the attached panel meter. When the meter display reaches 100%, press the ENT key on the drive display terminal. The drive will flash between FM and the adjusted value, indicating that the adjustment has been saved.		-
Pt	**[Mot cont. mode sel.]** Motor control mode		1
0	**[Constant V/Hz]**: Constant V/Hz Use constant V/Hz mode for loads that require the same torque at low speeds as at rated speeds. Low speed torque can be adjusted manually by setting parameter [Motor Voltage Boost] (ub) (see page 68). 		
1	**[Variable Torque]**: Variable torque Use variable torque mode for loads such as centrifugal fans and pumps whose torque requirements increase as a square of the increase in motor speed. Low speed torque can be adjusted manually by setting parameter ub. 		
2	**[Cst V/Hz+Boost]**: Constant V/Hz with automatic torque boost See the diagram on page 66. This mode is similar to the constant V/Hz mode (for loads that require the same torque at low speeds as at rated speeds), except it automatically increases motor voltage and torque to compensate for increases in load.		
3	**[SVC]**: Sensorless vector control Use sensorless vector control mode to increase torque at motor speeds below 3 Hz or to improve speed regulation (0.5 to 1%). See diagram on page 66.		
4	**[Economy]**: Energy saving In energy savings mode, the ATV212 drive monitors motor loading and automatically modulates the voltage applied to the motor to optimize energy consumption. If the ATV212 drive and the connected motor have the same power rating, and if the motor has a nominal 1500 rpm rating, no motor auto-tuning is required to use this motor control mode. Otherwise, follow the steps outlined in "Motor Tuning" on page 70.		
5	**[Do not use]**: Reserved		
6	**[Do not use]**: Reserved		

Code	Name / Description	Adjustment range	Factory setting
uL	[Motor rated freq.] Motor rated frequency	25.0 to 200.0 Hz	50.0 Hz
	Set parameter uL (vL) to the motor's rated frequency as indicated on the motor nameplate. Note: It is possible to set the drive's various motor control frequencies to 50 Hz by setting [Parameter reset] (tYP) to 1, the 50 Hz reset. For more information, see page 62.		
uLu	[Motor rated voltage]	According to drive rating	According to drive rating (1)
	Set parameter uLu (vLv) to the motor's rated voltage as indicated on the motor nameplate. ATV212●●●M3X: 50 to 330 V. ATV212●●●N4: 50 to 660 V **Note:** Drive output voltage cannot be set to exceed the input line voltage level.		

(1) See table page 167

Motor parameters

Configure the motor parameters and perform an auto-tuning ([Auto-tuning drive] (F400) = 2, see page 71 for auto-tuning).

<table>
<tr><th>Code</th><th>Name / Description</th><th>Adjustment range</th><th>Factory setting</th></tr>
<tr><td>F415</td><td>[Motor rated current] Motor rated full load current</td><td>0.1 to 200.0 A</td><td>According to drive rating (1)</td></tr>
<tr><td></td><td colspan="3">Set parameter F415 to the motor rated full load current in amperes as indicated on the motor’s nameplate.</td></tr>
<tr><td>F417</td><td>[Motor rated speed]</td><td>100 to 15000 rpm</td><td>According to drive rating (1)</td></tr>
<tr><td></td><td colspan="3">Set parameter F417 to the motor rated speed in rpm as indicated on the motor’s nameplate.</td></tr>
<tr><td>F601</td><td>[Motor Current Limit]</td><td>10 to 110% of the drive’s output current rating</td><td>110%</td></tr>
<tr><td></td><td colspan="3">CAUTION
RISK OF DAMAGE TO THE MOTOR AND THE DRIVE
● Check that the motor will withstand this current.
● Check that the profile mission complies with the derating curve given in the installation manual
Failure to follow this instruction can result in equipment damage.
Parameter F601 can be adjusted to limit current during motoring or braking.

Display in Current Limit Mode:
When the drive goes into current limit mode, it will:
Adjust the output frequency to limit the flow of motor current (down when motoring, up when braking).

Display the letter C and the output frequency flashing on the embedded software terminal, ex: C 50

If parameter [Unit value selection] (F701) is set to 1 (see page 120), parameter F601 will be adjusted in amperes. If parameter F701 is set to 0, parameter F601 will be adjusted as a percentage of the drive’s output rated current as listed on its nameplate.

The setting of parameter [Switch. freq. level] (F300) (see page 85) does not change the drive’s rated current for the sake of this calculation.

Do not set parameter F601 below the no-load current rating of the motor.</td></tr>
<tr><td>F400</td><td>[Auto-tuning drive] Auto tuning enabled</td><td>-</td><td>0</td></tr>
<tr><td></td><td colspan="3">DANGER
HAZARD OF ELECTRIC SHOCK OR ARC FLASH
● During auto-tuning, the motor operates at rated current.
● Do not service the motor during auto-tuning.
Failure to follow these instructions will result in death or serious injury.

WARNING
LOSS OF CONTROL
● It is essential that the following parameters uLu (vLv), uL (vL), F415 and F417 are correctly configured before starting auto-tuning.
● When one or more of these parameters have been changed after auto-tuning has been performed, F400 will return 0 and the procedure will have to be repeated.
Failure to follow these instructions can result in death or serious injury.</td></tr>
<tr><td>0</td><td colspan="3">[Disabled]: Disabled</td></tr>
<tr><td>1</td><td colspan="3">[Initialize constant] (2): Auto-tuning is performed immediatly if possible. Parameter Auto Torque Boost [Auto Torque Boost] (F402) may need adjustment</td></tr>
<tr><td>2</td><td colspan="3">[Complete tune] (2): complete auto tuning</td></tr>
</table>

(1) See table page 168.
(2) Parameter F400 is reset to “0” after the auto tuning is performed.

Programming Parameters

4

What's in this Chapter?

This chapter contains the following topics:

Parameter Reset

Parameter Reset Options

The ATV212 drive offers three options to return parameters to their factory default settings:

- Factory reset: set parameter [Parameter reset] (tYP) to 3
- 50 Hz reset: set parameter [Parameter reset] (tYP) to 1
- 60 Hz reset: set parameter [Parameter reset] (tYP) to 2

Code	Name / Description	Factory setting
tYP	**[Parameter reset]**	0
	⚠ DANGER **UNINTENDED EQUIPMENT OPERATION** When tYP is set to 3 or 8: - Check that the modification of the current configuration is compatible with the wiring diagram used. - All logic inputs must be deactivated to avoid unintended restart. **Failure to follow these instructions will result in death or serious injury.**	
0	**[No action]**	
1	**[50 Hz reset]**: 50 Hz parameter reset Setting parameter tYP to a value of 1 will set specific parameters to values suitable for many 50 Hz (motor base frequency) applications. See Parameters whose values after a reset vary by reset type table on page 166 and table on page 168 for a list of parameters that are affected by this reset action and their resultant values.	
2	**[60 Hz reset]**: 60 Hz parameter reset Setting parameter tYP to 2 sets specific parameters to values suitable for many 60 Hz (motor base frequency) applications. See table "Parameters whose values after a reset vary by reset type" on page 166 and table "Parameters whose values after a reset are drive model dependant but do not vary by reset type" on page 167 for a list of parameters that are affected by this reset action and their resultant values.	
3	**[Factory set]**: Factory reset Setting parameter tYP to 3 resets most parameters to their factory settings. See tables listed below for a listing of the values that will be copied into the drive by this factory reset action: Parameters whose values after a reset do not vary by reset type (on page 162). Parameters whose values after a reset vary by reset type (on page 166). Parameters whose values after a reset are drive model dependant but do not vary reset type (on page 167). Parameters whose values after a reset are drive model and reset type dependant (on page 168). Parameters whose values do not change if a reset is performed (on page 169). A factory reset will also clear the detected fault history.	
4	**[Trip cleared]**: detected fault history cleared Setting parameter tYP to 4 clears the detected fault history. As soon as the detected fault history is reset, parameter tYP resumes its default value of 0.	
5	**[Cumul time clear]**: Elapsed Motor Run Time Reset Setting parameter tYP to 5 resets the elapsed motor run time clock. As soon as the elapsed motor run time clock is reset, parameter tYP resumes its default value of 0.	
6	**[EtYP fault reset]**: Clear EtYP detected fault Setting parameter tYP to 6 clears a EtYP detected fault. As soon as the EtYP detected fault is cleared, parameter tYP resumes its default value of 0.	
7	**[Save parameters]**: Save user-defined settings The drive parameter settings can be stored into memory into the drive as a custom parameter set. Set parameter tYP to 7 to save the current drive parameter settings to memory	
8	**[Recall parameters]**: Recalls user-defined settings The drive parameter settings can be reloaded into the drive as a custom parameter set. Set parameter tYP to 8 to reload into the drive the parameter settings last saved by setting tYP to 7.	
9	**[Elapse time reset]**: Elapsed drive run time reset Setting parameter tYP to 9 resets the elapsed drive run time clock. As soon as the elapsed motor run time clock is reset, parameter tYP resumes its default value of 0.	

Macro Programming (AU4)

The ATV212 drive can be configured for four common control schemes by setting parameter AU4:

Code	Name / Description	Factory setting
AU4	**[Auto set function]** Macro Programming (1)	0
	⚠ DANGER **UNINTENDED EQUIPMENT OPERATION** Check that the selected macro configuration is compatible with the wiring diagram used. **Failure to follow these instructions will result in death or serious injury.**	
0	**[Factory set]** Command reference: logic inputs (CMOd = 0). See page 77. Speed reference: analog input VIA = 0–10 V or 0–20 mA (FMOd = 1, F201 = 0). See [Frequency mode sel] (FMOd) page 77 and Analog Input Speed Reference page 106. F: run forward (F111 = 2). See F Logic Input Function page 90. R: preset speed 1 (F112 = 6). See R Logic Input Function page 90. RES: clear detected fault (F113 = 10). See RES Logic Input Function page 90. Drive ready for operation (F110 = 1). See Active Logic Function 2 page 112.	
1	**[Run permissive]** Command reference: logic inputs (CMOd = 0). See page 77. Speed reference: analog input VIA = 0–10 V or 0–20 mA (FMOd = 1). See [Frequency mode sel] (FMOd) page 77. F: run forward (F111 = 2). See F Logic Input Function page 90. R: run permissive (F112 = 1). See R Logic Input Function page 90. RES: clear detected fault (F113 = 10). See RES Logic Input Function page 90.	
2	**[3-wire]** Command reference: logic inputs (CMOd = 0). See page 77. Speed reference: analog input VIA = 0–10 V or 0–20 mA (FMOd = 1). See See [Frequency mode sel] (FMOd) page 77. F: run forward (F111 = 2). See F Logic Input Function page 90. R: stop ramp (F112 = 49). See R Logic Input Function page 90. RES: clear detected fault (F113 = 10). See RES Logic Input Function page 90.	
3	**[+/- Speed]** Command reference: logic inputs (CMOd = 0). See page 77. Speed reference: +/- Speed (FMOd = 5). See See [Frequency mode sel] (FMOd) page 77 F: run forward (F111 = 2). See F Logic Input Function page 90. R: + Speed (F112 = 41). See R Logic Input Function page 90. RES: - Speed (F113 = 42). See RES Logic Input Function page 90.	
4	**[4-20 mA speed ref]** Command reference: logic inputs (CMOd = 0). See page 77. Speed reference: analog input VIA = 4–20 mA (FMOd = 1, F201 = 20). SeeSee [Frequency mode sel] (FMOd) page 77 and Analog Input Speed Reference page 106. F: run forward (F111 = 2). See F Logic Input Function page 90. R: preset speed 1 (F112 = 6). See R Logic Input Function page 90. RES: clear detected fault (F113 = 10). See RES Logic Input Function page 90.	

(1) When programming parameter AU4, the embedded display terminal will display two numbers. The left number is the value last entered into AU4. The right number will be 0. Use the UP/DOWN keys to change the right number to the desired value and press ENT. Entering 0 into AU4 has no effect on the drive. Programming 0 into AU4 will not return the seven parameters to their factory default values.

Parameter Lock

Code	Name / Description	Factory setting
F700	**[Parameter lock]**	0
0	**[Unlocked]**: All parameters are unlocked and can be changed. See table on page 37 for the parameters that cannot be changed while the drive is running.	
1	**[Locked]**: Only parameter F700 can be changed.	

Display of Submenu AUF (F738)

Code	Name / Description	Factory setting
F738	**[Quick menu AUF]**	0
	The setting of this parameter determines whether the AUF submenu, Quick Menu, will be displayed on the HMI (see page 30).	
0	**[AUF displayed]**: AUF parameter displayed	
1	**[AUF hidden]**: AUF parameter hidden	

Motor Control Parameters

5

What's in this Chapter?

This chapter contains the following topics:

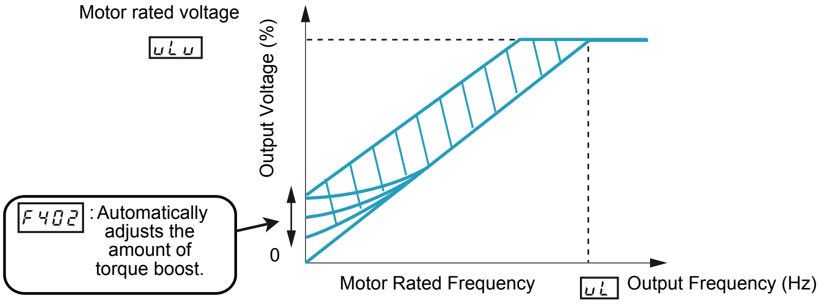
Motor Control Mode

Constant V/Hz Mode with AutomaticTorque Boost ([Mot cont. mode sel.] (Pt) = 2)

Use parameter [Auto Torque Boost] (F402) to adjust the amount of automatic torque boost (see page 74).

If the ATV212 drive and the connected motor have the same power rating, and if the motor has a nominal 1500 rpm rating, no motor auto-tuning is required to use this motor control mode. Otherwise, follow the steps outlined in “Motor Tuning” on page 70.

Due to the feedback circuit used in this mode, it is possible for motor speed to oscillate. If this occurs, select the Constant V/Hz mode ([Mot cont. mode sel.] (Pt) = 0) and adjust torque boost manually with parameter [Motor Voltage Boost] (ub).



Sensorless Vector Control Mode ([Mot cont. mode sel.] (Pt) = 3)

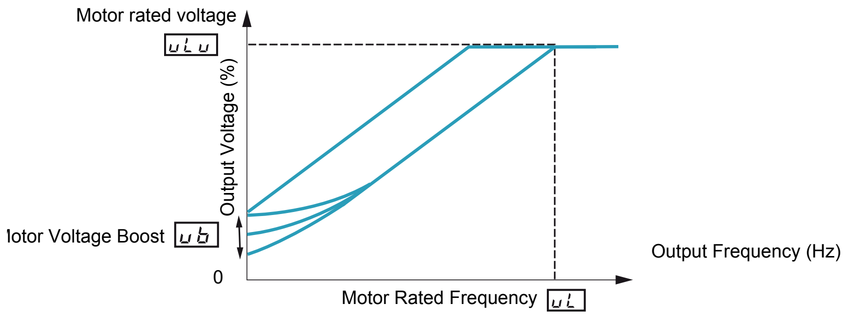
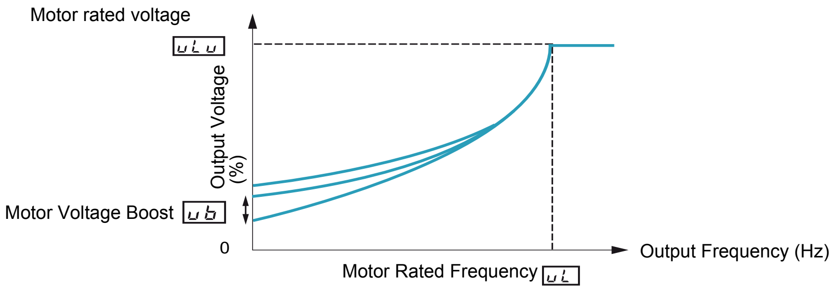
Sensorless vector control mode is only for use in applications where:

- Each motor is powered by its own ATV212 drive (not for multi-motor applications).
- The motor has a power rating equal to that of the ATV212 drive, or no lower than one hp rating less.
- The motor has between two and eight poles (750 to 3000 rpm).

Sensorless vector control will not improve motor control above the motor’s rated speed.

Sensorless vector control is more effective if the motor leads are less than 30 m (100 ft) in length. If motor leads longer than 30 m (100 ft) are required, perform an auto-tuning with the long motor leads included in the circuit. Motor torque may not be maximized at the motor’s rated frequency due to voltage drop in the motor leads.

Connecting a load reactor or a motor filter on the output of the ATV212 drive may reduce the torque generated by the motor in sensorless vector control mode. Auto-tuning will most likely not be possible with a reactor or filter attached to the drive. Manual tuning will be required

Code	Name / Description	Factory setting
Pt	**[Mot cont. mode sel.]** Motor control mode	1
0	**[Constant V/Hz]**: Constant V/Hz Use constant V/Hz mode for loads that require the same torque at low speeds as at rated speeds. Low speed torque can be adjusted manually by setting parameter [Motor Voltage Boost] (ub) (see page 68).  	
1	**[Variable Torque]**: Variable torque Use variable torque mode for loads such as centrifugal fans and pumps whose torque requirements increase as a square of the increase in motor speed. Low speed torque can be adjusted manually by setting parameter ub.  	
2	**[Cst V/Hz+Boost]**: Constant V/Hz with automatic torque boost See the diagram on page 66. This mode is similar to the constant V/Hz mode (for loads that require the same torque at low speeds as at rated speeds), except it automatically increases motor voltage and torque to compensate for increases in load.	
3	**[SVC]**: Sensorless vector control See the diagram on page 66. Use sensorless vector control mode to increase torque at motor speeds below 3 Hz or to improve speed regulation (0.5 to 1%).	
4	**[Economy]**: Energy saving In energy savings mode, the ATV212 drive monitors motor loading and automatically modulates the voltage applied to the motor to optimize energy consumption. If the ATV212 drive and the connected motor have the same power rating, and if the motor has a nominal 1500 rpm rating, no motor auto-tuning is required to use this motor control mode. Otherwise, follow the steps outlined in “Motor Tuning” on page 70.	
5	**[Do not use]**: Reserved	
6	**[Do not use]**: Reserved	

Other Motor Control Mode Parameters

The table below lists other parameters that may need to be adjusted, depending on the setting of parameter [Mot cont. mode sel.] (Pt).

Relationship Between [Mot cont. mode sel.] (Pt) setting and Other Motor Parameters

Parameter	Function	Parameter [Mot cont. mode sel.] (Pt) setting				
		0	1	2	3	4
		Constant V/Hz Control	Variable Torque Control	Constant V/Hz with Automatic Torque Boost Control	Sensorless Vector Control	Energy Saving Control
uL (vL)	[Motor rated freq.]	⊗	⊗	⊗	⊗	⊗
uLu	[Motor rated voltage]	⊗	⊗	⊗	⊗	⊗
ub	[Mot Voltage Boost]	⊗	⊗	X	X	X
F170	[Mot 2 rated Freq.]	O	X	X	X	X
F171	[Motor 2 rated Volt]	O	X	X	X	X
F172	[Motor 2 Volt Boost]	O	X	X	X	X
F400	[Auto-tuning drive]	X	X	O	O	O
F401	[Slip Compensation]	X	X	X	O	X
F402	[Auto Torque Boost]	X	X	⊗	⊗	⊗
F415	[Motor rated current]	O	O	⊗	⊗	⊗
F416	[Mot no-load current]	X	X	O	O	O
F417	[Motor rated speed]	O	O	⊗	⊗	⊗
F418	[Frequency loop gain]	X	X	O	O	O
F419	[Freq. loop stability]	X	X	O	O	O
F480	[No load cur. coef]	X	X	O	O	X
F485	[Stall control coef. 1]	O	O	O	O	O
F492	[Stall control coef. 2]	O	O	O	O	O
F494	[Mot. adj coefficient]	O	O	O	O	O
F495	[Motor voltage coef.]	O	O	O	O	O
F496	[PWM adj. coef.]	O	O	O	O	O

X: Not applicable for the [Mot cont. mode sel.] (Pt) setting
⊗: Adjustment of this parameter is required.
O: Adjust this parameter if necessary.

Code	Name / Description	Adjustment range	Factory setting
ub	**[Motor Voltage Boost]**	0.0 to 30.0%	According to drive rating
	Low speed motor torque can be adjusted with parameter ub when parameter [Mot cont. mode sel.] (Pt) (see page 67) is set to 0 (Constant V/Hz) or 1 (Variable Torque). See curves on page 66 for more information. If nuisance overcurrent faults occur during starting, reducing the setting of parameter ub may help.		

(1) See table page 167.

Code	Name / Description	Adjustment range	Factory setting
F601	**[Motor Current Limit]**	10 to 110% of the drive’s output current rating	110%

CAUTION

RISK OF DAMAGE TO THE MOTOR AND THE DRIVE

- Check that the motor will withstand this current.
- Check that the profile mission complies with the derating curve given in the installation manual

Failure to follow this instruction can result in equipment damage.

Parameter F601 can be adjusted to limit current during motoring or braking.

Display in Current Limit Mode:
When the drive goes into current limit mode, it will:
Adjust the output frequency to limit the flow of motor current (down when motoring, up when braking).

Display the letter C and the output frequency flashing on the embedded software terminal, ex: C 50

If parameter [Unit value selection] (F701) is set to 1 (see page 120), parameter F601 will be adjusted in amperes. If parameter F701 is set to 0, parameter F601 will be adjusted as a percentage of the drive’s output rated current as listed on its nameplate.

The setting of parameter [Switch. freq. level] (F300) (see page 85) does not change the drive’s rated current for the sake of this calculation.

Do not set parameter F601 below the no-load current rating of the motor.

Motor Tuning

Tuning the drive to specific motor values will optimize motor performance if parameter [Mot cont. mode sel.] (Pt) (see page 67) is set to:

- 2 (constant V/Hz with automatic boost),
- 3 (sensorless vector control), or
- 4 (energy savings)

At a minimum, manually set parameters uL (vL), uLu (vLv), F415, F416, and F417.

Parameters [Slip Compensation] (F401), [Auto Torque Boost] (F402), [Frequency loop gain] (F418) and [Freq. loop stability] (F419) can be set manually or they can be set automatically using the auto tuning function, parameter [Auto-tuning drive] (F400).

More precise motor control adjustments can be made with parameters F307, F480, F485, F492, and F494 – F496.

Code	Name / Description		Adjustment range	Factory setting
uLu	**[Motor Rated Voltage]**		According to drive rating (1)	According to drive rating (1)
	Set parameter uLu (vLv) to the motor's rated voltage as indicated on the motor nameplate. ATV212●●●M3X: 50 to 330 V. ATV212●●●N4: 50 to 660 V **Note:** Drive output voltage cannot be set to exceed the input line voltage level.			
uL	**[Motor rated freq.]**		25.0 to 200.0 Hz	50.0 Hz
	Set parameter uL (vL) to the motor's rated frequency as indicated on the motor nameplate. **Note:** It is possible to set the drive's various motor control frequencies to 50 Hz by setting [Parameter reset] (tYP) to 1, the 50 Hz reset. For more information, see page 62.			
tHr	**[Motor thermal prot.]**	Motor rated current overload setting	10 to 100% of the drive's output current rating	100%
	Set parameter tHr to the motor's rated current as indicated on the motor nameplate for the selected operating voltage. If parameter [Unit value selection] (F701) is set to 1 (see page 120), parameter tHr will be adjusted in amperes. If parameter F701 is set to 0, parameter [Motor thermal prot.] (tHr) will be adjusted in percentage. In this case, divide the motor rated current by the drive rated current (as listed on its nameplate) and set parameter tHr to the resulting percentage. The setting of parameter [Switch. freq. level] (F300) does not change the drive's rated current for the sake of this calculation (see page 85).			
F607	**[Mot overload time]**	Motor overload time	10 to 2400 s	300 s
	CAUTION **RISK OF DAMAGE TO THE MOTOR** Check that the motor will withstand this time without overheating **Failure to follow this instruction can result in equipment damage.** Parameter F607 determines how long the drive will support a 150% motor overload before a fault detection occurs.			
F415	**[Motor rated current]**		0.1 to 200.0 A	According to drive rating (1)
	Set parameter F415 to the motor rated current in amperes as indicated on the motor's nameplate.			
F416	**[Mot no-load current]**	Motor no-load current	10.0 to 100.0%	According to drive rating (1)
	Set parameter F416 to the ratio of the motor's no load current to its rated current.			
F417	**[Motor rated speed]**	Motor rated speed	100.0 to 15000 rpm	According to drive rating (1)
	Set parameter F417 to the motor rated speed in rpm as indicated on the motor's nameplate.			

(1) See table page 167.

Auto-tuning

Before performing an auto-tune, verify that:

- A motor is connected and any load-side disconnect is closed.
- The motor is completely stopped and de-energized.
- The motor should be cool (room temperature).
- There is only one motor connected to the drive.
- All of the motor leads that will be used in the final installation are included in the output circuit during the auto-tuning process.
- Motor leads are no longer than 30 m (100 ft). Motor leads longer than 30 m (100 ft) may result in reduced motor torque and less than optimal motor control.
- No load reactors or filters are included in the motor circuit. Output reactors and filters may cause an auto-tuning detected fault Etn1 and reduce effectiveness of sensorless vector control.
- The motor is not more than 1 hp size smaller than the drive.
- The motor has at least 2 and not more than 8 poles (750 to 3000 rpm).
- The motor does not have a high slip rating.

Auto tuning is performed upon the first start command after parameter [Auto-tuning drive] (F400) below is set to 1 or 2 and is normally completed within 3 seconds. During the auto-tuning process, the graphic display option displays Atn1.

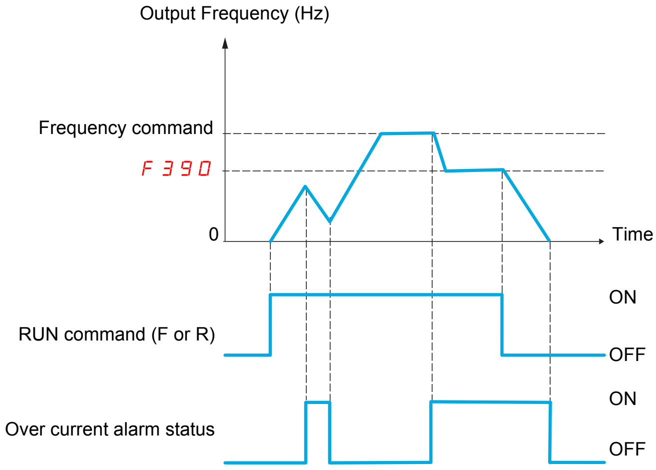
During the auto-tuning process voltage is applied to the motor, although it barely rotates and produces very little torque.

During the auto-tuning process, the drive checks for an output phase loss detection regardless of the setting of parameter F605. An output phase loss detection EPH0 will abort the auto-tuning process.

If the auto-tuning process is unsuccessful, the drive will display Etn1. In this event, no results of the aborted auto-tuning 1 will be saved in the drive, and a manual tuning of parameters [Slip Compensation] (F401), [Auto Torque Boost] (F402), [Frequency loop gain] (F418) and [Freq. loop stability] (F419) will be required.

Code	Name / Description	Adjustment range	Factory setting
F400	**[Auto-tuning drive]**	-	0
	DANGER **HAZARD OF ELECTRIC SHOCK OR ARC FLASH** • During auto-tuning, the motor operates at rated current. • Do not service the motor during auto-tuning. **Failure to follow these instructions will result in death or serious injury.**		
	WARNING **LOSS OF CONTROL** • It is essential that the following parameters uLu, uL, F415 and F417 are correctly configured before starting auto-tuning. • When one or more of these parameters have been changed after auto-tuning has been performed, F400 will return 0 and the procedure will have to be repeated. **Failure to follow these instructions can result in death or serious injury.**		
	Auto tuning enable		
0	**[Disabled]**		
1	**[Initialize constant]**: Auto-tuning is performed immediatly if possible. Application of individual settings of Auto Torque Boost [Auto Torque Boost] (F402)		
2	**[Complete tune]**: Complete auto tuning. Parameter F400 is reset to “0” after the auto tuning is performed.		

Expert parameters

<table>
<tr><th>Code</th><th>Name / Description</th><th>Adjustment range</th><th>Factory setting</th></tr>
<tr><td rowspan="2">F390</td><td>[LL for ov.cur. prev.] Lower Limit function for Over Current Prevention</td><td>0.0 - UL</td><td>0.0</td></tr>
<tr><td colspan="3">In the present software, motor speed is decreased to 0Hz in case the stall prevention state is continued.
When motor speed is lower than F390 during stall prevention, motor speed is kept to F390 to increase motor current.
In this situation, motor current is beyond stall prevention level (F601 or F185), therefore over current or over load detected fault may occur in some case.

</td></tr>
<tr><td rowspan="2">F480</td><td>[No load cur. coef] Magnetizing current coefficient</td><td>100 to 130%</td><td>100%</td></tr>
<tr><td colspan="3">Use parameter F480 to fine tune motor torque during low-speed operation. To increase motor torque in the low-speed operating range, increase the setting of parameter F480. However, only adjust parameter F480 if an auto tune does not yield sufficient low-speed torque. Increasing the setting of parameter F480 may increase the motor’s no-load current during low-speed operation. Do not set this parameter so that the motor’s no-load current exceeds its rated operating current.</td></tr>
<tr><td rowspan="2">F485</td><td>[Stall control coef. 1] Stall prevention control coefficient 1</td><td>10 to 250</td><td>100</td></tr>
<tr><td colspan="3">Use parameter F485 to adjust the drive’s response to large, sudden changes in load when the motor is operated above its rated frequency. If a sudden change in load causes the motor to stall before the drive goes into current limit, gradually reduce the setting of F485.</td></tr>
<tr><td rowspan="2">F492</td><td>[Stall control coef. 2] Stall prevention control coefficient 2</td><td>50 to 150</td><td>100</td></tr>
<tr><td colspan="3">Use parameter F492 to adjust the drive’s response to a drop in the line supply voltage when the motor is operated above its rated frequency. Such a drop in voltage often causes fluctuations in motor current or vibration in the motor. To reduce these disturbances, set parameter F492 to a value between 80 and 90.
Note: Reducing the F492 setting increases the motor running current level.</td></tr>
<tr><td rowspan="2">F494</td><td>[Mot. adj coefficient] Motor adjustment coefficient</td><td>-</td><td>-</td></tr>
<tr><td colspan="3">DO NOT ADJUST.</td></tr>
<tr><td rowspan="2">F495</td><td>[Motor voltage coef.] Maximum voltage adjustment coefficient</td><td>90 to 120%</td><td>104%</td></tr>
<tr><td colspan="3">Use parameter F495 to limit the drive’s maximum output voltage. Increasing this setting increases torque when the motor is operated above its rated frequency, but may also cause motor vibration. Do not increase the value of F495 if motor vibrations occur.</td></tr>
<tr><td rowspan="2">F496</td><td>[PWM adj. coef.] Waveform switching adjustment coefficient</td><td>0.1 to 14.0 kHz</td><td>14.0 kHz</td></tr>
<tr><td colspan="3">Adjusting the value of parameter F496 may reduce motor noise and vibration during PWM waveform frequency shifts in the mid-speed operating range.</td></tr>
</table>

Supply Voltage Correction and Motor Voltage Limitation

The setting of parameter F307 determines:

- If the drive's voltage output will be corrected for fluctuations in the line supply voltage, or
- If the drive's voltage output will be limited, despite increases in the line supply voltage.

The drive's output voltage will not exceed the input supply voltage.

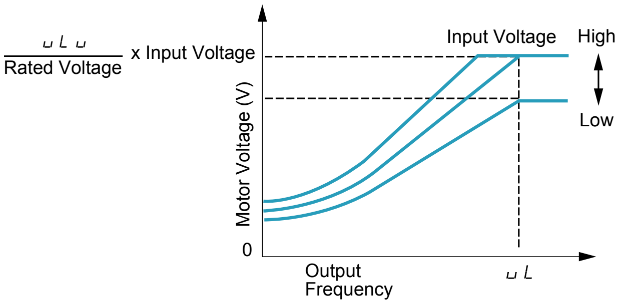
If parameter F307 is set to 0 or 2, no corrections are made in the motor voltage gating process in response to fluctuations in supply voltage. As a result, the V/Hz value of the output waveform to the motor will change in proportion to the input voltage. Conversely, if F307 is set to 1 or 3, the V/Hz value of the output waveform will be held constant, despite changes in the supply voltage level.

If parameter F307 is set to 0 or 1, output motor voltage will be limited to the value set by parameter [Motor rated voltage] (uLu) (see page 70), even if the input supply voltage rises. If F307 is set to 2 or 3, output motor voltage can rise above the level set by uLu if the input supply voltage rises above the motor rated voltage.

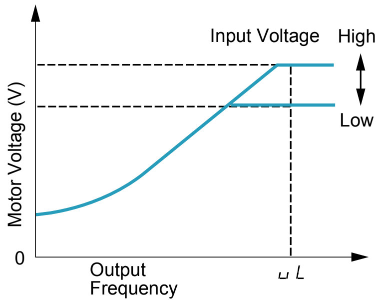
If parameter [Mot cont. mode sel.] (Pt) is set to a value of 2, 3, 4, 5, or 6, the supply voltage is corrected, regardless of the setting of parameter F307.

The diagrams below illustrate the impact of each setting of parameter F307.

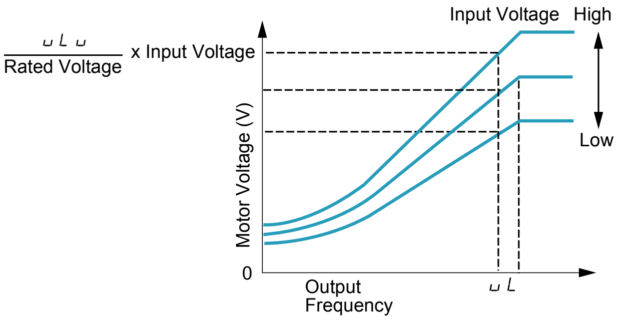
F307 = 0
Supply Voltage uncorrected, Motor Voltage Limited



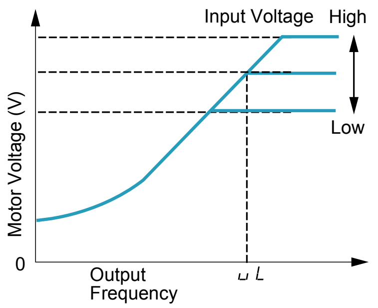
F307 = 1
Supply Voltage corrected,
Motor Voltage Limited



F307 = 2
Supply Voltage uncorrected, Motor Voltage Unlimited



F307 = 3
Supply Voltage corrected,
Motor Voltage Unlimited

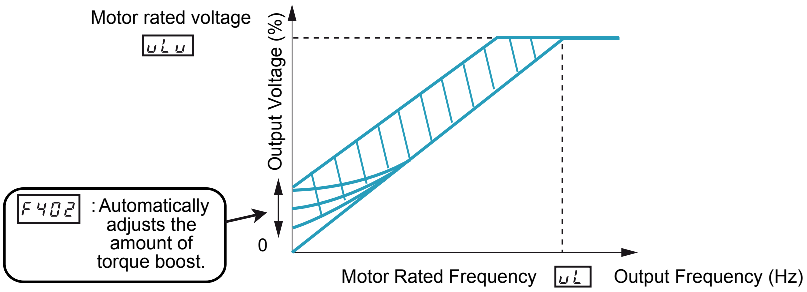


Code	Name / Description	Factory setting
F307	**[Mot volt limitation]** Supply Voltage Correction and Motor Voltage Limitation	3
0	**[Motor volt limit]**: Supply voltage uncorrected – motor voltage limited	
1	**[Line&mot correct.]**: Supply voltage corrected – motor voltage limited	
2	**[No action]**: Supply voltage uncorrected – motor voltage unlimited	
3	**[U Line correction]**: Supply voltage corrected – motor voltage unlimited	

Motor 2 Control Parameters

When logic inputs assigned to functions 39 or 40 are active, parameters F170 to F173 and F185 are the active set of motor control parameters.

When motor 2 control parameters are active, only constant V/Hz Motor Control Mode ([Mot cont. mode sel.] (Pt) = 0) is available (see page 67).

Code	Name / Description	Adjustment range	Factory setting
F170	**[Mot 2 rated Freq.]** Motor 2 rated frequency Set parameter F170 to the motor's rated frequency as indicated on the motor nameplate. **Note:** It is possible to set the drive's various motor control frequencies to 50 Hz by setting [Parameter reset] (tYP) to 1, the 50 Hz reset. For more information, see page 62.	25.0 to 200.0 Hz	50.0 Hz
F171	**[Motor 2 rated Volt]** Motor 2 rated voltage Set parameter F171 to the motor's rated voltage as indicated on the motor nameplate. ATV212●●●M3X: 50 to 330 V. ATV212●●●N4: 50 to 660 V **Note:** Drive output voltage cannot be set to exceed the input line voltage.	According to drive rating (1)	According to drive rating (1)
F172	**[Motor 2 Volt Boost]** Motor 2 voltage boost	0 to 30%	According to drive rating (1)
F173	**[Motor 2 Overload]** Motor 2 rated current overload setting Set parameter F173 to the motor's rated current as listed on the motor nameplate for the selected operating voltage.	10 to 100% of the drive's output current rating	100%
F185	**[Mot. 2 current limit]** Motor 2 current limit **CAUTION** **RISK OF DAMAGE TO THE MOTOR AND THE DRIVE** ● Check that the motor will withstand this current. ● Check that the profile mission complies with the derating curve given in the installation manual. **Failure to follow this instruction can result in equipment damage.** Adjust parameter F185 to limit current during motoring or braking. Do not set parameter F185 below the no-load current rating of the motor; otherwise, the drive will determine that motor braking is taking place and will increase the frequency applied to the motor.	10 to 100% of the drive's output current rating	110%
F401	**[Slip Compensation]** Before adjusting parameter F401, verify that parameter [Motor rated speed] (F417) (see page 70) is set to the rated speed of the motor in rpm. Parameter F401 can be used to fine tune the drive's slip compensation feature. Increasing the value of parameter F401 increases the drive's compensation of motor slip.	0 to 150%	50%
F402	**[Auto Torque Boost]** Use parameter F402 to adjust the amount of automatic torque boost that is applied. 	0.0 to 30.0%	According to drive rating (1)

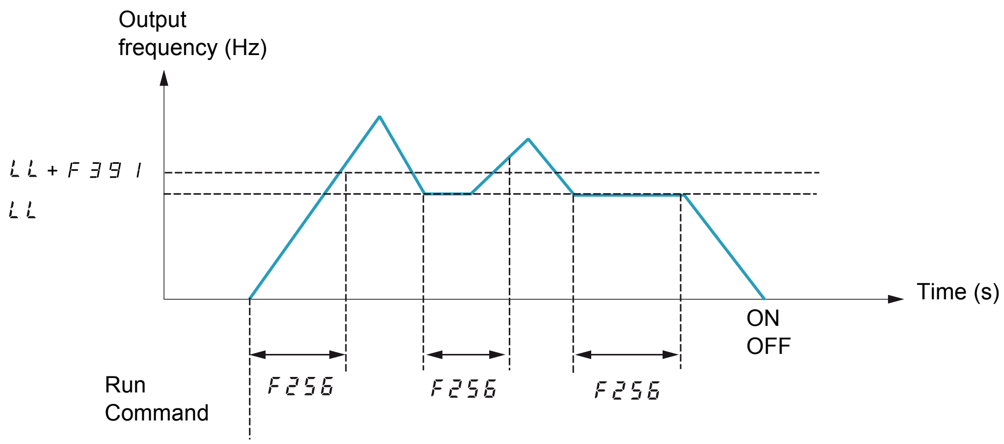
(1) See table page 167.

Code	Name / Description	Adjustment range	Factory setting
F418	**[Frequency loop gain]**	1 to 150	40
	Parameters F418 and [Freq. loop stability] (F419) reduce the speed of the drive's response to a change in speed command. The factory setting of these two parameters assumes that the inertia of the load is three times as large as that of the motor shaft. Adjust these two parameters if the factory setting is not appropriate for the application. Note: It is possible for the drive's output frequency to exceed its upper limit (parameter [Max frequency] (FH)) if the acceleration parameter (ACC or F507) is set to its minimum value. Increasing the setting of parameter F418 reduces the drive's response time to changes in the speed reference.		
F419	**[Freq. loop stability]** Frequency loop stability	1 to 100	20
	Increasing the setting of parameter F419 further reduces the drive's response to changes in the speed reference.		

Drive Control Parameters

6

Code	Name / Description	Adjustment range	Factory setting
CMOd	**[Command mode sel]** Remote Mode Start/Stop Control	-	0
	The setting of parameter CMOd determines the source of start, stop, forward, and reverse operation commands when the drive is in remote mode. The drive needs to be stopped to make changes to parameter CMOd. See diagram on page 46 and description page 50 for more information on the source of the drive's operation commands.		
0	**[Logic inputs]**: Control terminal logic inputs		
1	**[HMI]**: Graphic display option		
2	**[Communication]**: Serial communication		
FMOd	**[Frequency mode sel]** Remote Mode Primary Speed Reference Source	-	1
	The setting of parameter FMOd determines the source of the drive's speed reference when the drive is in remote mode. The drive needs to be stopped to make changes to parameter FMOd. See diagram on page 46 and description page 50 for more information on the source of the drive's speed reference.		
1	**[Ref source VIA]**: VIA		
2	**[Ref source VIB]**: VIB		
3	**[HMI reference]**: Graphic display option		
4	**[Serial com ref.]**: Serial communication		
5	**[+/- Speed]**: +/- Speed		
FC	**[Local speed ref.]** Local Mode Speed Reference	LL - UL	0.0 Hz
	The speed reference set by the UP/DOWN keys in local mode will be stored in parameter FC when the ENT key is pressed. The next time the drive is started in local mode, it will accelerate the motor directly to the speed setpoint memorized by FC.		
Fr	**[Local mot. direction]** Local Mode Motor Rotation Direction Command	-	0
0	**[Run FW]**: Run forward only.		
1	**[Run rev.]**: Run reverse only.		
2	**[Run FW+rev]**: Run forward with reverse selectable.		
3	**[Run rev+FW]**: Run reverse with forward selectable.		
	If Fr is set to 2 or 3: The motor direction can be changed in local mode to forward by pressing the UP key while holding the ENT key and to reverse by pressing the DOWN key while holding the ENT key. The new motor direction will be displayed (forward = Fr-F, reverse = Fr-r) before the motor direction is reversed. The motor's last operating direction in local mode will be stored before a power removal or loss detection. When power is restored to the drive, the local mode motor rotation direction will be the same as before the power loss detection. If [Switch rem/Local] F295 (see page 78) is enabled and control is transferred from remote to local mode, the local mode operation will assume the same motor rotation direction as in remote mode, regardless of the setting of Fr.		
F707	**[Loc. speed ref. step]** Local Mode Speed Reference Step Changes	-	0.0 Hz
0	**[Disable]**: Disabled (0.00).		
1	**[Enable]**: Enabled (0.01 to Maximum Frequency [Max frequency] (FH) in Hz). If parameter F707 is disabled in local mode, the drive's speed reference will change in steps of 0.1 Hz each time the UP or DOWN key is pressed. If parameter F707 is enabled in local mode, the drive's speed reference will change in steps equal to the setting of F707 each time the UP or DOWN key is pressed. Enabling parameter F707 only affects drive operation if parameter [Customized freq val] (F702) is set to 0.00. See page 121. If the display flashes "HI" or "LO", it indicates that repeated usage of the UP or DOWN keys has caused to drive's speed reference to reach either the [Low limit frequency] (LL) (see page 82) or the [Upper limit freq] (UL) (see page 82). This may happen if parameter F707 is set to a value larger than 0.00 Hz.		

Code	Name / Description	Adjustment range	Factory setting
F721	**[Loc. mot stop mode]** Local Mode Motor Stop Type	-	0
	The setting of parameter F721 determines the type of motor stop that will be executed when then embedded display terminal STOP key is pressed. The RUN and STOP keys needs to be enabled be setting parameter [Run/stop key] (F733) (see page 80) to 0 for the motor to stop when the embedded display terminal STOP key is pressed.		
0	**[Ramp stop]**: Ramp stop		
1	**[Freewheel]**: Freewheel stop		
F295	**[Switch rem/Local]** Bumpless transfer from remote to local control	-	1
	If parameter F295 is enabled, the speed reference, run and direction commands will be transferred from remote to local mode when the LOC/REM key is pressed. Operation of the drive is not affected by a remote to local control mode transition. If parameter F295 is disabled, a remote to local control mode transition will cause the drive to remove power from the motor. A new run command and speed reference will need to be entered in the local mode. Regardless of the setting of parameter F295, a local to remote transition will cause the drive to immediately respond to the remote commands present at the moment of the transition.		
0	**[No bumpless]**: Bumpless disabled		
1	**[Bumpless]:** Bumpless enabled		
F256	**[Time limit low spd]**	0.0 to 600 s	0.0 s
0	**[Disable]**: (0.0)		
1	**[Enable]**: (0.01 to 600 seconds)		
	If parameter F256 is enabled and if the drive operates continuously at [Low limit frequency] (LL) (see page 82) for a time period equal to the setting of F256, the drive will ramp the motor to a stop. While the motor is stopped, "LStP" will flash on the drive embedded display terminal. When the speed reference to the drive exceeds the low speed level LL+F391, the drive will accelerate the motor to the new speed reference. If parameter F256 is enabled, drive operation at or below the low speed level is also monitored during startup or during reversing of the motor. See diagram below. 		
F207	**[Remote spd ref 2]**	-	2
1	**VIA**		
2	**VIB**		
3	**HMI**		
4	**Communication**		
5	**+/- Speed**		
	Parameter [Remote spd ref 2] (F207) defines the remote mode secondary speed reference source. The setting of parameter [Auto/man speed ref] (F200) (see page 108) determines whether this source is used for the speed reference. If F200 is set to 0, a logic input terminal set to function 38 (see page 108) determines if [Remote spd ref 2] (F207) identifies the speed reference source. If F200 is set to 1, [Remote spd ref 2] (F207) is the speed reference source when the drive's output frequency is 1 Hz or below. See diagram on page 46 for more detail.		

Code	Name / Description	Adjustment range	Factory setting
F650	[Forced fire control]	-	0

⚠ WARNING

LOSS OF CONTROL
The value of F650 will impact the direction of the motor.
- Check wiring motor power UVW is correct.
- Verify that the value of F650 is convenient for this application.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

0 **[Disable]**
1 **[Enable forward]**
2 **[Enable Reverse]**
To enable Forced fire control, set parameter F650 to 1 or 2 and assign a logic input to function 52 or 53 (see page 94). When parameter F650 is set to 1 or 2, the embedded display will briefly flash the code FIrE.
If parameter F650 is set to 1 or 2 and a logic input assigned to function 52 or 53 is activated, the drive will run at the frequency set by parameter [Forced speed freq.] (F294) (see below).

Note:
- First set [Motor direction] (F311) page 86 to allow forward or reverse operation.
- Push the ENT button for 2 sec to complete the setting.
- See F659 for more information of the behavior.

Code	Name / Description	Adjustment range	Factory setting
F659	[Forced fire function]	-	0

0 **[Enable transition]**
When parameter F659 is set to 0, the function is enabling on transition 0 -->1 of the logic input. The transition 1 -->0 will not disable the function.

⚠ WARNING

LOSS OF CONTROL
If the Forced fire mode on logic input (function 52) has been enabled and F659 is set to 0, the drive will run and only removing power from the drive will stop it.
If the Fire mode on logic input (function 53) has been enabled and F659 is set to 0, the drive will run and only removing power from the drive or a fault detection or a pressing on the STOP key on the display terminal will stop the drive.
Check that this value of F659 is convenient for the application.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

1 **[Enable level 1]**
When parameter F659 is set to 1, if the logic input is set to 0 the function is disabled.
If the logic input is set to 1 the function is enable

⚠ WARNING

RISK OF APPLICATION MALFUNCTION
When F659 is set to 1 for safety reason, the forced mode will be inhibited if the logic input is inactivated for any reason (order removed, input broken, wiring contact lost).
- Check that this value of F659 is conveniant for the application.
- If you need to continue to run if forced mode in any circonstance, select an other value of F659.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

2 **[Enable level 0]**
When parameter F659 is set to 2, if the logic input is set to 1 the function is disabled.
If the logic input is set to 0 the function is enable.

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION
When F659 is set to 2 for safety reason, the motor will run at Forced speed F294 in case of intempestive wire disconnection.
- Check and control the wiring connection periodically.
- Protect the signal conductors against damage that could result in unintentional conductor grounding.

Failure to follow these instructions will result in death or serious injury.

Code	Name / Description	Adjustment range	Factory setting
F294	[Forced speed freq.]	LL - UL	50.0 Hz

The F294 parameter is used to set the fixed frequency command for the drive when it is in Forced or Fire mode.

<table>
<tr><th>Code</th><th>Name / Description</th><th>Adjustment range</th><th>Factory setting</th></tr>
<tr><td>F730</td><td colspan="2">[Up/down key ref]
The setting of parameter F730 determines whether it is possible to set the drive’s speed by means of the embedded display terminal in local mode.</td><td>0</td></tr>
<tr><td>0
1</td><td colspan="3">[Enable]
[Disable]</td></tr>
<tr><td>F732</td><td colspan="2">[Loc/rem key]
Use parameter F732 to enable or disable the LOC/REM key on the drive embedded display terminal.
If the LOC/REM key is disabled, switching between local and remote mode can be achieved with parameters [Frequency mode sel] (FMOd) and [Command mode sel] (CMOd). See page 77.</td><td>0</td></tr>
<tr><td>0
1
2</td><td colspan="3">[Permitted memo]: still retained with the power off.
[Prohibited]
[Permitted no memo]: cancelled with the power off.</td></tr>
<tr><td>F733</td><td colspan="2">[Run/stop key]</td><td>0</td></tr>
<tr><td>0
1</td><td colspan="3">[Enable]
[Disable]
The setting of parameter F733 determines whether it is possible to start and stop the drive by the Run/Stop keys located on the drive and graphic display option.</td></tr>
<tr><td>F734</td><td colspan="2">[Priority stop]
⚠ WARNING
LOSS OF CONTROL
You are going to disable the stop button located on the drive and graphic display option
Do not select 1 unless exterior stopping methods exist.
Failure to follow these instructions can result in death, serious injury, or equipment damage.
The setting of parameter F734 determines whether it is possible to stop the drive by the Stop key located on the drive and graphic display option.</td><td>0</td></tr>
<tr><td>0
1</td><td colspan="3">[Enable]
[Disable]</td></tr>
<tr><td>F735</td><td colspan="2">[HMI reset button]
The setting of parameter [HMI reset button] (F735) determines whether it is possible to clear a drive detected fault by means of the embedded display terminal STOP key (see page 51 for more detail).</td><td>1</td></tr>
<tr><td>0
1</td><td colspan="3">[Enable]
[Disable]</td></tr>
</table>

Application Parameters

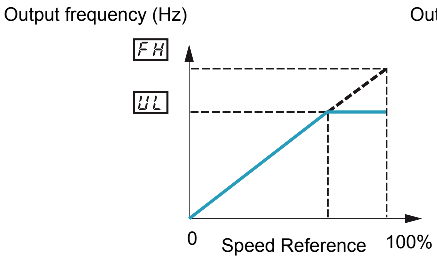
7

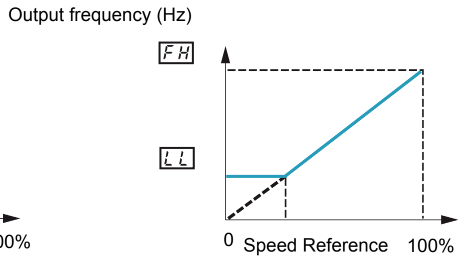
What's in this Chapter?

This chapter contains the following topics:

Application parameters

<table>
<tr><th>Code</th><th>Name / Description</th><th></th><th>Adjustment range</th><th>Factory setting</th></tr>
<tr><td rowspan="2">F H</td><td>[Max frequency]</td><td>Maximum Frequency</td><td>30.0 Hz to 200.0 Hz</td><td>50.0 Hz</td></tr>
<tr><td colspan="4">The setting of parameter F H determines the maximum output frequency of the drive.

F H limits the setting of parameter [Upper limit freq] (U L) (see page 82), which can be adjusted while the drive is operating. Acceleration and deceleration rates are also affected by the setting of F H, as the definition of [Acceleration time 1] (A C C) or [Deceleration time 1] (d E C) (see page 83) is the time it takes for the drive to ramp the motor up or down between zero speed and the setting of F H.
F H can only be adjusted while the drive is stopped.


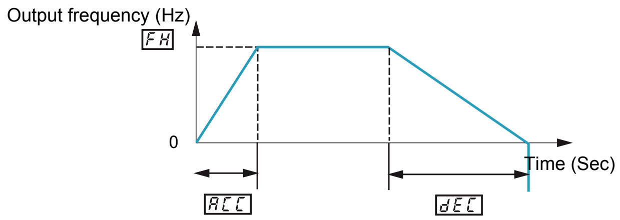

</td></tr>
<tr><td rowspan="2">U L</td><td>[Upper limit freq]</td><td>High speed</td><td>0.5 to [Max frequency] (F H) Hz</td><td>50.0 Hz</td></tr>
<tr><td colspan="4">Parameter U L sets the maximum frequency that can be commanded to the drive by the local or remote speed reference source. The top end of its range is limited by the setting of Maximum frequency [Max frequency] (F H). See diagram above.</td></tr>
<tr><td rowspan="2">L L</td><td>[Low limit frequency]</td><td>Low speed</td><td>0.0 to [Upper limit freq] (U L) Hz</td><td>0.0 Hz</td></tr>
<tr><td colspan="4">Parameter L L sets the minimum frequency that can be commanded to the drive by the local or remote speed reference source. See diagram above.</td></tr>
<tr><td rowspan="2">F 2 4 0</td><td>[Mot start freq.]</td><td>Output Starting Frequency</td><td>0.5 to 10.0 Hz</td><td>0.5 Hz</td></tr>
<tr><td colspan="4">The setting of parameter F 2 4 0 determines the drive's output frequency at the moment it receives a start command. There is no acceleration time to reach the parameter F 2 4 0 level.

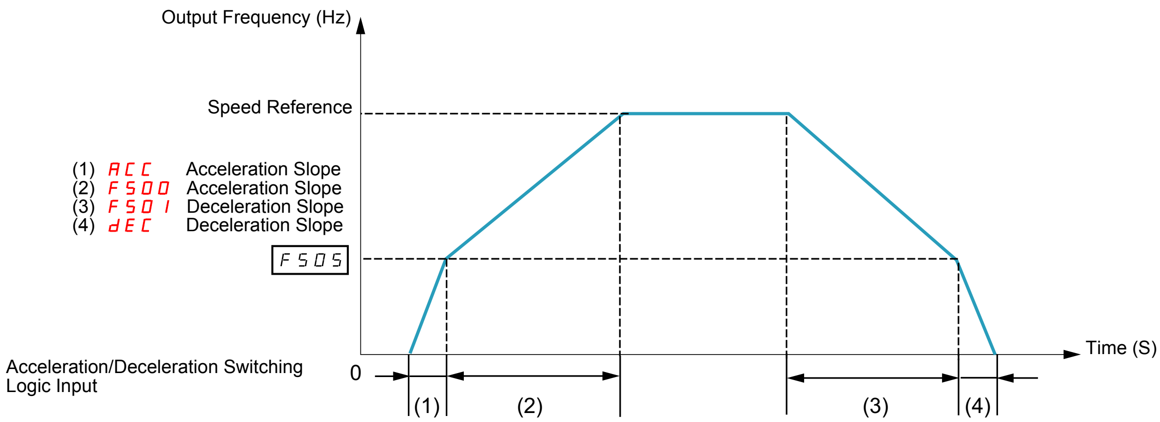
Parameter F 2 4 0 is typically set for the rated slip frequency of the motor. This allows motor torque to be generated as soon as a start command is given. Adjust parameter F 2 4 0 when a delay in the motor's response to a start command adversely affects the application.

To determine the motor's slip frequency:
1) Subtract the motor's rated speed at full load from it's no-load speed (in rpm).
2) Divide the result by the no-load speed.
3) Multiply this result by the motor's rated frequency in Hz.

Example:
Motor no-load speed = 1500 rpm
Motor rated speed at full load = 1450 rpm
Motor rated frequency = 50 Hz

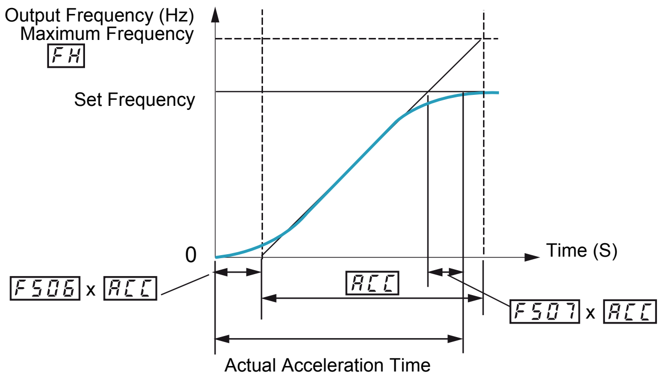
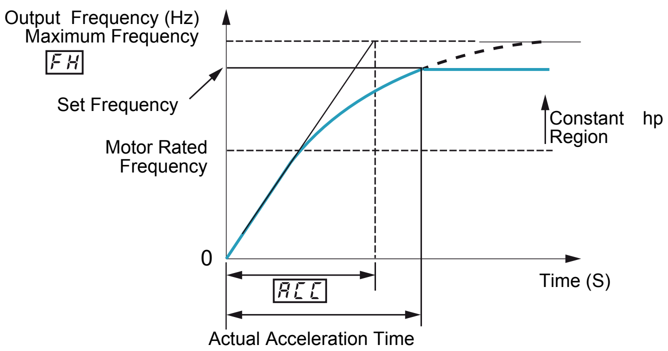
1500 rpm – 1450 rpm = 50 rpm
50 rpm / 1500 rpm = 3.33%
50 Hz x 0.0333 = 1.7 Hz (motor slip frequency)</td></tr>
</table>

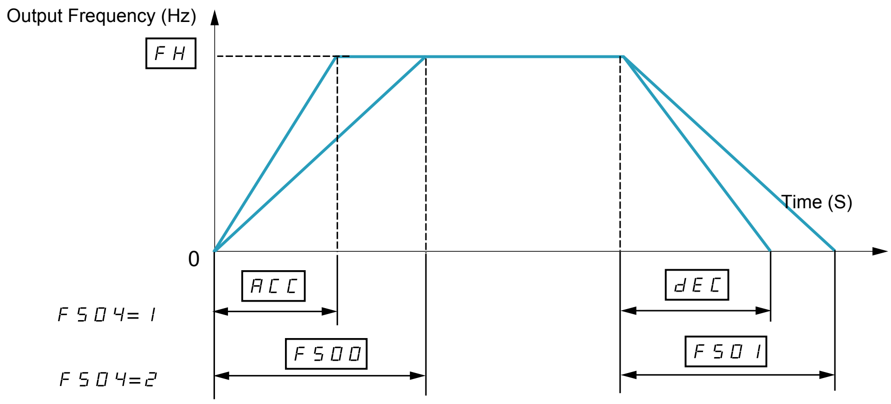
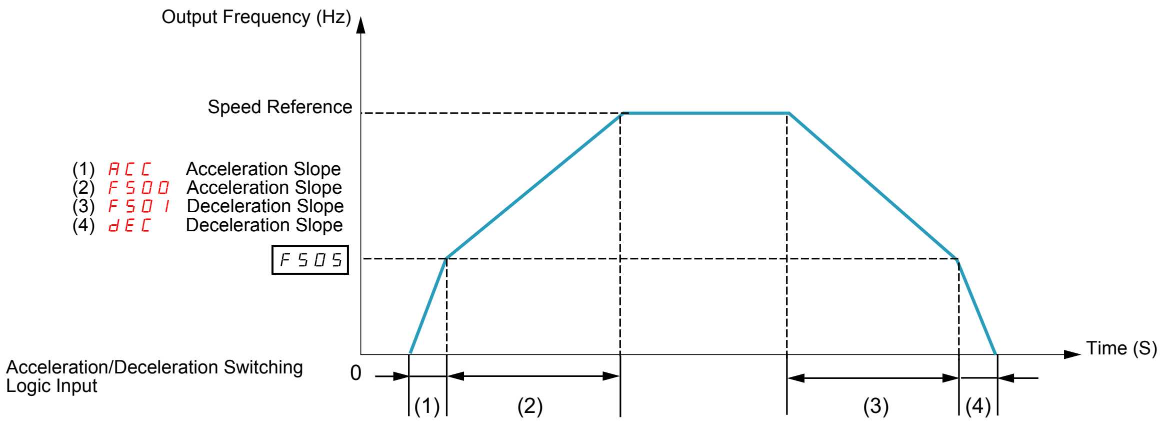
<table>
<tr><th>Code</th><th>Name / Description</th><th>Adjustment range</th><th>Factory setting</th></tr>
<tr><td rowspan="2">ACC</td><td>[Acceleration time 1]</td><td>0.0 to 3200 s</td><td>According to drive rating (5)</td></tr>
<tr><td colspan="3">
The setting of parameter ACC determines the slope of the acceleration ramp and the time it takes for the output frequency of the drive to increase from 0 Hz to the setting of [Max frequency] (FH) (see page 82).
If parameter [Auto ramp] (AU1) (see page 85) is set to 1 or 2, the acceleration ramp may be increased or decreased from the setting of ACC, depending on the amount of load on the motor during ramp up.
If two different acceleration rates are needed, see parameter [Acceleration time 2] (F500) on page 83.


</td></tr>
<tr><td rowspan="2">dEC</td><td>[Deceleration time 1]</td><td>0.0 to 3200 s</td><td>According to drive rating (5)</td></tr>
<tr><td colspan="3">
The setting of parameter dEC determines the slope of the deceleration ramp and the time it takes for the output frequency of the drive to decrease from the setting of [Max frequency] (FH) to 0 Hz.
If parameter [Auto ramp] (AU1) is set to 1, the deceleration ramp may be increased or decreased from the setting of dEC, depending on the amount of load on the motor during ramp down. See diagram above.
If two different deceleration rates are needed, see parameter [Deceleration time 2] (F501) on page 83.
</td></tr>
<tr><td rowspan="2">F500</td><td>[Acceleration time 2]</td><td>0.0 to 3200 s</td><td>20.0 s</td></tr>
<tr><td colspan="3">
Parameter F500 sets the second acceleration time. Switching between acceleration rates 1 and 2 is accomplished by means of:
Parameter [Ramp switching] (F504) (see page 85),
A particular operating frequency (see parameter [Commut. ramp freq.] (F505) on page 85), or
A logic input assigned to functions 5, 20, 21, 30, 31 – 35, or 40 (see table beginning on page 91)


</td></tr>
<tr><td rowspan="2">F501</td><td>[Deceleration time 2]</td><td>0.0 to 3200 s</td><td>20.0 s</td></tr>
<tr><td colspan="3">
Parameter F501 sets the second deceleration time. Switching between deceleration rates 1 and 2 is accomplished by means of:
- Parameter [Ramp switching] (F504) (see page 85),
- A particular operating frequency (see parameter [Commut. ramp freq.] (F505) on page 85), or
- A logic input assigned to functions 5, 20, 21, 30, 31 – 35, or 40 (see table beginning on page 91).
</td></tr>
</table>

(5) See table page 167.

Code	Name / Description	Adjustment range	Factory setting
F502	**[Acc/dec 1 pattern]**		0
0 1 2	**[Linear]** **[S-ramp 1]** (see diagram below) **[S-ramp 2]** (see diagram below for [Acc/dec 2 pattern] (F503) parameter). The linear acceleration and deceleration pattern is illustrated in diagram on page 83 and is used in most applications. S-pattern 1 (see diagram below) is for use in applications that need the shortest ramp time possible while minimizing jerks during speed changes. See below for more information about parameters [Acc/Dec S-pat start] (F506) and [Acc/Dec S-pat end] (F507). 		
F503	**[Acc/dec 2 pattern]**		0
0 1 2	**[Linear]** **[S-ramp 1]** See diagram below. **[S-ramp 2]** See previous diagram for parameter Acc/Dec Pattern 1 [Acc/dec 1 pattern] (F502). S-pattern 2 (diagram below) is for use in high-speed spindle applications where acceleration and deceleration rates need to be reduced as the motor operates above its rated operating frequency—a constant hp region where motor torque is reduced. Use parameter F503 to select the second Acc/Dec pattern. Switching between Acc/Dec patterns 1 and 2 is accomplished by means of: Parameter [Ramp switching] (F504) (see page 85), A particular operating frequency (see parameter [Commut. ramp freq.] (F505) on page 85), or A logic input assigned to functions 5, 20, 21, 30, 31 – 35, or 40 (see table beginning on page 91). For more information on Acc/Dec patterns, see parameter [Acc/dec 1 pattern] (F502) above. 		
F506	**[Acc/Dec S-pat start]** Acc/Dec S-pattern lower limit	0 to 50% of acceleration time	10%
	Use parameter F506 to adjust the lower portion of S-pattern 1. See diagram on page 85.		
F507	**[Acc/Dec S-pat end]** Acc/Dec S-pattern Upper Limit	0 to 50% of acceleration time	10%
	Use parameter F507 to adjust the upper portion of the S-pattern 1. See diagram on page 85.		

Code	Name / Description	Adjustment range	Factory setting
F504 1 2	**[Ramp switching]** Acc/Dec Pattern Selection **[Ramp 1]** **[Ramp 2]** Parameter F504 determines the Acc/Dec pattern. 	-	1
F505	**[Commut. ramp freq.]** Acc/Dec pattern switching frequency If parameter F505 is set to a frequency greater than 0.0, the drive will use Acc/Dec pattern 1 above that frequency and Acc/Dec pattern 2 above. 	0.0 to **[Upper limit freq]** (UL) (Hz)	0.0 Hz
AU1 0 1 2	**[Auto ramp]** Auto ramp adaptation **[Disabled]** **[Enable]** - [Acceleration time 1] (ACC) and [Deceleration time 1] (dEC) (see page 83) **[ACC only]** - [Acceleration time 1] (ACC) only If parameter AU1 is set to 1 or 2, the drive will monitor its own loading level and optimize the acceleration and deceleration ramps. The acceleration and deceleration (AU1 = 1 only) rates will be automatically adjusted between 1/8 to 8 times the settings of [Acceleration time 1] (ACC) and [Deceleration time 1] (dEC), depending on the drive's current rating and the load level on the motor. ACC and dEC should be appropriately set for an average load in the application. If the load on the motor increases rapidly during ramp up or ramp down, the auto ramp adaptation feature may not help prevent the drive from experiencing an over-current or overvoltage. If the application requires a consistent acceleration and deceleration time, set AU1 to 0, and set ACC and dEC manually as needed. The manual acceleration and deceleration times can still be overridden by the [Motor Current Limit] (F601) (see page 69) and [Overvoltage fault] (F305) (see page 128) and [Overvoltage level] (F626) (see page 128) functions.		1
F300	**[Switch. freq. level]** Switching Frequency Level Increasing the switching frequency may reduce audible motor noise. Increasing the switching frequency will increase the heat dissipated by the drive. The capacity of the drive may need to be derated accordingly if the switching frequency is increased. See the derating curves in the ATV212 Installation Manual.	6.0 to 16.0 kHz in 0.1 kHz steps	According to drive rating (1)

(5) See table page 167.

Code	Name / Description	Adjustment range	Factory setting
F311	**[Motor direction]**	-	1
	Use parameter F311 to permit only forward or reverse operation.		
0	**[Fw & Rev.]**		
1	**[Fw only]**		
2	**[Rev. only]**		
F312	**[Noise reduction]** Switching Frequency Random Mode		0
	Random control of the switching frequency may reduce audible motor noise. Random control of the switching frequency will not be performed if the switching frequency is set above 7.1 kHz, regardless of the setting of F312.		
0	**[Disable]**		
1	**[Enable]**		
F316	**[Switch. freq. mode]** Switching frequency control mode		1
0	**[Fixed]** - ATV212●●●M3X and ATV212●●●N4: switching frequency NOT automatically reduced		
1	**[Auto]** - ATV212●●●M3X and ATV212●●●N4: switching frequency automatically reduced		
2	**[460 V fixed]** - ATV212●●●N4 (2): switching frequency NOT automatically reduced		
3	**[460 V Auto]** - ATV212●●●N4 (2): switching frequency automatically reduced		
	If parameter F316 is set to 1 or 3, the switching frequency level will be automatically controlled to help prevent a drive over-heating. If the drive senses an impending overheating, it will reduce the switching frequency, thus reducing heat produced by the controller. As the temperature approaches normal, the switching frequency will return to the level selected by parameter [Switch. freq. level] (F300). If F316 is set to 1 or 3, motor control performance is optimized if parameter F300 is set to 6 kHz or 8 kHz.		

(1) See table page 168.
(2) For 400 V applications with motor leads longer than 30 m (100 ft).

Skip Frequencies

Do not set the skip frequency bands so that they overlap.

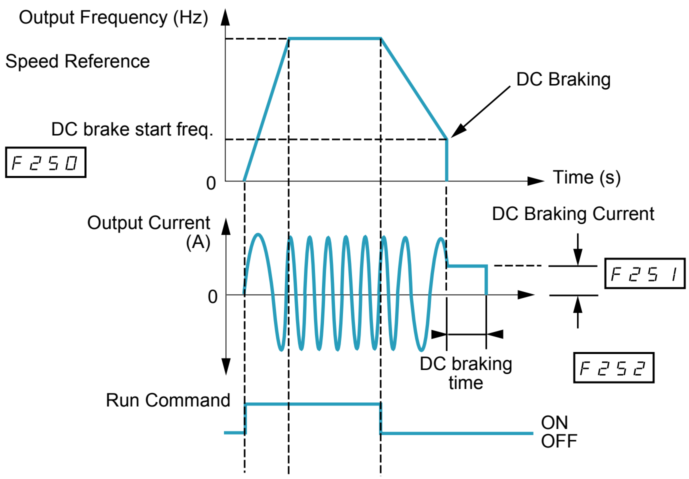
While the drive will not operate within these skip frequency bands during steady state operation, skip frequency bands are ignored by the drive during motor acceleration and deceleration.

Code	Name / Description		Adjustment range	Factory setting
F270	[Jump frequency 1]	Skip frequency 1 midpoint	0.0 to [Max frequency] (FH) Hz	0.0 Hz
F271	[Jump bandwidth 1]	Skip frequency 1 bandwidth	0.0 to 30.0 Hz	0.0 Hz
F272	[Jump frequency 2]	Skip frequency 2 midpoint	0.0 to [Max frequency] (FH) Hz	0.0 Hz
F273	[Jump bandwidth 2]	Skip frequency 2 bandwidth	0.0 to 30.0 Hz	0.0 Hz
F274	[Jump frequency 3]	Skip frequency 3 midpoint	0.0 to [Max frequency] (FH) Hz	0.0 Hz
F275	[Jump bandwidth 3]	Skip frequency 3 bandwidth	0.0 to 30.0 Hz	0.0 Hz

DC Injection Braking Parameters

The drive can inject DC current into the motor to apply braking torque to the load. Parameters [DC brake start freq.] (F250), [DC braking current] (F251) and [DC braking time] (F252) determine the Output Starting Frequency, current level, and braking time.

During DC injection braking, the drive's switching frequency is 6 kHz regardless of the setting of parameter [Switch. freq. level] (F300) (see page 85).



Code	Name / Description	Adjustment range	Factory setting
F250	**[DC brake start freq.]**	0.0 to **[Max frequency]** (FH) Hz	0.0 Hz
	WARNING **NO HOLDING TORQUE** • DC injection braking does not provide holding torque at zero speed. • DC injection braking does not work when there is a loss of power or when the drive detects a fault. • When necessary, use a separate brake to maintain torque levels. **Failure to follow these instructions can result in death, serious injury, or equipment damage.** When stopping the motor, the drive will apply DC injection braking once the output frequency drops below the level set by parameter F250.		
F251	**[DC braking current]** DC braking current level	0 to 100%	50% (1)
	CAUTION **RISK OF DAMAGE TO THE MOTOR** Check that the motor will withstand this current without overheating. **Failure to follow this instruction can result in equipment damage.** Parameter F251 sets the level of current applied to the motor during DC injection braking. The displayed value, percent or amperes, is set by parameter [Unit value selection] (F701) (see page 120). During DC injection braking, the drive's overload protection sensitivity increases. The drive automatically lowers the applied DC current to avoid an overload detected fault.		
F252	**[DC braking time]**	0.0 to 20.0 s	1.0 s
	CAUTION **RISK OF DAMAGE TO THE MOTOR** • Long periods of DC injection braking can cause overheating and damage the motor. • Protect the motor by avoiding long periods of DC injection braking. **Failure to follow this instruction can result in equipment damage.** Parameter F252 determines how long DC injection braking is applied to the motor.		

(1) Percentage of the drive's rated current or ampere range. This will vary according to drive power rating.

I/O Control Parameters

8

What's in this Chapter?

This chapter contains the following topics:

Logic Inputs Functions

See table on page 91 for a complete list of F, R and RES logic inputs assignments

Code	Name / Description		Adjustment range	Factory setting
F111	[LI F selection]	F Logic Input Function	0 to 73	2
	The setting of parameter F111 determines the control function of logic input terminal F.			
F112	[LI R selection]	R Logic Input Function	0 to 73	6
	The setting of parameter F112 determines the control function of logic input terminal R.			
F113	[LI RES selection]	RES Logic Input Function	0 to 73	10
	The setting of parameter F113 determines the control function of logic input terminal RES.			
F109	[VIA selection]	VIA Input Function (Analog or Logic Selection)	-	0
	DANGER **UNINTENDED EQUIPMENT OPERATION** Prevent accidental grounding of logic inputs configured for sink logic. Accidental grounding can result in unintended activation of drive functions. Protect the signal conductors against damage that could result in unintentional conductor grounding. **Failure to follow these instructions will result in death or serious injury.**			
0	[AI]: Analog input			
1	[LI sink]: Logic input - sink (negative logic)			
2	[LI source]: Logic input - source (positive logic)			
	The setting of parameter F109 determines whether control input terminal VIA will serve as an analog input (0-10 Vdc or 0–20 mA) or as a logic input (either sink or source). When configuring VIA as a logic input, be certain to slide switch SW100 on the main control board to the V (voltage) position. When configuring VIA as a logic input using sink (negative) logic, be certain to connect a 4.7 kΩ (1/2 W) resistor between control terminals P24 and VIA. For more information on the use of control input terminal VIA, see ATV212 Installation manual.			
F118	[VIA LI selection]	VIA Logic Input Function	0 to 73	7
	Set first parameter [VIA selection] (F109) before setting parameter F118. The setting of parameter F118 determines the control function of logic input terminal VIA. See page 91 for a complete list of VIA logic input assignments.			

Logic inputs F, R, RES, and VIA (if parameter [VIA selection] (F109) is set to 1 or 2) can be set to the functions described in the table below. See table on page 97 for logic input function compatibility.

Function		**Action**			
No.	**Description**				
0	[No assigned] No function assigned	Logic input disabled			
1	[Run permissive] (see also input function 54, page 95)	OFF: drive motor output disabled, motor coasts to stop ON: drive ready for operation If [Logic Funct 2 active] (F110) is not set to 1 [Run permissive], a logic input should be assigned to the [Run permissive] logic function to enable the motor to start.			
2	[Forward] (2-wire control: input function 49 NOT used) or (3-wire control: input function 49 USED)	**Mode**	**Logic Input Action**		
		2-wire control	OFF: Motor ramps down to a stop ON: Motor runs forward		
		Mode	**Stop Input State**	**Logic Input Action**	
		3-wire control	OFF	OFF: no function ON: no function	
		3-wire control	ON	OFF to ON transition starts the drive, motor runs forward	
3	[Reverse] (2-wire control: input function 49 NOT used) or (3-wire control: input function 49 USED)	**Mode**	**Logic Input Action**		
		2-wire control	OFF: Motor ramps down to a stop ON: Motor runs reverse		
		Mode	**Stop Input State**	**Logic Input Action**	
		3-wire control	OFF	OFF: no function ON: no function	
		3-wire control	ON	OFF to ON transition starts the drive, motor runs in reverse	
5	[Acc / Dec]	OFF: Acceleration/deceleration pattern 1 ON: Acceleration/deceleration pattern 2			
6	[PS1] Preset speed command input 1	Input 3	Input 2	Input 1	Motor Speed
		0	0	0	minimum speed or speed reference per [Frequency mode sel] (FMOd)
		0	0	1	Sr1: preset speed 1
7	[PS2] Preset speed command input 2	0	1	0	Sr2: preset speed 2
		0	1	1	Sr3: preset speed 3
		1	0	0	Sr4: preset speed 4
8	[PS3] Preset speed command input 3	1	0	1	Sr5: preset speed 5
		1	1	0	Sr6: preset speed 6
		1	1	1	Sr7: preset speed 7
10	[Fault reset] (see also input function 55, page 95)	**⚠ DANGER** **UNINTENDED EQUIPMENT OPERATION** This configuration enables to reset the drive. Check this action will not endanger personnel or equipment in any way **Failure to follow these instructions will result in death or serious injury.** ON to OFF transition clears a detected fault (if cause of detected fault has been cleared)			
11	[Ext Fault] (see also input function 45, page 94)	OFF: No external detected fault ON: Motor stops according to method set by parameter [Ext. fault stop Mode] (F603) Embedded display terminal displays E detected fault, detected fault relay activated			

Function		Action
No.	**Description**	
13	[DC braking]	**⚠ WARNING** **NO HOLDING TORQUE** ● DC injection braking does not provide any holding torque at zero speed. ● DC injection braking does not work when there is a loss of power or when the drive detects a fault. ● Where necessary, use a separate brake to maintain torque levels. **Failure to follow these instructions can result in death, serious injury, or equipment damage.** OFF: No DC braking command ON: DC braking applied to motor, Level and time set by parameters [DC braking current] (F251) and [DC braking time] (F252)
14	[PID disable]	OFF: PID control permitted ON: PID control prohibited PID control prohibited input terminal function is available to switch PID control and open-loop control. Also Clear PID integral value input terminal function (function 65) is available. **Note:** For software version lower than V1.7IE04, when Clear PID integral value (function 65) and PID Control Prohibited (function 14) are used, it is necessary to set [Command mode sel] (CMOd) to [Logic inputs] (0) Control terminal logic inputs.
15	[Param Edit] Functional only when parameter [Parameter lock] (F700) = 1	OFF: Parameters locked (if parameter F700 = 1) ON: Programming changes permitted
16	[Run reset]	OFF: drive motor output disabled, motor coasts to stop ON: drive ready for operation ON to OFF transition clears a detected fault (if cause of detected fault has cleared)
20	[FW-RMP2] Combination of forward run command and acceleration/deceleration pattern 2 selection	OFF: Motor stops, ramping down per ACC/dEC pattern 2 ON: Motor runs forward, ramping up per ACC/dEC pattern 2
21	[Rev- RMP2] Combination of reverse run command and acceleration/deceleration pattern 2 selection	OFF: Motor stops, ramping down per ACC/dEC pattern 2 ON: Motor runs in reverse, ramping up per ACC/dEC pattern 2
22	[FW, PS1] Combination of forward run command and preset speed 1 command	OFF: Motor ramps down to a stop ON: Motor runs forward, at speed set by Sr1, preset speed 1
23	[RV, PS1] Combination of reverse run command and preset speed 1 command	OFF: Motor ramps down to a stop ON: Motor runs in reverse, at speed set by Sr1, preset speed 1
24	[FW, PS2] Combination of forward run command and preset speed 2 command	OFF: Motor ramps down to a stop ON: Motor runs forward, at speed set by Sr2, preset speed 2
25	[RV, PS2] Combination of reverse run command and preset speed 2 command	OFF: Motor ramps down to a stop ON: Motor runs in reverse, at speed set by Sr2, preset speed 2
26	[FW, PS3] Combination of forward run command and preset speed 3 command	OFF: Motor ramps down to a stop ON: Motor runs forward, at speed set by Sr3, preset speed 3

Function		Action
No.	**Description**	
27	[RV, PS3] Combination of reverse run command and preset speed 3 command	OFF: Motor ramps down to a stop ON: Motor runs in reverse, at speed set by Sr3, preset speed 3
30	[FW-RMP2-SP1] Combination of forward run command, preset speed 1 command, and acceleration/deceleration pattern 2 selection	OFF: Motor stops, ramping down per ACC/dEC pattern 2 ON: Motor runs forward, at speed set by Sr1, preset speed 1, ramping up per ACC/dEC pattern 2
31	[Rev-RMP2-SP1] Combination of reverse run command, preset speed 1 command, and acceleration/deceleration pattern 2 selection	OFF: Motor stops, ramping down per ACC/dEC pattern 2 ON: Motor runs in reverse, at speed set by Sr1, preset speed 1, ramping up per ACC/dEC pattern 2
32	[FW-RMP2-SP2] Combination of forward run command, preset speed 2 command, and acceleration/deceleration pattern 2 selection	OFF: Motor stops, ramping down per ACC/dEC pattern 2 ON: Motor runs forward, at speed set by Sr2, preset speed 2, ramping up per ACC/dEC pattern 2
33	[Rev-RMP2-SP2] Combination of reverse run command, preset speed 2 command, and acceleration/deceleration pattern 2 selection	OFF: Motor stops, ramping down per ACC/dEC pattern 2 ON: Motor runs in reverse, at speed set by Sr2, preset speed 2, ramping up per ACC/dEC pattern 2
34	[FW-RMP2-SP3] Combination of forward run command, preset speed 3 command, and acceleration/deceleration pattern 2 selection	OFF: Motor stops, ramping down per ACC/dEC pattern 2 ON: Motor runs forward, at speed set by Sr3, preset speed 3, ramping up per ACC/dEC pattern 2
35	[Rev-RMP2-SP3] Combination of reverse run command, preset speed 3 command, and acceleration/deceleration pattern 2 selection	OFF: Motor stops, ramping down per ACC/dEC pattern 2 ON: Motor runs in reverse, at speed set by Sr3, preset speed 3, ramping up per ACC/dEC pattern 2
38	[Frequency source] Frequency reference source switching	OFF: drive follows speed reference set by parameter [Frequency mode sel] (FMOd) ON: drive follows speed reference set by parameter [Remote spd ref 2] (F207) > (if [Auto/man speed ref] (F200) = 1)
39	[Motor switch]	**CAUTION** **RISK OF DAMAGE TO THE MOTOR** ● The motor switching function disables motor thermal protection. ● The use of external overload protection is required when using motor switching. **Failure to follow these instructions can result in death, serious injury, or equipment damage.** OFF: 1st motor V/Hz parameter set active: ([Mot cont. mode sel.] (Pt), [Motor rated freq.] (uL), [Motor rated voltage] (uLu), [Mot Voltage Boost] (ub), [Motor thermal prot.] (tHr)) ON: 2nd motor V/Hz parameter set active: (Pt = 0, F170, F171, F172, F173)

Function		Action
No.	**Description**	
40	[Mot param. switch] Motor control parameter switching V/Hz, current limit, acceleration/deceleration pattern	**CAUTION** **RISK OF DAMAGE TO THE MOTOR** ● The parameter switching function disables motor thermal protection. ● The use of external overload protection is required when using motor switching. **Failure to follow these instructions can result in death, serious injury, or equipment damage.** OFF: 1st motor control parameter set active: ([Mot cont. mode sel.] (Pt), [Motor rated freq.] (uL), [Motor rated voltage] (uLu), [Mot Voltage Boost] (ub), [Motor thermal prot.] (tHr), [Acceleration time 1] (ACC), [Deceleration time 1] (dEC), [Acc/dec 1 pattern] (F502), [Motor Current Limit] (F601)) ON: 2nd motor control parameter set active: (Pt = 0, F170, F171, F172, F173, F185, F500, F501, F503)
41	[(+) speed]	OFF: No motor speed increase ON: Motor accelerates
42	[(-) speed]	OFF: No motor speed reduction ON: Motor decelerates
43	[+/- clear]	OFF to ON transition clears frequency level set by +/- speed inputs
44	[+/- SPD, FLT CLR]	OFF to ON transition clears frequency level set by +/- speed inputs ON to OFF transition clears a detected fault (if cause of detected fault has been cleared)
45	[Inv Ext. fault] Inversion of external detected fault signal (see also input function 11, page 91)	OFF: Motor stops according to method set by parameter [Ext. fault stop Mode] (F603) Embedded display terminal displays E detected fault ON: No external detected fault
46	[Ext. Th fault] External overheating input (see also input function 47)	OFF: No external overheating ON: Motor stops, embedded display terminal displays OH2
47	[Inv Ext. Th fault] Inversion of external overheating input (see also input function 46)	OFF: Motor stops, embedded display terminal displays OH2 ON: No external overheating
48	[Forced local]	OFF: No forced local function ON: Control of the drive is forced to mode set by [Frequency mode sel] (FMOd), [Command mode sel] (CMOd), and [Remote spd ref 2] (F207).
49	[3-wire]	OFF: Motor ramps down to a stop ON: drive ready for operation
51	[Reset kWh] Clear accumulated power consumption kWh display	OFF: No function ON: Clears kWh memory
52	[Forced mode]	**⚠ DANGER** LOSS OF PERSONNEL AND EQUIPMENT PROTECTION When F650 is set to 1 or 2 and a logic input set to function "52" is activated, all the drive controller protection will be disable. • Logic input should not be enable on function 52 for typical applications... • Logic input should be enable on function 52 only in extraordinary situations where a thorough risk analysis demonstrates that the presence of adjustable speed drive protection poses a greater risk than personnel injury or equipment damage. **Failure to follow these instructions will result in death or serious injury.** This function enables the "Forced fire" mode. In this mode, all the detected fault will be ignored or if it is a hardware trip, the drive will be reset to try to restart. OFF: No function ON: Motor runs at speed set by F294 **Note:** F650, F659 and F294 must be configured to activate this function.

Function		Action
No.	**Description**	
53	[Fire mode]	This function enables the "Fire" mode OFF: No function ON: Motor runs at speed set by F294 **Note:** F650, F659 and F294 must be configured to activate this function.
54	[Inverse Run permis.] Inversion of run permissive (see also input function 1 page 91)	OFF: drive ready for operation ON: drive motor output disabled, motor coasts to stop This mode allows to have a freewheel stop using a terminal command.
55	[Inv fault reset] Inversion of clear detected fault (see also input function 10 page 91)	**⚠ DANGER** **UNINTENDED EQUIPMENT OPERATION** This configuration enables to reset the drive. Check this action will not endanger personnel or equipment in any way **Failure to follow these instructions will result in death or serious injury.** OFF to ON transition clears a detected fault (if cause of detected fault has been cleared)
56	[Run, FW] Combination of run permissive and run forward command (2-wire control only)	OFF: drive motor output disabled, motor coasts to stop ON: Motor runs forward
57	[Run, RV] Combination of run permissive and run reverse command (2-wire control only)	OFF: drive motor output disabled, motor coasts to stop ON: Motor runs reverse
61	[I limit 1/2] Current limit level selection	OFF: Current limit level 1 [Motor Current Limit] (F601) selected ON: Current limit level 2 [Mot. 2 current limit] (F185) selected
62	[RY on] Holding of RYA-RYC relay output	OFF: Normal real-time relay operation ON: RYA-RYC is held on once activated
64	[Cancel HMI cmd] Cancellation of last graphic display option command	OFF: Last graphic display option command cancelled ON: Last graphic display option command retained
65	[PID integral] Clear PID integral value	OFF: No action ON: PID integral value held at zero
66	[Run-fw-sp1] Combination of run permissive, run forward command, and preset speed 1 command	OFF: drive motor output disabled, motor coasts to stop ON: Motor runs forward at speed set by Sr1, preset speed 1
67	[Run-rev-sp1] Combination of run permissive, run reverse command, and preset speed 1 command	OFF: drive motor output disabled, motor coasts to stop ON: Motor runs reverse at speed set by Sr1, preset speed 1
68	[Run-fw-sp2] Combination of run permissive, run forward command, and preset speed 2 command	OFF: drive motor output disabled, motor coasts to stop ON: Motor runs forward at speed set by Sr2, preset speed 2
69	[Run-rev-sp2] Combination of run permissive, run reverse command, and preset speed 2 command	OFF: drive motor output disabled, motor coasts to stop ON: Motor runs reverse at speed set by Sr2, preset speed 2

Function		Action
No.	**Description**	
70	[Run-fw-sp4] Combination of run permissive, run forward command, and preset speed 4 command	OFF: drive motor output disabled, motor coasts to stop ON: Motor runs forward at speed set by Sr4, preset speed 4
71	[Run-rev-sp4] Combination of run permissive, run reverse command, and preset speed 4 command	OFF: drive motor output disabled, motor coasts to stop ON: Motor runs reverse at speed set by Sr4, preset speed 4
72	[PID rev] PID error signal reversed	OFF: if F111 = 72 and F terminal is OFF, PI error input = reference - feedback ON: if F111 = 72 and F terminal is ON, PI error input = feedback - reference
73	[Damper feedBack]	OFF: if F111 or F112 or F113 is not set to 73 the damper has no effect. ON: if F111 or F112 or F113 = 73 the damper is ON. The damper feedback has not effect if not configured to an output.

Logic Input Function Compatibility

O = Compatible

X = Incompatible

+ = Compatible under some conditions

@ = Priority

Function No. / Function		1/54	2	3	5	6-9	10/55	11/45	13	14	15	46/47	48	41-43	49	38	39	40	52/53
1/54	[No assigned] / [Inverse Run permissive]		@	@	@	@	O	O	@	O	O	O	O	O	@	O	O	O	X
2	[Forward]	+		X	O	O	O	X	X	O	O	X	O	O	X	O	O	O	X
3	[Reverse]	+	+		O	O	O	X	X	O	O	X	O	O	X	O	O	O	X
5	[Acc / Dec]	+	O	O		O	O	X	X	O	O	X	O	O	O	O	O	X	O
6~8	[PS1]~[PS3]	+	O	O	O		O	X	X	O	O	X	O	O	O	O	O	O	X
10/55	[Fault reset] / [Inv fault reset]	O	O	O	O	O		X	O	O	O	X	O	O	O	O	O	O	X
11/45	[Ext. fault] / [Inv. Ext. fault]	+	@	@	@	@	@		@	@	O	+	O	@	@	O	O	O	X
13	[DC braking]	+	@	@	@	@	O	X		@	O	X	O	@	@	O	O	O	X
14	[PID disable]	O	O	O	O	O	O	X	X		O	X	O	O	O	O	O	O	X
15	[Param Edit]	O	O	O	O	O	O	O	O	O		O	O	O	O	O	O	O	O
46/47	[Ext. Th fault] / [Inv Ext. Th fault]	@	@	@	@	@	@	+	@	@	O		O	O	@	O	O	O	X
48	[Forced local]	O	O	O	O	O	O	O	O	O	O	O		O	O	O	O	O	X
41-43	[(+) speed] [(-) speed] [+/- clear]	O	O	O	O	O	O	O	O	O	O	O	O		O	O	O	O	X
49	[3-wire]	+	@	@	O	O	O	X	X	O	O	X	O	O		O	O	O	X
38	[Frequency source]	O	O	O	O	O	O	O	O	O	O	O	O	O	O		O	O	X
39	[Motor switch]	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O		X	O
40	[Mot param. switch]	O	O	O	@	O	O	O	O	O	O	O	O	O	O	O	@		O
52/53	[Forced mode] / [Fire mode]	@	@	@	O	@	@	@	@	@	O	@	@	@	@	@	O	O	

The following logic input functions are active, regardless of the [Frequency mode sel] (FMOd) and [Command mode sel] (CMOd) setting.

- (1) Run permissive
- (10) Clear detected fault
- (11) External detected fault

When determining function compatibility using the table above, the function listed horizontally is activated first and the function listed vertically is activated second.

Relay Output Functions

The two relay outputs (FL and RYA-RYC) can be set to the functions described in the table below.

Function No. / Description		Action
0	[Low speed reach] Low speed reached	OFF: output frequency is low speed setting [Low limit frequency] (LL) ON: output frequency is > low speed setting LL
1	[Inv low spd reach] Inversion of low speed reached	OFF: output frequency is > low speed setting [Low limit frequency] (LL) ON: output frequency is low speed setting LL
2	[High speed reach] High speed reached	OFF: output frequency is < high speed setting [Upper limit freq] (UL) ON: output frequency is high speed setting UL
3	[Inv Hi spd reach] Inversion of high speed reached	OFF: output frequency is high speed setting [Upper limit freq] (UL) ON: output frequency is < high speed setting UL
4	[F100 speed reach] F100 speed reached (See page 114 for more details on parameter F100)	OFF: output frequency is < [Freq. 1 reached] (F100) speed setting ON: output frequency is F100 speed setting
5	[Inv F100 sp reach] Inversion of F100 speed reached	OFF: output frequency is [Freq. 1 reached] (F100) speed setting ON: output frequency is < F100 speed setting
6	[Speed reach] Commended speed reached	OFF: output frequency is commanded speed +/- [Freq.2 bandw.] (F102) hysteresis band ON: output frequency is > commanded speed +/- F102 hysteresis band
7	[Inv speed reach] Inversion of commanded speed reached	OFF: output frequency is > commanded speed +/- [Freq.2 bandw.] (F102) hysteresis band ON: output frequency is commanded speed +/- F102 hysteresis band
8	[F101 speed reach] F101 speed reached (See page 114 for more details on parameters F101 and F102.)	OFF: output frequency is [Freq. 2 reached] (F101) speed +/- [Freq.2 bandw.] (F102) hysteresis band ON: output frequency is > F101 speed +/- F102 hysteresis band
9	[Inv F101 sp reach] Inversion of F101 speed reached	OFF: output frequency is > [Freq. 2 reached] (F101) speed +/- [Freq.2 bandw.] (F102) hysteresis band ON: output frequency is F101 speed +/- F102 hysteresis band
10	[Drive fault] Fault relay. The drive is not in a fault state during auto fault reset attempts. See also function 36 page 102.	OFF: No drive detected fault ON: drive detected fault **⚠ WARNING** **LOSS OF CONTROL** ● When F130, F132, F137 is set to 10, the output will be active when the drive will detect a fault. ● The drive status will not be detected if the wiring is damaged for any reason. ● Do not select 10 unless you are sure that your signal will be present in any case. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**
11	[No drive fault] Inversion of Drive fault function.	OFF: drive detected fault ON: No drive detected fault
12	[Overload flt] Overtorque fault Overtorque fault detection is active only if parameter F615 = 1. See page 132 for more detail on an overtorque detected fault and parameters F616 and F618.)	OFF: Estimated motor torque has NOT been at [Overtorque level] (F616) level for a time period longer than that set by [Ovtorque det time] (F618) ON: Estimated motor torque has been at F616 level for a time period longer than that set by F618. drive stopped, displaying Ot
13	[Inv overload flt] Inversion of Overload flt function	OFF: Estimated motor torque has been at [Overtorque level] (F616) level for a time period longer than that set by [Ovtorque det time] (F618). drive stopped, displaying Ot ON: Estimated motor torque has NOT been at F616 level for a time period longer than that set by F618

Function No. / Description		Action
14	[Drive running] Run relay	OFF: drive is not powering the motor ON: drive is powering the motor, accelerating, decelerating, at constant speed, or DC braking
15	[Drive no run] Inversion of Drive no run function	OFF: drive is powering the motor, accelerating, decelerating, at constant speed, or DC braking ON: drive is not powering the motor
16	[Motor overload] Motor overload alarm detection is only active if parameter OLM is set to either 0, 1, 4, or 5. See page 135 for more detail on motor overload protection settings.	OFF: motor thermal state is < 50% of motor overload detected fault level ON: motor thermal state is 50% of motor overload detected fault level
17	[Inv mot. overload] Inversion of Motor overload function	OFF: motor thermal state is 50% of motor overload detected fault level ON: motor thermal state is < 50% of motor overload detected fault level
20	[Torque alarm] Overtorque alarm detection is active only if parameter F615 = 0. See page 132 for more detail on the overtorque alarm and parameters [Overtorque level] (F616), [Overtorque band] (F619).	OFF: Estimated motor torque is < 70% of F616 level minus F619 hysteresis band ON: Estimated motor torque is 70% of F616 level
21	[Inv torque alarm] Inversion of Torque alarm function	OFF: Estimated motor torque is 70% of [Overtorque level] (F616) level ON: Estimated motor torque is < 70% of F616 level minus [Overtorque band] (F619) hysteresis band
22	[Gen. alarm] General alarm	OFF: No detected fault condition from the sources listed below exists ON: A detected fault has been issued by one of the following sources: • Overtorque detected fault (output functions 12 and 13) • Motor overload (output functions 16 and 17) • Overtorque detected fault (output functions 20 and 21) • Load detection loss (output functions 24 and 25) • Run time (output functions 42 and 43) • Undervoltage (output functions 54 and 55) • drive in sleep mode (see for more detail on parameter F256) • Power loss (see for more detail on parameter F302) • Overcurrent – motor current limit level (parameter F601) • Overvoltage – DC bus voltage overvoltage stall level (parameter F626) • Drive overheating
23	[Inv gen. alarm] Inversion of General alarm function	OFF: A detected fault has been issued by one of the following sources: • Overtorque detected fault (output functions 12 and 13) • Motor overload (output functions 16 and 17) • Overtorque detection loss (output functions 20 and 21) • Failure of load detection (output functions 24 and 25) • Run time (output functions 42 and 43) • Undervoltage (output functions 54 and 55) • Drive in sleep mode (see for more detail on parameter F256) • Power loss (see for more detail on parameter F302) • Overcurrent – motor current limit level (parameter F601) • Overvoltage – DC bus voltage overvoltage stall level (parameter F626) • drive overheating ON: No alarm condition from the sources listed above exists
24	[Underload detect.] (See page 130 for more detail on parameters F609 – F612 and the underload function.)	OFF: Motor current is greater than F611 level + F609 hysteresis band ON: Motor current is less than F611 level for the time set by F612
25	[Inv underl. det.] Inversion of Underload detect. function	OFF: Motor current is less than F611 level for the time set by F612 ON: Motor current is greater than F611 level + F609 hysteresis band

Function No. / Description		Action
26	[Manu reset flt.] Non-autoresettable detected fault	OFF: None of the detected fault conditions listed below exist ON: One (or more) of the following detected fault conditions exists and has stopped the drive: • E – external detected fault • E-18 – VIA analog input signal detected fault • E-19 – main control board CPU communication • E-20 – excessive torque boost • E-21 – main control board CPU detected fault 2 • EEP1 – main control board EEPROM detected fault 1 • EEP2 – main control board EEPROM detected fault 2 • EEP3 – main control board EEPROM detected fault 3 • EF2 – ground detected fault • EPHO – output phase detected fault detection • EPH1 – input phase detected fault detection • Err1 – speed reference • Err2 – main control board RAM • Err3 – main control board ROM • Err4 – main control board CPU detected fault 1 • Err5 – serial communication control • Err7 – motor current sensor • Err8 – serial communication network • Err9 – graphic display option communication interruption • Etn1 – auto-tuning • EtYP – drive ratings • OCA – short-circuit detected in drive output inverter stage during motor startup • OCL – short-circuit detected in motor or output wiring during motor startup • OH2 - external overheating • Ot – overtorque • Uc – underload • UP1 - Undervoltage
27	[Inv manu reset flt.] Inversion of Manu reset flt. function	OFF: One (or more) of the following fault conditions exists and has stopped the drive: • E – external detected fault • E-18 – VIA analog input signal • E-19 – main control board CPU communication • E-20 – excessive torque boost • E-21 – main control board CPU detected fault 2 • EEP1 – main control board EEPROM detected fault 1 • EEP2 – main control board EEPROM detected fault 2 • EEP3 – main control board EEPROM detected fault 3 • EF2 – ground fault • EPHO – output phase loss detection • EPH1 – input phase loss detection • Err1 – speed reference • Err2 – main control board RAM • Err3 – main control board ROM • Err4 – main control board CPU detected fault 1 • Err5 – serial communication control • Err7 – motor current sensor • Err8 – serial communication network • Err9 – graphic display option communication interruption • Etn1 – auto-tuning • EtYP – drive ratings • OCA – short-circuit detected in drive output inverter stage during motor startup • OCL – short-circuit detected in motor or output wiring during motor startup • OH2 - external overheating • Ot – overtorque • Uc – underload • UP1 - Undervoltage ON: None of the detected fault conditions listed above exist

Function No. / Description		Action
28	[Auto-reset fault] Auto-clear detected fault **Note:** Relay activates when maximum number of autoclear set by [Number auto reset] (F303) page 124 is reached.	OFF: None of the detected fault conditions listed below exist ON: One (or more) of the following detected fault conditions exists: • Fd1 – damper detected fault 1 (closed damper) • Fd2 – damper detected fault 2 (opened damper) • OC1 – overcurrent during acceleration • OC2 – overcurrent during deceleration • OC3 – overcurrent during constant speed • OC1P – Short circuit or ground detected fault during acceleration • OC2P – Short circuit or ground detected fault during deceleration • OC3P – Short circuit or ground detected fault during constant speed • OH – drive overheating • OL1 – drive overload • OL2 – motor overload • OP1 – overvoltage during acceleration • OP2 – overvoltage during deceleration • OP3 – overvoltage during constant speed
29	[Inv auto-reset flt] Inversion of Auto-reset fault function **Note:** Relay deactivates when maximum number of autoclear set by [Number auto reset] (F303) page 124 is reached.	OFF: One (or more) of the following detected fault conditions exists: • Fd1 – damper detected fault 1 (closed damper) • Fd2 – damper detected fault 2 (opened damper) • OC1 – overcurrent during acceleration • OC2 – overcurrent during deceleration • OC3 – overcurrent during constant speed • OC1P – Short circuit or ground detected fault during acceleration • OC2P – Short circuit or ground detected fault during deceleration • OC3P – Short circuit or ground detected fault during constant speed • OH – drive overheating • OL1 – drive overload • OL2 – motor overload • OP1 – overvoltage during acceleration • OP2 – overvoltage during deceleration • OP3 – overvoltage during constant speed ON: None of the detected fault conditions listed above exist
30	[Drive rdy 1] drive ready condition 1	OFF: drive not ready for operation ON: drive ready for operation (ready includes active run permissive and active run command)
31	[Inv drive rdy 1] Inversion of Drive rdy 1 function	OFF: drive ready for operation (ready includes active run permissive and active run command) ON: drive not ready for operation
32	[Drive rdy 2] drive ready condition 2	OFF: drive not ready for operation ON: drive ready for operation (ready does not include active run permissive or active run command)
33	[Inv drive rdy 2] Inversion of Drive rdy 2 function	OFF: drive ready for operation (ready does not include active run permissive or active run command) ON: drive not ready for operation
34	[VIB ref source] VIB input reference source	OFF: analog input terminal VIB is NOT the active speed reference source ON: VIB is the active speed reference source
35	[Inv VIB ref source] Inversion of VIB ref source function	OFF: analog input terminal VIB is the active speed reference source ON: VIB is NOT the active speed reference source

Function No. / Description		Action
36	[Fault relay] (The drive is not in a fault state during auto clear detected fault attempts. See also function 10 page 98)	**⚠ WARNING** **LOSS OF CONTROL** • When F130, F132, F137 is set to 36, the output will be active when the drive will detect a fault. • The drive status will not be detected if the wiring is damaged for any reason. • Do not select 36 unless you are sure that your signal will be present in any case. **Failure to follow these instructions can result in death, serious injury, or equipment damage.** OFF: No drive detected fault ON: drive detected fault. Relay activates when a clearable fault occurs and the drive attempts to restart. Relay deactivates when drive is restarting.
37	[Inv fault relay] Inversion of Fault relay function 36	OFF: drive detected fault ON: No drive detected fault Relay deactivates when a clearable fault occurs and the drive attempts to restart. Relay activates when drive is restarting.
38	[Ser. data relay FL] Serial communication data	OFF: Serial communication word FA50 bit 0 = 0 ON: Serial communication word FA50 bit 0 = 1
39	[Inv ser. dat rel. FL] Inversion of ser. dat rel. FL function	OFF: Serial communication word FA50 bit 0 = 1 ON: Serial communication word FA50 bit 0 = 0
40	[Ser. data relay RY] Serial communication data	OFF: Serial communication word FA50 bit 1 = 0 ON: Serial communication word FA50 bit 1 = 1
41	[Inv ser. dat rel RY] Inversion of ser. dat rel. RY function	OFF: Serial communication word FA50 bit 1 = 1 ON: Serial communication word FA50 bit 1 = 0
42	[Drive run time al] Drive operational run time alarm (see page 120 for more detail on parameter F621).	OFF: Run time is < F621 time setting ON: Run time is F621 time setting
43	[Inv.drive run time al] Inversion of Drive run time al function	OFF: Run time is F621 time setting ON: Run time is < F621 time setting
44	[Drive serv. alarm] Drive service alarm (see page 133 for more detail on parameter F634).	OFF: drive maintenance detected fault not active ON: drive maintenance detected fault active
45	[Inv. drive serv. alarm] Inversion of Drive serv. alarm function	OFF: drive maintenance detected fault active ON: drive maintenance detected fault not active
48	[LI F state] Logic input F state	OFF: Logic input F is not active ON: Logic input F is active
49	[Inv. LI F state] Inversion of LI F state function	OFF: Logic input F is active ON: Logic input F is not active
50	[LI R state] Logic input R state	OFF: Logic input R is not active ON: Logic input R is active
51	[Inv. LI R state] Inversion of LI R state function	OFF: Logic input R is active ON: Logic input R is not active
52	[Speed ref = VIA] Drive speed reference equals VIA signal	OFF: Speed reference from the source identified by [Frequency mode sel] (FMOD) or the source identified by [Remote spd ref 2] (F207) ≠ VIA signal ON: Speed reference from the source identified by FMOD or the source identified by F207 = VIA signal
53	[Inv. speed ref = VIA] Inversion of Speed ref = VIA function	OFF: Speed reference from the source identified by [Frequency mode sel] (FMOD) or the source identified by [Remote spd ref 2] (F207) = VIA signal ON: Speed reference from the source identified by FMOD or the source identified by F207 ≠ VIA signal

Function No. / Description		Action
54	[Undervolt. alarm] Undervoltage alarm	OFF: Undervoltage detected fault is not active ON: Undervoltage detected fault is active
55	[Inv. undervolt. alarm] Inversion of Undervolt. al. function	OFF: Undervoltage detected fault is active ON: Undervoltage detected fault is not active
56	[Loc / remote] Local/remote switching	OFF: drive is in remote mode ON: drive is in local mode
57	[Inv. loc / remote] Inversion of Loc / remote function	OFF: drive is in local mode ON: drive is in remote mode
58	[PTC alarm] PTC thermal alarm	OFF: Motor temperature as indicated by PTC thermal probes is < 60% of the detected fault level ON: Motor temperature as indicated by PTC thermal probes is 60% of the detected fault level
59	[Inv. PTC alarm] Inversion of PTC alarm function	OFF: Motor temperature as indicated by PTC thermal probes is 60% of the detected fault level ON: Motor temperature as indicated by PTC thermal probes is < 60% of the detected fault level
60	[Speed ref = VIB] Drive speed reference equals VIB signal	OFF: Speed reference from the source identified by [Frequency mode sel] (FMOd) or the source identified [Remote spd ref 2] (F207) ≠ VIB signal ON: Speed reference from source identified by FMOd or the source identified F207 = VIB signal
61	[Inv. speed ref = VIB] Inversion of Speed ref = VIB function	OFF: Speed reference from source identified by [Frequency mode sel] (FMOd) or the source identified [Remote spd ref 2] (F207) = VIB signal ON: Speed reference from the source identified by FMOd or the source identified F207 ≠ VIB signal
62	[VIA detection] Analog VIA detection	ON: The value of VIA is equal to or higher than F160 + F161 OFF: The value of VIA is equal to or lower than F160 - F161
63	[Inv. VIA detection] Inversion of VIA detection function	ON: The value of VIA is equal to or lower than F160 - F161 OFF: The value of VIA is equal to or higher than F160 + F161
64	[VIB detection] Analog VIB detection	ON: The value of VIB is equal to or higher than F162 + F163 OFF: The value of VIB is equal to or lower than F162 - F163
65	[Inv. VIB detection] Inversion of VIB detection function	ON: The value of VIB is equal to or lower than F162 - F163 OFF: The value of VIB is equal to or higher than F162 + F163
66	[Freq. reach hyst] Set frequency attainment signal with hysteresis	ON: The ouptput frequency is equal to or higher than F101 + F102 OFF: The ouptput frequency is equal to or lower than F101 - F102 (See page 114 for more detail on parameters F101 and F102.)
67	[Inv. freq. reach hyst] Inversion of Freq. reach hyst function	ON: The ouptput frequency is equal to or lower than F101 - F102 OFF: The ouptput frequency is equal to or higher than F101 + F102 (See page 114 for more detail on parameters F101 and F102.)
68	[Damper] Damper control	ON: The damper is ON. OFF: The damper is OFF (see page 116)
69	[Inv. damper] Inversion of Damper function	ON: The damper is OFF. OFF: The damper is ON (see page 116)
254	[Relay OFF] Relay output is OFF	OFF
255	[Relay ON] Relay output is ON	ON

Analog Input Functions

Two analog inputs are supplied with the ATV212 drive. The terminals are designated VIA and VIB.

Analog Input VIA

- VIA can accept the following signal types:
  - Voltage (V): 0–10 V, voltage or potentiometer input
  - Current (I): 0–20 mA or 4–20 mA

  The signal type (V or I) is selected by setting SW100 on the main control board.
  For information on wiring, consult the ATV212 Installation manual.
- The slope and bias of the input signal are adjusted with parameters F201–F204 and F470–F471. For more information, see page 106.
- VIA is configured as the speed reference input in the following macro-configurations:
  - Run permissive
  - 3-wire
  - 4-20 mA.
- Relay output functions 34 and 35 can signal when VIA is being used as the speed reference source. For more information, see table on page 101 and consult “I/O Control Parameters” on page 90.
- Relay output functions 52 and 53 can be used to signal the results of a comparison between the signal at VIA and the speed reference commanded by [Frequency mode sel] (FMOd) or [Remote spd ref 2] (F207). This function can also be used to send out a signal indicating whether the amount of processing and the amount of feedback agree with each other. For more information, see table on page 98. Also, consult “I/O Control Parameters” on page 90 and review information about parameter F167 on page 115.
- The drive can enter a detected fault state if the VIA signal drops below a specified level for more than 300 mS. For more information, see parameter F633 on page 130 and code E-18 on page 150.
- VIA can serve as an analog or a logic input, depending on setting of parameter F109 (set to 0 for analog input). Analog input is the factory setting. See page 90 for more information about parameter F109.

Analog Input VIB

- VIB can accept the following signal types:
- Voltage (V): 0–10V, voltage or potentiometer input
- PTC motor thermal sensor input. For more information, see parameters F645 and F646 on page 111.
- Adjust the slope and bias of the input signal with parameters F210 - F213 and F472 - F473. For more information, see page 106.
- Relay output functions 52 and 53 can signal when VIA is being used as the speed reference source. For more information, see table on page 102 and consult “I/O Control Parameters” on page 90.
- Relay output functions 60 and 61 can be used to signal the results of a comparison between the signal at VIB and the speed reference commanded by [Frequency mode sel] (FMOd) or [Remote spd ref 2] (F207). This function can also be used to send out a signal indicating whether the amount of processing and the amount of feedback agree with each other. For more information, see table on page 98. Also, consult “I/O Control Parameters” on page 90 and review information about parameter F167 on page 115.

General

- The selection of VIA or VIB as the speed reference input in remote mode is made through parameters [Frequency mode sel] (FMOd) and [Remote spd ref 2] (F207). FMOd is the primary speed reference source, while F207 is the secondary source. Switching between the two is determined by the setting of parameter [Auto/man speed ref] F200. For more information, see page 108.
- Analog output terminal FM can be configured to provide a signal in proportion to the VIA or VIB signal levels. See parameter FMSL, selections 13 and 14, on page 108.
- When PID control is enabled, VIA or VIB can serve as the setpoint input. Either VIA or VIB needs to be selected as the feedback input. See page 110 for more information on parameter F360 and PID control.
- Information can be transferred between the serial communication network and the analog inputs via read and write functions F870, F871, and F875-F879. For more information, see pages 140 to 141.

Analog Output Functions

One analog output is supplied with the ATV212 drive. The terminal is designated FM.

FM is a multifunctional programmable analog output supplying an output frequency signal as the factory default.

The FM terminal can output a voltage or current signal.

- When switch SW101 is set to V (voltage), FM outputs a 0–10 Vdc signal at 1 mA.
- When switch SW101 is set to I (current), FM outputs a 0–20 mA signal up to 24 Vdc. For detail on proper wiring, consult the ATV212 Installation manual.

The drive value represented by the FM analog output signal is determined by the setting of parameter [AO funct. selection] (F M S L) (see page 108).

Calibrating the FM signal output to provide full scale deflection on an analog meter is achieved by adjusting parameter [AO scaling] (F M) (see page 108).

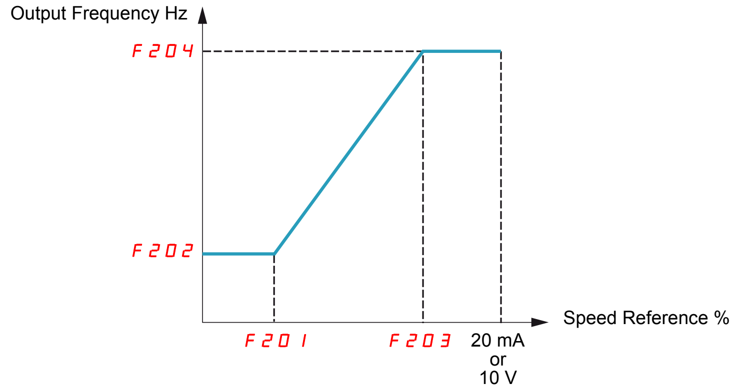
The slope and bias of the FM analog output signal can be adjusted using parameters F 6 9 1 and F 6 9 2. For more information, see page 109.

Analog Input Adjustments

Analog Input Speed Reference and Output Frequency

Do not set the same frequency values for both output frequency levels 1 and 2. This will cause an Err1 detected fault.

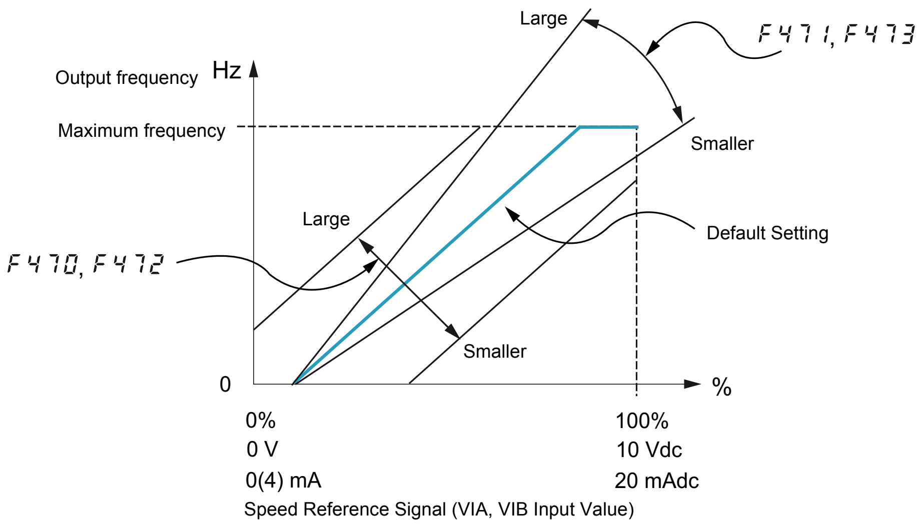
When using a 4–20 mA signal, set speed reference level 1 value to 20% (4 ÷ 20 = 20%).



A further refinement of the bias and slope of the analog input signals can be made with parameters F470 – F473.

Code	Name / Description		Adjustment range	Factory setting
F201	[VIA ref point 1]	VIA speed reference level 1	0 to 100%	0%
F202	[VIA freq. point 1]	VIA output frequency level 1	0.0 to 200.0 Hz	0.0 Hz
F203	[VIA ref point 2]	VIA speed reference level 2	0 to 100%	100%
F204	[VIA freq. point 2]	VIA output frequency level 2	0.0 to 200.0 Hz	50.0 Hz
F160	[VIA rel thresh. logic]	Threshold logic for relay link to VIA	0 to 100%	0%
F161	[VIA threshold hyst.]	Hysteresis threshold for logic relay link to VIA	0 to 20%	3%
F210	[VIB ref. point 1]	VIB speed reference level 1	0 to 100%	0%
F211	[VIB freq. point 1]	VIB output frequency level 1	0.0 to 200.0 Hz	0.0 Hz
F212	[VIB ref. point 2]	VIB speed reference level 2	0 to 100%	100%
F213	[VIB freq. point 2]	VIB output frequency level 2	0.0 to 200.0 Hz	50.0 Hz
F162	[VIB rel thresh. logic]	Threshold logic for relay link to VIB	0 to 100%	0%
F163	[VIB threshold hyst.]	Hysteresis threshold for logic relay link to VIB	0 to 20%	3%

Code	Name / Description		Adjustment range	Factory setting
F470	**[VIA bias]**	VIA analog input bias	0 to 255	128
	⚠ DANGER UNINTENDED EQUIPMENT OPERATION If the input bias level is set too high, the drive will start the motor without a signal present at VIA or VIB. **Failure to follow these instructions will result in death or serious injury.**			
F471	**[VIA gain]**	VIA analog input gain	0 to 255	148
F472	**[VIB bias]**	VIB analog input bias	0 to 255	128
	⚠ DANGER UNINTENDED EQUIPMENT OPERATION If the input bias level is set too high, the drive will start the motor without a signal present at VIA or VIB. **Failure to follow these instructions will result in death or serious injury.**			
F473	**[VIB gain]**	VIB analog input gain	0 to 255	148



Parameters [VIA bias] (F470) and [VIB bias] (F472) are factory set so that a minimal signal needs to be applied to VIA or VIB before the drive starts the motor.

- To increase the signal level required to start the motor, decrease the input bias level.
- To reduce the signal level required to start the motor, increase the input bias level.

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

If the input bias level is set too high, the drive will start the motor without a signal present at VIA or VIB.

Failure to follow these instructions will result in death or serious injury.

Parameters [VIA gain] (F471) and [VIB gain] (F473) are factory set so that the drive output reaches rated voltage and frequency just before the signal to VIA or VIB reaches its maximum level.

- To decrease the signal level required before the drive output reaches rated voltage and frequency, increase the input gain level.
- To increase the signal level required before the drive output reaches rated voltage and frequency, decrease the input gain level.

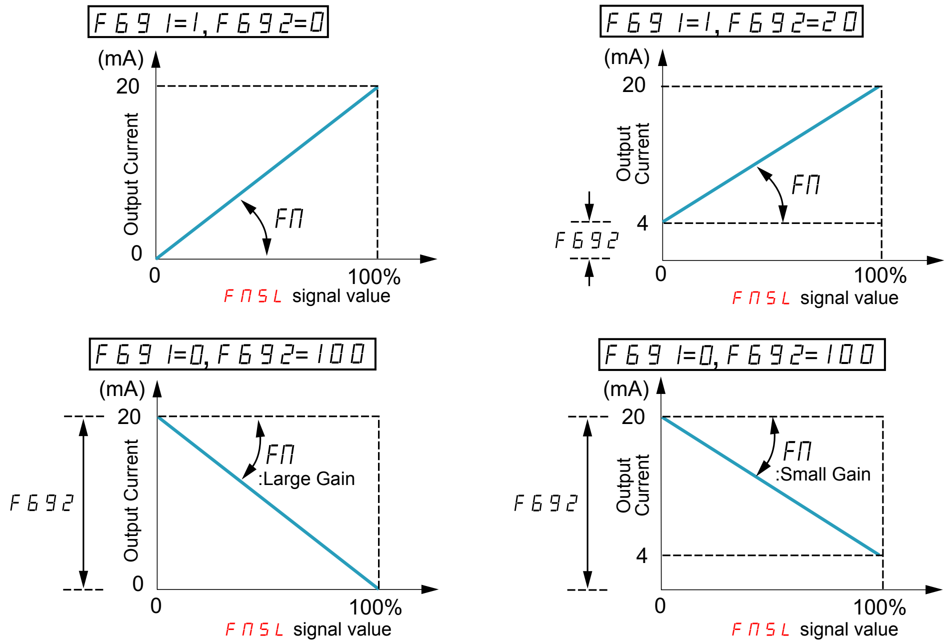
Note: If the input gain level is set too low, the drive output may never reach rated voltage and frequency.

Code	Name / Description		Factory setting
F200	**[Auto/man speed ref]**	Auto/Manual Speed Reference Switching	0
0 1	**[Enable]** **[Disable]** Switching between two speed reference sources by means of a logic input is enabled if parameter F200 is set to 0. To use this function, you need to assign a logic input to function 38, Auto/Man speed ref. When the assigned logic input is off, the drive will follow the speed reference source defined by parameter [Frequency mode sel] (FMOd) (see page 77). When the assigned logic input is on, the drive will follow the speed reference source defined by parameter [Remote spd ref 2] (F207) (see page 78). When parameter F200 is set to 1, the drive will follow the FMOd speed reference source when it is operating above 1 Hz. Below 1 Hz, it will follow the F207 speed reference source.		
FMSL	**[AO funct. selection]**	Analog Output Function Selection	0
FM	**[AO scaling]**	Analog Output Scaling	-
	Parameter FM is used to match the FM terminal output signal with the input requirements of the attached panel meter by adjusting the slope and bias of the analog output signal. Before adjusting FM, set [AO funct. selection] (FMSL) to either 15 or 17. As you adjust the value of FM, monitor the display on the attached panel meter. When the meter display reaches 100%, press the ENT key on the drive embedded display terminal. The drive will flash between FM and the adjusted value, indicating that the adjustment has been saved.		

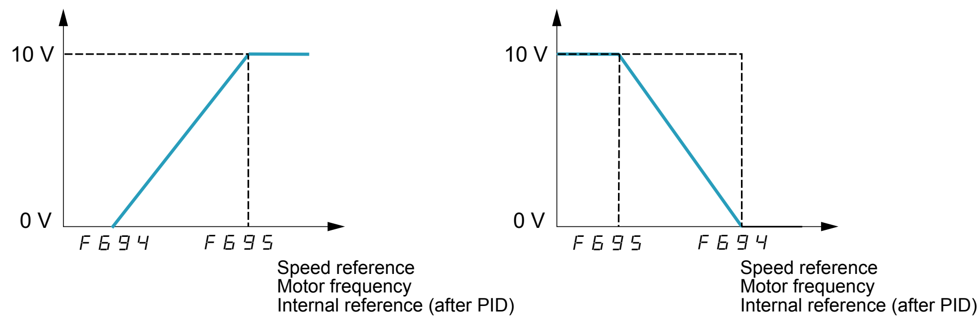
FMSL values:

Value	Function	Maximum Signal
0	**[Motor frequency]**: Output frequency	**[Max frequency]** (FH)
1	**[Motor current]**: Output current	150 % of **[Motor current]**
2	**[Speed ref]**: Speed reference	**[Max frequency]** (FH)
3	**[DC bus U]**: DC bus voltage	150 % of **[DC bus U]**
4	**[Motor U]**: Output motor voltage	150 % of **[Motor U]**
5	**[Input power]**: Input power	185 % of **[Input power]**
6	**[Output power]**: Output power	185 % of **[Output power]**
7	**[motor torque]**: Estimated motor torque	250 % of rated motor torque
8	**[Torque I]**: Motor torque current	Current at 250 % of rated motor torque
9	**[Motor thermal]**: Motor thermal state	100 % of motor's rating
10	**[Drive thermal]**: drive thermal state	100 %
11	**[Do not use]**: DO NOT USE	-
12	**[Internal reference]**: Internal speed reference (after PID)	**[Max frequency]** (FH)
13	**[VIA]**: VIA input value	Maximum input value
14	**[VIB]**: VIB input value	Maximum input value
15	**[Fixed 100%]**: Fixed output – 100% signal (Selection 1 – output current)	-
16	**[Fixed 50%]**: Fixed output – 50% signal (Selection 1 – output current)	-
17	**[Fixed 100%]**: Fixed output – 100% signal (Selections 0, 2, 3, 4, 5, 6, 7, 8, 9,10, 12, 13, 14, 18)	-
18	**[Com data]**: Serial communication data	FA51 = 1000
19	**[Do not use]**: DO NOT USE	-

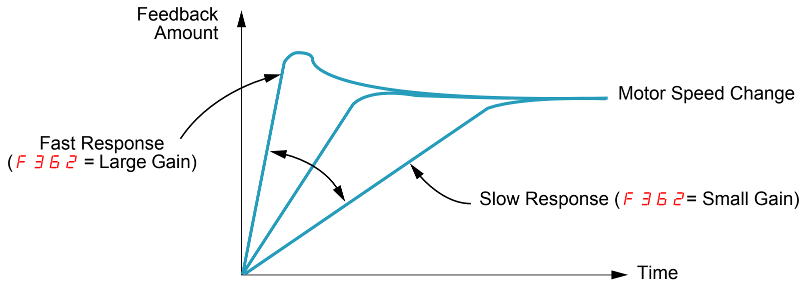
Code	Name / Description		Adjustment range	Factory setting
F691	**[AO slope]**	Analog Output Slope	-	1
0 1	**[Negative slope]** **[Positive slope]**			
F692	**[Analog output bias]**		0 to 100%	0%
	Refer to the diagram below for examples of adjusting parameters [AO scaling] (FM), [AO slope] (F691), and F692.			

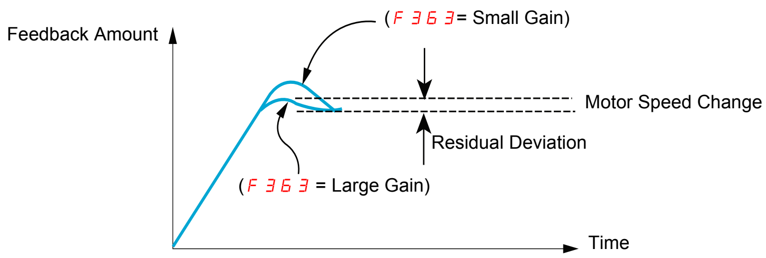


Code	Name / Description		Adjustment range	Factory setting
F694	**[Freq. for AO = 0V]**	Low frequency when analog output equal 0 V	0 Hz to [Max frequency] (FH) Hz	0 Hz
	Refer to the diagram below for adjusting parameters F694, and [Freq. for AO = 10V] (F695).			

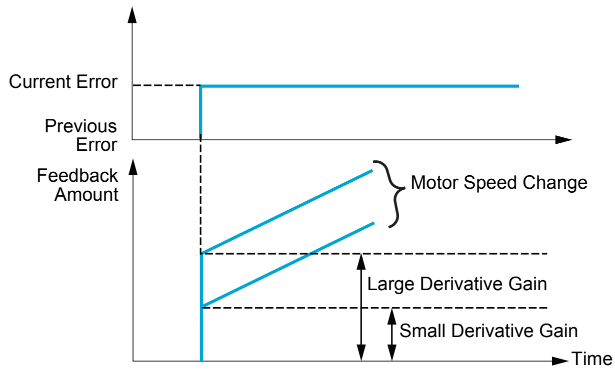


Code	Name / Description		Adjustment range	Factory setting
F695	**[Freq. for AO = 10V]**	High frequency when analog output equal 10 V	0 Hz to [Max frequency] (FH) Hz	0 Hz
	Refer to the diagram above for adjusting parameters [Freq. for AO = 0V] (F694), and F695.			
F130	**[RY Relay Function 1]**	RYA-RYC Relay Function	0 to 69, 254, 255	4
	For a complete description of the various functions assignable to the RYA-RYC relay, see page 98. The RYA-RYC relay can have a secondary assignment with programmed selection logic. See parameters [RY Relay Function 2] (F137) and [RY logic select.] (F139) on page 113 for more detail.			
F146	**[RY delay]**	Delay for RYA-RYC Relay	0.0 to 60.0 s	0.0 s
	This parameter introduce a delay on RYA-RYC output signal relay.			
F132	**[FL Relay Function]**	Function for FL Relay	0 to 69, 254, 255	11
	For a complete description of the various functions assignable to the FL relay, see page 98.			

<table>
<tr><th>Code</th><th>Name / Description</th><th></th><th>Adjustment range</th><th>Factory setting</th></tr>
<tr><td>F147</td><td>[FL Relay delay]</td><td>Delay for FL Relay</td><td>0.0 to 60.0 s</td><td>0.0 s</td></tr>
<tr><td></td><td colspan="4">This parameter introduce a delay on FL output signal relay.</td></tr>
<tr><td>F360</td><td colspan="2">[PID control enable]</td><td>-</td><td>0</td></tr>
<tr><td>0
1
2</td><td colspan="4">[No PID]: PID disabled
[PID by VIA]: Enabled (feedback source is VIA)
[PID by VIB]: Enabled (feedback source is VIB)
Parameter F360 is used to enable PID control and define the source of the feedback signal.
The PID source is defined by the setting of parameter [Frequency mode sel] (FMOD) (see page 77).
Parameter [Freq band det range] (F167) can be adjusted to command a drive relay to signal when the PID setpoint and feedback are in agreement (see page 115).</td></tr>
<tr><td>F362</td><td>[PID Prop Gain]</td><td>PID Proportionnal Gain</td><td>0.01 to 100.0%</td><td>0.30%</td></tr>
<tr><td></td><td colspan="4">Parameter F362 adjusts the proportional gain applied during PID control. The speed change applied to the motor is a correctional value proportional to the product of this parameter's setting and the process error (deviation between the setpoint and the feedback value).
A higher setting of F362 provides a fast response to a process error but may also result in instability such as hunting. The diagram below illustrates the effect produced by adjusting F362.

</td></tr>
<tr><td>F363</td><td colspan="2">[PID Integral Gain]</td><td>0.01 to 100.0</td><td>0.20</td></tr>
<tr><td></td><td colspan="4">Parameter F363 adjusts the integral gain applied during PID control. Any residual process errors that remain after correction by the proportional gain are cleared to zero over time by the integral gain function.

A higher setting of F363 provides a fast response to a process error but may also result in instability such as hunting. The diagram below illustrates the effect produced by adjusting F363.


The integral gain value can be set to zero by setting a logic input to function 65. For more information, see table on page 91 and parameters [LI F selection] (F111), [LI R selection] (F112), [LI RES selection] (F113), page 90, and [VIA LI selection] (F118), page 90.</td></tr>
</table>

<table>
<tr><th>Code</th><th>Name / Description</th><th></th><th>Adjustment range</th><th>Factory setting</th></tr>
<tr><td>F366</td><td colspan="2">[PID Derivative Gain]</td><td>0.00 to 2.55</td><td>0.00</td></tr>
<tr><td></td><td colspan="4">Parameter F366 adjusts the derivative gain applied during PID control. This gain adjusts the response time of the drive to rapid changes in the process.
Increasing the setting of F366 more than necessary may cause great fluctuations in motor speed resulting in system instability.
The diagram below illustrates the effect produced by adjusting F366.

</td></tr>
<tr><td>F359</td><td>[PID ctrl wait time]</td><td>PID Control Waiting Time</td><td>0 to 2400 s</td><td>0</td></tr>
<tr><td></td><td colspan="4">If parameter F359 is set to a value greater than 0 seconds, the drive will not immediately enter PID control upon startup. For the time set by F359, the drive will ignore the feedback signal, accelerating the motor to the speed set by the reference input. This function can be used to help prevent the drive from entering PID control mode before the system approaches the final operating level.</td></tr>
<tr><td>F380</td><td>[PID reverse error]</td><td>PI regulator reversal direction correction</td><td></td><td>0</td></tr>
<tr><td>0
1</td><td colspan="4">[No]
[Yes]

This function is used to reverse the error PI for Water Pump.
If F380 = 0 or No, PI error input = reference - feedback. The motor speed increases when the error is positive.
If F380 = 1 or Yes, PI error input = feedback - reference. The motor speed decreases when the error is positive.</td></tr>
<tr><td>F391</td><td>[Stop on LL hyst]</td><td>Stop on LL hysteresis</td><td>0.0 to [Max frequency] (FH)</td><td>0.2 Hz</td></tr>
<tr><td>F392</td><td>[PID wake up (thres)]</td><td>PI wake up threshold on PI error</td><td>0.0 to [Max frequency] (FH)</td><td>0.0 Hz</td></tr>
<tr><td></td><td colspan="4">⚠ DANGER
UNINTENDED EQUIPMENT OPERATION
Check that unintended restarts will not endanger personnel or equipment in any way.
Failure to follow these instructions will result in death or serious injury.</td></tr>
<tr><td>F393</td><td>[PID wake up, feedb]</td><td>PI wake up threshold on PI feedback error</td><td>0.0 to [Max frequency] (FH)</td><td>0.0 Hz</td></tr>
<tr><td></td><td colspan="4">⚠ DANGER
UNINTENDED EQUIPMENT OPERATION
Check that unintended restarts will not endanger personnel or equipment in any way.
Failure to follow these instructions will result in death or serious injury.</td></tr>
<tr><td>F645</td><td>[Mot PTC selection]</td><td>PTC Motor Thermal Protection Enable</td><td>-</td><td>0</td></tr>
<tr><td>0
1

2</td><td colspan="4">[Disabled]
[Enabled fault] (detected fault mode). If F645 is set to 1 and the PTC probe exceeds a given, threshold, the drive will trip and display an [PTC overheating] (OH2) code.
[Enabled alarm] (alarm mode). If F645 is set to 2 and the PTC probe exceeds a given, threshold, the drive will signal a detected fault and continue operating.
Setting parameter F645 to 1 or 2 converts control terminal VIB into a PTC motor thermal probe input. See the ATV212 Installation manual, for wiring details.</td></tr>
</table>

Code	Name / Description		Adjustment range	Factory setting
F646	[PTC resistor value]		10 to 9999 Ω	3000 Ω

Active Logic Function

Two logic input functions can be configured to be active. The logic input functions assigned to parameters [Logic Funct 1 active] (F108) and [Logic Funct 2 active] (F110) will continuously affect drive operation. See table beginning on page 91 for a list of available logic input functions.

Code	Name / Description		Adjustment range	Factory setting
F108	[Logic Funct 1 active]	Active Logic Function 1	0 to 73	0
F110	[Logic Funct 2 active]	Active Logic Function 2	0 to 73	1

If F110 is not set to 1 (logic function [Run permissive]), a logic input should be assigned to the [Run permissive] logic function to enable the motor to start.

Preset Speeds

A maximum of seven preset speeds can be selected by 4 logic inputs (F, R, RES, or VIA). Preset speed control is only active when the drive is in logic input control ([Command mode sel] (CMOd) = 0).

For one preset speed, assign a logic input to function 6.

For up to three preset speeds, use two logic inputs for functions 6 and 7.

For up to seven preset speeds, use three logic inputs for functions 6, 7, and 8.

Preset speed commands take priority over speed commands from any other source. For more information on preset speeds, see page 91. See page 42, for wiring instructions and timing diagram.

Code	Name / Description	Adjustment range	Factory setting
Sr1	[Preset speed 1]	LL to UL Hz	15 Hz
Sr2	[Preset speed 2]	LL to UL Hz	20 Hz
Sr3	[Preset speed 3]	LL toUL Hz	25 Hz
Sr4	[Preset speed 4]	LL to UL Hz	30 Hz
Sr5	[Preset speed 5]	LL to UL Hz	35 Hz
Sr6	[Preset speed 6]	LL to UL Hz	40 Hz
Sr7	[Preset speed 7]	LL to UL Hz	45 Hz

+/- Speed Control Parameters

+/- speed (motorized potentiometer) control is selected by setting parameter [Frequency mode sel] (F M O d) or [Remote spd ref 2] (F 2 0 7) to 5 (see pages 77 and 78). Two logic inputs are required, one to increase the speed command (logic input function 41) and one to decrease the speed command (logic input function 42). Logic input function 43 clears the speed reference value accumulated by the +/- speed logic inputs.

Parameters F 2 6 4 – F 2 6 9 refine the operation of +/- speed control.

The ratio of parameter F 2 6 5 to parameter F 2 6 4 determines the (+) speed command slope:

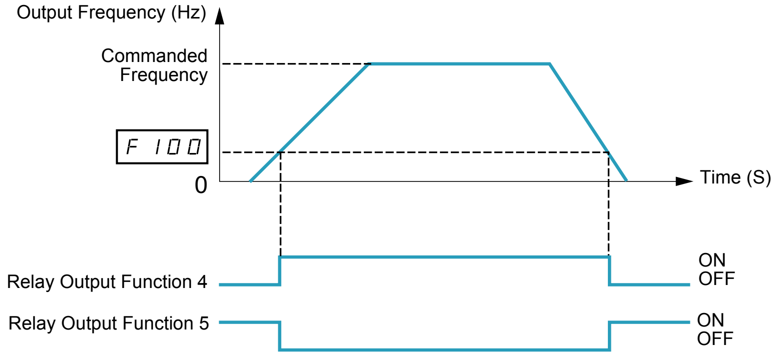
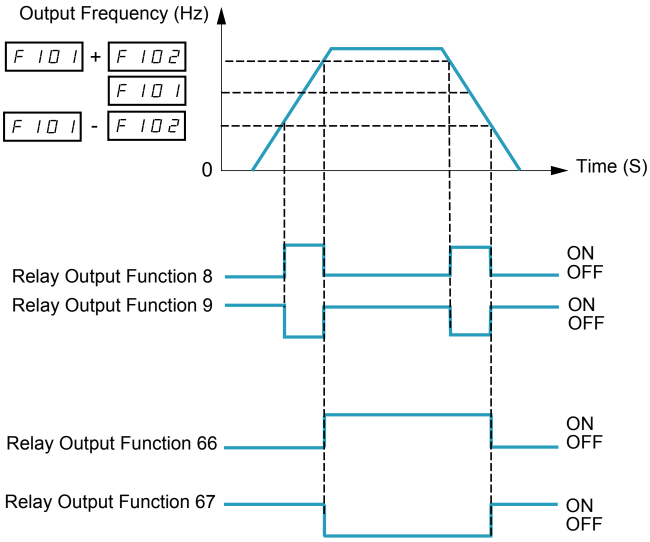
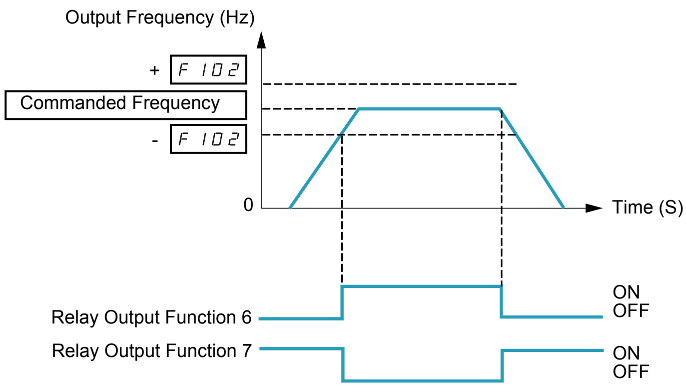
(+) speed command slope = F 2 6 5 / F 2 6 4

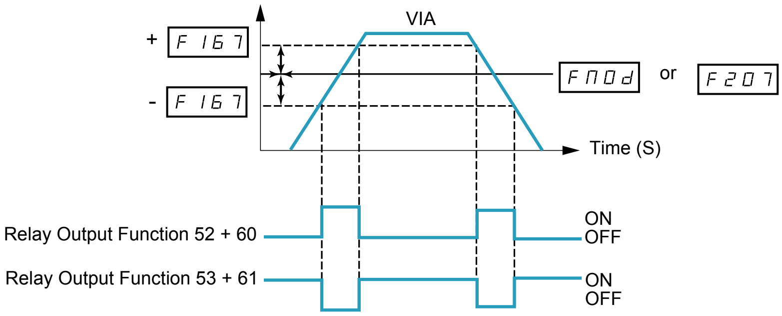
The ratio of parameter F 2 6 7 to parameter F 2 6 6 determines the (-) speed command slope.

(-) speed command slope = F 2 6 7 / F 2 6 6

For more detail, see page 94.

Code	Name / Description		Adjustment range	Factory setting
F 2 6 4	**[+speed LI resp time]**	+Speed Logic Input Response Time	0.0 to 10.0 s	0.1 s
	Parameter F 2 6 4 sets the maximum on-time of the logic input assigned to (+) speed, limiting the speed increase, as defined by parameter [+speed freq. step] (F 2 6 5), to only one step. Keeping the logic input active longer than the time set by parameter F 2 6 4 will allow multiple step increases of the speed command.			
F 2 6 5	**[+speed freq. step]**	+Speed Frequency Steps	0.0 to [Max frequency] (F H) Hz	0.1 Hz
	Parameter F 2 6 5 sets the frequency width in Hz of each (+) speed command step.			
F 2 6 6	**[- speed LI resp time]**	-Speed Logic Input Response Time]	0.0 to 10.0 s	0.1 s
	Parameter F 2 6 6 sets the maximum on-time of the logic input assigned to (-) speed, limiting the speed decrease, as defined by parameter [-speed freq. step] (F 2 6 7), to only one step. Keeping the logic input active longer than the time set by parameter [+speed freq. step] (F 2 6 5) will allow multiple step decreases of the speed command.			
F 2 6 7	**[- speed freq. step]**	-Speed Frequency Steps	0.0 to [Max frequency] (F H) Hz	0.1 Hz
	Parameter F 2 6 7 sets the frequency width in Hz of each (-) speed command step.			
F 2 6 8	**[Init +/- Speed]**	Initial +/- Speed Command	0.0 to [Max frequency] (F H) Hz	0.0 Hz
	Parameter F 2 6 8 sets the +/- speed command in Hz that is applied to the drive when it is first powered up. Leaving this parameter at its default value will result in the drive's output frequency starting at 0 Hz every time it is powered up.			
F 2 6 9	**[Init +/- Speed memo]**	Change of Initial +/- Speed Frequency	-	1
0 1	**[Disable]** **[Enable]** The setting parameter F 2 6 9 determines whether the value of parameter [Init +/- Speed] (F 2 6 8) will change every time power is cycled to the drive. If parameter F 2 6 9 is set to 1, parameter F 2 6 8 will be set to the last speed command received by the drive before power was removed.			
F 1 3 7	**[RY Relay Function 2]**	RYA-RYC Relay Secondary Function	0 to 61, 254, 255	255
	The RYA-RYC relay can be set to signal a secondary condition. The primary RYA-RYC relay function is set by parameter [RY Relay Function 1] (F 1 3 0) (see page 109). See table beginning on page 98 for a complete description of the primary and secondary functions that can be assigned to the RYA-RYC relay.			
F 1 3 9	**[RY logic select.]**	RYA-RYC Relay Function Logic Selection	-	0
0 1	**[Function 1and 2]**: [RY Relay Function 1] (F 1 3 0) (primary) and [RY Relay Function 2] (F 1 3 7) (secondary) **[Function 1 or 2]**: F 1 3 0 (primary) or F 1 3 7 (secondary) The RYA-RYC relay can be configured to energize when either: Both the primary AND secondary conditions are met (true) (F 1 3 9 = 0), or Only one OR the other is met (true) (F 1 3 9 = 1)			

<table>
<tr><th>Code</th><th>Name / Description</th><th>Adjustment range</th><th>Factory setting</th></tr>
<tr><td rowspan="2">F100</td><td>[Freq. 1 reached] Relay Output – Frequency Level 1 Attained</td><td>0.0 to [Max frequency] (FH) Hz</td><td>0.0 Hz</td></tr>
<tr><td colspan="3">The frequency set by parameter F100 is the threshold level for relay output functions 4 and 5 (see page 98).

</td></tr>
<tr><td rowspan="2">F101</td><td>[Freq. 2 reached] Relay Output – Frequency Level 2 Attained</td><td>0.0 to [Max frequency] (FH) Hz</td><td>0.0 Hz</td></tr>
<tr><td colspan="3">The frequency set by parameter F101 +/- the [Freq.2 bandw.] (F102) detection band is the threshold level for relay output functions 8 and 9 and the hysteresis for relay output functions 66 and 67 (see page 103).

</td></tr>
<tr><td rowspan="2">F102</td><td>[Freq.2 bandw.] Frequency Attained Detection Band</td><td>0.0 to [Max frequency] (FH) Hz</td><td>2.5 Hz</td></tr>
<tr><td colspan="3">Parameter F102 determines the bandwidth around the [Freq.2 reached] (F101) frequency (see diagram above) and the commanded frequency (see diagram below) driving relay output functions 6 through 9 (see page 98).

</td></tr>
</table>

Code	Name / Description	Adjustment range	Factory setting
F167	**[Freq band det range]** Frequency bandwidth detection range	0.0 to [Max frequency] (FH) Hz	2.5 Hz
	Parameter F167 determines the bandwidth around the VIA or VIB speed reference (see below) driving relay output functions 52, 53, 60, and 61 (see page 102). This function can be used to signal whether the amount of processing and the amount of feedback agree when the PID function is in use. 		
F603	**[Ext. fault stop Mode]** External detected fault stop mode	-	0
0 1 2	**[Freewheel]**: Freewheel stop **[Ramp stop]** **[DC braking]**: DC injection braking The setting of parameter F603 determines how the drive will stop if a logic input assigned to function 11 or 46 is activated (see table on pages 91 and 94).		
F604	**[DC brk time ext flt]** External Fault DC braking time	0.0 to 20.0 s	1.0 s
	If parameter [Ext. fault stop Mode] (F603) is set to 2, parameter F604 will determine how long DC current will be injected into the motor while the external fault logic input is active.		

Damper control

This function applies to the ventilation ducts. The aim is to control the opening of the duct (shutter device called a "damper") when the fan starts up.

Damper opening command

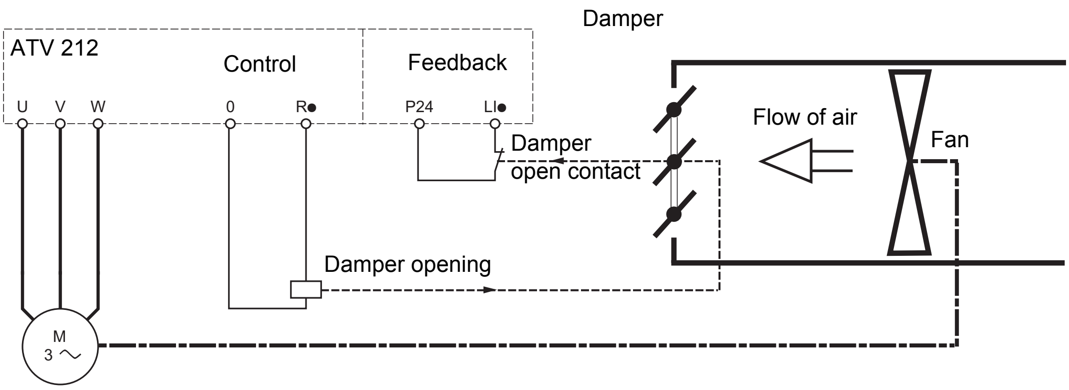
The opening command can be assigned to a relay via the F130 or F132 parameters to the function [Damper] 68 or [Inv. damper] 69 page 103. The damper is closed automatically when there is no longer an opening command.

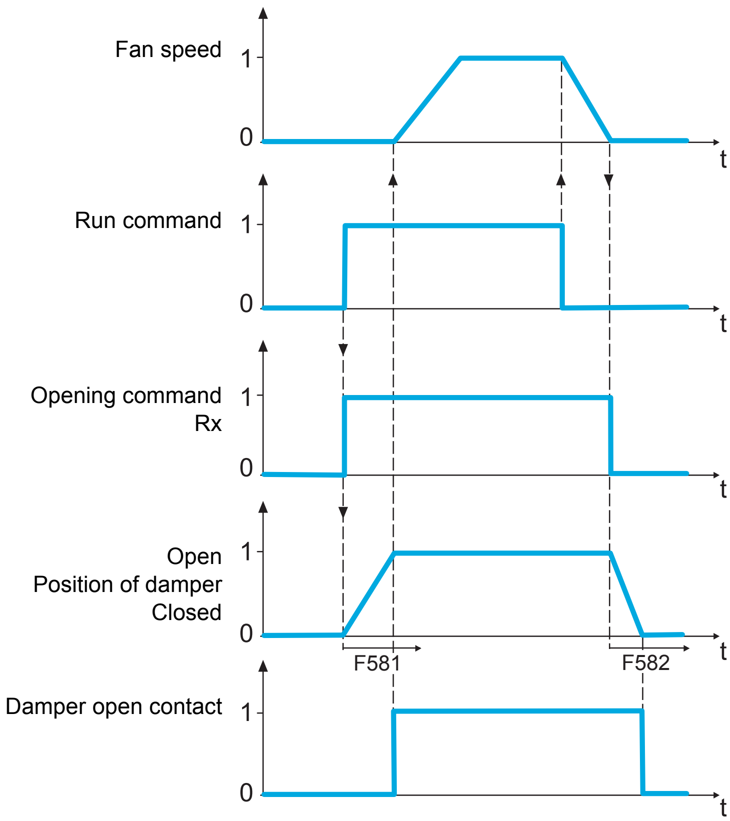
Damper opening feedback

Opening is controlled by a bit or a logic input that can be assigned via the F111 or F112 or F113 parameters to the function [Damper feedBack] 73 page 96. The corresponding logic input or bit can be configured via the parameter [Damper fdb type] F580.

When there is an inconsistency, the drive goes on a [Damper fault 1] Fd1 if the damper does not open and on a [Damper fault 2] Fd2 if it does not close.

The parameter [Time open damper] F581 can be used to delay tripping on an opening fault when a run command is sent and the parameter [Time close damper] F582 delays the closing fault when a stop command is sent.





Code	Name / Description	Adjustment range	Factory setting
F580	**[Damper fdb type]**		0
0 1 2 3 4	**[No feedback]**: No feedback used (Default value) **[LI L set]**: Logical input and active at level 0 (shunt). When setting F580 to 1, first assign logic inputs. **[LIH set]**: Logical input and active at level 1 (open). When setting F580 to 2, first assign logic inputs. **[Com. LIL set]**: Serial link to communication bit selected by [Com channel choice] (F807) and active at level 0 (shunt). Please refer to communication manual. **[Com. LIH set]**: Serial link to communication bit selected by F807 and active at level 1 (open). Please refer to communcation manual. Setting of F580 parameter is independent of the type of command mode. The F807 parameter allows selecting the communication channel used for communication damper feedback		
F581	**[Time open Damper]**	0.05 s to 300.00 s	60.00
	Opening fault monitoring time delay. If the damper is not open at the end of the set time, the drive will lock in [Damper fault 1] Fd1 detected fault mode. The timer is launch after the run command. The time delay needs to be greater than the normal opening time of the damper.		
F582	**[Time close Damper]**	0.05 s to 300.00 s	60.00
	Closing fault monitoring time delay. If the damper is not close at the end of the set time, the drive will lock in [Damper fault 2] Fd2 detected fault mode. The timer is launch when the motor is stopped. The time delay needs to be greater that the normal closing time of the damper		
F583	**[Damper flt behavior]**		1
0 1 2	**[No fault]** **[Freewheel stop]** **[Ramp stop]** The F583 parameter allows defining the behavior when [Damper fault 1] (Fd1) occurs.		

Display Parameters

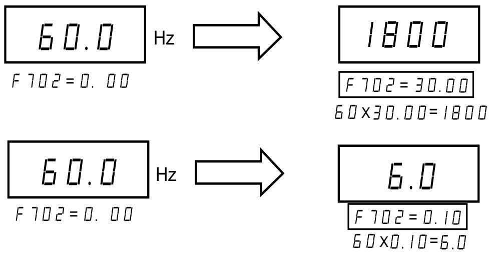
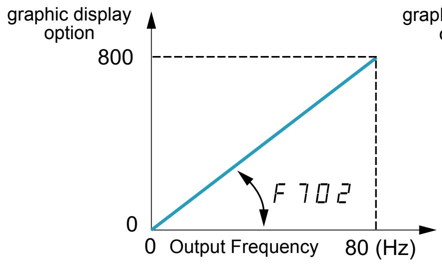
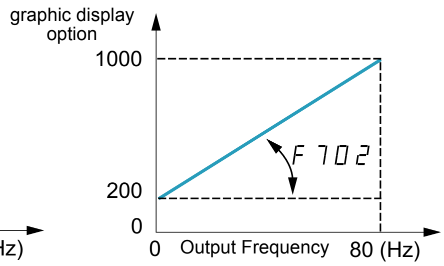
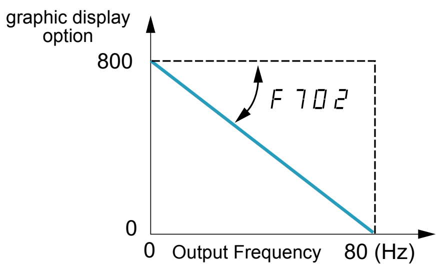
9

What's in this Chapter?

This chapter contains the following topics:

Display parameters

Code	Name / Description		Adjustment range	Factory setting
F710	**[Displayed param.]**	Default graphic display option operational value	0 to 10	0
0	**[Motor frequency]** Motor operating frequency (Hz or custom display), see [Customized freq val] (F702) on page 121.			
1	**[Reference]** Speed reference (Hz or custom display), see F702 on page 121.			
2	**[I Mot]** Motor current (% or A), see [Unit value selection] (F701) below.			
3	**[Drive rated I]** Drive rated current (A)			
4	**[Drive therm state]** (%)			
5	**[Motor power]** Output power (kW)			
6	**[Int speed ref]** Internal speed reference (after PID function) (Hz or custom display, see F702 on page 121.			
7	**[Com data]** Serial communication data			
8	**[Motor speed]** Output speed (rpm, see [Motor rated speed] (F417) on page 70)			
9	**[Com count]** Displays the total number of frames received by the communication card since the last power ON			
10	**[Com count norm st.]** Displays the total number of valid frames received by the communication card since the last power ON The setting of parameter [Displayed param.] (F710) determines the default display on the drive's embedded display terminal upon power up. Status alarms C, P, L, and H can only be displayed on the graphic display option if [Displayed param.] (F710) is set to 0. See "Run Mode" on page 23 for more information.			
F701	**[Unit value selection]**	Unit value selection	-	1
0	**[%]**			
1	**[Amp or Volt]** The setting of parameter F701 determines how certain values will be displayed on the drive embedded display terminal, either as a percentage of the drive rating or as a value of amperes or volts as appropriate. The setting of F701 will only affect parameters and display values that can be represented in amperes or volts. This includes the following parameters: [Motor thermal prot.] (tHr) and F173: motor rated current F251: DC braking current level F185 and F601: motor current limit F611: underload detection level Motor rated voltage (parameters uLu and F171) are displayed in volts.			
F708	**[Display ref. resol.]**	graphic display option Frequency Resolution	-	0
0	Disabled - 0.1 Hz steps			
1 to 255	See the formula below Parameter F708 works along with parameter [Loc. speed ref. step] (F707) (see page 77) to adjust the incremental steps of the drive embedded display terminal frequency display. At its factory setting, parameter F708 is disabled and the embedded display terminal increments or decrements frequency displays in 0.1 Hz steps. If parameter F708 is set to a value other than 0, then the embedded display terminal frequency display is determined as follows: embedded display terminal frequency display = Internal speed reference (after PID function) x F708 / F707 For example, if both F707 and F708 are equal to 1, the embedded display terminal frequency display will increase only in 1 Hz steps.			
F621	**[Run time alarm]**		0.0 to 999.9	610.0 (6100 hours)
	Parameter F621 is used in conjunction with a relay output set to functions 42 or 43 (see page 102) to signal that the run time specified by the setting of F621 has accumulated. 0.1 = 1 hour, 100 = 1000 hours			
F748	**[Power cons. memo]**	Accumulated power consumption memory	-	1
0	**[Disable]**			
1	**[Enable]** The setting of parameter F748 determines whether the drive's accumulated power consumption memory, displayed in kilowatt-hours (kWh), is cleared when the line power is cycled. If F748 is set to 0, the memory is cleared. If set to 1, the kWh memory is retained.			

Code	Name / Description	Adjustment range	Factory setting
F749	**[Power cons. unit]**	-	According to drive rating (1)
0 1 2 3	**[1 kWh]** **[0.1 = 1 kWh]** **[0.01 = 1 kWh]** **[0.001 = 1 kWh]** The setting of parameter F749 determines the scaling of the kWh display on the embedded display terminal.		
F702	**[Customized freq val]** Customized freq val	0.00 to 200.00	0.00
	Parameters F702, F705, and F706 can be used to customize a speed display on the drive embedded display terminal to match the application’s operational speed, for example, feet per minute or units per hour. 0.00: Frequency displayed in Hz 0.0 If parameter F702 is set to a value other than 0.00, the frequency value displayed will be calculated as follows: Value displayed = display or parameter frequency x F702. See example below. 1 to 200.0: Conversion factor  		
F703	**[Frequency convert.]** Frequency free unit conversion selection]		0
0 1	**[All]** Frequencies display free unit **[PID only]** PID frequencies free unit conversion		
F705	**[Custom freq. slope]** Custom Frequency Display Conversion Slope]	-	1
0 1	**[Negative slope]** **[Positive slope]** Parameter F705 sets the slope of the custom frequency display conversion. See the diagrams below for examples of the operation of this function.		
F706	**[Customize unit bias]** Custom Frequency Display Conversion Bias	0.00 to FH Hz	0.00 Hz
	Parameter F706 adds a bias to the custom frequency display conversion process. F701=1, F706=0.00  F705=1, F706=20.00  F705=0, F706=80.00  		

(1) See table page 167.

Detected Fault Management Parameters

10

What's in this Chapter?

This chapter contains the following topics:

Code	Name / Description	Factory setting
F303	[Number auto reset]	0
	DANGER UNINTENDED EQUIPMENT OPERATION ● The automatic restart can only be used on machines or installations which do not pose any danger to either personnel or equipment. ● If the automatic restart is activated, the fault relay will only indicate a fault has been detected once the time-out period for the restart sequence has expired. ● The equipment must be used in compliance with national and regional safety regulations **Failure to follow these instructions will result in death or serious injury.**	
0	Disabled.	
1 to 10	Number of clear attempts.	

Description

The table below lists the detected faults that can be cleared with Auto clear. If parameter F303 is set to a value greater than 0 and one of these detected faults occurs, the drive will attempt to automatically clear the detected fault, allowing it to be re-started:

Fault detection codes that can be cleared with the automatic restart function after the cause has disappeared

Code	Description	Code	Description
Fd1	Damper detected fault 1 (closed damper)	OH2	External overheating
OC1	Overcurrent during acceleration	OL1	Drive overload
OC2	Overcurrent during deceleration	OL2	Motor overload
OC3	Overcurrent during constant speed	OP1	Overvoltage during acceleration
OC1P	Short-circuit or ground detected fault during acceleration	OP2	Overvoltage during deceleration
OC2P	Short-circuit or ground detected fault during deceleration	OP3	Overvoltage during constant state operation
OC3P	Short-circuit or ground detected fault during constant speed operation	SOUt	Permanent magnet motor step-out
OH	Drive overheating		

Auto clear attempts will continue until the number of attempts set by parameter F303 has been exhausted.

If these attempts do not clear the detected fault condition, the drive will stop and a manual clear will be required.

If another type of detected fault occurs during the auto clear process, the drive will stop and a manual clear will be required.

A successful auto clear means that the drive accelerates the motor to the commanded speed without another detected fault occurring.

If an unspecified period of time elapses after a successful auto clear attempt without another detected fault occurring, the reset attempt counter will clear allowing another full set of reset attempts to be made during a future detected fault occurrence.

During the auto clear process, the drive embedded display terminal alternately displays rtrY and the display value selected by parameter [Displayed param.] (F710), page 120.

Conditions permitting auto clear

An auto clear attempt will not be made if the cause of the detected fault persists.

In the case of an OL1 or OL2 overload detected fault, the drive will calculate the cooling time necessary to clear the detected fault.

In the event of an OH detected fault, the heatsink temperature probe will indicate when the detected fault can be cleared.

DC bus voltage measurements will indicate when an OP1, OP2, or OP3 detected fault can be cleared.

Time delay

The first clear is attempted 1 second after the detected fault occurs. Each subsequent clear attempt adds 1 second to the time interval, as illustrated in the table below.

Clear detected fault attempts

Attempt number	Time delay between detected fault reset attempt and most recent fault
1	1 second
2	2 seconds
3	3 seconds
4	4 seconds
5	5 seconds
6	6 seconds
7	7 seconds
8	8 seconds
9	9 seconds
10	10 seconds

Fault relay action

An output relay set to functions 10 and 11 (see table on page 98) will not indicate a detected fault until all clear attempts have been exhausted.

Output relay functions 28 and 29 can be used to indicate that an auto-resetable detected fault has occurred.

Output relay functions 36 and 37 can be used to signal any kind of drive detected fault, even during auto clear attempts.

Drive fault memory

If parameter [Drive fault memory] (F602) is set to 1 and power to the drive is cycled while an auto-resetable detected fault is active, the auto clear action will be cancelled (see page 127).

Catch On The Fly (F301)

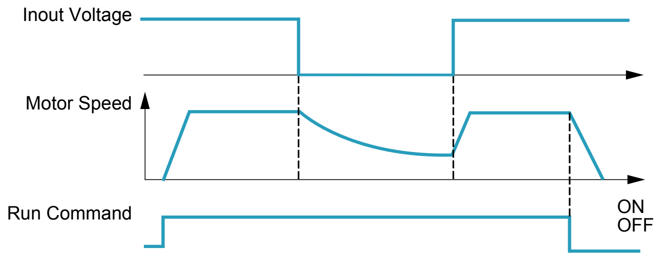
If catch-on-the-fly motor starting is enabled (parameter F301 is not set to 0), the drive will detect the motor's rotating direction and speed before applying power. This will result in a smooth reapplication of power to a coasting motor without high current or torque pulses.

If F301 is disabled and the drive is started into a spinning motor, it will apply a low starting frequency to the motor, operating in current limit until the motor almost stops. Then, the drive will accelerate the motor to the commanded speed.

Catch-on-the-fly motor starting will be applied if F301 is set to 1 or 3 and:

- There is a brief power loss (the embedded display terminal does not go blank) that results in the drive removing power from the motor,
- and, there is a continuous run command to the drive (2-wire control)

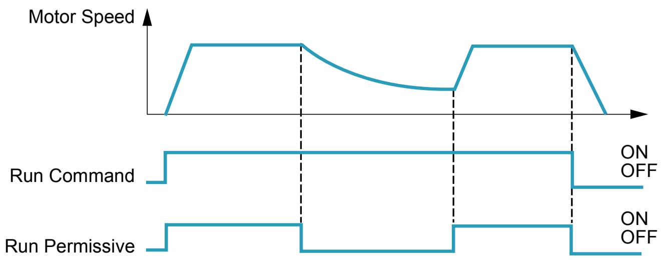
F301 Set to 1 or 3



Catch-on-the-fly motor starting will be applied if F301 is set to 2 or 3 and:

- The run permissive (logic input assigned to functions 1 or 54) is removed and restored,
- and, there is a continuous run command to the drive (2-wire control)

F301 Set to 2 or 3



If F301 is set to 4, the drive will perform a motor speed and direction search each time it receives a run command.

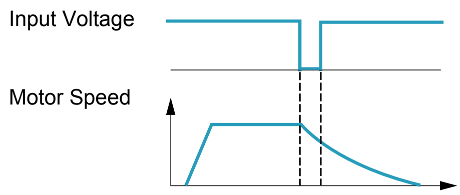
Note: Enabling catch-on-the-fly adds about 300 milliseconds to implementation of each start command to the drive.

Do not use catch-on-the-fly if there is more than one motor supplied by the drive.

Code	Name / Description	Factory setting
F301	**[Catch on fly]**	3 (1)
0	**[Disable]**	
1	**[Brief power loss]** After brief power loss	
2	**[Run restored]** After run permissive is restored	
3	**[Power loss, run]** After brief power loss or run permissive is restored	
4	**[Each start]** During every startup	
F632	**[Mot overload memo]** Motor Overload Memory	0
0	**[Disabled]** Cleared If parameter F632 is set to 0, the drive's memory of the motor's thermal state (used for overload calculation) is cleared whenever the power is cycled.	
1	**[Enabled]** Retained If parameter F632 is set to 1, the drive's memory of the motor's thermal state is retained even when power is removed. If the drive is tripped on an Motor Overload detected fault OL2, a cooling time (as calculated by the drive) needs to expire before the motor can be restarted.	

(1) Catch-on-the-fly motor starting after a drive detected fault is active if auto clear is enabled (parameter [Number auto reset] (F303) is not set to 0, see page 124)

Code	Name / Description	Factory setting
F602	**[Drive fault memory]**	0
0	**[Cleared]** If parameter F602 is set to 0 and the drive is powered after a detected fault: If the cause of the detected fault has been removed, the drive will reset and can be started. Information about the detected fault just cleared will be transferred to the detected fault history. If the cause of the detected fault has not been removed, the detected fault will be displayed again but the drive's memory of the operational information associated with the detected fault will be transferred to the detected fault history. Information about the 4th most recent detected fault will be removed from the detected fault history.	
1	**[Retained]** If parameter F602 is set to 1 and the drive is powered after a detected fault: If the cause of the detected fault has been removed, the drive will reset and can be started. Information about the detected fault just cleared will be transferred to the detected fault history. If the cause of the detected fault has not been removed, the original detected fault and all of its operational data will be available for viewing as the current detected fault in the monitoring mode. Information about the 4th most recent detected fault will be retained in the detected fault history. Auto clear will be disabled.	
F608	**[Input phase loss]** Input phase loss detection mode	1
0	**[Disable]**: Disabled If parameter F608 is set to 0, input phase loss detection is disabled. Loss of one input phase will not cause the drive to trip.	
1	**[Enable]**: Enabled If parameter F608 is set to 1, the loss of one input phase will cause an EPH1 detected fault.	
F302	**[Supply loss behav.]**	0
0	**[Disabled]** If parameter F302 is set to 0 and the drive briefly loses input power, it may not trip but may instead experience a momentary reduction of motor voltage and/or current and then resume normal operation once nominal input power is restored.	
1	**[Do not use]**: DO NOT SELECT	
2	**[Freewheel]** If parameter F302 is set to 2 and the drive briefly loses input power, the drive will remove power from the motor and allow it to coast to a stop. The embedded display terminal will flash StOP. The drive can only be restarted by providing a new run command.	



.

Code	Name / Description	Adjustment range	Factory setting
F627	**[Undervolt detect.]** Undervoltage Fault Operation Mode	-	0
0	**[Alarm (0.6U)]**: Alarm only (detection level below 60 %) If parameter F627 is set to 0 and the supply voltage drops below 60% of its rated value, the drive will stop and indicate a detected fault code on the embedded display terminal, but it will not activate a fault relay. If the supply voltage rises above 60% of its rated value, the detected fault code on the embedded display terminal will be cleared without a clear action and the drive will be ready to operate.		
1	**[Fault (0.6U)]**: Fault (detection level below 60 %) If parameter F627 is set to 1 and the supply voltage drops below 60% of its rated value, the drive will trip and will require a reset action to clear the detected fault before it can be restarted.		
2	**[Alarm (0.5U)]**: Alarm only (detection level below 50 %) If parameter F627 is set to 2 and the supply voltage drops below 50% of its rated value, the drive will stop and indicate a detected fault code on the embedded display terminal, but it will not activate a fault relay. If the supply voltage rises above 50% of its rated value, the detected fault code on the embedded display terminal will be cleared without a clear action and the drive will be ready to operate.		

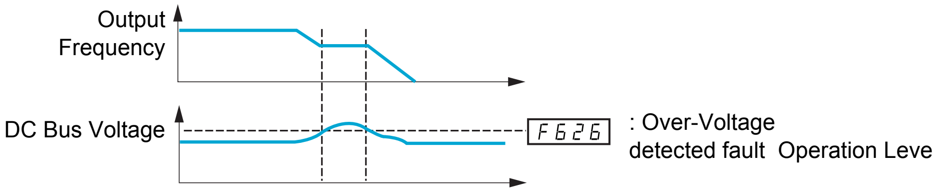
CAUTION

RISK OF DAMAGE TO DRIVE

When F627 = 2 , use a line choke.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Code	Name / Description	Adjustment range	Factory setting
F305	**[Overvoltage fault]** Overvoltage protection	-	2
0	**[Enable]** If parameter F305 is set to 0, and the drive detects an impending DC bus overvoltage, it will automatically take one of the following actions: Increase the deceleration time Keep the motor at a steady speed Increase the motor speed		



1	**[Disabled]** If parameter F305 is set to 1, the drive will take no action to avoid a DC bus overvoltage.		
2	**[Quick deceleration]**: Enabled (quick deceleration mode) If parameter F305 is set to 2, and the drive detects an impending DC bus overvoltage, it will increase the V/Hz ratio of the power applied to the motor. Motor over-excitation is used to dissipate regenerative energy into the motor instead of the drive.		
3	**[Dyn. deceleration]**: Enabled (dynamic quick deceleration mode) If parameter F305 is set to 3, the drive will increase the V/Hz ratio of the power applied to the motor as soon as slow down begins instead of waiting for the DC bus voltage to approach the detected fault level. When motor speed is being reduced, a DC bus overvoltage can often be caused by regenerated energy being absorbed by the drive from the load and motor.		
F626	**[Overvoltage level]**	100 to 150 % of nominal DC bus voltage	140%
	Parameter F626 sets the DC bus voltage level at which the actions defined by parameter F305 take place. See diagram above for more details.		

Code	Name / Description	Factory setting
F605	**[Output phase loss]** Output phase loss detection Mode	3

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- If F605 = 0, loss of cable is not detected
- If F605 = 1 or 2, loss of cable is only detected at the startup of the motor
- Check this action will not endanger personnel or equipment in any way

Failure to follow these instructions will result in death or serious injury.

If output phase loss detection is enabled and an output phase loss persists for more than 1 second, the drive will trip and display the EPH0 code.

0 **[Disabled]**
If parameter F605 is set to 0, output phase loss detection is disabled.

1 **[First start]**: At the first start-up.
If parameter F605 is set to 1, an output phase loss check is made only during the first motor start-up after power is applied to the drive.

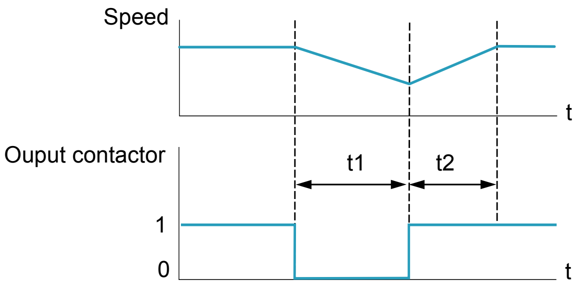
2 **[Each start]**: At every start-up.
If parameter F605 is set to 2, an output phase loss check is made every time the motor is started.

3 **[During run]**: During operation.
If parameter F605 is set to 3, continuous output phase loss monitoring is performed while the motor is running.

4 **[Permanent]**: At start-up and during operation.
If parameter F605 is set to 4, monitoring for an output phase loss is performed at motor start-up and continuously during operation.

5 **[Output contactor]**: Load side disconnect mode.
Setting 5 for parameter F605 is for applications with a load side disconnect. The drive will automatically restart the motor if the following are true:

- An all-phase loss has been detected (an output contactor or a load side disconnect has opened)
- The drive detects that a 3-phase connection has been reestablished (the output contactor or load side disconnect has closed). It is necessary to wait 1 s between disconnection and connection. See following scheme to have an example of loss of output contactor.



t1: deceleration without ramp (freewheel)
t2: acceleration with ramp

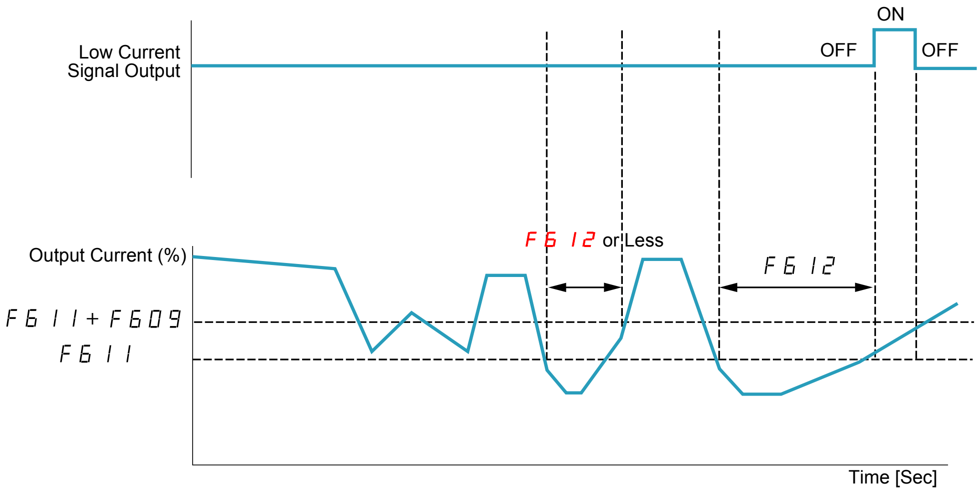
- A valid run command exists.

An output phase loss detection sweep is made as part of the auto-tuning process, regardless of the setting of parameter F605.
High-speed motors and other special motors may cause nuisance output phase losss.

Code	Name / Description		Adjustment range	Factory setting
F610	**[Underload det.]**	Underload / alarm selection	-	0
0	**[Alarm]** If parameter F610 is set to 0, relay output functions 24 or 25 (see page 130) can be used to signal an underload condition without the drive faulting.			
1	**[Fault]** If parameter F610 is set to 1 and the loading level drops below the setting of F611 for a period of time longer than that set by F612, the drive will trip, displaying code UC. The fault relay will be set if one has been defined (relay output functions 10 or 11, see page 98). A relay assigned to signal an underloaded condition (functions 24 or 25, see page 99) will also be set.			

The drive's response to an underload condition is set by parameters F609, F610, F611, and F612.
The setting of parameter F610 determines whether an underload condition signals an alarm with an output relay or faults the drive.
The sum of parameters F609 and F611 determines the drive loading level that will clear an underload alarm/detected fault.
Parameter F612 determines how long the drive can be under load before an alarm or detected fault is signaled.
See parameters F609, F610, F611 and F612 diagram below for more details.

F610 = 0 (Alarm Only)



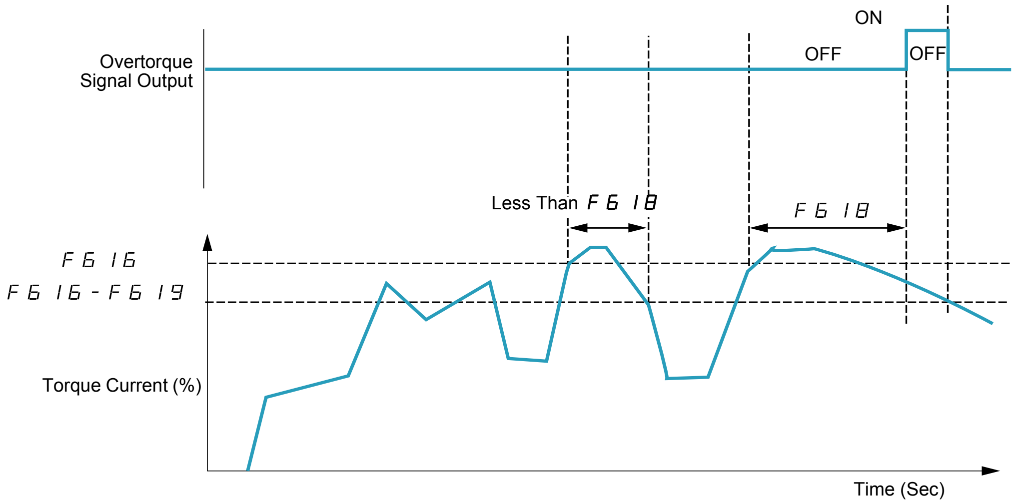
Code	Name / Description		Adjustment range	Factory setting
F611	**[Underload level]**	Underload Detection Level	0 to 100% (1)	0%
	Parameter F611 sets the underload detection level.			
F609	**[Underload band]**	Underload Detection Level Bandwidth	1 to 20% (2)	10%
F612	**[Underload det. time]**	Underload Detection Time	0 to 255 s	0 s
F633	**[Loss of VIA]**	Loss of VIA Analog Signal	0 to 100% (3)	0%
0	**[Disabled]** Disabled. If parameter F633 is set to 0, the drive will not monitor for loss of signal at analog input terminal VIA			
1 to 100	**[Fault detection level]** If parameter F633 is set to a value greater than 0 and: The signal at VIA drops below the detection level selected, and, the low signal level persists for 300 milliseconds or longer, the drive will trip and the embedded display terminal will display the code E-18.			

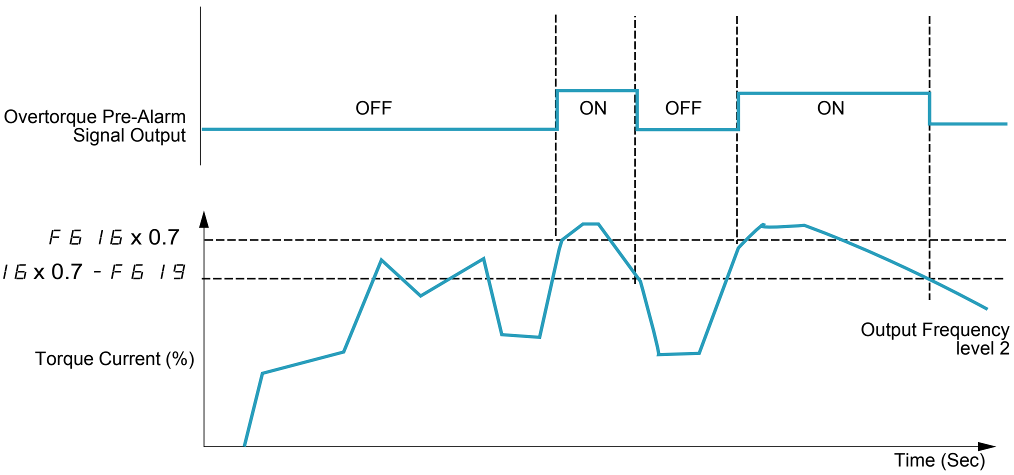
(1) Percentage of the drive's current rating. Display can also be in amperes, depending on setting of parameter [Unit value selection] (F701) (see page 120).
(2) Percentage of [Underload level] (F611) setting.
(3) Percentage of maximum VIA signal level

Code	Name / Description		Adjustment range	Factory setting
F644	**[4-20 mA loss]**	Drive behavior on 4-20 event		0
0 1 2 3 4	**[No]**: No **[Freewheel]** Freewheel. Freewheel stop and alarm. **[Set speed]** Fallback speed. Switch to fallback speed. Maintained as long as the trip cause is present and the run command is not disabled. See parameter [4-20mA fallback sp] (F649) for fallback speed. **[Keep speed]** Speed maintain. The drive maintains the speed being applied when the trip occurred, as long as the trip cause is present and the run command is not disabled. **[Ramp stop]** Ramp stop.			
F649	**[4-20mA fallback sp]**	Fallback speed	0.0 to **[Max frequency]** (FH)	0.0 Hz
	See parameter [4-20 mA loss] (F644).			
F613	**[Short circuit det.]**	Output short-circuit detection mode	-	0
0 1 2 3	**[Each time (std)]**: Each time a RUN command is given (standard pulse) **[One time (std)]**: Only one time after power is turned on (standard pulse) **[Each time (short)]**: Each time a RUN command is given (short-time pulse) **[One time (short)]**: Only one time after power is turned on (short-time pulse) The setting of parameter F613 determines how the drive determines an output short-circuit during start-up. Select the short-time pulse if the drive is powering a low impedance motor.			

Overtorque Detection

The drive's response to a particular motor torque level is determined by the setting of parameters F615 – F619.



<table>
<tr><th>Code</th><th>Name / Description</th><th></th><th>Adjustment range</th><th>Factory setting</th></tr>
<tr><td>F615</td><td>[Overtorque det.]</td><td>Overtorque detected fault/Alarm Selection</td><td>-</td><td>0</td></tr>
<tr><td>0
1</td><td colspan="4">[Alarm]
If parameter F633 is set to 0, the drive will not monitor for loss of signal at analog input terminal VIA.
[Fault]
If parameter F615 is set to 1 and the drive faults, the overtorque signal output will remain latched on until the detected fault is cleared.
Depending on the setting of parameter F615, the drive can use output relay function 12 or 13 (see table on pages 98) to signal an overtorque alarm or detected fault (Ot code).</td></tr>
<tr><td>F616</td><td>[Overtorque level]</td><td>Overtorque Detection Level</td><td>0 to 250 % of nominal rated motor torque</td><td>130%</td></tr>
<tr><td></td><td colspan="4">The setting of parameter F616 determines the level at which the drive will act upon a motor overtorque condition (see diagrams above and below).


Output relay functions 20 or 21 can be used to signal a overtorque pre-alarm when the calculated motor torque reaches 70% of the value set by parameter F616.</td></tr>
<tr><td>F618</td><td>[OvTorque det time]</td><td>Overtorque Detection Time</td><td>0.0 to 10 s</td><td>0.5 s</td></tr>
<tr><td></td><td colspan="4">The setting of parameter F618 determines how long the drive needs to detect a motor overtorque condition before it signals an alarm or detected fault (see above diagram).</td></tr>
<tr><td>F619</td><td>[Overtorque band]</td><td>Overtorque Detection Level Bandwidth</td><td>0 to 100 % of F616 level</td><td>10%</td></tr>
<tr><td></td><td colspan="4">While the setting of parameter F616 determines the level at which a motor overtorque alarm or detected fault will be signaled, the setting of parameter F619 determines how far the calculated motor torque needs to drop before the alarm or detected fault is cleared (see above diagram).</td></tr>
</table>

Code	Name / Description	Factory setting
F634	**[Amb. temp. alarm]** Ambient Temperature For drive Service Alarm	3
1 2 3 4 5 6	**[- 10 to 10 °C]** **[11 to 20 °C]** **[21 to 30 °C]** **[31 to 40 °C]** **[41 to 50 °C]** **[51 to 60 °C]** The drive can be programmed to signal a service alarm using output relay functions 44 or 45 (see page 102). The status of the service alarm can be displayed on the embedded display terminal (see page 21). At initial start-up, set parameter F634 to the drive's average ambient operating temperature. Setting F634 to the highest annual temperature or changing the value after drive operation has begun may result in an early drive service alarm.	

Nuisance Overvoltage And Input Phase Detected Fault Avoidance

Parameters F481 to F483 can be used to avoid nuisance overvoltage and input phase faults caused by:

- High input impedance: line reactor
- Low input impedance: high kVA distribution network
- Voltage instability: generator power source

If nuisance faults occur, increase the value of parameter F481. If increasing the value of F481 over 1000 does not remove nuisance faults, increase the values of parameters F482 and F483 as needed.

Code	Name / Description	Adjustment range	Factory setting
F481	**[In noise comp. filter]** Line noise compensation filter	0 to 9999 µs	0 µs
F482	**[In noise Inhibit filter]** Line noise Inhibitor filter	0 to 9999 µs	442 µs
F483	**[In noise inhibit gain]** Line noise Inhibitor gain	0 to 300 %	100%
F484	**[Pwr supply adj. gain]** Power supply adjustment gain	0.0 to 2.0 s	0.0

When the using machine has specific resonance, the following phenomena are happened:

- the machine occurs vibration,
- unusual noise of machine or peripheral.

If these phenomena are occurred, the following parameters should be adjusted:

- at first, set [Pwr supply adj. gain] (F484) to 0.5,
- next, set F484 as another value when no effect by setting F484 to 0.5,
- if [Motor rated freq.] (uL) = 50 Hz, set F481 to the following value 531,
- if uL = 60 Hz, set F481 to the following value 442.

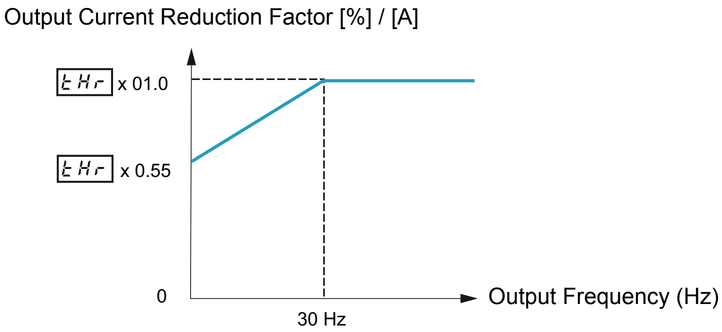
Note: F481 and F483 are invalid when F484 has a value excluding 0.0.

Motor Overload Characteristics

Motor Type

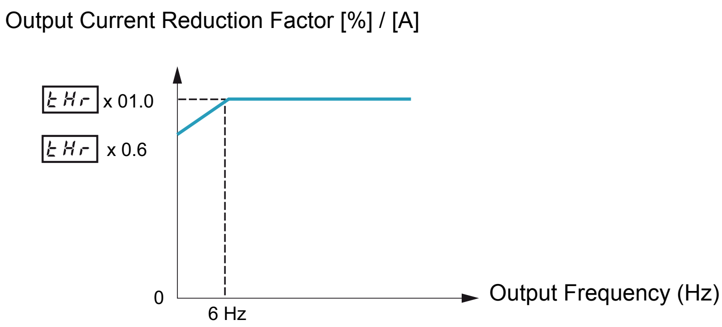
Set OLM to 0, 1, 2, or 3 if a self-cooled motor is being powered by the drive. The diagram below illustrates the overload protection level for the self-cooled motor as a function of motor frequency.

Overload Protection for a Self-Cooled Motor



Set OLM to 4, 5, 6, or 7 if a forced-cooled motor is being powered by the drive. The diagram below illustrates the overload protection level for the forced-cooled motor as a function of motor frequency.

Overload Protection for a Forced-Cooled Motor



Overload Protection

To enable motor overload protection, set OLM to 0, 1, 4, or 5.

CAUTION
RISK OF DAMAGE TO THE MOTOR When OLM is set to 2, 3, 6 or 7 motor thermal protection is no longuer provided by the drive. Provide an alternative means of thermal protection. **Failure to follow these instructions can result in equipment damage.**

To disable motor overload protection, set OLM to 2, 3, 6, or 7. In this case, a separate overload protective device, external to the ATV212 drive, needs to be wired between the drive and the motor.

Overload Stall

The overload stall function is only compatible with variable torque loads where the load on the motor and drive is dependent on the operating frequency and where the load can be reduced by slowing the motor.

If overload stall is enabled, the drive will reduce its output frequency if it detects an impending overload. As the overload condition of the motor is dissipated, the drive will return its output frequency to the commanded value.

To enable overload stall, set OLM to 1, 3, 5, or 7.

To disable overload stall, set OLM to 0, 2, 4, or 6.

Code	Name / Description	Factory setting
OLn	**[Motor overload prot]** Motor Overload Characteristics	0

CAUTION

RISK OF DAMAGE TO THE MOTOR
When OLn is set to 2, 3, 6?or 7 motor thermal protection is no longuer provided by the drive. Provide an alternative means of thermal protection.
Failure to follow these instructions can result in equipment damage.

This parameter value depends on:
- the motor type (self cool or forced cooled),
- and the protection.

Motor type	Protection		OLn value	Description	Behavior
	Overload protection	Overload stall			
Self cooled	enabled	disabled	0	[Std mot. protect.]	In case of overload defined by [Motor thermal prot.] (tHr) parameter, the drive trips in OL2 and the letter L is flashing.
	enabled	enabled	1	[Std & stall mot. prot]	In case of overload defined by [Motor thermal prot.] (tHr) parameter, the drive reduces automatically the speed and follows a fallback speed (80 % of Motor rated frequency uL) (1). If the overload remains during the fallback speed, the drive trips in OL2 and the letter L is flashing.
	disabled	disabled	2	[Self cool]	-
	disabled	enabled	3	[Slf cool stall ov.load]	In case of overload defined by [Motor thermal prot.] (tHr) parameter, the drive reduces automatically the speed and follows a fallback speed (80 % of Motor rated frequency uL) (1). The drive will not trip in OL2.
Forced cooled	enabled	disabled	4	[Forced cool prot]	In case of overload defined by [Motor thermal prot.] (tHr) parameter, the drive trips in OL2 and the letter L is flashing.
	enabled	enabled	5	[Forc cool stall prot]	In case of overload defined by [Motor thermal prot.] (tHr) parameter, the drive reduces automatically the speed and follows a fallback speed (80 % of Motor rated frequency uL) (1). If the overload remains during the fallback speed, the drive trips in OL2 and the letter L is flashing.
	disabled	disabled	6	[Forced cool]	-
	disabled	enabled	7	[F cool & stall ov load]	In case of overload defined by [Motor thermal prot.] (tHr) parameter, the drive reduces automatically the speed and follows a fallback speed (80 % of Motor rated frequency uL) (1). The drive will not trip in OL2.

(1) If the speed is lower than the fallback speed, the drive will keep the same speed.

Serial Communication Parameters

11

What's in this Chapter?

This chapter contains the following topics:

Network communication between the ATV212 drive and a master controller

⚠ WARNING
LOSS OF CONTROL • The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop. • Separate or redundant control paths must be provided for critical control functions. • System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link (1). **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

(1) For additional information, refer to NEMA ICS 1.1 (latest edition), “Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control” and to NEMA ICS 7.1 (latest edition), “Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems.”

Network communication between the ATV212 drive and a master controller is possible through five protocols selectable through the embedded display terminal:

- Modbus® RTU
- Metasys® N2
- Apogee® P1 FLN
- BACnet
- LonWorks®

Three types of data exchange are possible:

- Monitoring: monitoring values such as output frequency, voltage, and current
- Programming: reading, editing, and writing drive parameters
- Control: starting and stopping the drive and controlling the frequency reference

For operation on a network containing multiple drives, each ATV212 drive needs to be assigned a unique address using parameter F802.

For operation on a network where all drives are slaves responding to a central control system:

- Parameters [Command mode sel] (CMOd) (see page 77) and [Frequency mode sel] (FMOd) (see page 77) needs to be set correctly:
  - Setting CMOd to 2 enables start/stop control of the drive via network communication
  - Setting FMOd to 4 enables the frequency reference to be controlled by network communication
  - Setting either CMOd to 2 or FMOd to 4 enables serial communication error detection. The setting of parameter F851 determines the drive’s response in case of a loss of communication.

Control of the ATV212 drive can be established by a master controller over a serial communication network regardless of the setting of CMOd or FMOd (see diagram on page 46). Control can be restored to the source defined by CMOd and FMOd if the serial communication network relinquishes control or a logic input assigned to function 48 (forced local) is enabled.

Code	Name / Description		Adjustment range	Factory setting
F800	**[Mdb RJ45 baud]**	Modbus RJ45 baud rate	-	1
0 1	**[9600 bps]** **[19200 bps]**			
F801	**[Mdb RJ45 parity]**	Modbus RJ45 parity	-	1
0 1 2	**[No]**: No parity **[Even]**: Even parity **[Odd]**: Odd parity			
F802	**[Modbus address]**		0 to 247	1
	This address is used whatever the port used.			

Code	Name / Description		Adjustment range	Factory setting
F803	**[Com. time out]**		-	3
	⚠ WARNING **LOSS OF CONTROL** • If F803 is set to 0, communication control will be inhibited. • For safety reasons, inhibiting the communication interruption detection should be restricted to the debug phase or to special applications. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**			
0	Communication error detection disabled			
1 to 100	1 to 100 seconds			
F820	**[Mdb network baud]**	Modbus network baud rate	-	1
0	**[9600]**			
1	**[19200]**			
F821	**[Mdb network parity]**	Modbus network parity	-	1
0	**[No]**: No parity			
1	**[Even]**: Even parity			
2	**[Odd]**: Odd parity			
F829	**[Network protocol]**	Network protocol selection	-	1
1	**[Mdb RTU]**			
2	**[Metasys N2]**			
3	**[Apogee P1]**			
4	**[BACnet]**			
5	**[LonWorks]**			
	F829 is enable if F807 is set to 1 previously. **Note:** On the ATV21, Lonworks configuration corresponded to value 1.			
F851	**[Com. fault setting]**	Communication fault setting	-	4
	⚠ WARNING **LOSS OF CONTROL** If F851 is set to 1, communication control will be inhibited. For safety reasons, inhibiting the communication interruption detection should be restricted to the debug phase or to special application. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**			
	⚠ WARNING **LOSS OF CONTROL** Know and understand the setting of parameter F851. This parameter controls the behavior of the drive in the event of a network communication loss. If the value of F851 is 0, 1, 2, or 3, the drive will not trip on an Err8. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**			
0	**Ramp stp (F/Cmod):** Drive ramps to a stop. Serial control is relinquished to the sources defined by [Frequency mode sel] (FMOd) and [Command mode sel] (CMOd). This function is only used with the Lonworks terminal board.			
1	**[No active]**: Last commanded operation continues.			
2	**[Ramp stop]**: Drive ramps to a stop. Serial control is maintained.			
3	**[Freewheel]**: Drive removes power from the motor which coasts to a stop. Serial control is maintained.			
4	**[Err5 or Err8]**: Drive faults with either a communication detected fault Err5 or a network detected fault Err8. **Note:** For Modbus connection, only the function 1 is taken into account. The other function make drive trip in Err8 or Err5.			
F807	**[Com channel choice]**	Communication channel choice	-	1
0	**[RJ45]**: command Modbus via RJ45 port.			
1	**[Open style]**: Modbus, BACnet, Apogee P1, Metasys N2 and Lonworks defined by [Network protocol] F829 via open style port. F807 can only be adjusted while the drive is stopped.			

Data structure parameters

Parameters F856– F880 define the structure of data transmitted between the drive and the data communication network

Code	Name / Description	Factory setting
F856	**[Mot. poles (comm.)]** Number of motor poles for communication	2
1	**[2 poles]**	
2	**[4 poles]**	
3	**[6 poles]**	
4	**[8 poles]**	
5	**[10 poles]**	
6	**[12 poles]**	
7	**[14 poles]**	
8	**[16 poles]**	
F870	**[Block write data 1]**	0
0	**[No select]**: No selection	
1	**[Command word 1]**	
2	**[Command word 2]**	
3	**[Frequency Setpoint]**	
4	**[Relay command]**: Ouput data on the terminal board	
5	**[FM command]**: Analog output for communication	
6	**[Speed Setpoint]**	
F871	**[Block write data 2]**	0
0	**[No select]**: No selection	
1	**[Command word 1]**	
2	**[Command word 2]**	
3	**[Frequency Setpoint]**	
4	**[Relay command]**: Ouput data on the terminal board	
5	**[FM command]**: Analog output for communication	
6	**[Speed Setpoint]**	
F875	**[Block read data 1]**	0
0	**[No select]**: No selection	
1	**[Status info]**	
2	**[Freq. out]**: Output frequency	
3	**[Motor current]**: Ouput current	
4	**[Ouput volt]**: Ouput voltage	
5	**[Alarm info]**: Alarm information	
6	**[PID feedback value]**	
7	**[Input term. mon]**: Input terminal board monitor	
8	**[Out term. mon]**: Output terminal board monitor	
9	**[VIA monitor]**: VIA terminal board monitor	
10	**[VIB monitor]**: VIB terminal board monitor	
11	**[Mot speed mon.]**: Ouput motor speed monitor	
F876	**[Block read data 2]**	0
0	**[No select]**: No selection	
1	**[Status info]**	
2	**[Freq. out]**: Output frequency	
3	**[Motor current]**: Ouput current	
4	**[Ouput volt]**: Ouput voltage	
5	**[Alarm info]**: Alarm information	
6	**[PID feedback value]**	
7	**[Input term. mon]**: Input terminal board monitor	
8	**[Out term. mon]**: Output terminal board monitor	
9	**[VIA monitor]**: VIA terminal board monitor	
10	**[VIB monitor]**: VIB terminal board monitor	
11	**[Mot speed mon.]**: Ouput motor speed monitor	

Code	Name / Description	Factory setting
F877	**[Block read data 3]**	0
0	**[No select]**: No selection	
1	**[Status info]**	
2	**[Freq. out]**: Output frequency	
3	**[Motor current]**: Ouput current	
4	**[Ouput volt]**: Ouput voltage	
5	**[Alarm info]**: Alarm information	
6	**[PID feedback value]**	
7	**[Input term. mon]**: Input terminal board monitor	
8	**[Out term. mon]**: Output terminal board monitor	
9	**[VIA monitor]**: VIA terminal board monitor	
10	**[VIB monitor]**: VIB terminal board monitor	
11	**[Mot speed mon.]**: Ouput motor speed monitor	
F878	**[Block read data 4]**	0
0	**[No select]**: No selection	
1	**[Status info]**	
2	**[Freq. out]**: Output frequency	
3	**[Motor current]**: Ouput current	
4	**[Ouput volt]**: Ouput voltage	
5	**[Alarm info]**: Alarm information	
6	**[PID feedback value]**	
7	**[Input term. mon]**: Input terminal board monitor	
8	**[Out term. mon]**: Output terminal board monitor	
9	**[VIA monitor]**: VIA terminal board monitor	
10	**[VIB monitor]**: VIB terminal board monitor	
11	**[Mot speed mon.]**: Ouput motor speed monitor	
F879	**[Block read data 5]**	0
0	**[No select]**: No selection	
1	**[Status info]**	
2	**[Freq. out]**: Output frequency	
3	**[Motor current]**: Ouput current	
4	**[Ouput volt]**: Ouput voltage	
5	**[Alarm info]**: Alarm information	
6	**[PID feedback value]**	
7	**[Input term. mon]**: Input terminal board monitor	
8	**[Out term. mon]**: Output terminal board monitor	
9	**[VIA monitor]**: VIA terminal board monitor	
10	**[VIB monitor]**: VIB terminal board monitor	
11	**[Mot speed mon.]**: Ouput motor speed monitor	

Code	Name / Description	Adjustment range	Factory setting
F880	**[Free ID parameter]** Free Notes	0 to 65535	0
	The free notes parameter can be used to set a unique value to identify the drive on a network.		

Parameters F890 – F896 should be adjusted only if the corresponding optional equipment has been installed. See the ATV212 catalog for more detail.

Code	Name / Description
F890	**[Network adress]**
F891	**[Network baud rate]**
F892	**[Network time out]**
F893	**[Instance number H]**
F894	**[Instance number L]**
F895	**[Max master]**
F896	**[Max info frames]**

When the value of F829 parameter is changed, the adjustment range and factory setting of F890 to F896 are automatically setted.

	Modbus		APOGEE FLN P1		METASYS N2		BACNET	
	Setting Range	Factory setting	Setting Range	Factory setting	Setting Range	Factory set-ting	Setting Range	Factory setting
F829	-	1	3	3	2	2	4	4
F890	0 to 65535	0	1 to 99	99	1 to 255	1	0 to 127	0
F891			0 to 6	0	1 to 5	5	1 to 5	5
F892			20 to 600	100	20 to 600	100	20 to 600	100
F893			0 to 4194	0	0 to 4194	0	0 to 4194	0
F894			0 to 999	0	0 to 999	0	0 to 999	0
F895			0 to 127	0	0 to 127	0	0 to 127	127
F896			0 to 100	0	0 to 100	0	1 to 100	1

There are 2 connection port witch support different communication protocol, embedded or using option board.

The two channels could communicate simultaneously with the product, but only one could send the logical or frequency command to the drive:

- The two channel used for monitoring
- One channel used for command (run order and speed) and the second for monitoring.

The configuration parameters of communication are taking account at next power up of the product.

	Description	RJ45 Modbus	Network Modbus	Network Apogee P1	Network Metasys N2	Network BACnet	Network LonWorks
F829	Network selection	-	●	●	●	●	●
F800	Modbus RJ45 Baud rate	●	-	-	-	-	-
F801	Modbus RJ45 Parity	●	-	-	-	-	-
F802	Modbus address	●	●	-	-	-	-
F803	Modbus time out	●	●	-	-	-	(1)
F851	Com fault behavior	●	●	●	●	●	●
F820	Modbus Net Baud rate	-	●	-	-	-	-
F821	Modbus Net Parity	-	●	-	-	-	-
F890	Network parameter	-	-	●	●	●	-
F891	Network parameter	-	-	●	-	●	-
F892	Network parameter	-	-	●	●	●	-
F893	Network parameter	-	-	-	-	●	-
F894	Network parameter	-	-	-	-	●	-
F895	Network parameter	-	-	-	-	●	-
F896	Network parameter	-	-	-	-	●	-

(1) Time out disconnection board, internal default value (3s)

Start/Stop Control By Speed Reference Level

12

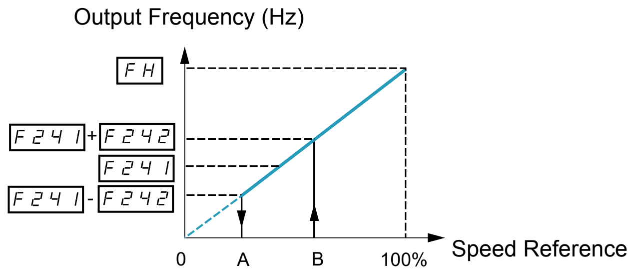
What's in this Chapter?

This chapter contains the following topics:

Overview

Use parameters [Freq. pedestal] (F241) and [Freq. pedestal hyst.] (F242) to enable start/stop control of the drive based on the speed reference level.

If the drive operates normally and has a run permissive signal, it will start powering the motor as soon as the speed reference level exceeds the frequency set by F241 + F242 (point B in diagram below). It will remove power from the motor as soon as the output frequency drops below the level set by F241 – F242 (point A in diagram below).



Code	Name / Description		Adjustment range	Factory setting
F241	[Freq. pedestal]	Operating starting frequency]	0.0 to [Max frequency] (FH) Hz	0.0 Hz
F242	[Freq. pedestal hyst.]	Operating starting frequency hysteresis	0.0 to [Max frequency] (FH) Hz	0.0 Hz

Droop Control

13

What's in this Chapter?

This chapter contains the following topics:

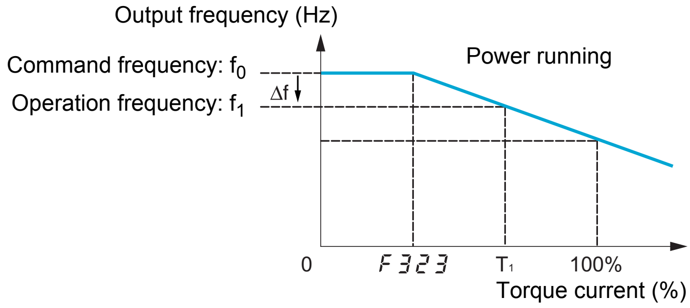
Droop control principle

The use of droop control (or negative slip compensation) can help balance the load between multiple motors in a load sharing application. The amount of slip or speed droop allowed in the motor powering the load is determined by the load current level and the setting of parameters F320 and F323.

During motoring, droop control decreases the drive output frequency. During regenerative braking, droop control increases the drive output frequency.

When enabled, droop control is active when:

- The load current exceeds the level set by parameter F323.
- The drive output frequency is between the [Mot start freq.] F240 (see page 82) and [Max frequency] (FH) (see page 82).



The amount of speed droop allowed (f) can be calculated by this equation:
f = uL (1) x F320 x (load current – F323)(2)

Example:
uL = 60 Hz
F320 = 10%
F323 = 30% (of drive's rated current)
Load current = 100% of drive's rating

f = 60 x 0.1 x (1 – 0.3)
f = 60 x 0.07
f = 4.2

Assuming the speed reference is set to 60 Hz, the output frequency will be: f1 = f0 – f = 60 – 4.2 = 55.8 (Hz).

Code	Name / Description	Adjustment range	Factory setting
F320	**[Load gain]**	0 to 100%	0%
F323	**[Load gain offset]**	0 to 100% (3)	10%

(1) Parameter [Motor Rated freq] (uL) (see page 70). The value entered for uL in this formula should not exceed 100, regardless of the actual setting of parameter uL.
(2) Speed droop is zero if (load current – F323 = 0).
(3) Percent of the drive's rated current.

Diagnostics and troubleshooting

III

What's in this Part?

This part contains the following chapters:

Diagnostics and troubleshooting

14

What's in this Chapter?

This chapter contains the following topics:

Detected fault conditions

Refer to tables on pages hereafter to diagnose and solve troubles when there is a fault detection, or when an alarm, or pre-alarm condition occurs.

If the trouble cannot be solved by the actions described in the tables, contact your Schneider Electric representative.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Read and understand the instructions in «Before you begin» chapter, before performing the procedure in this section.

Failure to follow these instructions will result in death or serious injury.

Alarm Codes

Code	Name	Possible causes	Remedies
CF12	[Download transfer fault]	• Invalid configuration. The configuration loaded in the drive via the bus or communication network is inconsistent. • Transfer using PC soft has not been successful due to rating differences (for example upload of an ATV212●●●N4 configuration to an ATV212●●●M3)	• Check the configuration loaded previously. • Load a compatible configuration. • To perform download, uncheck "Display communication error" (in Tool / Environnement option / Startup/Comm.)
E-18	[VIA signal fault]	• The VIA analog signal is below the level set by parameter F633.	• Check the signal at VIA and rectify the cause of the signal loss. • Verify that parameter F633 is set correctly.
E-19	[CPU communications err.]	• Communication error between control CPUs	• Contact Schneider Electric to repair the drive.
E-20	[Excess torque boost flt]	• Torque boost parameter [Auto Torque Boost] (F402) is set too high. • The motor impedance is too low.	• Repeat the drive auto-tune and then adjust down parameter [Auto Torque Boost] (F402).
		During deceleration when [Mot cont. mode sel.] (Pt) = (1) [Quadr. U/F] with 3 conditions: - Processing for stop - Load current value > 88% x [Motor Current Limitation] (F601) - Too slow deceleration, [Max frequency] (FH) /[Deceleration time 1] (dEC) x 2 msec < 0.01Hz	• Set [Auto ramp] (AU1) = (0) [Disabled] • Decrease the deceleration ramp with [Deceleration time 2] (F501) and [Commut. ramp freq.] (F505).
E-21	[CPU error 2 fault]	• The control board CPU is inoperable.	• Contact Schneider Electric to repair the drive.
E38	[EEprom pwr incompat.]	• Eeprom power incompatible. • Product hardware detected fault.	• Contact Schneider Electric to repair the drive.
EEP1	[EEPROM error 1 fault]	• A data writing error has occurred.	• Cycle power to clear the detected fault.
EEP2	[EEPROM error 2 fault]	• Power was removed from the drive during a parameter reset operation resulting in a data writing error.	• Cycle power to clear the detected fault and try the parameter reset operation again. • If the detected fault does not clear, contact Schneider Electric to repair the drive.
EEP3	[EEPROM error 3 fault]	• A data reading error has occurred.	• Cycle power to clear the detected fault.
EF2	[Ground fault]	• Ground fault in motor or motor cables	• Check the motor and motor cables for ground faults.
EPH0	[Output phase loss fault]	• Loss of one or more output phases	• Determine the cause of the missing output phase (such as a bad connection, an output disconnect, or an open winding in the motor) and rectify the trouble. • Check parameter F605.
EPH1	[Input phase loss fault]	• Loss of one input phase	• Determine the cause of the missing input phase and rectify. • Check parameter F608.
Err1	[Speed ref. error fault]	• Parameters F202, F203, F210, or F212 are set improperly.	• Set the parameters to the correct settings.

Code	Name	Possible causes	Remedies
Err2	[RAM fault]	• The control board RAM is inoperable.	• Contact Schneider Electric to repair the drive.
Err3	[ROM fault]	• The control board ROM is inoperable.	• Contact Schneider Electric to repair the drive.
Err4	[CPU fault 1]	• The control board CPU is inoperable.	• Contact Schneider Electric to repair the drive.
Err5	[Com RJ45 fault]	• Serial communication error	• Check network control devices and cables. • Check the setting of the communication timeout parameter, F803. • Check the remote graphic display option cable. • Check the setting of F829 parameters.
Err7	[Current sensor fault]	• A motor current sensor is inoperable.	• Replace the drive.
Err8	[Network error fault]	• Network communication error	• Check the network control devices and cables.
Err9	[Remote keypad fault]	• Graphic display option cable disconnected	• Check the RJ45 cable.
Etn1	[Auto-tuning fault]	• Parameters F401 to F494 are incorrectly set. • The motor is too large for the drive. • The motor cable gauge is too small. • The motor is still rotating at the start of the auto-tune. • The drive is not powering a 3-phase induction motor.	• Set parameters F401–F494 correctly. • Use a larger drive. • Use a larger gauge motor cable. • Verify that the motor is stopped before starting an auto-tune. • Use the drive to power only a 3-phase induction motor.
EtYP	[Drive fault]	• The main control board is inoperable.	• Set parameter [Parameter reset] (tYP) to 6. • If this does not clear the detected error, replace the drive.
Fd1	[Closed damper 1 fault]	• Damper is locked in closed position.	• Set [Damper flt behavior] (F583) to 0. • Check the FL relay connection (FLA/FLB). • Check the relay configuration (F130/F132).
Fd2	[Closed damper 2 fault]	• Damper blocked open or soldered.	• Set [Damper fdb type] (F580) to 0 or 1.Check the FL relay connection (FLA/FLB). • Check the relay configuration (F130/F132).
n020	[Total input power]	• The accumulated input power value is more than 999.999 kWh.	• Clear the accumulated input power value using logic input function 51, or parameter F748.
OC1	[Overcurrent acceleration]	• The acceleration time is too short. • The setting of parameter [Mot cont. mode sel.] (Pt) is incorrect. • The drive is starting into a rotating load. • The drive is powering a low impedance motor. • Ground fault	• Increase the acceleration time parameters (ACC or F500). • Select the correct setting for parameter [Mot cont. mode sel.] (Pt). • Enable catch on the fly, parameter F301. • Adjust the switching frequency parameter F300. • Set parameter F316 to 1 or 3.
OC1P	[SC or ground fault acc.]	• Short circuit or ground fault during acceleration	• Using a 1000 V testing tool megger, check the motor and motor cables for ground faults.
OC2	[Overcurrent deceleration]	• The deceleration time is too short. • Ground fault	• Increase the deceleration time parameters (dEC or F501). • Set parameter F316 to 1 or 3.
OC2P	[SC or ground fault dec.]	• Short circuit or ground fault during deceleration	• Using a 1000 V megger, check the motor and motor cables for ground faults.
OC3	[Overcurrent cont. speed]	• Abrupt fluctuations in load • Abnormal load condition	• Reduce the load fluctuations. • Check the load. • Set parameter F316 to 1 or 3.
OC3P	[SC/ground flt cont. spd]	• Short circuit or ground fault during constant speed operation	• Using a 1000 V megger, check the motor and motor cables for ground faults.
OCA	[SC inverter at start]	• Ground fault	• Using a 1000 V megger, check the motor and motor cables for ground faults.
OCL	[SC mot. cable at start]	• Phase to phase output short circuit • The motor impedance is too low.	• Using a 1000 V megger, check the motor and motor cables for ground faults.

Code	Name	Possible causes	Remedies
OH	[Drive overtemperature]	• The drive cooling fan is not working. • The ambient temperature is too high. • An enclosure air vent is blocked. • A heat source is too close to the drive. • The drive heatsink temperature sensor is malfunctioning.	• Restart operation by resetting the drive detected fault after cool-off. • Decrease the ambient temperature by increasing the free space around the drive and removing any heat generating source from the proximity of the drive. • Check the fan operation
OH2	[PTC overheating]	• The external PTC embedded in the motor windings indicates a motor overtemperature condition.	• Correct the motor overload condition. • Check the PTC for correct operation.
OL1	[Drive overload]	• The acceleration time is too short. • The DC injection current level is too high. • The setting of parameter [Mot cont. mode sel.] (Pt) is incorrect. • The drive is starting into a rotating load. • The load is too large.	• Increase the acceleration time parameters (ACC or F500). • Reduce the setting of parameters F251 and/or F252. • Select the correct setting for parameter [Mot cont. mode sel.] (Pt). • Enable catch on the fly, parameter F301. • Set parameter F302 to 2. • Use a drive with a higher power rating.
OL2	[Motor overload]	• The setting of parameter [Mot cont. mode sel.] (Pt) is incorrect. • The motor is jammed. • Low-speed operation is performed continuously • Excessive load is applied to the motor.	• Select the correct setting for parameter [Mot cont. mode sel.] (Pt). • Check the load. • Adjust parameter OLM to the overload level that the motor can withstand during low speed operation.
OP1	[Overvoltage acceleration]	• The input voltage is fluctuating abnormally. • Power network is greater than 200 kVA. • Power factor capacitor switching • SCR switching on power network • The drive is starting into a rotating load. • Intermittent output phase fault	• Install a line reactor. • Enable catch on the fly, parameter F301. • Set parameter F302 to 2. • Determine the cause of the missing output phase (such as a bad connection, an output disconnect, or an open winding in the motor) and rectify the trouble.
OP2	[Overvolt. deceleration]	• The deceleration time is too short. • Overhauling load • The input voltage is fluctuating abnormally. • Power network is greater than 200 kVA • Power factor capacitor switching • SCR switching on power network • The drive is starting into a rotating load. • Intermittent output phase fault	• Increase the deceleration time parameters (DEC or F501). • Enable parameter F305. • Install a line reactor. • Check the input and output circuits for phase loss detection and rectify. • Enable catch on the fly, parameter F301.
OP3	[Overvoltage cont. speed]	• The input voltage is fluctuating abnormally. • Power network is greater than 200 kVA • Power factor capacitor switching • SCR switching on power network • The drive is regenerating - the load causes the motor to run at a frequency higher than drive output frequency. • Intermittent output phase fault	• Install a line reactor. • Check the input and output circuits for phase loss detection and rectify.
Ot	[Overtorque]	• The calculated motor torque has reached the level set by parameter F616.	• Adjust the settings of parameters F615 and F616 as needed. • Verify machine operation.
SOUt	[PM motor step-out] (permanent magnet motor pulls out of synchronism)	• The motor is jammed. • Output phase loss • Impact load	• Check the load and correct the jammed condition. • Check the condition of the motor and load wiring.
UC	[Underload]	• The measured motor current has dropped below the level set by parameter F611.	• Check parameters F610–612 for the correct settings.
UP1	[Undervoltage]	• The input voltage is too low.	• Check the input voltage and rectify the trouble. • Select the correct setting for parameter F627. • Enable catch on the fly, parameter F301. • Set parameter F302 to 2.

Alarm Conditions

Alarms do not cause the drive to enter a fault condition.

Alarm Codes

Code	Description	Possible causes	Remedies
AtN1	[Auto tune]	• Auto-tuning in process	• Normal if it the message disappears after a few seconds.
CLr	[Reset active]	• This message is displayed after the STOP key is pressed while an detected fault is displayed.	• Press the STOP key again to clear the detected fault.
db	[DC braking]	• DC braking in process	• The alarm code goes off in several seconds if no trouble occurs.
dbOn	[dbOn]	• Motor shaft fixing control	•
E-17	[HMI error]	• A graphic display option key has been held down for more than 20 seconds. • A graphic display option key may not be operating properly.	• Release the graphic display option key. • If this does not clear the error, replace the drive.
E1	[Excess value] The number of digits that can be displayed has been exceeded	• The number of digits entered for values such as frequencies is more than 4 (the upper digits have priority).	• Lower the frequency free-unit magnification [Customized freq val] (F702).
EOFF	[Loc. Stop en.]	• The operation panel is used to stop the operation in automatic control or remote control mode.	• Press the STOP key for an emergency stop. To cancel the emergency stop, press any other key.
Err1	[Speed ref alarm]	• The frequency setting signals at points 1 and 2 are set too close to each other.	• Set the frequency setting signals at points 1 and 2 apart from each other.
h999	[Pin&1MWh] Integral input power	• Integral input power is more than 999.99 kWh.	• Press and hold down the ENT key for 3 s or more when power is off or when the input terminal function CKWH is turned on or displayed.
H999	[Pout&1MWh] Integral output power	• Integral output power is more than 999.99 kWh.	• Press and hold down the ENT key for 3 s or more when power is off or when the input terminal function CKWH is turned on or displayed.
HEAd End	[Head] [End] Display of first/last data items	• The first and last data item in the auh data group is displayed.	• Press MODE key to exit the data group.
HI LO	[High] [Low] Parameter adjustment error	• During programming, a value was entered that exceeds the maximum or minimum value of the parameter.	• Enter a value within the bounds of the parameter
InIt	[Initialization]	• Parameters are being initialized to default values.	• Normal if the message disappears after several seconds.
LStP	[Low speed stop] Auto-stop because of continuous operation at the lower-limit frequency	• The automatic stop function selected with F256 was activated.	• To deactivate the automatic stop function, increase the frequency command above the lower-limit frequency LL+F391 or turn off the operation command.
MOFF	[Line undervolt flt]	• The phase-to-phase input voltage is too low.	• Measure the main circuit supply voltage. If the voltage is at a normal level, the drive requires repair.
OFF	[Drive stop]	• The ST-CC (run permissive) circuit is open.	• Close the ST-CC circuit.
nSt	[Lock State]	• The Li is already active when the function is validated. • The Li is already active when a configuration transfer is done with the function is validated.	• Deactivate the active Li configured.
rtrY	[Auto reset]	• The drive is in the process of restart. • A momentary stop occurred.	• The drive is operating normally if it restarts after several seconds.
StOP	[Stop supply] Momentary power loss slowdown stop prohibition function activated.	• The slowdown stop prohibition function set with F302 (momentary power loss ride-through operation) is activated.	• To restart operation, reset the drive or input an operation signal again.

Pre-alarm Conditions

Pre-alarm Codes

Code	Pre-alarm	Description
C	[Current alarm]	• The drive is at current limit. • For more information, refer to parameter F601 (see page 69) and F185 (see page 74).
P	[DC bus alarm]	• The drive is approaching an overvoltage detected fault due to a high supply line, regenerative motor braking, or a combination of these. For more information, refer to parameters F305 (see page 128) and F626 (see page 128).
L	[Motor overload al]	• The motor overload timer has reached or exceeded 50% of its detected fault level.
H	[Drv overheat alrm]	• The drive is approaching an overheating fault detection.

The pre-alarm codes are displayed, flashing on the embedded HMI, in the following order from left to right: C, P, L, H.

If two or more troubles arise simultaneously, one of the following pre-alarm codes appears and flashes: CP, PL, CPL.

Clearing the detected fault

In the event of a non resettable detected fault:

1. Disconnect all power, including external control power that may be present.
2. Lock all power disconnects in the open position.
3. Wait 15 minutes to allow the DC bus capacitors to discharge (the drive LEDs are not indicators of the absence of DC bus voltage).
4. Measure the voltage of the DC bus between the PA/+ and PC/– terminals to ensure that the voltage is less than 42 Vdc.
5. If the DC bus capacitors do not discharge completely, contact your local Schneider Electric representative. Do not repair or operate the drive.
   - Find and correct the detected fault.
   - Restore power to the drive to confirm the detected fault has been rectified.

When any overload function (OL 1 or OL 2) is active, the drive cannot be reset by inputting a reset signal from an external device or with the Stop key on the display terminal if the calculated cooling time has not expired. Calculated cooling time:

- OL 1: 30 seconds after the detected fault has occurred
- OL 2: 120 seconds after the detected fault has occurred

CAUTION
RISK OF DAMAGE TO THE MOTOR ● Repeated reset of the thermal state after a thermal overload can result in thermal stress to the motor. ● When trips occur, promptly inspect the motor and driven equipment for problems (such as a locked shaft or mechanical overload) before restarting. Also check the power supplied to the motor for abnormal conditions (such as a phase loss or phase imbalance). **Failure to follow these instructions can result in equipment damage.**

Annex

IV

What's in this Part?

This part contains the following chapters:

Migration

15

What's in this Chapter?

This chapter contains the following topics:

Migration ATV21 - ATV212

General

The ATV212 is compatible with the ATV21

Migration Modbus ATV21 to ATV212: When controlling ATV21 using Modbus RJ45, parameter [Network protocol] (F829) should be set to 1.

With ATV212, parameter F829 should also be set to 1 and parameter [Com channel choice] (F807) set to [RJ45] (0). Factory setting is [Open style] (1).

Settings of other communication parameters described from page 138 remain the same as on ATV21.

Note: For LonWorks, parameter F829 needs to be set to 1 for ATV21 and needs to be set to 5 for ATV212.

A configuration transfer from ATV21 to ATV212 is possible.

For example:

You can upload a configuration from an ATV21 via PC Soft (and selected the inverter Type : ATV21) and download it into ATV212.

After a transfer from ATV21 to ATV212, the new parameters stay at their factory setting:

[Damper fdb type] (F580), [Time open Damper] (F581), [Time close Damper] (F582) ,[Damper flt behavior] (F583),[Forced fire control] (F650), [Forced fire function] (F659), [Com channel choice] (F807), [Mdb network baud] (F820), [Mdb network parity] (F821) and [LL for ov.cur. prev.] (F390).

The download configuration is not allowed if the drive is running.

In case of an interruption of download configuration transfer to the drive and detected fault, the CF12 is set. This detected fault code keeps also present even after power off of the drive.

To reset the download transfer detected fault code CF12:

- Make a new successful transfer
- Make a factory setting on the drive (using tYP parameter)

At the end of download transfer, the drive cannot run if a logic input configured to a function is active. To use the function and run the motor, it's necessary to disable and enable the logic input.

Commissioning

Compatible loader tool with ATV21

- PC Soft V1.0 and higher

Compatible loader tools with ATV212:

- PC Soft V1.06 and higher,
- Multi-Loader V3.11 and higher,
- SoMoveMobile V2.2 and higher,

Parameters Reset Tables

16

Parameter Reset

Refer to Menu navigation diagram page 62 to know how to reach [Parameter reset] (tYP) parameter.

The Altivar 212 drive offers three parameter reset options:

- Factory reset: [Parameter reset] (tYP) = 3
- 50 Hz reset: [Parameter reset] (tYP) = 1
- 60 Hz reset: [Parameter reset] (tYP) = 2

This appendix describes parameter values after these reset operations.

The following tables identify:

- Parameters whose values after a reset do not vary by reset type, see page 162.
- Parameters whose values after a reset vary by reset type, see page 166.
- Parameters whose values after a reset are drive model dependant but do not vary by reset type, see page 167.
- Parameters whose values after a reset are drive model and reset type dependant, see page 168.
- Parameters whose values do not change if a reset is performed, see page 169.

Parameter values that do not vary by reset type

The table below lists the parameters whose values, after a reset, do not vary by the reset type.

To determine the value of a parameter after a reset, locate the parameter in the first column and read across the row to the default value column. The number that appears at the intersection of the parameter and the default value is the parameter's value after a reset of any type ([Parameter reset] (tYP) = 1, [Parameter reset] (tYP) = 2, or [Parameter reset] (tYP) = 3).

Parameters whose values after a reset do not vary by reset type

Parameter	Description	Unit	Default Value
AU1	[Auto ramp]	–	1
AU4	[Auto set function]	–	0
FMSL	[AO funct. selection]	–	0
FM	[AO scaling]	–	–
tYP	[Parameter reset]	–	0
Fr	[Local mot. direction]	–	0
FC	[Local speed ref.]	Hz	0.0
LL	[Low limit frequency]	Hz	0.0
Pt	[Mot cont. mode sel.]	–	1
OLM	[Motor overload prot]	–	0
Sr1	[Preset speed 1]	Hz	15
Sr2	[Preset speed 2]	Hz	20
Sr3	[Preset speed 3]	Hz	25
Sr4	[Preset speed 4]	Hz	30
Sr5	[Preset speed 5]	Hz	35
Sr6	[Preset speed 6]	Hz	40
Sr7	[Preset speed 7]	Hz	45
F100	[Freq. 1 reached]	Hz	0.0
F101	[Freq. 2 reached]	Hz	0.0
F102	[Freq.2 bandw.]	Hz	2.5
F108	[Logic Funct 1 active]	–	0
F109	[VIA selection]	–	0
F110	[Logic Funct 2 active]	–	1
F111	[LI F selection]	–	2
F112	[LI R selection]	–	6
F113	[LI RES selection]	–	10
F118	[VIA LI selection]	–	7
F130	[RY Relay Function 1]	–	4
F132	[FL Relay Function]	–	11
F137	[RY Relay Function 2]	–	255
F139	[RY logic select.]	–	0
F167	[Freq band det range]	Hz	2.5
F200	[Auto/man speed ref]f	–	0
F201	[VIB ref. point 1]	%	0
F202	[VIA freq. point 1]	Hz	0.0
F203	[VIA freq. point 2]	%	100
F207	[Remote spd ref 2]	–	2
F210	[VIB ref. point 1]	%	0

Parameter	Description	Unit	Default Value
F211	[VIB freq. point 1]	Hz	0.0
F212	[VIB ref. point 2]	%	100
F240	[Mot start freq.]	Hz	0.5
F241	[Freq. pedestal]	Hz	0.0
F242	[Freq. pedestal hyst.]	Hz	0.0
F250	[DC brake start freq.]	Hz	0.0
F251	[DC braking current]	A	50
F252	[DC braking time]	s	1.0
F256	[Time limit low spd]	s	0.0
F264	[+speed LI resp time]	s	0.1
F265	[+speed freq. step]	Hz	0.1
F266	[- speed LI resp time]	s	0.1
F267	[- speed freq. step]	Hz	0.1
F268	[Init +/- Speed]	Hz	0.0
F269	[Init +/- Speed memo]	–	1
F270	[Jump frequency 1]	Hz	0.0
F271	[Jump bandwidth 1]	Hz	0.0
F272	[Jump frequency 2]	Hz	0.0
F273	[Jump bandwidth 2]	Hz	0.0
F274	[Jump frequency 3]	Hz	0.0
F275	[Jump bandwidth 3]	Hz	0.0
F294	[Forced speed freq.]	Hz	50
F295	[Switch rem/Local]	–	1
F301	[Catch on fly]	–	3
F302	[Supply loss behav.]	–	0
F305	[Overvoltage fault]	–	2
F307	[Mot volt limitation]	–	3
F311	[Motor direction]	–	1
F312	[Noise reduction]	–	0
F316	[Switch. freq. mode]	–	1
F320	[Load gain]	%	0
F323	[Load gain offset]	%	10
F359	[PID ctrl wait time]	s	0
F360	[PID control enable]	–	0
F362	[PID Prop Gain]	–	0.30
F363	[PID Integral Gain]	–	0.20
F366	[PID Derivative Gain]	–	0.00
F400	[Auto-tuning drive]	–	0
F401	[Slip Compensation]	%	50
F418	[Frequency loop gain]	–	40
F419	[Freq. loop stability]	–	20
F470	[VIA bias]	–	128
F471	[VIA gain]	–	148
F472	[VIB bias]	–	128
F473	[VIB gain]	–	148
F482	[In noise Inhibit filter]	µs	442

Parameter	Description	Unit	Default Value
F483	[In noise inhibit gain]	–	100
F484	[Pwr supply adj. gain]	–	0.0
F485	[Stall control coef. 1]	–	100
F492	[Stall control coef. 2]	–	100
F495	[Motor voltage coef.]	%	104
F496	[PWM adj. coef.]	kHz	14.0
F502	[Acc/dec 1 pattern]	–	0
F503	[Acc/dec 2 pattern]	–	0
F504	[Ramp switching]	–	1
F505	[Commut. ramp freq.]	Hz	0.0
F506	[Acc/Dec S-pat start]	%	10
F507	[Acc/Dec S-pat end]	%	10
F602	[Drive fault memory]	–	0
F603	[Ext. fault stop Mode]	–	0
F604	[DC brk time ext flt]	s	1.0
F605	[Output phase loss]	–	3
F607	[Mot overload time]	s	300
F608	[Input phase loss]	–	1
F609	[Underload band]	%	10
F610	[Underload det.]	–	0
F611	[Underload level]	% / A	0
F612	[Underload det. time]	s	0
F613	[Short circuit det.]	–	0
F615	[Overtorque det.]	–	0
F616	[Overtorque level]	%	130
F618	[OvTorque det time]	s	0.5
F619	[Overtorque band]	%	10
F621	[Run time alarm]	h	610.0 (6100 h)
F627	[Undervolt detect.]	–	0
F632	[Mot overload memo]	–	0
F633	[Loss of VIA]	%	0
F634	[Amb. temp. alarm]	–	3
F645	[Mot PTC selection]	–	0
F646	[PTC resistor value]	Ω	3000
F650	[Forced fire control]	–	0
F691	[AO slope]	–	1
F692	[Analog output bias]	%	0
F700	[Parameter lock]	–	0
F701	[Unit value selection]	–	1
F702	[Customized freq val]	–	0
F703	[Frequency convert.]	–	0
F706	[Customize unit bias]	Hz	0.0
F707	[Loc. speed ref. step]	Hz	0.0
F708	[Display ref. resol.]	–	0
F710	[Displayed param.]	–	0
F721	[Loc. mot stop mode]	–	0

Parameter	Description	Unit	Default Value
F730	[Up/down key ref]	–	0
F732	[Loc/rem key]	–	0
F733	[Run/stop key]	–	0
F734	[Priority stop]	–	0
F735	[HMI reset button]	–	1
F738	[Quick menu AUF]	–	0
F748	[Power cons. memo]	–	1
F800	[Mdb RJ45 baud]	–	1
F801	[Mdb RJ45 parity]	–	1
F802	[Modbus address]	–	1
F803	[Com. time out]	s	3
F829	[Network protocol]	–	1
F851	[Com. fault setting]	–	4
F856	[Mot. poles (comm.)]	–	2
F870	[Block write data 1]	–	0
F871	[Block write data 2]	–	0
F875	[Block read data 1]	–	0
F876	[Block read data 2]	–	0
F877	[Block read data 3]	–	0
F878	[Block read data 4]	–	0
F879	[Block read data 5]	–	0
F880	[Free ID parameter]	–	0
F890	[Network adress]	–	(1)
F891	[Network baud rate]	–	(1)
F892	[Network time out]	–	(1)
F893	[Instance number H]	–	(1)
F894	[Instance number L]	–	(1)
F895	[Max master]	–	(1)
F896	[Max info frames]	–	(1)

(1) See table page 167.

Parameter values that vary according to reset type

The table below lists the parameters whose values, after a reset, depend on the reset type ([Parameter reset] (tYP) = 1, [Parameter reset] (tYP) = 2, or [Parameter reset] (tYP) = 3).

To determine the value of a parameter after a reset, locate the parameter in the first column and read across the row to the column that corresponds to the reset type. The number that appears at the intersection of the parameter and the reset type is the parameter's value after a reset of the corresponding type.

Parameters whose values after a reset vary by reset type

Parameter	Description	Unit	Factory Reset tYP = 3	50 Hz Reset tYP = 1	60 Hz Reset tYP = 2
CMOd	[Command mode sel]	–	0	0	0
FMOd	[Frequency mode sel]	–	1	1	1
FH	[Max frequency]	Hz	50	50	60
uL	[Upper limit freq]	Hz	50	50	60
uL	[Motor rated freq.]	Hz	50	50	60
F170	[Mot 2 rated Freq.]	Hz	50	50	60
F204	[VIA freq. point 2]	Hz	50	50	60
F213	[VIB freq. point 2]	Hz	50	50	60
F303	[Number auto reset]	–	0	0	0
F480	[No load cur. coef]	%	100	0	100
F481	[In noise comp. filter]	micro-seconds	0	100	0

Parameter values that vary According to drive rating, but not reset type

The table below lists the parameters whose values, after a reset, depend on the drive model.

To determine the value of a parameter after a reset, locate the drive model number in first column and read across the row to the column that corresponds to the parameter code. The number that appears at the intersection of the model number and the parameter code is the parameter's value after a reset. These values are the same for every reset types ([Parameter reset] (tYP) = 1, [Parameter reset] (tYP) = 2, or [Parameter reset] (tYP) = 3).

Parameters whose values after a reset are drive model dependant but do not vary by reset type

Reference	Parameter									
	ACC	**dEC**	**vLv**	**ub**	**F171**	**F172**	**F300**	**F402**	**F494**	**F626**	**F749**
	s	s	V	%	V	%	kHz	%	-	%	-
ATV212H075M3X	10	10	200	6	200	6	12	5.8	80	140	0
ATV212HU15M3X	10	10	200	6	200	6	12	4.3	70	140	0
ATV212HU22M3X	10	10	200	5	200	5	12	4.1	70	140	0
ATV212HU30M3X	10	10	200	5	200	5	12	3.7	70	140	0
ATV212HU40M3X	10	10	200	5	200	5	12	3.4	70	140	1
ATV212HU55M3X	10	10	200	4	200	4	12	3.0	70	140	1
ATV212HU75M3X	10	10	200	3	200	3	12	2.5	70	140	1
ATV212HD11M3X	10	10	200	2	200	2	12	2.3	60	140	1
ATV212HD15M3X	10	10	200	2	200	2	12	2.0	50	140	1
ATV212HD18M3X	30	30	200	2	200	2	8	2.0	50	140	1
ATV212HD22M3X	30	30	200	2	200	2	8	1.8	50	140	1
ATV212HD30M3X	30	30	200	2	200	2	8	1.8	50	140	1
ATV212H075N4	10	10	400	6	400	6	12	5.8	80	140	0
ATV212HU15N4	10	10	400	6	400	6	12	4.3	70	140	0
ATV212HU22N4	10	10	400	5	400	5	12	4.1	70	140	0
ATV212HU30N4	10	10	400	5	400	5	12	3.7	70	140	0
ATV212HU40N4	10	10	400	5	400	5	12	3.4	70	140	1
ATV212HU55N4	10	10	400	4	400	4	12	2.6	70	140	1
ATV212HU75N4	10	10	400	3	400	3	12	2.3	70	140	1
ATV212HD11N4	10	10	400	2	400	2	12	2.2	60	140	1
ATV212HD15N4	10	10	400	2	400	2	12	1.9	50	140	1
ATV212HD18N4	30	30	400	2	400	2	8	1.9	50	140	1
ATV212HD22N4S	30	30	400	2	400	2	6	1.8	50	140	1
ATV212HD22N4	30	30	400	2	400	2	8	1.8	50	140	1
ATV212HD30N4	30	30	400	2	400	2	8	1.8	50	140	1
ATV212HD37N4	30	30	400	2	400	2	8	1.8	50	140	2
ATV212HD45N4	30	30	400	2	400	2	8	1.7	50	140	2
ATV212HD55N4	30	30	400	2	400	2	8	1.6	40	140	2
ATV212HD75N4	30	30	400	2	400	2	8	1.5	40	140	2

Parameter values that vary According to drive rating and reset type

The table below lists lists the parameters whose values, after a reset, depend on the drive model and the reset type ([Parameter reset] (tYP) = 1, [Parameter reset] (tYP) = 2, or [Parameter reset] (tYP) = 3). To determine the value of a parameter after a reset:

1. Locate the drive model number in the first column.
2. Read across the row to the group of columns that corresponds to the reset type ([Parameter reset] (tYP) = 1, [Parameter reset] (tYP) = 2, or [Parameter reset] (tYP) = 3).
3. Locate the parameter code in the columns corresponding to the reset type.

The number that appears at the intersection of the drive model number and the parameter code is the parameter's value after a reset of the specified type.

Parameters whose values after a reset are drive model and reset type dependant

Reference	Factory reset tYP = 3				50 Hz reset tYP = 1							60 Hz reset tYP = 2						
	tHr	F173	F185	F601	tHr	F173	F185	F415	F416	F417	F601	tHr	F173	F185	F415	F416	F417	F601
	%	%	%	%	%	%	%	A	%	rpm	%	%	%	%	A	%	rpm	%
ATV212H075M3X	100	100	110	110	100	100	110	3.5	64	1400	110	100	100	110	3.0	60	1700	110
ATV212HU15M3X	100	100	110	110	100	100	110	6.1	61	1420	110	100	100	110	5.8	59	1715	110
ATV212HU22M3X	100	100	110	110	100	100	110	8.8	59	1430	110	100	100	110	8.0	61	1715	110
ATV212HU30M3X	100	100	110	110	100	100	110	12.5	63	1420	110	100	100	110	12.4	48	1760	110
ATV212HU40M3X	100	100	110	110	100	100	110	15.8	61	1425	110	100	100	110	15.2	51	1769	110
ATV212HU55M3X	100	100	110	110	100	100	110	20.6	57	1430	110	100	100	110	22.0	53	1780	110
ATV212HU75M3X	100	100	110	110	100	100	110	26.3	54	1450	110	100	100	110	28.0	42	1780	110
ATV212HD11M3X	100	100	110	110	100	100	110	36.9	53	1450	110	100	100	110	36.0	39	1766	110
ATV212HD15M3X	100	100	110	110	100	100	110	49.5	53	1455	110	100	100	110	48.0	36	1771	110
ATV212HD18M3X	100	100	110	110	100	100	110	61.0	53	1455	110	100	100	110	61.0	39	1771	110
ATV212HD22M3X	100	100	110	110	100	100	110	68.0	53	1460	110	100	100	110	68.0	36	1771	110
ATV212HD30M3X	100	100	110	110	100	100	110	93.0	50	1460	110	100	100	110	93.0	33	1771	110
ATV212H075N4	100	100	110	110	100	100	110	2.0	64	1400	110	100	100	110	1.5	60	1720	110
ATV212HU15N4	100	100	110	110	100	100	110	3.5	61	1420	110	100	100	110	2.9	59	1700	110
ATV212HU22N4	100	100	110	110	100	100	110	5.1	59	1430	110	100	100	110	4.0	61	1715	110
ATV212HU30N4	100	100	110	110	100	100	110	7.2	63	1420	110	100	100	110	6.2	48	1715	110
ATV212HU40N4	100	100	110	110	100	100	110	9.1	61	1425	110	100	100	110	7.6	51	1760	110
ATV212HU55N4	100	100	110	110	100	100	110	11.9	57	1430	110	100	100	110	11.0	53	1769	110
ATV212HU75N4	100	100	110	110	100	100	110	15.2	54	1450	110	100	100	110	14.0	42	1780	110
ATV212HD11N4	100	100	110	110	100	100	110	21.3	53	1450	110	100	100	110	21.0	39	1780	110
ATV212HD15N4	100	100	110	110	100	100	110	28.6	53	1455	110	100	100	110	27.0	36	1766	110
ATV212HD18N4	100	100	110	110	100	100	110	35.1	53	1455	110	100	100	110	35.1	39	1771	110
ATV212HD22N4S	100	100	110	110	100	100	110	41.7	53	1460	110	100	100	110	41.7	36	1780	110
ATV212HD22N4	100	100	110	110	100	100	110	41.7	53	1460	110	100	100	110	41.7	36	1771	110
ATV212HD30N4	100	100	110	110	100	100	110	55.0	50	1460	110	100	100	110	55.0	33	1771	110
ATV212HD37N4	100	100	110	110	100	100	110	67	51	1475	110	100	100	110	67	31	1771	110
ATV212HD45N4	100	100	110	110	100	100	110	81	51	1475	110	100	100	110	71	34	1771	110
ATV212HD55N4	100	100	110	110	100	100	110	99	53	1480	110	100	100	110	86	31	1771	110
ATV212HD75N4	100	100	110	110	100	100	110	135	53	1480	110	100	100	110	114	31	1771	110

Parameter values that do not change if reset

The parameters listed in the table below cannot be reset. The table lists the default settings of these parameters.

Parameters whose values do not change if a reset is performed

Parameter	Description	Default Value
FM	[AO scaling]	–
FMSL	[AO funct. selection]	0
F109	[VIA selection]	0
F470	[VIA bias]	128
F471	[VIA gain]	148
F472	[VIB bias]	128
F473	[VIB gain]	148
F880	[Free ID parameter]	0

User Settings Tables

17

Use the Configuration Setting Table to look up parameter default settings, to record customized parameter settings, and to look up sections of the manual, by page number, that contain detailed parameter descriptions.

Configuration Setting Table

Code	Page	Name	Unit	Adjustment Range / Function		Factory Setting	User Setting
FC	77	[Local speed ref.]	Hz	–	[Low limit frequency] (LL) to [Upper limit freq] (UL)	0.0	
AU1	85	[Auto ramp]	-	0	[Disabled]	1	
				1	[Enable]		
				2	[ACC only]		
AU4	63	[Auto set function]	-	0	[Factory set]	0	
				1	[Run permissive]		
				2	[3-wire]		
				3	[+/- Speed]		
				4	[4-20mA speed ref]		
CMOd	77	[Command mode sel]	-	0	[Logic inputs]	0	
				1	[HMI]		
				2	[Communication]		
FMOd	77	[Frequency mode sel]	-	1	[Ref source VIA]	1	
				2	[Ref source VIB]		
				3	[HMI reference]		
				4	[Serial com ref.]		
				5	[+/- Speed]		
FMSL	108	[AO funct. selection]	-	0	[Motor frequency]	0	
				1	[Motor current]		
				2	[Speed ref]		
				3	[DC bus U]		
				4	[Motor U]		
				5	[Input power]		
				6	[Output power]		
				7	[motor torque]		
				8	[Torque I]		
				9	[Motor thermal]		
				10	[Drive thermal]		
				11	[Do not use]		
				12	[Internal reference]		
				13	[VIA]		
				14	[VIB]		
				15	[Fixed 100%]		
				16	[Fixed 50%]		
				17	[Fixed 100%]		
				18	[Com data]		
				19	[Do not use]		
FM	108	[AO scaling]	-	–	–	–	

Code	Page	Name	Unit	Adjustment Range / Function		Factory Setting	User Setting
tYP	62	[Parameter reset]	-	0	[No action]	0	–
				1	[50 Hz reset]		
				2	[60 Hz reset]		
				3	[Factory set]		
				4	[Trip cleared]		
				5	[Cumul time clear]		
				6	[EtYP fault reset]		
				7	[Save parameters]		
				8	[Recall parameters]		
				9	[Elapse time reset]		
Fr	77	[Local mot. direction]	-	0	[Run FW]	0	
				1	[Run rev.]		
				2	[Run FW+rev]		
				3	[Run rev+FW]		
ACC	83	[Acceleration time 1]	s	–	0.0 – 3200	Model depen-dent	
dEC	83	[Deceleration time 1]	s	–	0.0 – 3200	Model depen-dent	
FH	82	[Max frequency]	Hz	–	30.0 – 200.0	80.0	
UL	82	[Upper limit freq]	Hz	–	0.5 – [Max frequency] (FH)	50.0	
LL	82	[Low limit frequency]	Hz	–	0.0 – [Upper limit freq] (UL)	0.0	
uL	70	[Motor rated freq.]	Hz	–	25.0 – 200.00	50.0	
uLu	70	[Motor Rated Voltage]	V	230 V models	50 – 330	230	
				460 V models	50 – 660	400	
Pt	67	[Mot cont. mode sel.]	-	0	[Constant V/Hz]	1	
				1	[Variable Torque]		
				2	[Cst V/Hz+Boost]		
				3	[SVC]		
				4	[Economy]		
				5	[Do not use]		
				6	[Do not use]		
ub	68	[Motor Voltage Boost]	%	–	0.0 – 30.0	Model depen-dent	
tHr	70	[Motor thermal prot.]	%/A	–	10 – 100% of drive's output current rating	100%	
OLn	135	[Motor overload prot]	-	0	[Std mot. protect.]	0	
				1	[Std & stall mot. prot]		
				2	[Self cool]		
				3	[Slf cool stall ov.load]		
				4	[Forced cool prot]		
				5	[Forc cool stall prot]		
				6	[Forced cool]		
				7	[F cool & stall ov load]		
Sr1	112	[Preset speed 1]	Hz	1	[Low limit frequency] (LL) to [Upper limit freq] (UL)	15	
Sr2	112	[Preset speed 2]	Hz	1	[Low limit frequency] (LL) to [Upper limit freq] (UL)	20	
Sr3	112	[Preset speed 3]	Hz	1	[Low limit frequency] (LL) to [Upper limit freq] (UL)	25	
Sr4	112	[Preset speed 4]	Hz	1	[Low limit frequency] (LL) to [Upper limit freq] (UL)	30	
Sr5	112	[Preset speed 5]	Hz	1	[Low limit frequency] (LL) to [Upper limit freq] (UL)	35	
Sr6	112	[Preset speed 6]	Hz	1	[Low limit frequency] (LL) to [Upper limit freq] (UL)	40	
Sr7	112	[Preset speed 7]	Hz	1	[Low limit frequency] (LL) to [Upper limit freq] (UL)	45	
F100	114	[Freq. 1 reached]	Hz	-	0.0 to [Max frequency] (FH)	0.0	
F101	114	[Freq. 2 reached]	Hz	-	0.0 to [Max frequency] (FH)	0.0	
F102	114	[Freq.2 bandw.]	Hz	-	0.0 to [Max frequency] (FH)	2.5	
F108	112	[Logic Funct 1 active]	-	0 – 73	See table on page 91	0	

Code	Page	Name	Unit	Adjustment Range / Function		Factory Setting	User Setting
F109	90	[VIA selection]	-	0	AI	0	
				1	LI sink		
				2	LI source		
F110	112	[Logic Funct 2 active]	-	0 – 73	See table page 162	1	
F111	90	[LI F selection]	-	0 – 72	See table page 162	2	
F112	90	[LI R selection]	-	0 – 72	See table page 162	6	
F113	90	[LI RES selection]	-	0 – 72	See table page 162	10	
F118	90	[VIA LI selection]	-	0 – 73	See table page 162	7	
F130	109	[RY Relay Function 1]	-	0 – 61, 254, 255	See table page 162	4	
F132	109	[FL Relay Function]	-	0 – 61, 254, 255	See table page 162	11	
F137	113	[RY Relay Function 2]	-	0 – 61, 254, 255	See table page 162	255	
F139	113	[RY logic select.]	-	0	Function 1and 2	0	
				1	Function 1 or 2		
F146	109	[RY delay]	s	-	0.0 – 60.0 s	0.0	
F147	110	[FL Relay delay]	s	-	0.0 – 60.0 s	0.0	
F160	106	[VIA rel thresh. logic]	%	-	0 – 100	0	
F161	106	[VIA threshold hyst.]	%	-	0 – 20	3	
F162	106	[VIB rel thresh. logic]	%	-	0 – 100	0	
F163	106	[VIB threshold hyst.]	%	-	0 – 20	3	
F167	115	[Freq band det range]	Hz	-	0.0 to [Max frequency] (FH)	2.5	
F170	74	[Mot 2 rated Freq.]	Hz	-	25.0 to 200.0	50.0	
F171	74	[Motor 2 rated Volt]	V	230V model	50 to 330	230	
				460V model	50 to 660	400	
F172	74	[Motor 2 Volt Boost]	%	-	0 – 30	Model depen-dant	
F173	74	[Motor 2 Overload]	%/A	-	10 – 100% of drive rating	100	
F185	74	[Mot. 2 current limit]	%/A	-	10 – 110%	110	
F200	108	[Auto/man speed ref]	-	0	[Enable]	0	
				1	[Disable]		
F201	106	[VIA ref point 1]	%	-	0 – 100	0	
F202	106	[VIA freq. point 1]	Hz	-	0.0 – 200.0	0.0	
F203	106	[VIA freq. point 2]	%		0 – 100	100	
F204	106	[VIA freq. point 2]	Hz		0.0 – 200.0	50.0	
F207	78	[Remote spd ref 2]	-	1	[VIA]	2	
				2	[VIB]		
				3	[HMI]		
				4	[Communication]		
				5	[+/– Speed]		
F210	106	[VIB ref. point 1]	%		0 – 100	0	
F211	106	[VIB freq. point 1]	Hz		0.0 – 200.0	0.0	
F212	106	[VIB ref. point 2]	%		0 – 100	100	
F213	106	[VIB freq. point 2]	Hz		0.0 – 200.0	50.0	
F240	82	[Mot start freq.]	Hz	-	0.5 – 10.0	0.5	
F241	144	[Freq. pedestal]	Hz	-	0.0 – [Max frequency] (FH)	0.0	
F242	144	[Freq. pedestal hyst.]	Hz	-	0.0 – [Max frequency] (FH)	0.0	
F250	88	[DC brake start freq.]	Hz	-	0.0 – [Max frequency] (FH)	0.0	
F251	88	[DC braking current]	%/A	-	0 – 100%	50	

Code	Page	Name	Unit	Adjustment Range / Function		Factory Setting	User Setting
F252	88	[DC braking time]	s	-	0.0 – 20.0	1.0	
F256	78	[Time limit low spd]	s	0	[Disable]	0.0	
				1	[Enable]		
F264	113	[+speed LI resp time]	s	-	0.0 – 10.0	0.1	
F265	113	[+speed freq. step]	Hz	-	0.0 – [Max frequency] (FH)	0.1	
F266	113	[- speed LI resp time]	s	-	0.0 – 10.0	0.1	
F267	113	[- speed freq. step]	Hz	-	0.0 – [Max frequency] (FH)	0.1	
F268	113	[Init +/- Speed]	Hz	-	0.0 – [Max frequency] (FH)	0.0	
F269	113	[Init +/- Speed memo]	-	0	[Disable]	1	
				1	[Enable]		
F270	87	[Jump frequency 1]	Hz	-	0.0 – [Max frequency] (FH)	0.0	
F271	87	[Jump bandwidth 1]	Hz	-	0.0 – 30.0	0.0	
F272	87	[Jump frequency 2]	Hz	-	0.0 – [Max frequency] (FH)	0.0	
F273	87	[Jump bandwidth 2]	Hz	-	0.0 – 30.0	0.0	
F274	87	[Jump frequency 3]	Hz	-	0.0 – [Max frequency] (FH)	0.0	
F275	87	[Jump bandwidth 3]	Hz	-	0.0 – 30.0	0.0	
F294	79	[Forced speed freq.]	Hz	-	[Low limit frequency] (LL) – [Upper limit freq] (UL)	50.0	
F295	78	[Switch rem/Local]	-	0	[No bumpless]	1	
				1	[Bumpless]		
F300	85	[Switch. freq. level]	kHz	-	6.0 – 16.0	Model depen-dent	
F301	126	[Catch on fly]	-	0	[Disable]	3	
				1	[Brief power loss]		
				2	[Run restored]		
				3	[Power loss, run]		
				4	[Each start]		
F302	127	[Supply loss behav.]	-	0	[Disabled]	0	
				1	[Do not use]		
				2	[Freewheel]		
F303	124	[Number auto reset]	-	0	[Disabled]	3	
				1 - 10	[Number of fault reset attempts]		
F305	128	[Overvoltage fault]	-	0	[Enable]	2	
				1	[Disabled]		
				2	[Quick deceleration]		
				3	[Dyn. deceleration]		
F307	73	[Mot volt limitation]	-	0	[Motor volt limit]	3	
				1	[Line & mot correct.]		
				2	[No action]		
				3	[U Line correction]		
F311	86	[Motor direction]	-	0	[Fw & Rev.]	1	
				1	[Fw only]		
				2	[Rev. only]		
F312	86	[Noise reduction]	-	0	[Disable]	0	
				1	[Enable]		
F316	86	[Switch. freq. mode]	-	0	[Fixed]	1	
				1	[Auto]		
				2	[460 V fixed]		
				3	[460 V Auto]		
F320	146	[Load gain]	%	-	0 – 100%	0	
F323	146	[Load gain offset]	%	-	0 – 100%	10	
F359	111	[PID ctrl wait time]	s	-	0 – 2400	0	
F360	110	[PID control enable]	-	0	[No PID]	0	
				1	[PID by VIA]		
				2	[PID by VIB]		
F362	110	[PID Prop Gain]	-	-	0.01 – 100.0	0.30	
F363	110	[PID Integral Gain]	-	-	0.01 – 100.0	0.20	

Code	Page	Name	Unit	Adjustment Range / Function		Factory Setting	User Setting
F366	111	[PID Derivative Gain]	-	-	0.00 – 2.55	0.00	
F380	111	[PID reverse error]	-	0	[No]	0	
				1	[Yes]		
F391	111	[Stop on LL hyst]	Hz	-	0.0 – [Max frequency] (FH)	0.2	
F392	111	[PID wake up (thres)]	Hz	-	0.0 – [Max frequency] (FH)	0.0	
F393	111	[PID wake up, feedb]	Hz	-	0.0 – [Max frequency] (FH)	0.0	
F400	71	[Auto-tuning drive]	-	0	[Disabled]	0	
				1	[Initialize constant]		
				2	[Complete tune]		
F401	74	[Slip Compensation]	%	-	0 – 150	50	
F402	74	[Auto Torque Boost]	%	-	0.0 – 30.0	Model depen-dent	
F415	70	[Motor rated current]	A	-	0.1 – 200.0	Model depen-dent	
F416	70	[Mot no-load current]	%	-	10.0 – 100.0	Model depen-dent	
F417	70	[Motor rated speed]	rpm	-	100 – 15000	Model depen-dent	
F418	75	[Frequency loop gain]	-	-	1 – 150	40	
F419	75	[Freq. loop stability]	-	-	1 – 100	20	
F470	107	[VIA bias]	-	-	0 – 255	128	
F471	107	[VIA gain]	-	-	0 – 255	148	
F472	107	[VIB bias]	-	-	0 – 255	128	
F473	107	[VIB gain]	-	-	0 – 255	148	
F480	72	[No load cur. coef]	-	-	100 – 130	100	
F481	133	[In noise comp. filter]	µs	-	0 – 9999	0	
F482	133	[In noise Inhibit filter]	µs	-	0 – 9999	442	
F483	133	[In noise inhibit gain]	-	-	0.0 – 300.0	100.0	
F484	133	[Pwr supply adj. gain]	-	-	0.0 to 2.0	0.0	
F485	72	[Stall control coef. 1]	-	-	10 – 250	100	
F492	72	[Stall control coef. 2]	-	-	50 – 150	100	
F494	72	[Mot. adj coefficient]	-	-	DO NOT ADJUST	Model depen-dant	
F495	72	[Motor voltage coef.]	%	-	90 – 120	104	
F496	72	[PWM adj. coef.]	kHz	-	0.1 – 14.0	14.0	
F500	83	[Acceleration time 2]	s	1	0.0 – 3200	20.0	
F501	83	[Deceleration time 2]	s	1	0.0 – 3200	20.0	
F502	84	[Acc/dec 1 pattern]	-	0	[Linear]	0	
				1	[S-ramp 1]		
				2	[S-ramp 2]		
F503	84	[Acc/dec 2 pattern]	-	0	[Linear]	0	
				1	[S-pattern 1]		
				2	[S-pattern 2]		
F504	85	[Ramp switching]	-	1	[Ramp 1]	1	
				2	[Ramp 2]		
F505	85	[Commut. ramp freq.]	Hz	-	0.0 – [Upper limit freq] (UL)	0.0	
F506	84	[Acc/Dec S-pat start]	%	-	0 – 50	10	
F507	84	[Acc/Dec S-pat end]	-	-	0 – 50	10	

Code	Page	Name	Unit	Adjustment Range / Function		Factory Setting	User Setting
F580	117	[Damper fdb type]	-	0	[No feedback]	0	
				1	[LIH set]		
				2	[LIL set]		
				3	[Com. LIH set]		
				4	[Com. LIL set]		
F581	117	[Time open Damper]	-	-	0.05 to 300.00 s	60.00	
F582	117	[Time close Damper]	-	-	0.05 to 300.00 s	60.00	
F583	117	[Damper flt behavior]	-	0	[No fault]	1	
				1	[Freewheel stop]		
				2	[Ramp stop]		
F601	69	[Motor Current Limit]	%/A	-	10 – 110%	110%	
F602	127	[Drive fault memory]	-	0	[Cleared]	0	
				1	[Retained]		
F603	115	[Ext. fault stop Mode]	-	0	[Freewheel]	0	
				1	[Ramp stop]		
				2	[DC braking]		
F604	115	[DC brk time ext flt]	s	-	0.0 – 20.0	1.0	
F605	129	[Output phase loss]	-	0	[Disabled]	3	
				1	[First start]		
				2	[Each start]		
				3	[During run]		
				4	[Permanent]		
				5	[Catch on fly]		
F607	70	[Mot overload time]	s	-	10 – 2400	300	
F608	127	[Input phase loss]	-	0	[Disable]	1	
				1	[Enable]		
F609	130	[Underload band]	%	-	1 – 20	10	
F610	130	[Underload det.]	-	0	[Alarm]	0	
				1	[Fault]		
F611	130	[Underload level]	%/A	-	0 – 100%	0	
F612	130	[Underload det. time]	s	-	0 – 255	0	
F613	131	[Short circuit det.]	-	0	[Each time (std)]	0	
				1	[One time (std)]		
				2	[Each time (short)]		
				3	[One time (short)]		
F615	132	[Overtorque det.]	-	0	[Alarm]	0	
				1	[Fault]		
F616	132	[Overtorque level]	%	-	0 – 250	130	
F618	132	[OvTorque det time]	s	-	0.0 – 10.0	0.5	
F619	132	[Overtorque band]	%	-	0 – 100%	10	
F621	120	[Run time alarm]	h	-	0.0 – 999.9 (0.1 = 1 hour, 100 = 1000 hours)	610.0	
F626	128	[Overvoltage level]	%	1	[100 – 150% of nominal DC bus voltage]	140	
F627	127	[Undervolt detect.]	-	0	[Alarm (0.6U)]	0	
				1	[Fault (0.6U)]		
				2	[Alarm (0.5U)]		
F632	126	[Mot overload memo]	-	0	[Disabled]	0	
				1	[Enabled]		
F633	130	[Loss of VIA]	%	0	[Disabled]	0	
				1??? 100	[Fault detection level]		
F634	133	[Amb. temp. alarm]	-	1	[-10 to 10°C]	3	
				2	[11 to 20°C]		
				3	[21 to 30°C]		
				4	[31 to 40°C]		
				5	[41 to 50°C]		
				6	[51 to 60°C]		

Code	Page	Name	Unit	Adjustment Range / Function		Factory Setting	User Setting
F644	131	[4-20 mA loss]	-	0	[No]	0	
				1	[Freewheel]		
				2	[Set speed]		
				3	[Keep speed]		
				4	[Ramp stop]		
F645	111	[Mot PTC selection]	-	0	[Disabled]	0	
				1	[Enabled fault]		
				2	[Enabled alarm]		
F646	112	[PTC resistor value]	W	-	100 – 9999	3000	
F649	131	[4-20mA fallback sp]	Hz	-	0 – [Max frequency] (FH) Hz	0	
F650	79	[Forced fire control]	-	0	[Disable]	0	
				1	[Enable forward]		
				2	[Enable Reverse]		
F659	79	[Forced fire function]	-	0	[Enable transition ”0->1”]	0	
				1	[Enable level 1]		
				2	[Enable level 0]		
F691	109	[AO slope]	-	0	[Negative slope]	1	
				1	[Positive slope]		
F692	109	[Analog output bias]	%	-	0 – 100%	0	
F694	109	[Freq. for AO = 0V]	Hz	-	0 – [Max frequency] (FH) Hz	0	
F695	109	[Freq. for AO = 10V]	Hz	-	0 – [Max frequency] (FH) Hz	0	
F700	64	[Parameter lock]	-	0	[Unlocked]	0	
				1	[Locked]		
F701	120	[Unit value selection]	-	0	[%]	1	
				1	[Amp or Volt]		
F702	121	[Customized freq val]	-	0	Frequency displayed in Hz	0	
				0.01 – 200.0	Conversion factor		
F703	121	[Frequency convert.]	-	0	[All]	0	
				1	[PID only]		
F705	121	[Custom freq. slope]	-	0	[Negative slope]	1	
				1	[Positive slope]		
F706	121	[Customize unit bias]	Hz	-	0.00 – [Max frequency] (FH)	0.00	
F707	77	[Loc. speed ref. step]	Hz	0	[Disable]	0.00	
				1	[Enable]		
F708	120	[Display ref. resol.]	-	0	Disabled – 0.1 Hz steps	0	
				1 – 255	See formula on page 120		
F710	120	[Displayed param.]	-	0	[Motor frequency]	0	
				1	[Reference]		
				2	[I Mot]		
				3	[Drive rated I]		
				4	[Drive therm state]		
				5	[Motor power]		
				6	[Int speed ref]		
				7	[Com data]		
				8	[Motor speed]		
				9	[Com count]		
				10	[Com count norm st.]		
F721	78	[Loc. mot stop mode]	-	0	[Ramp stop]	0	
				1	[Freewheel]		
F730	80	[Up/down key ref]	-	0	[Enable]	0	
				1	[Disable]		
F732	80	[Loc/rem key]	-	0	[Permitted memo]	0	
				1	[Prohibited]		
				2	[Permitted no memo]		
F733	80	[Run/stop key]	-	0	[Enable]	0	
				1	[Disable]		
F734	80	[Priority stop]	-	0	[Enable]	0	
				1	[Disable]		
F735	80	[HMI reset button]	-	0	[Disable]	1	
				1	[Enable]		

Code	Page	Name	Unit	Adjustment Range / Function		Factory Setting	User Setting
F738	64	[Quick menu AUF]	-	0	[AUF displayed]	0	
				1	[AUF hidden]		
F748	120	[Power cons. memo]	-	0	[Disable]	Model depen-dant	
				1	[Enable]		
F749	121	[Power cons. unit]	kWh	0	[1 kWh]	Model depen-dant	
				1	[0.1 kWh]		
				2	[0.01 kWh]		
				3	[0.001 kWh]		
F800	138	[Mdb RJ45 baud]	-	0	[9600 bps]	1	
				1	[19200 bps]		
F801	138	[Mdb RJ45 parity]	-	0	[No]	1	
				1	[Even]		
				2	[Odd]		
F802	138	[Modbus address]	-	-	0 – 247	1	
F803	139	[Com. time out]	s	0	Communication error detection disabled	3	
				1-100	1 to 100 seconds		
F807	139	[Com channel choice]	-	0	[RJ45]	1	
				1	[Open style]		
F820	139	[Mdb network baud]	-	0	[9600]	1	
				1	[19200]		
F821	139	[Mdb network parity]	s	0	[No]	1	
				1	[Even]		
				2	[Odd]		
F829	139	[Network protocol]	-	1	[Mdb RTU]		
				2	[Metasys N2]		
				3	[Apogee P1]		
				4	[BACnet]		
				5	[LonWorks]		
F851	139	[Com. fault setting]	-	0	[Ramp stp (F/Cmod)]	4	
				1	[No active]		
				2	[Ramp stop]		
				3	[Freewheel]		
				4	[Err5 or Err8]		
F856	140	[Mot. poles (comm.)]	-	1	[2 poles]	2	
				2	[4 poles]		
				3	[6 poles]		
				4	[8 poles]		
				5	[10 poles]		
				6	[12 poles]		
				7	[14 poles]		
				8	[16 poles]		
F870	140	[Block write data 1]	-	0	[No select]	0	
				1	[Command word 1]		
				2	[Command word 2]		
				3	[Frequency Setpoint]		
				4	[Relay command]		
				5	[FM command]		
				6	[Speed Setpoint]		
F871	140	[Block write data 2]	-	0	[No select]	0	
				1	[Command word 1]		
				2	[Command word 2]		
				3	[Frequency Setpoint]		
				4	[Relay command]		
				5	[FM command]		
				6	[Speed Setpoint]		

Code	Page	Name	Unit	Adjustment Range / Function		Factory Setting	User Setting
F875	140	[Block read data 1]	-	0	[No select]	0	
				1	[Command 1]		
				2	[Freq. out]		
				3	[Motor current]		
				4	[Output volt]		
				5	[Alarm info]		
				6	[PID feedback value]		
				7	[Input term. mon]		
				8	[Out term. mon]		
				9	[VIA monitor]		
				10	[VIB monitor]		
				11	[Mot speed mon.]		
F876	140	[Block read data 2]	-	0	[No select]	0	
				1	[Command 1]		
				2	[Freq. out]		
				3	[Motor current]		
				4	[Output volt]		
				5	[Alarm info]		
				6	[PID feedback value]		
				7	[Input term. mon]		
				8	[Out term. mon]		
				9	[VIA monitor]		
				10	[VIB monitor]		
				11	[Mot speed mon.]		
F877	141	[Block read data 3]	-	0	[No select]	0	
				1	[Status info]		
				2	[Freq. out]		
				3	[Motor current]		
				4	[Output volt]		
				5	[Alarm info]		
				6	[PID feedback value]		
				7	[Input term. mon]		
				8	[Out term. mon]		
				9	[VIA monitor]		
				10	[VIB monitor]		
				11	[Mot speed mon.]		
F878	141	[Block read data 4]	-	0	[No select]	0	
				1	[Status info]		
				2	[Freq. out]		
				3	[Motor current]		
				4	[Output volt]		
				5	[Alarm info]		
				6	[PID feedback value]		
				7	[Input term. mon]		
				8	[Out term. mon]		
				9	[VIA monitor]		
				10	[VIB monitor]		
				11	[Mot speed mon.]		
F879	141	[Block read data 5]	-	0	[No select]	0	
				1	[Status info]		
				2	[Freq. out]		
				3	[Motor current]		
				4	[Output volt]		
				5	[Alarm info]		
				6	[PID feedback value]		
				7	[Input term. mon]		
				8	[Out term. mon]		
				9	[VIA monitor]		
				10	[VIB monitor]		
				11	Mot speed mon.		
F880	141	[Free ID parameter]	-	-	0 – 65535	0	
F890	142	[Network adress]	-	-	0 – 65535	(1)	
F891	142	[Network baud rate]	-	-	0 – 65535	(1)	

Code	Page	Name	Unit	Adjustment Range / Function		Factory Setting	User Setting
F892	142	[Network time out]	-	-	20 - 600	(1)	
F893	142	[Instance number H]	-	-	0 – 4194	(1)	
F894	142	[Instance number L]	-	-	0 – 999	(1)	
F895	142	[Max master]	-	-	0 – 127	(1)	
F896	142	[Max info frames]	-	-	0 – 100	(1)	

(1) See table page 142.

Altivar 212

Variable speed drives for asynchronous motors

Installation manual

09/2011

S1A53832

www.schneider-electric.com

All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

Table of content

Safety Information

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER
DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death or serious injury.

WARNING
WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury or equipment damage.

CAUTION
CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

CAUTION
CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result** in equipment damage.

PLEASE NOTE

The word "drive" as used in this manual refers to the controller portion of the adjustable speed drive as defined by NEC.

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this product.

About the book

At a Glance

Document Scope

The purpose of this document is:

- to give you mechanical and electrical information related to the ATV212 drive,
- to show you how to install and wire this drive.

Validity Note

This documentation is valid for the Altivar 212 drive.

Related Documents

Title of Documentation	Reference Number
ATV212 Quick Start	S1A53825
ATV212 Programming manual	S1A53838
ATV212 Modbus manual	S1A53844
ATV212 BACnet manual	S1A53845
ATV212 Metasys N2 manual	S1A53846
ATV212 Apogee FLN P1 manual	S1A53847
ATV212 LONWORKS manual	S1A53848

You can download the latest versions of these technical publications and other technical information from our website at www.schneider-electric.com.

Introduction

1

What's in this Chapter?

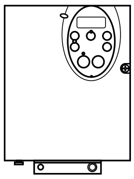
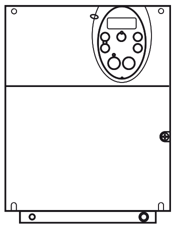
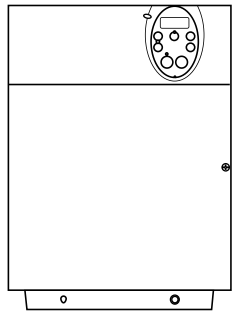
This chapter contains the following topics:

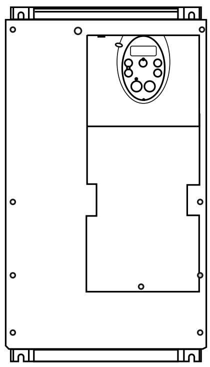
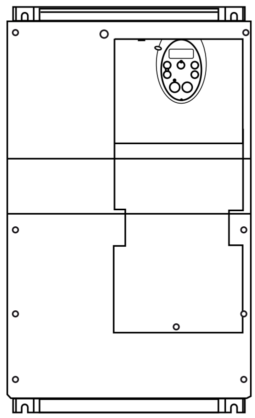
Device overview

The product

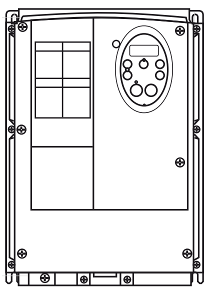
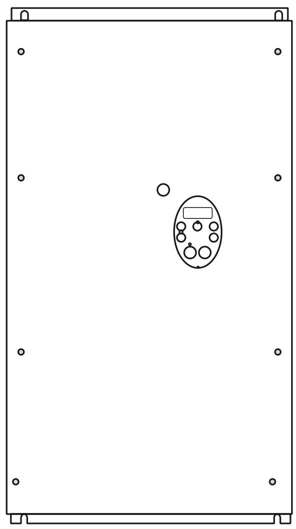
The ATV212 drive is mainly dedicated to HVAC applications in Building sector. The ATV212 drive family consists of five IP21 and two IP55 product sizes

The IP21 «H» range - 5 drive sizes - Three-phase 50/60 Hz supply voltage

ATV212H075M3X, U15M3X, U22M3X, 075N4, U15N4, U22N4, U30M3X, U40M3X, U30N4, U40N4, U55N4	ATV212HU55M3X, U75M3X, U75N4, D11N4	ATV212HD11M3X, D15M3X, D15N4, D18M3X, D18N4, D22N4S
0.75 to 5.5 kW	5.5 to 11 kW	11 to 22 kW
		

ATV212HD22M3X, D22N4, D30N4, D37N4, D45N4	ATV212HD30M3X, D55N4, D75N4
22 to 45 kW	30 to 75 kW
	

The IP55 «W» range - 2 drive sizes - Three-phase 50/60 Hz supply voltage

ATV21W075N4…U22N4, U30N4...U75N4	ATV12WD11N4...D75N4
0.75 to 7.5 kW	11 to 75 kW
	

Reference description

IP21 and IP55 variable speed drives - Three-phase 50/60 Hz supply voltage: 200 ... 240 V and 380 ... 480 V

ATV	212	H	D30	N4	S

Product designation ATV - Altivar

Product range

Degree of protection
H - IP21 product
W - IP55 product

Drive rating
075 - 0.75 kW (1 HP)
U15 - 1.5 kW (2 HP)
U22 - 2.2 kW (3 HP)
U30 - 3 kW
U40 - 4 kW (5 HP)
U55 - 5.5 kW ($7^{1/2}$ HP)
U75 - 7.5 kW (10 HP)
D11 - 11 kW (15 HP)
D15 - 15 kW (20 HP)
D18 - 18.5 kW (25 HP)
D22 - 22 kW (30 HP)
D30 - 30 kW (40 HP)

D37 - 37 kW (50 HP)
D45 - 45 kW (60 HP)
D55 - 55 kW (75 HP)
D75 - 75 kW (100 HP)
380 - 480 V range only

Power supply voltage
M3X : 200 - 240 V range three-phase
N4 : 380 - 480 V range three-phase (With integrated EMC filter C2, C3)
N4C : 380 - 480 V range three-phase (With integrated C1 EMC filter for UL Type 12/IP55 products ATV212W●●●●●●)

Slim version
Available for 22 kW (30 HP) rating, IP21 version

Before you begin

2

What's in this Chapter?

This chapter contains the following topics:

Safety instructions

Read and understand these instructions before performing any procedure with this drive.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Read and understand this manual before installing or operating the drive. Installation, adjustment, repair, and maintenance must be performed by qualified personnel.
- The user is responsible for compliance with all international and national electrical code requirements with respect to grounding of all equipment.
- Many parts of this drive, including the printed circuit boards, operate at the line voltage. DO NOT TOUCH. Use only electrically insulated tools.
- DO NOT touch unshielded components or terminal strip screw connections with voltage present.
- DO NOT short across terminals PA/+ and PC/– or across the DC bus capacitors.
- Before servicing the drive:
  - Disconnect all power, including external control power that may be present.
  - Place a "DO NOT TURN ON" label on all power disconnects.
  - Lock all power disconnects in the open position.
  - WAIT 15 MINUTES to allow the DC bus capacitors to discharge.
  - Measure the voltage of the DC bus between the PA/+ and PC/– terminals to ensure that the voltage is less than 42 Vdc.
  - If the DC bus capacitors do not discharge completely, contact your local Schneider Electric representative. Do not repair or operate the drive.
- Install and close all covers before applying power or starting and stopping the drive.

Failure to follow these instructions will result in death or serious injury.

DANGER

UNINTENDED EQUIPMENT OPERATION

- Read and understand the programming manual before operating the drive.
- Any changes made to the parameter settings must be performed by qualified personnel.

Failure to follow these instructions will result in death or serious injury.

WARNING

LOSS OF CONTROL

- The designer of any wiring scheme must consider the potential failure modes of control channels and, for certain critical control functions, provide a means to achieve a safe state during and after a channel failure. Examples of critical control functions are emergency stop and overtravel stop.
- Separate or redundant control channels must be provided for critical control functions.
- System control channels may include links carried out by the communication. Consideration must be given to the implications of unanticipated transmission delays or failures of the link[1].

Failure to follow these instructions can result in death, serious injury, or equipment damage.

1. For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems."

CAUTION

INCOMPATIBLE LINE VOLTAGE

Before turning on and configuring the drive, ensure that the line voltage is compatible with the supply voltage range shown on the drive nameplate. The drive may be damaged if the line voltage is not compatible.

Failure to follow these instructions can result in injury or equipment damage.

Before removing the drive from its packaging, verify that the carton was not damaged in shipping. Carton damage usually indicates improper handling and the potential for device damage. If any damage is found, notify the carrier and your Schneider Electric representative.

⚠WARNING
DAMAGED PACKAGING
If the packaging appears damaged: - handle with care - check if the product appears damaged
Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠WARNING
DAMAGED DRIVE EQUIPMENT
Do not operate or install any drive or drive accessory that appears damaged.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Storing and shipping

If the drive is not immediately installed, store it in a clean, dry area where the ambient temperature is between –25 and +70 °C (–13 to +158 °F). If the drive has to be shipped to another location, use the original shipping material and carton to help protect the drive.

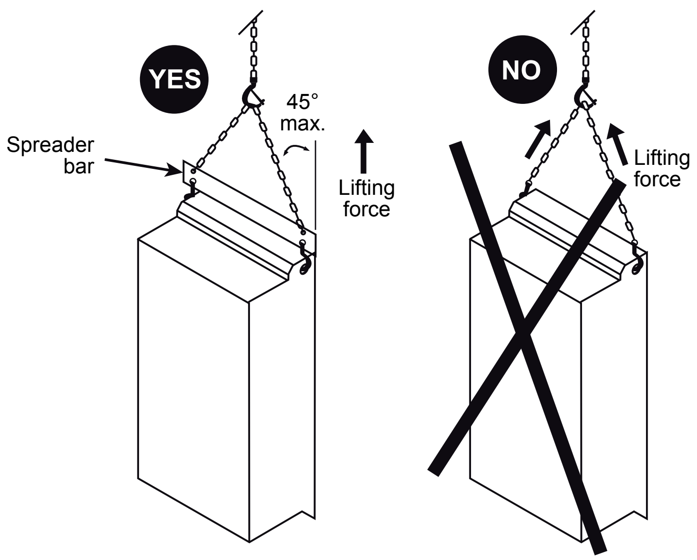
Lifting and handling instructions

⚠WARNING

HANDLING AND LIFTING HAZARD

Keep the area below any equipment being lifted clear of all personnel and property. Use the lifting method illustrated in following figure.

Failure to follow these instructions can result in death, serious injury, or equipment damage.



- Altivar 212 drives up to ATV212HD22N4S and ATV212W075N4 can be removed from their packaging and installed without a handling device.
- A hoist must be used for higher ratings.
- After removing the drive from its packaging, inspect it for damage. If any damage is found, notify the carrier and your sales representative.
- Verify that the drive nameplate and label conform to the packing slip and corresponding purchase order.

⚠WARNING

RISK OF TOPPLING

- Keep the drive on the pallet until ready to install.
- Never place the drive in an upright position without proper support, such as a hoist, braces, or other mounting supports.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

CAUTION

RISK OF DERATED PERFORMANCE DUE TO CAPACITOR AGING

The product capacitor performances after a long time storage above 2 years can be degraded.
In that case, before using the product , apply the following procedure:

- Use a variable AC supply connected between L1 and L2 (even for ATV212●●●N4 references).
- Increase AC supply voltage to have:
  - 25% of rated voltage during 30 min
  - 50% of rated voltage during 30 min
  - 75% of rated voltage during 30 min
  - 100% of rated voltage during 30 min

Failure to follow these instructions can result in equipment damage.

Steps for setting up

3

What's in this Chapter?

This chapter contains the following topics:

Steps for setting up

INSTALLATION

1. Check the delivery of the drive

- ☐ Check that the part number printed on the label is the same as that on the purchase order.
- ☐ Remove the Altivar from its packaging and check that it has not been damaged in transit.

2. Check the line voltage compatibility

- ☐ Check that the voltage range of the drive is compatible with the supply voltage (see page 20).

Steps 1 to 4 must be performed with the **power off**.

3. Mount the drive vertically

- ☐ Mount the drive in accordance with the instructions in this document (see page 25).
- ☐ Install any options required (see option documentation).

4. Wire the drive (see page 38)

- ☐ Connect the line supply and the ground, after making sure that the power is off.
- ☐ Connect the motor, ensuring that its connections correspond to the voltage.
- ☐ Connect the control part.

PROGRAMMING

5. Please refer to the programming manual.

Technical data

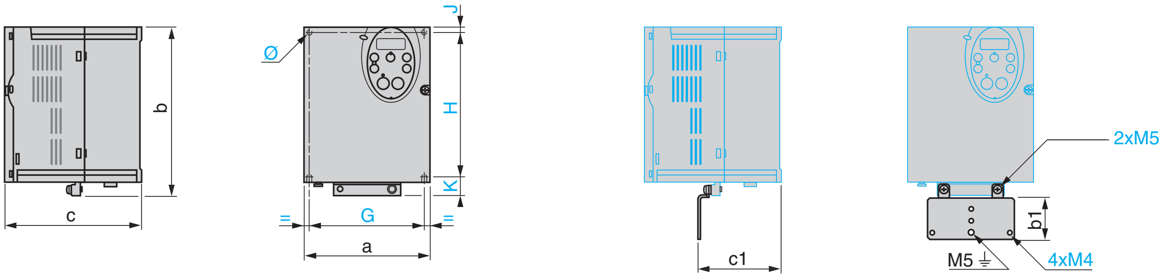
4

What's in this Chapter?

This chapter contains the following topics:

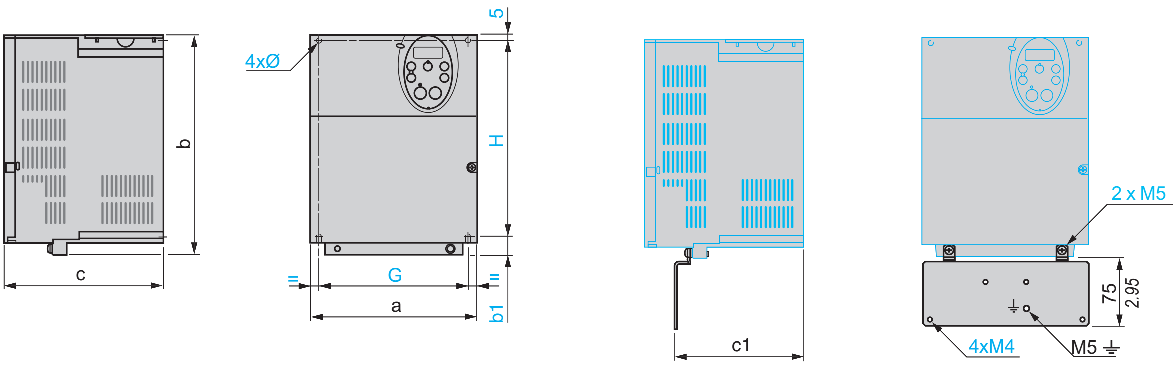
ATV212H dimensions and weights

The figures below shows outline drawings of the ATV212 drives and the tables gives the dimensions and weights of the various models.

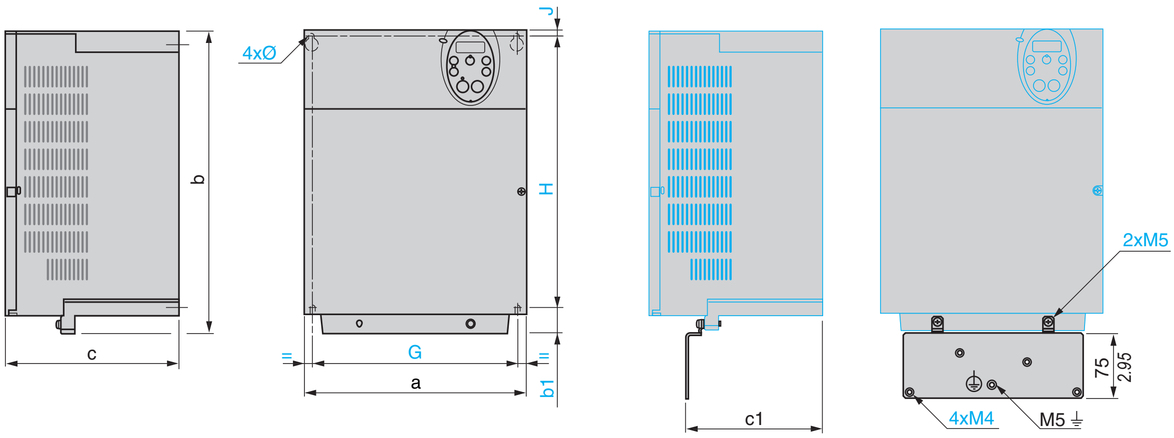


<table>
<tr><th rowspan="2">ATV212H</th><th colspan="10">Dimensions mm (in.)</th><th rowspan="2">Weight kg (lb)</th></tr>
<tr><th>a</th><th>b</th><th>b1</th><th>c</th><th>c1</th><th>G</th><th>H</th><th>K</th><th>J</th><th>Ø</th></tr>
<tr><td>075M3X, U15M3X, U22M3X</td><td rowspan="2">107 (4.2)</td><td rowspan="2">143 (5.6)</td><td rowspan="2">49 (1.93)</td><td rowspan="2">150 (5.9)</td><td rowspan="2">67.3 (2.65)</td><td rowspan="2">93 (3.6)</td><td rowspan="2">121.5 (4.7)</td><td rowspan="2">16.5 (0.65)</td><td rowspan="2">5 (0.20)</td><td rowspan="2">5 (0.20)</td><td>1.80 (3.978)</td></tr>
<tr><td>075N4, U15N4, U22N4</td><td>2.00 (4.42)</td></tr>
<tr><td>U30M3X, U40M3X</td><td rowspan="2">142 (5.6)</td><td rowspan="2">184 (7.2)</td><td rowspan="2">48 (1.8)</td><td rowspan="2">150 (5.9)</td><td rowspan="2">88.8 (3.50)</td><td rowspan="2">126 (4.9)</td><td rowspan="2">157 (6.1)</td><td rowspan="2">20.5 (0.8)</td><td rowspan="2">6.5 (0.26)</td><td rowspan="2">5 (0.20)</td><td>3.05 (6.741)</td></tr>
<tr><td>U30N4, U40N4, U55N4</td><td>3.35 (7.404)</td></tr>
</table>

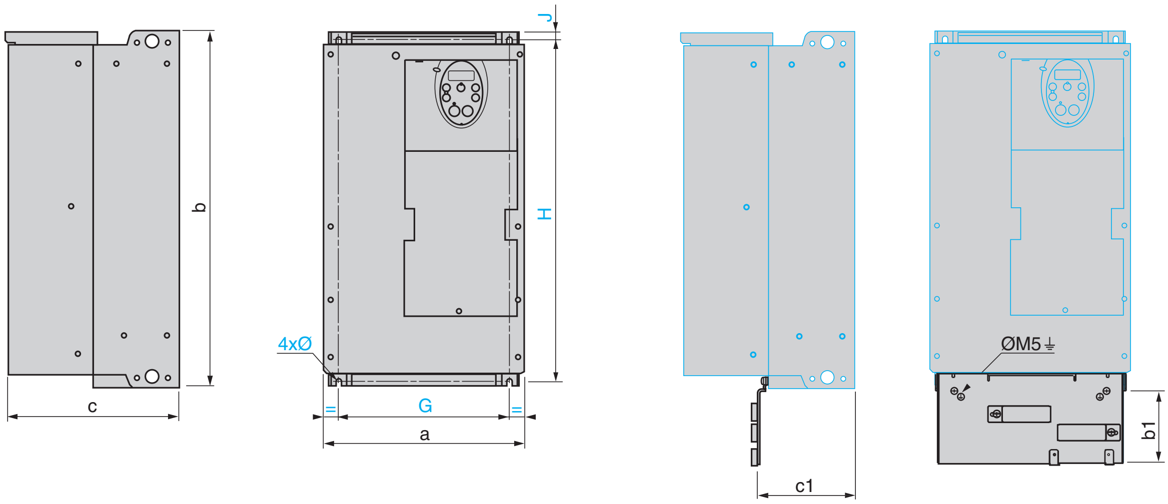
ATV212HU55M3X, U75M3X, HU75N4, HD11N4



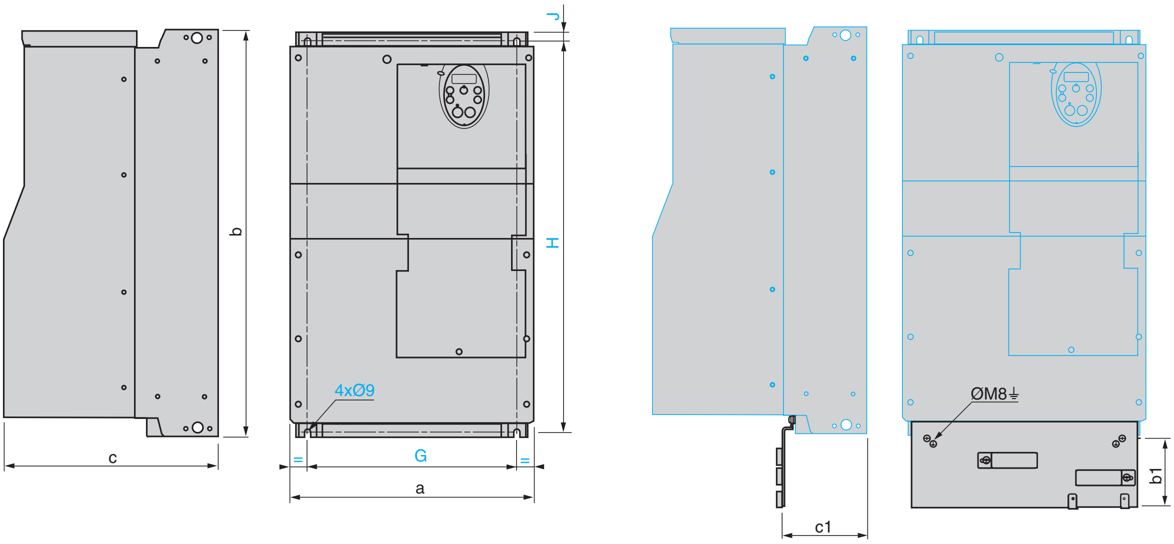
ATV212HD11M3X, D15M3X, HD15N4, HD18N4, HD22N4S



<table>
<tr><th rowspan="2">ATV212H</th><th colspan="9">Dimensions mm (in.)</th><th rowspan="2">Weight kg (lb)</th></tr>
<tr><th>a</th><th>b</th><th>b1</th><th>c</th><th>c1</th><th>G</th><th>H</th><th>J</th><th>Ø</th></tr>
<tr><td>U55M3X, U75M3X,
U75N4, D11N4</td><td>180 (7)</td><td>232 (9.1)</td><td>17 (0.67)</td><td>170 (6.7)</td><td>134.8 (5.31)</td><td>160 (6.3)</td><td>210 (8.2)</td><td>5 (0.20)</td><td>5 (0.20)</td><td>6.10 (13.481)</td></tr>
<tr><td>D11M3X, D15M3X
D15N4, D18N4, D18M3X, D22N4S</td><td>245 (9.6)</td><td>329.5 (12.97)</td><td>27.5 (1.08)</td><td>190 (7.5)</td><td>147.6 (5.81)</td><td>225 (8.8)</td><td>295 (11.6)</td><td>7 (0.28)</td><td>6 (0.24)</td><td>11.50 (25.4)</td></tr>
</table>

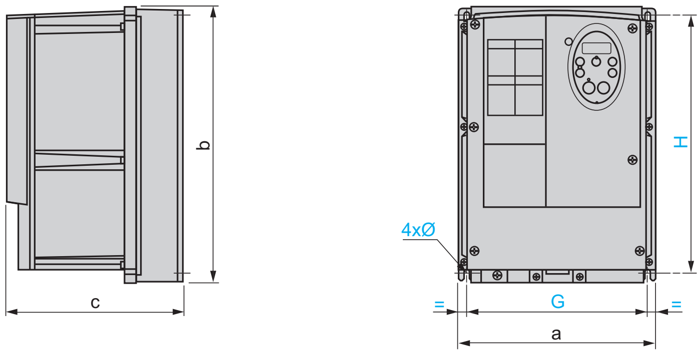


ATV212H	Dimensions mm (in.)									Weight kg (lb)
	a	b	b1	c	c1	G	H	J	Ø	
D22M3X	240 (9.4)	420 (16.5)	122 (4.8)	214 (8.4)	120 (4.72)	206 (8.1)	403 (15.8)	10 (0.39)	6 (0.24)	27.40 (60.554)
D22N4, D30N4										26.40 (58.344)
D37N4, D45N4	240 (9.4)	550 (21.65)	113 (4.45)	244 (9.61)	127 (5.0)	206 (8.1)	529 (20.83)	10 (0.39)	6 (0.24)	23.50 (51.81)

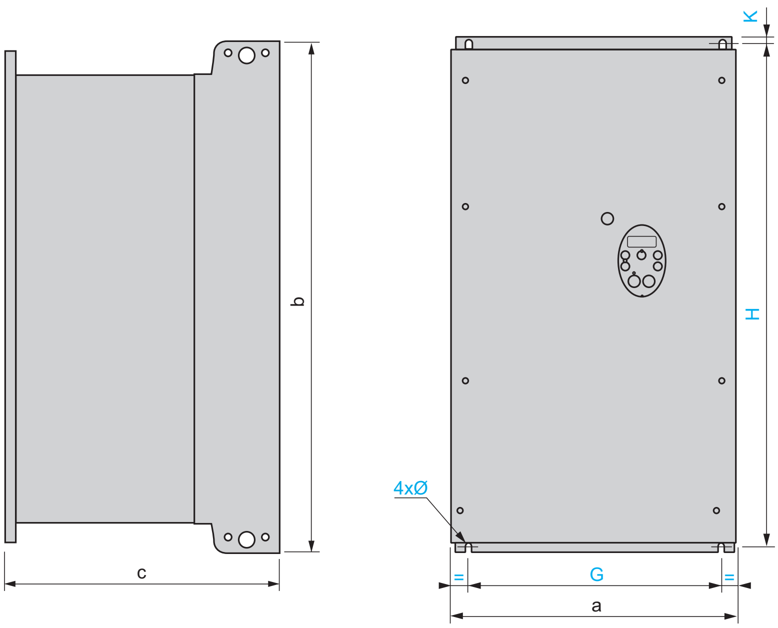


ATV212H	Dimensions mm (in.)									Weight kg (lb)
	a	b	b1	c	c1	G	H	J	Ø	
D30M3X	320 (12.5)	630 (24.8)	118 (4.65)	290 (11.4)	173 (6.81)	280 (11)	604.5 (23.8)	10 (0.39)	9 (0.35)	38.650 (85.42)
D55N4, D75N4	320 (12.5)	630 (24.8)	118 (4.65)	290 (11.4)	173 (6.81)	280 (11)	604.5 (23.8)	10 (0.39)	9 (0.35)	39.70 (87.74

ATV212W dimensions and weights



ATV212W	Dimensions mm (in.)						Weight kg (lb)
	a	b	c	G	H	Ø	
075N4…U22N4	215 (8.5)	297 (11.7)	192 (7.6)	197 (7.8)	277 (10.9)	5.5 (0.2)	7.00 (15.43)
075N4C…U22N4C							7.50 (16.53)
U30N4…U55N4	230 (9.1)	340 (13.4)	208 (8.2)	212 (8.3)	318 (12.5)		9.65 (21.27)
U75N4							10.95 (24.14)
U30N4C…U55N4C							10.55 (23.53)
U75N4C							11.85 (26.13)



ATV212W	Dimensions mm (in.)							Weight kg (lb)
	a	b	c	G	H	K	Ø	
D11N4, D15N4,	290 (11.41)	560 (22.05)	315 (12.40)	250 (9.84)	544 (21.42)	8 (0.3)	6 (0.24)	30.3 (66.78)
D11N4C, D15N4C								36.5 (80.45)
D18N4,	310 (12.20)	665 (26.18)	315 (12.40)	270 (10.62)	650 (25.59)	10 (0.4)	6 (0.24)	374 (82.43)
D18N4C								45 (99.18)
D22N4, D30N4,	284 (11.18)	720 (28.35)	315 (12.40)	245 (9.64)	700 (27.56)	10 (0.4)	7 (0.27)	49.5 (109.10)
D22N4C, D30N4C								58.5 (128.93)
D37N4, D45N4	284 (11.18)	880 (34.34)	343 (13.50)	245 (9.64)	860 (33.86)	10 (0.4)	7 (0.27)	57.4 (126.5)
D37N4C, D45N4C								77.4 (171)
D55N4, D75N4,	362 (14.25)	1000 (39.37)	364 (14.33)	300 (11.81)	975 (38.39)	10 (0.4)	9 (0.35)	61.9 (136.5)
D55N4C, D75N4C								88.4 (195)

Electrical data

ATV212H●●●●●● - Three-phase supply voltage: 200 ... 240 V 50/60 Hz

Motor		Line supply (input)					Drive (output)		Reference (5)
Power indicated on plate (1)		Max. line current (2)		Apparent power	Max. prospective line Isc (3)	Power dissipated at nominal current	Nominal current (1)	Max. transient current (1) (4)	
		at 200 V	at 240 V	at 240 V					
kW	HP	A	A	kVA	kA	W	A	A	
0.75	1	3.3	2.7	1.1	5	63	4.6	5.1	ATV212H075M3X
1.5	2	6.1	5.1	2.1	5	101	7.5	8.3	ATV212HU15M3X
2.2	3	8.7	7.3	3.0	5	120	10.6	11.7	ATV212HU22M3X
3	—	—	10.0	4.2	5	146	13.7	15.1	ATV212HU30M3X
4	5	14.6	13.0	5.4	5	193	18.7	19.3	ATV212HU40M3X
5.5	7.5	20.8	17.3	7.2	22	249	24.2	26.6	ATV212HU55M3X
7.5	10	27.9	23.3	9.7	22	346	32.0	35.2	ATV212HU75M3X
11	15	42.1	34.4	14.3	22	459	46.2	50.8	ATV212HD11M3X
15	20	56.1	45.5	18.9	22	629	61.0	67.1	ATV212HD15M3X
18.5	25	67.3	55.8	23.2	22	698	74.8	82.3	ATV212HD18M3X
22	30	80.4	66.4	27.6	22	763	88.0	96.8	ATV212HD22M3X
30	40	113.3	89.5	37.2	22	1085	117.0	128.7	ATV212HD30M3X

ATV212H●●●●●● - Three-phase supply voltage: 380 ... 480 V 50/60 Hz

Drives with an integrated EMC filter, category C2, C3

Motor		Line supply (input)					Drive (output)		Reference (5)
Power indicated on plate (1)		Max. line current (2)		Apparent power	Max. prospective line Isc (3)	Power dissipated at nominal current	Nominal current (1)	Max. transient current (1) (4)	
		at 380 V	at 480 V	at 380 V					
kW	HP	A	A	kVA	kA	W	A	A	
0.75	1	1.7	1.4	1.1	5	55	2.2	2.4	ATV212H075N4
1.5	2	3.2	2.5	2.1	5	78	3.7	4.0	ATV212HU15N4
2.2	3	4.6	3.6	3.0	5	103	5.1	5.6	ATV212HU22N4
3	—	6.2	4.9	4.1	5	137	7.2	7.9	ATV212HU30N4
4	5	8.1	6.4	5.3	5	176	9.1	10.0	ATV212HU40N4
5.5	7.5	10.9	8.6	7.2	22	215	12.0	13.2	ATV212HU55N4
7.5	10	14.7	11.7	9.7	22	291	16.0	17.6	ATV212HU75N4
11	15	21.1	16.8	13.9	22	430	22.5	24.8	ATV212HD11N4
15	20	28.5	22.8	18.7	22	625	30.5	33.6	ATV212HD15N4
18.5	25	34.8	27.8	22.9	22	603	37.0	40.7	ATV212HD18N4
22	30	41.1	32.8	27	22	723	43.5	47.9	ATV212HD22N4S
22	30	41.6	33.1	27.3	22	626	43.5	47.9	ATV212HD22N4
30	40	56.7	44.7	37.3	22	847	58.5	64.4	ATV212HD30N4
37	50	68.9	54.4	45.3	22	976	79	86.9	ATV212HD37N4
45	60	83.8	65.9	55.2	22	1253	94	103.4	ATV212HD45N4
55	75	102.7	89	67.6	22	1455	116	127.6	ATV212HD55N4
75	100	141.8	111.3	93.3	22	1945	160	176	ATV212HD75N4

(1) These values are given for a nominal switching frequency of 12 kHz up to ATV212HD15M3X and up to ATV212HD15N4 or 8 kHz for ATV212HD18M3X…HD30M3X and ATV212HD18N4…HD75N4 drives, 6 kHz for ATV212HD22N4S, for use in continuous operation at 40°C (104 °F) ambient.
The switching frequency can be set between 6 and 16 kHz for all ratings.
Above 8 kHz or 12 kHz, depending on the rating, the drive will reduce the switching frequency automatically in the event of an excessive temperature rise. For continuous operation above the nominal switching frequency, derate the nominal drive current. See page 26 for derating curves as a function of switching frequency, ambient temperature, and mounting conditions.

(2) Current on a line supply with the "Input withstand rating", see QuickStart guide.

(3) Current on a line supply with the indicated short-circuit current rating.

(4) The drive is designed to run up to 60 seconds at this level.

(5) See reference description on page 8.

ATV212W●●●●● - Three-phase supply voltage: 380 ... 480 V 50/60 Hz
Drives with an integrated EMC filter, category C2, C3

Motor		Line supply (input)				Drive (output)		Reference (5)
Power indicated on plate (1)		Max. line current (2)		Apparent power	Max. prospective line Isc (3)	Nominal current (1)	Max. transient current (1) (4)	
		at 380 V	at 480 V	at 380 V				
kW	HP	A	A	kVA	kA	A	A	
0.75	1	1.7	1.4	1.1	5	2.2	2.4	ATV212W075N4
1.5	2	3.2	2.5	2.1	5	3.7	4	ATV212WU15N4
2.2	3	4.6	3.6	3	5	5.1	5.6	ATV212WU22N4
3	—	6.2	4.9	4.1	5	7.2	7.9	ATV212WU30N4
4	5	8.1	6.4	5.3	5	9.1	10	ATV212WU40N4
5.5	7.5	10.9	8.6	7.2	22	12	13.2	ATV212WU55N4
7.5	10	14.7	11.7	9.7	22	16	17.6	ATV212WU75N4
11	15	21.2	16.9	14	22	22.5	24.8	ATV212WD11N4
15	20	28.4	22.6	18.7	22	30.5	33.6	ATV212WD15N4
18.5	25	34.9	27.8	23	22	37	40.7	ATV212WD18N4
22	30	41.6	33.1	27.3	22	43.5	47.9	ATV212WD22N4
30	40	56.7	44.7	37.3	22	58.5	64.4	ATV212WD30N4
37	50	68.9	54.4	45.3	22	79	86.9	ATV212WD37N4
45	60	83.8	65.9	55.2	22	94	103.4	ATV212WD45N4
55	75	102.7	89	67.6	22	116	127.6	ATV212WD55N4
75	100	141.8	111.3	93.3	22	160	176	ATV212WD75N4

ATV212W●●●●● - Three-phase supply voltage: 380 ... 480 V 50/60 Hz
Drives with an integrated C1 EMC filter

Motor		Line supply (input)				Drive (output)		Reference (5)
Power indicated on plate (1)		Max. line current (2)		Apparent power	Max. prospective line Isc (3)	Nominal current (1)	Max. transient current (1) (4)	
		at 380 V	at 480 V	at 380 V				
kW	HP	A	A	kVA	A	A	A	
0.75	1	1.7	1.4	1.1	5	2.2	2.4	ATV212W075N4C
1.5	2	3.2	2.6	2.1	5	3.7	4	ATV212WU15N4C
2.2	3	4.6	3.7	3	5	5.1	5.6	ATV212WU22N4C
3	—	6.2	5	4.1	5	7.2	7.9	ATV212WU30N4C
4	5	8.2	6.5	5.4	5	9.1	10	ATV212WU40N4C
5.5	7.5	11	8.7	7.2	22	12	13.2	ATV212WU55N4C
7.5	10	14.7	11.7	9.7	22	16	17.6	ATV212WU75N4C
11	15	21.1	16.7	13.9	22	22.5	24.8	ATV212WD11N4C
15	20	28.4	22.8	18.7	22	30.5	33.6	ATV212WD15N4C
18.5	25	34.5	27.6	22.7	22	37	40.7	ATV212WD18N4C
22	30	41.1	33.1	27.1	22	43.5	47.9	ATV212WD22N4C
30	40	58.2	44.4	38.3	22	58.5	64.4	ATV212WD30N4C
37	50	68.9	54.4	45.3	22	79	86.9	ATV212WD37N4C
45	60	83.8	65.9	55.2	22	94	103.4	ATV212WD45N4C
55	75	102.7	89	67.6	22	116	127.6	ATV212WD55N4C
75	100	141.8	111.3	93.3	22	160	176	ATV212WD75N4C

(1) These values are given for a nominal switching frequency of 12 kHz up to ATV212WD15M3X and up to ATV212HD15N4 or 8 kHz for ATV212WD18M3X…HD30M3X and ATV212WD18N4…HD75N4 drives, for use in continuous operation at 40°C (104 °F) ambient.
Above 8 kHz or 12 kHz, depending on the rating, the drive will reduce the switching frequency automatically in the event of an excessive temperature rise. For continuous operation above the nominal switching frequency, derate the nominal drive current. See page 26 for derating curves as a function of switching frequency, ambient temperature, and mounting conditions

(2) Current on a line supply with the "Input withstand rating", see page QuickStart guide.

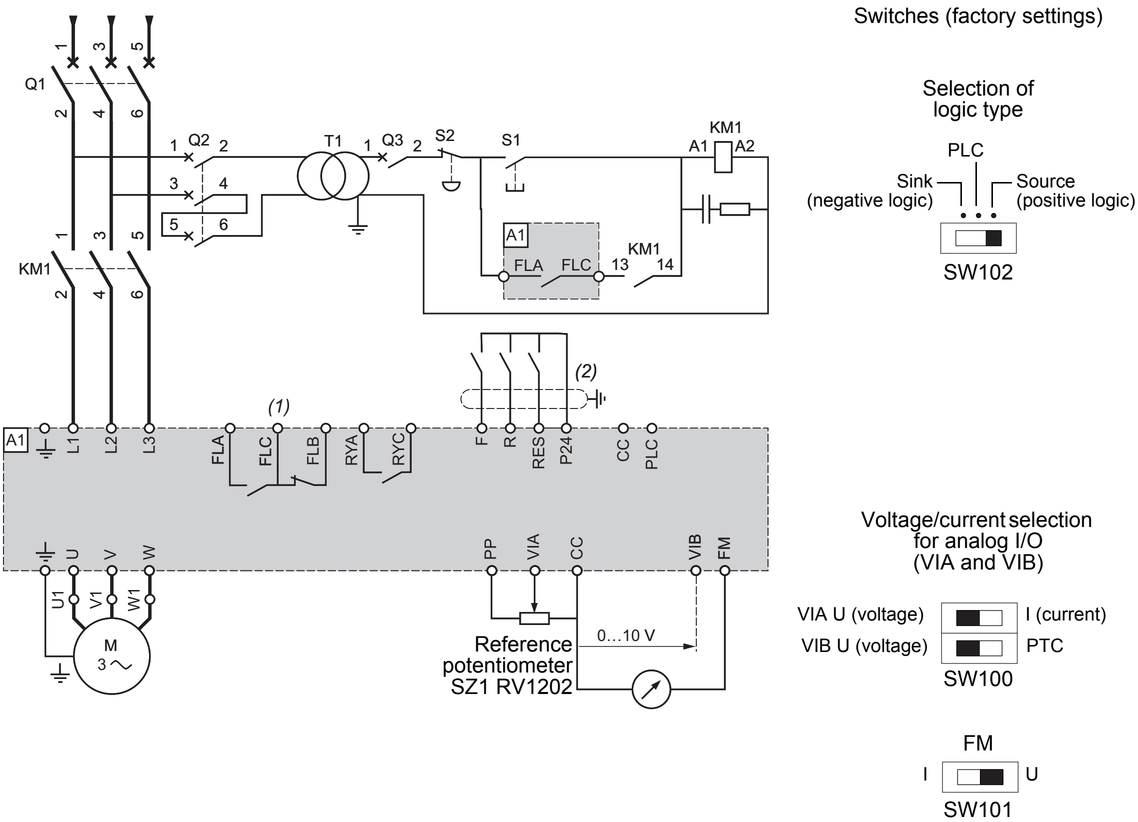
(3) Current on a line supply with the indicated short-circuit current rating.

(4) **Note:** The drive is designed to run up to 60 seconds at this level.

(5) See reference description on page 8.

Connection diagrams

Recommended diagram for ATV212H●●●M3X, ATV212●●●●N4, ATV212W●●●N4C



(1) Fault relay contacts. Used for remote signaling of the drive status.

(2) Connection of the common for the logic inputs depends on the position of the switch (Source, PLC, Sink); see page 45.

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

- Modify only the setting of switches when the product is switched off.
- Do not change the setting of switch SW102 unless your system is wired for sink logic.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

RISK OF BODY INJURY

use a screw driver to change the position of the switches.

Failure to follow these instructions can result in injury or equipment damage.

Note: All terminals are located at the bottom of the drive. Install interference suppressors on all inductive circuits near the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.

Examples of recommended circuit diagrams

Logic input switch

The logic input switch SW102 assigns the logic input type to either 24 V (source logic) or 0 V (sink logic).

⚠ DANGER

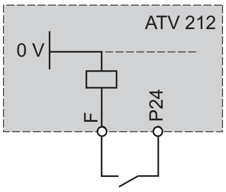
UNINTENDED EQUIPMENT OPERATION

- Prevent accidental grounding of logic inputs configured for sink logic. Accidental grounding can result in unintended activation of drive functions.
- Protect the signal conductors against damage that could result in unintentional conductor grounding.
- Follow NFPA 79 and EN 60204 guidelines for proper control circuit grounding practices.

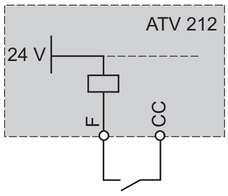
Failure to follow these instructions will result in death or serious injury.

Logic inputs according to the position of the logic type switch

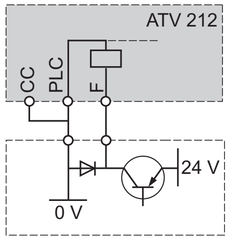
"Source" position



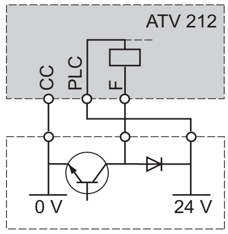
"Sink" position



"PLC" position with PLC transistor outputs

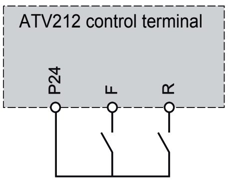


PLC



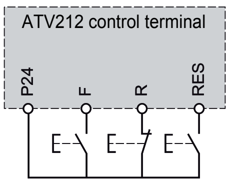
PLC

2-wire control



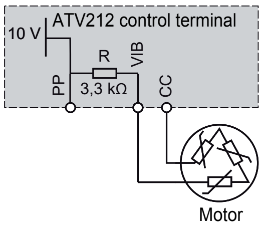
F: Forward
R: Preset speed

3-wire control



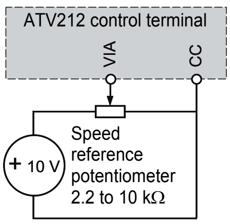
F: Forward
R: Stop
RES: Reverse

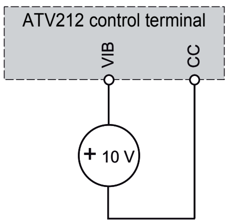
PTC probe



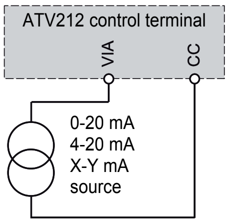
Analog inputs

Voltage analog inputs
External + 10 V

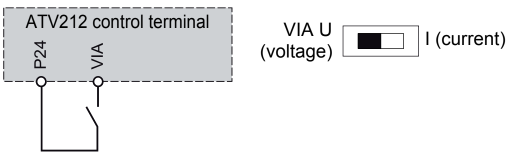




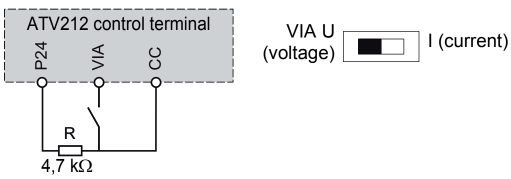
Voltage analog inputs
0-20 mA, 4-20 mA, X-Y mA



Voltage analog inputs
Positive logic («Source» position)



Negative logic («Sink» position)



Installation

5

What's in this Chapter?

This chapter contains the following topics:

Drive mounting generalities

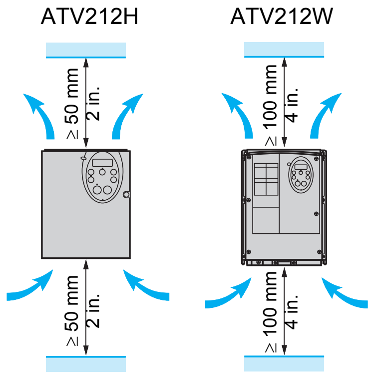
CAUTION

RISK OF DAMAGE TO THE DRIVE

Follow mounting recommendations described in this document.

Failure to follow these instructions can result in equipment damage.

Mounting and temperature conditions



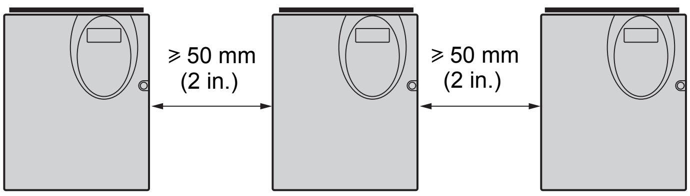
Depending on the conditions in which the drive is to be used, its installation will require certain precautions and the use of appropriate accessories.

- Install the drive vertically, at ± 10°.
- Fix it on the mounting surface using M5 screws with captive washer.
- Do not place it close to heating elements.
- Leave sufficient free space so that the air required for cooling purposes can circulate from the bottom to the top of the drive.
- Free space in front of the drive: 10 mm (0.39 in.) minimum.

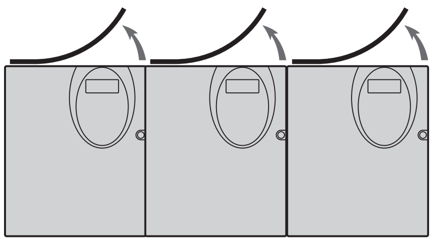
The use of washers is recommended with all mounting screws.

Mounting methods

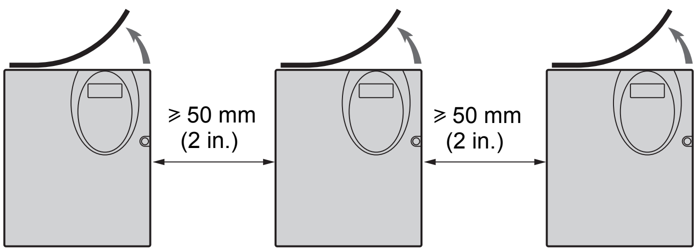
Type A mounting - ATV212H●●●M3X, ATV212H●●●N4● and ATV212W●●●N4, ATV212W●●●N4C
Free space ⩾ 50 mm (2 in.) on each side, with the protective cover in place.



Type B mounting - ATV212H●●●M3X, ATV212H●●●N4●
Drives mounted side-by-side, with the protective cover removed
(degree of protection becomes open type IP20).



Type C mounting - ATV212H●●●M3X, ATV212H●●●N4●
Free space ⩾ 50 mm (2 in.) on each side, with the protective cover removed
(degree of protection becomes open type IP20).



These mounting types are possible without derating up to 40°C (104 °F) at the factory-set switching frequency.
For other ambient temperatures and switching frequencies, see derating curves page 26.

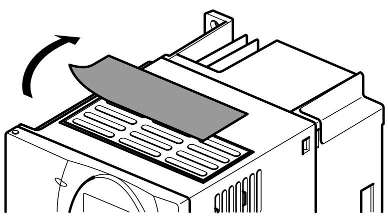
Removing the protective cover on ATV212H drives

See Mounting methods, page 25 to determine the type of mounting appropriate for your application before removing the protective cover from the drive.

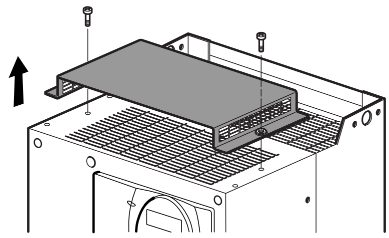
When IP20 protection is adequate, remove the protective cover on top of the drive as shown below.

For UL Type 1 protection, leave the protective cover on top of the drive and install a conduit entry kit (mounting outside the enclosure). See entry kit references in the catalog on www.schneider-electric.com.

ATV212H 075M3X to D18M3X, and ATV212H 075N4 to D22N4S



ATV212H D22M3X to D30M3X and ATV212H D22N4 to D30N4



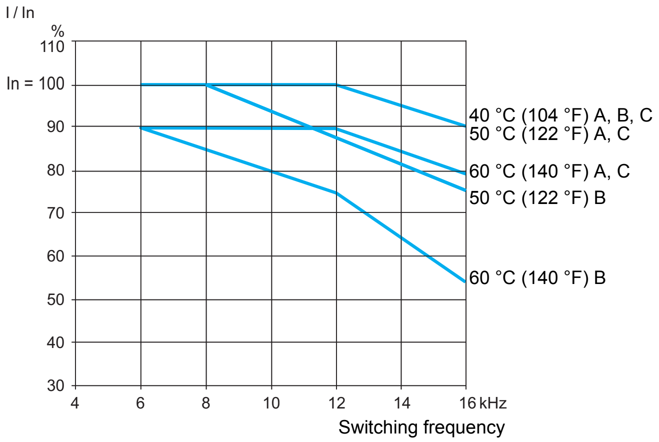
Derating curves

The curves illustrate the drive nominal current derating percentage (I/In%) as a function of the temperature, switching frequency, and the different types of mounting (A, B and C).

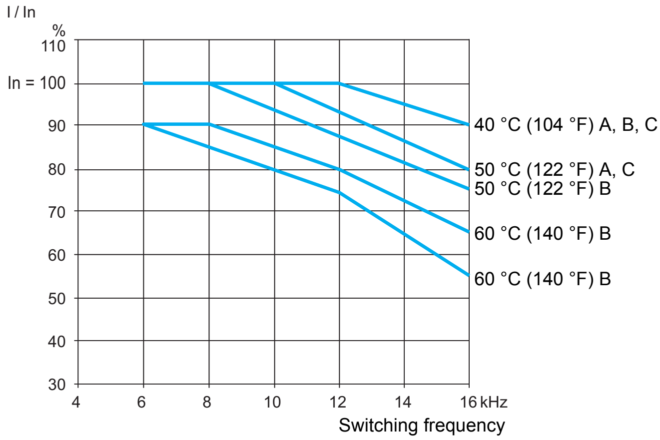
For example, 80% derating of a 20 hp, 460 V ATV212 drive nominally rated for 30.5 amperes continuously: 30.5 x 0.8 = 24.4 (15 hp).

For intermediate temperatures, interpolate between two curves.

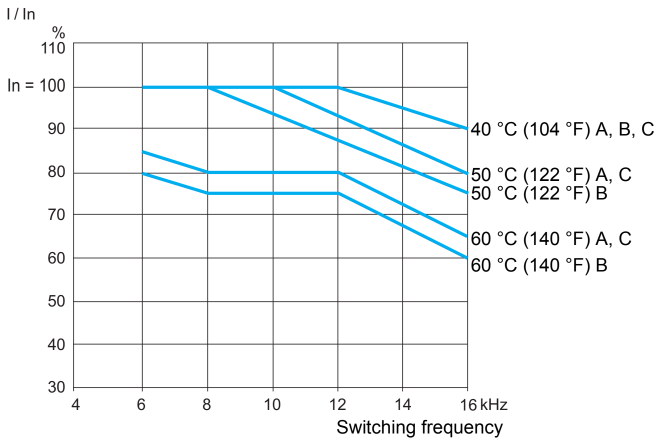
ATV212H075M3X



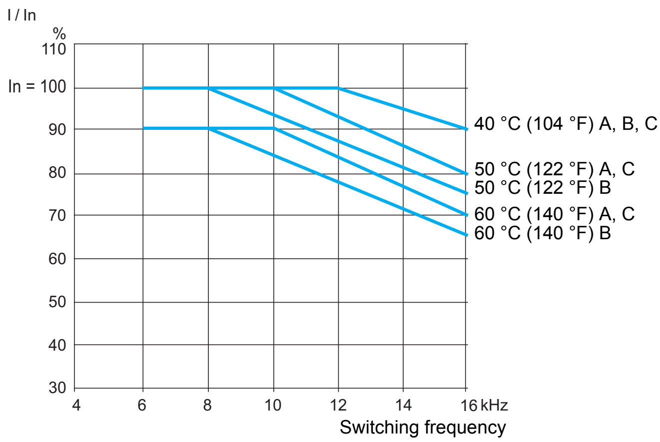
ATV212HU15M3X



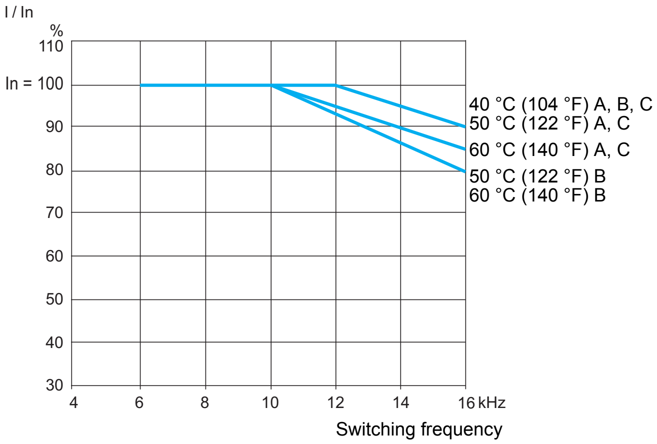
ATV212HU22M3X



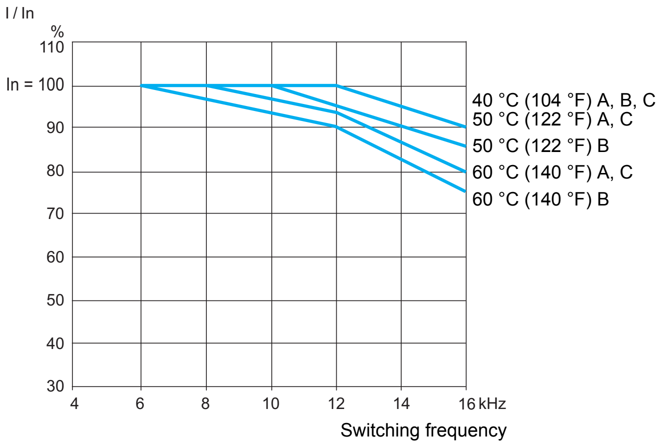
ATV212HU30M3X, HU40M3X



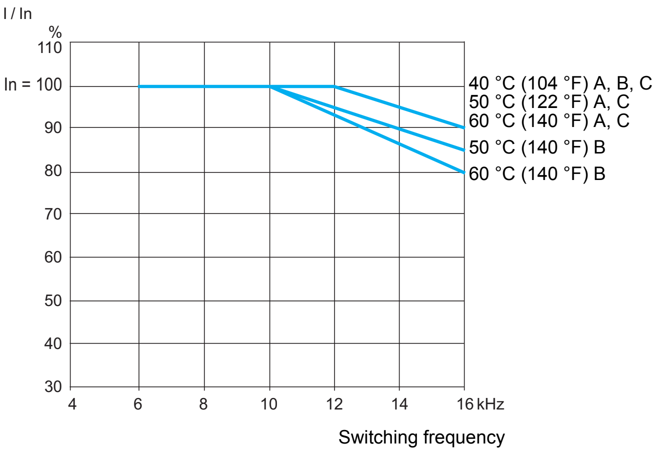
ATV212HU55M3X



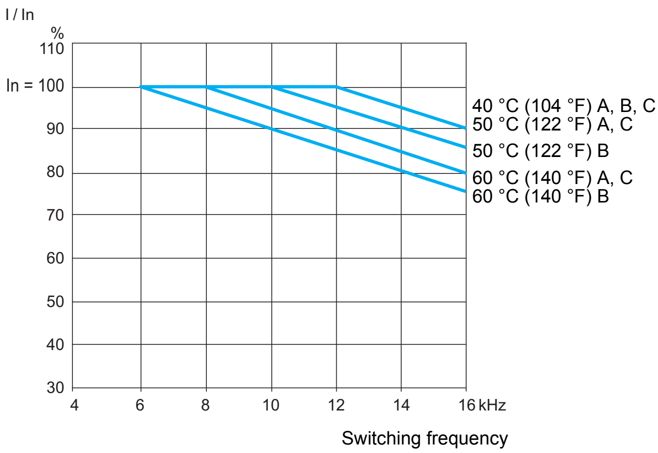
ATV212HU75M3X



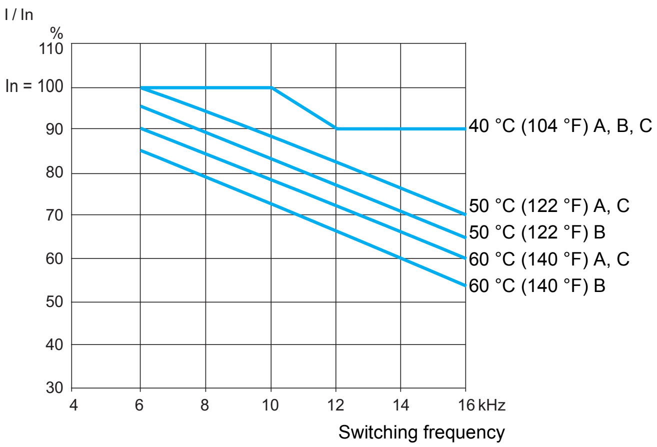
ATV212HD11M3X



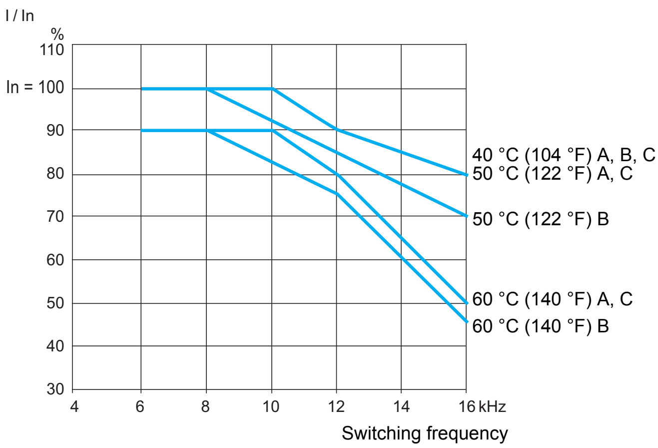
ATV212HD15M3X



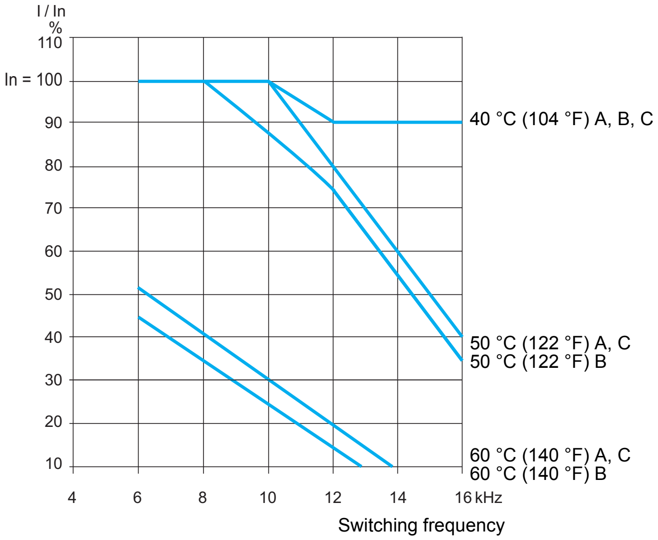
ATV212HD18M3X



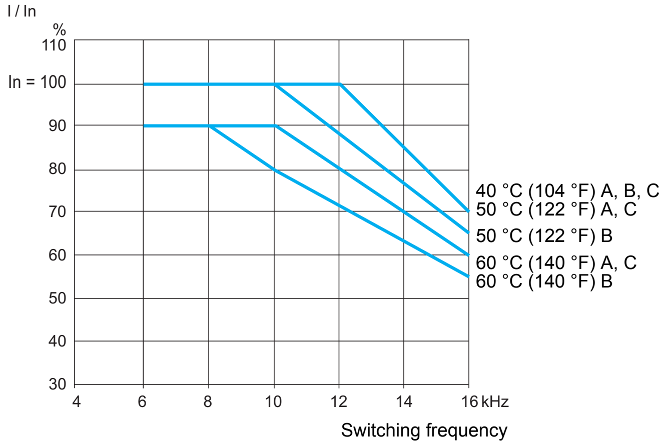
ATV212HD22M3X



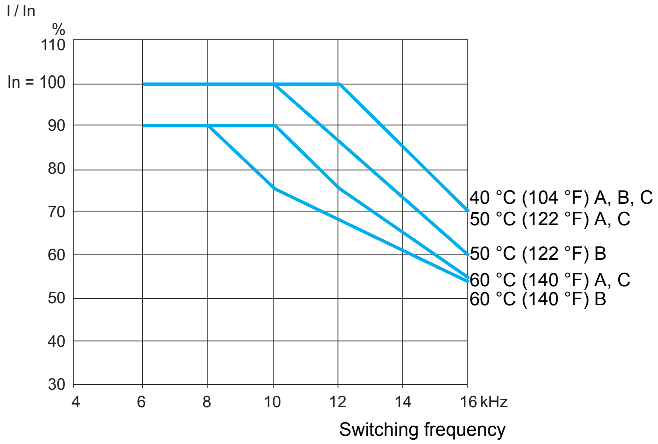
ATV212HD30M3X



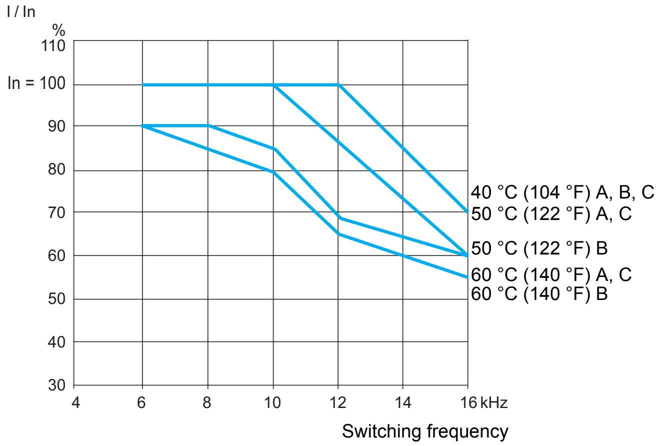
ATV212H075N4



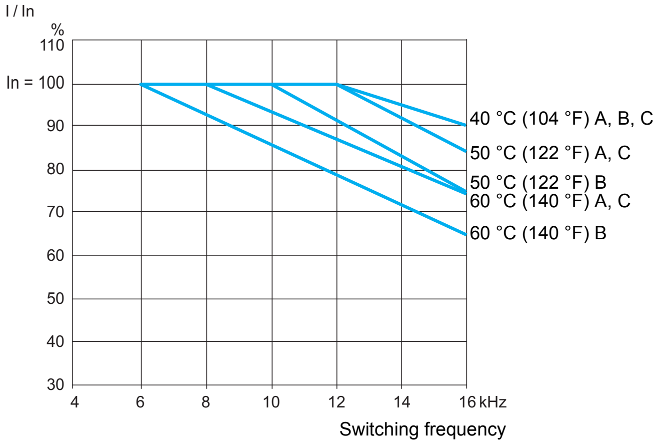
ATV212HU15N4



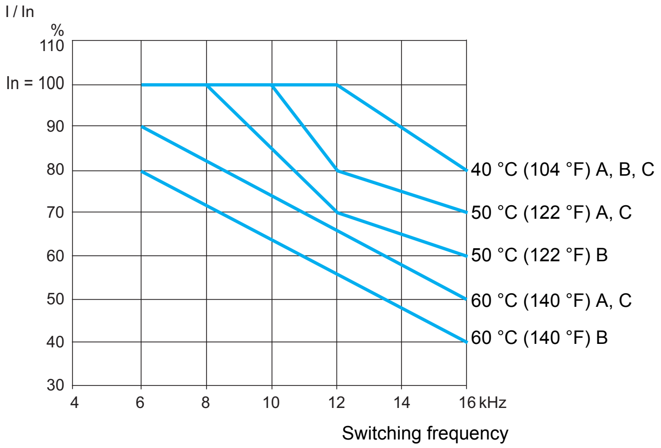
ATV212HU22N4



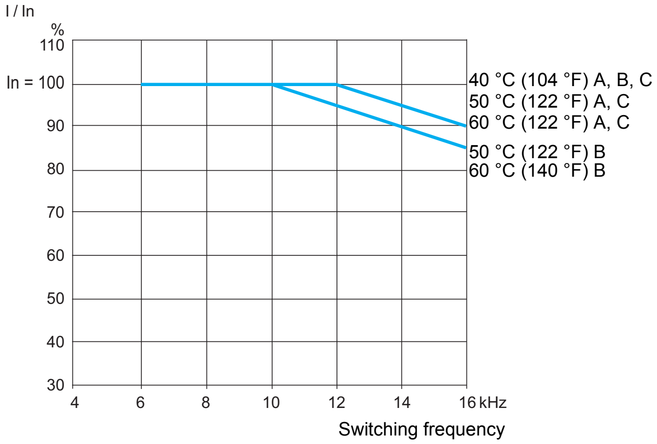
ATV212HU30N4, HU40N4



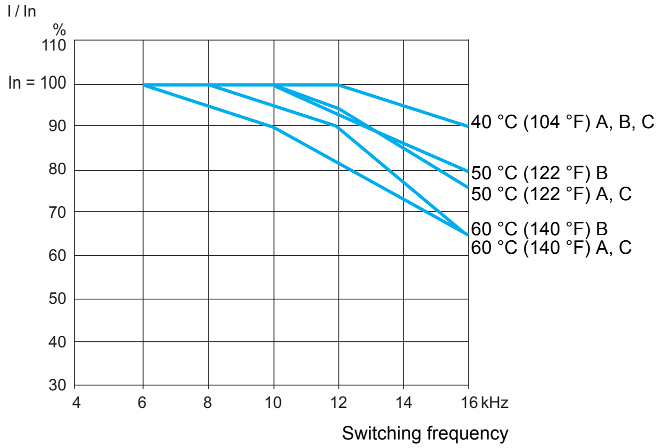
ATV212HU55N4



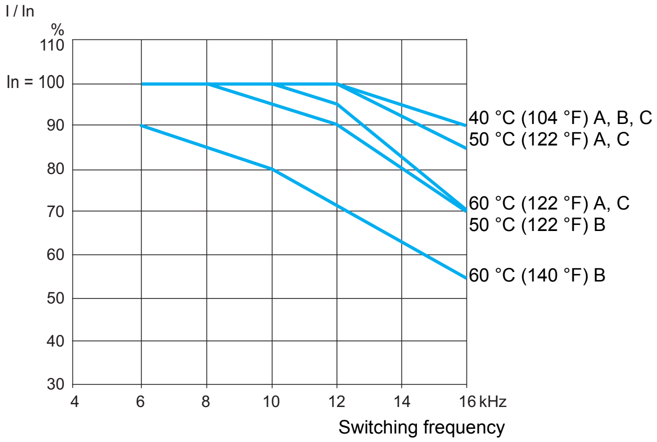
ATV212HU75N4



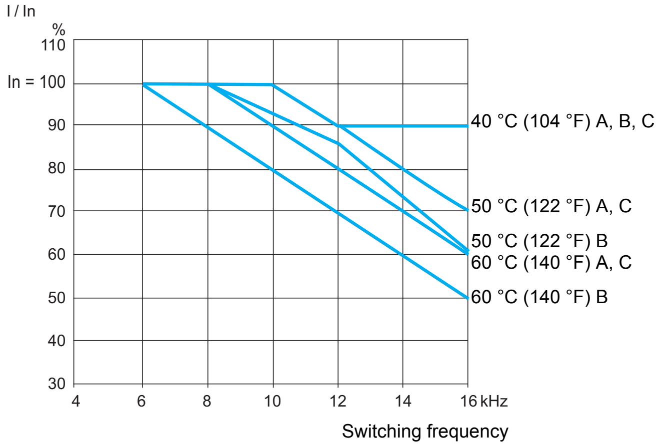
ATV212HD11N4



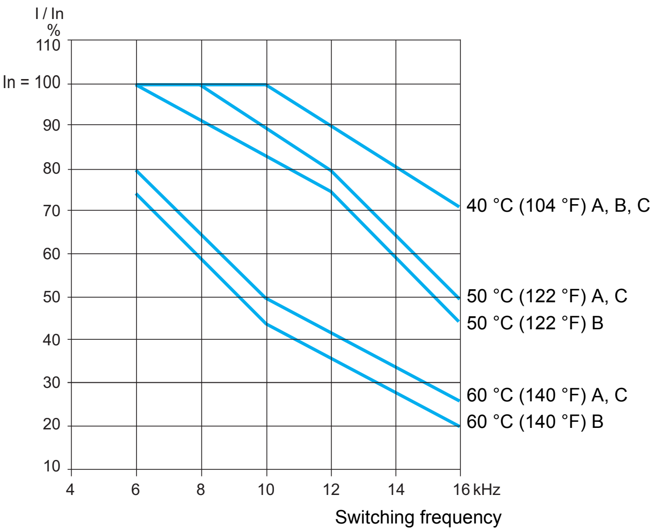
ATV212HD15N4



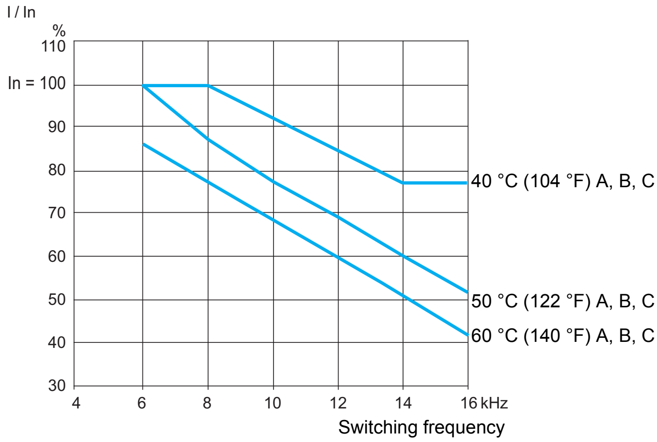
ATV212HD18N4



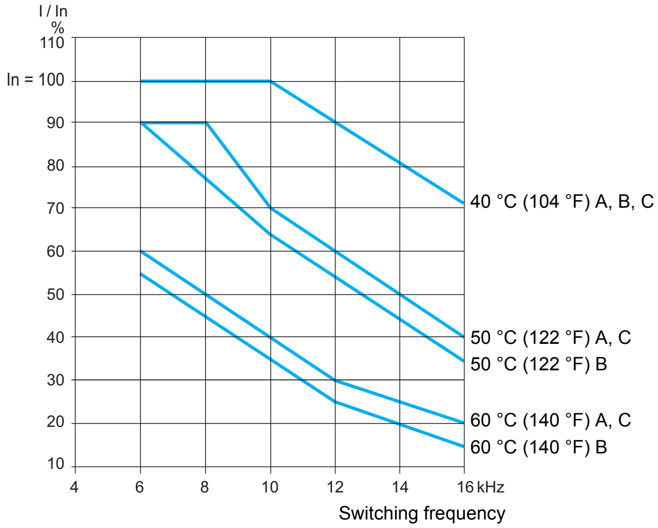
ATV212HD22N4



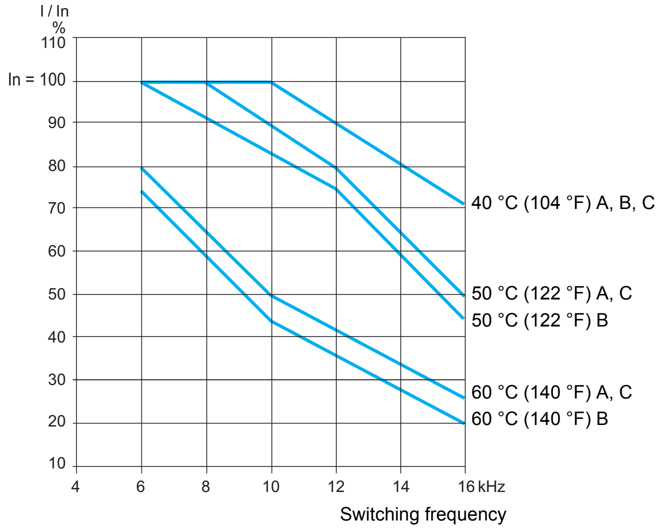
ATV212HD22N4S



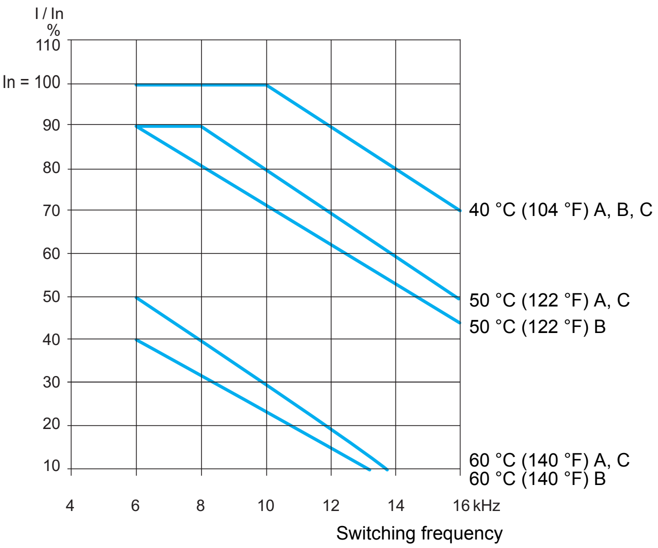
ATV212HD30N4



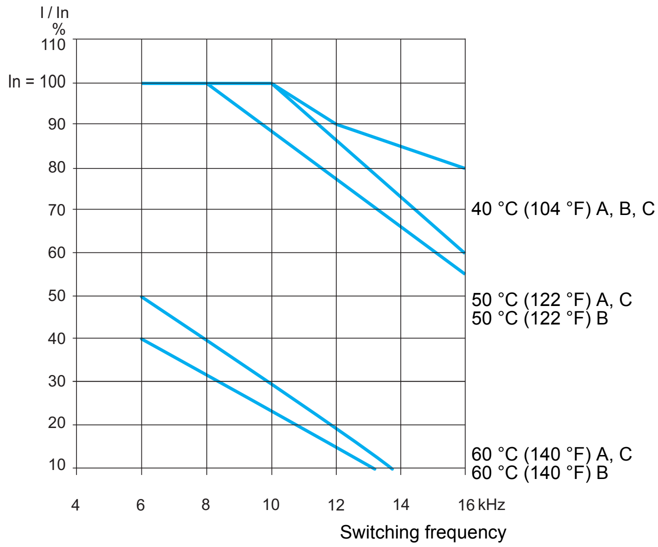
ATV212HD37N4



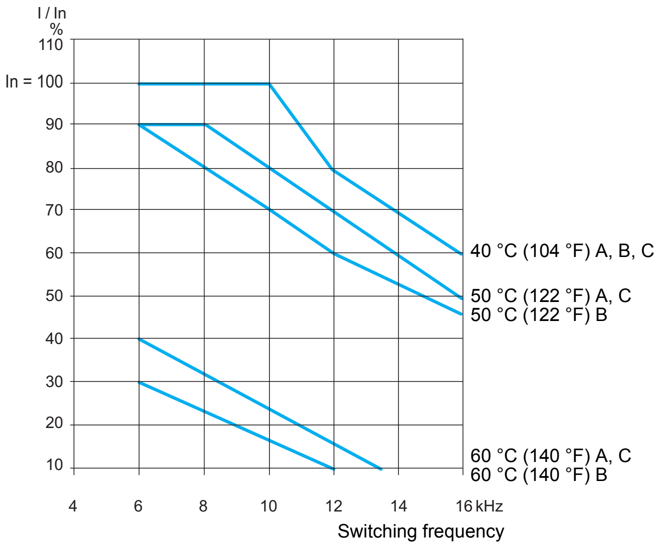
ATV212HD45N4



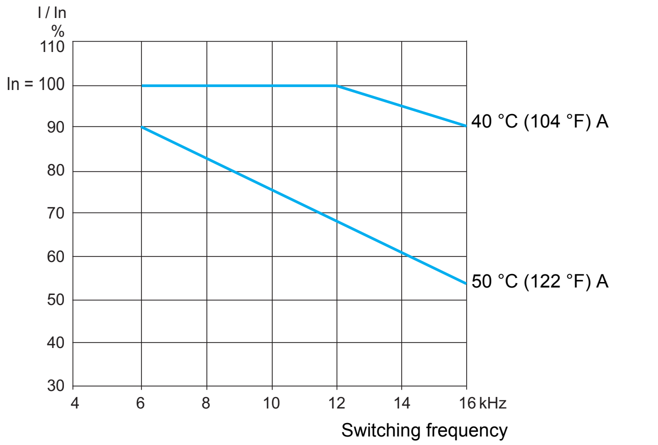
ATV212HD55N4



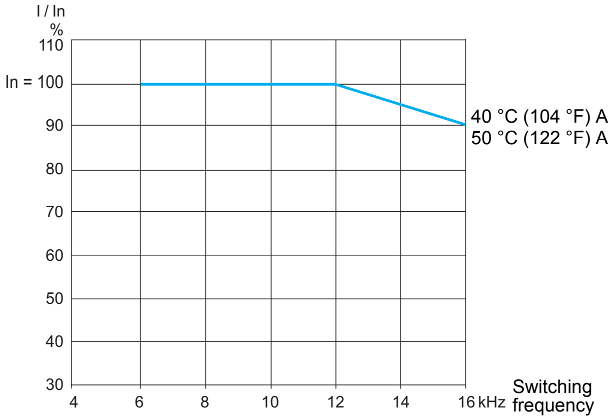
ATV212HD75N4



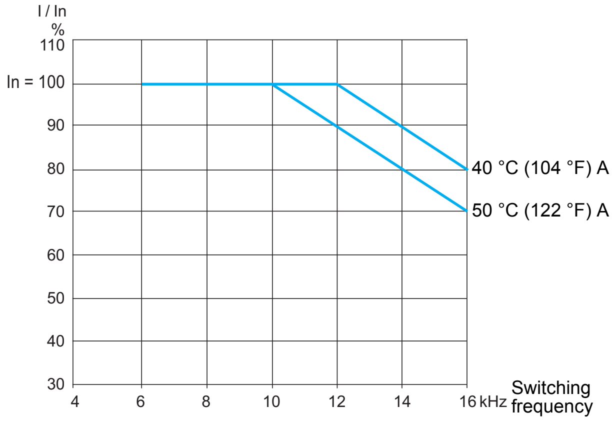
ATV212W075N4…WU75N4, ATV212W075N4C…WU75N4C



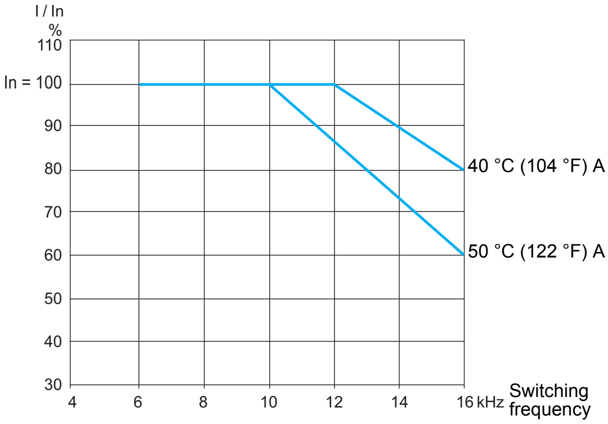
ATV212WD11N4, ATV212WD11N4C



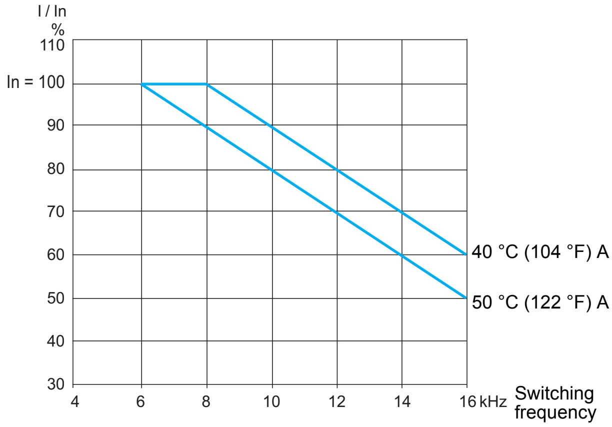
ATV212WD15N4, ATV212WD15N4C



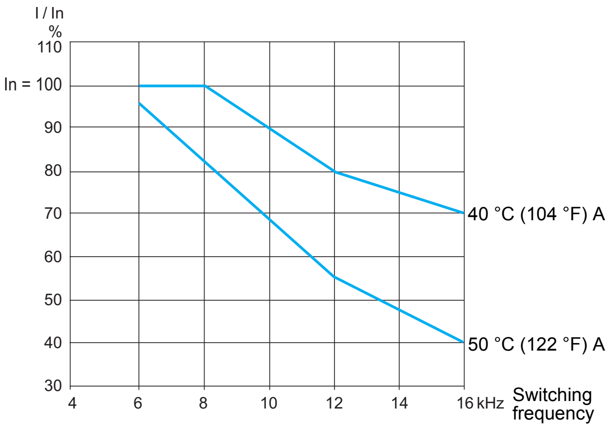
ATV212WD18N4, ATV212WD18N4C



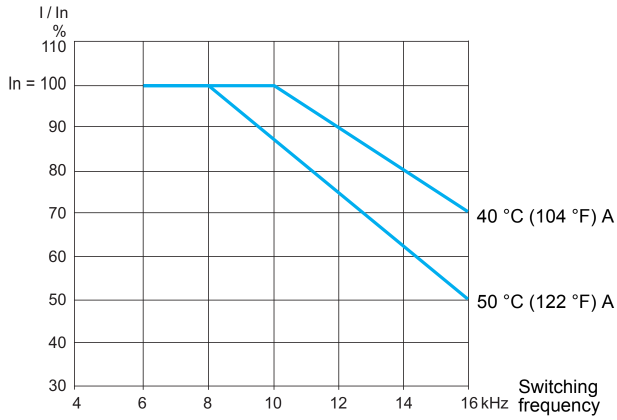
ATV212WD22N4, ATV212WD22N4C



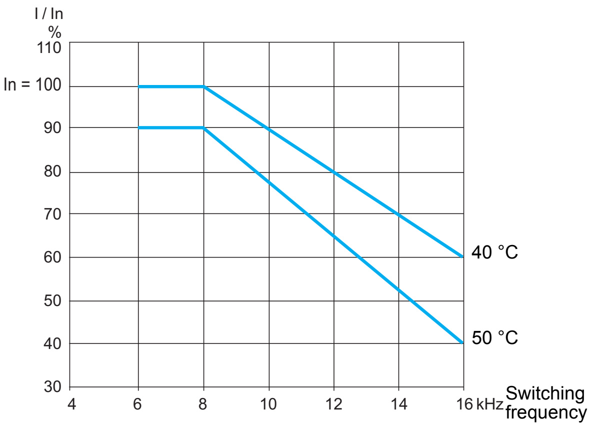
ATV212WD30N4, ATV212WD30N4C



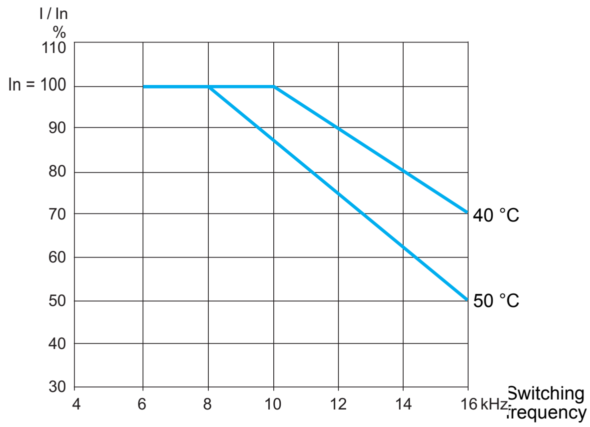
ATV212WD37N4, ATV212WD37N4C



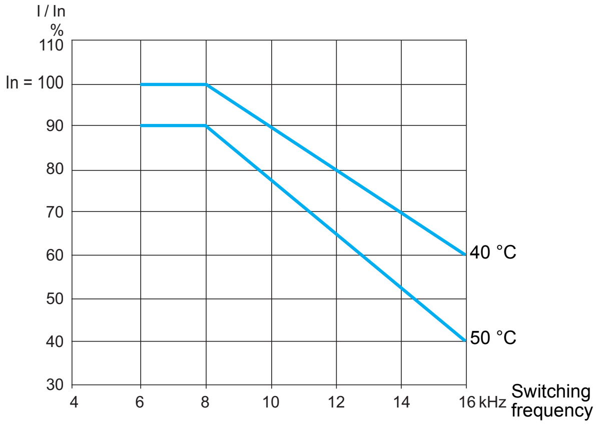
ATV212WD45N4, ATV212WD45N4C



ATV212WD55N4, ATV212WD55N4C

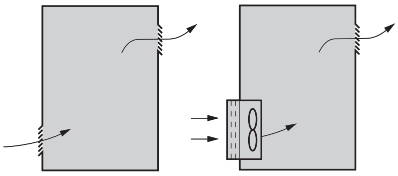


ATV212WD75N4, ATV212WD75N4C



Specific recommendations for mounting in an enclosure

Note: The following only applies to ATV212H●●●M3X and ATV212H●●●N4 drives.



Observe the mounting recommendations described on page 25.
To help ensure proper air circulation in the drive:
- Fit ventilation grilles.
- Check that there is sufficient ventilation. If there is not, install a forced ventilation unit with a filter. The openings and/or fans must provide a flow rate at least equal to that of the drive fans (see below).
- Use special filters with UL Type 12/IP54 protection.
- Remove the blanking cover from the top of the drive, see page 25.

Refer to power dissipated at nominal current, see page 20.

Minimum air flow rates

If you are installing the drive in a Type 1 enclosure, provide forced ventilation at a rate at least equal to the value listed below each drive.

For drive	Flow rate	
	m^3/hour	ft^3/min
ATV212H075M3X	22	13
ATV212HU15M3X	35	21
ATV212HU22M3X	41	25
ATV212HU30M3X	50	30
ATV212HU40M3X	66	39
ATV212HU55M3X	85	50
ATV212HU75M3X	118	70
ATV212HD11M3X	157	93
ATV212HD15M3X	215	127
ATV212HD18M3X	239	141
ATV212HD22M3X	261	154
ATV212HD30M3X	371	219

For drive	Flow rate	
	m^3/hour	ft^3/min
ATV212H075N4	19	12
ATV212HU15N4	27	16
ATV212HU22N4	35	21
ATV212HU30N4	47	28
ATV212HU40N4	60	36
ATV212HU55N4	74	44
ATV212HU75N4	100	59
ATV212HD11N4	147	87
ATV212HD15N4	206	122
ATV212HD18N4	214	126
ATV212HD22N4S	214	126
ATV212HD22N4	214	126
ATV212HD30N4	290	171
ATV212HD37N4	334	197
ATV212HD45N4	429	252
ATV212HD55N4	498	293
ATV212HD75N4	666	392

Sealed metal enclosure

CAUTION

RISK DUE TO CONDENSATION

Where condensation is possible, keep the drive powered up when the motor is not running, or install thermostatically controlled strip heaters.

Failure to follow these instructions can result in equipment damage.

The drive must be mounted in a dust and damp proof enclosure in certain environmental conditions, such as dust, corrosive gases, high humidity with risk of condensation and dripping water, splashing liquid, etc.

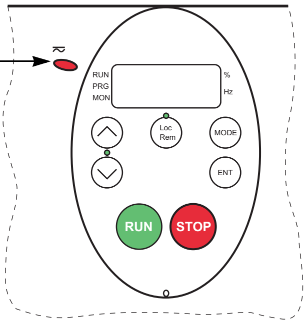
This enables the drive to be used in an enclosure where the maximum internal temperature reaches 50°C.

When mounting the drive inside an UL Type 12 or IP54 enclosure, follow these ventilation instructions:

- Observe the minimum clearance distances shown on page 25.
- If necessary, install a stirring fan to circulate the air inside the enclosure, to help prevent hot spots in the drive, and to distribute the heat uniformly to surfaces used for convection cooling.

Position of the charging LED

The capacitor charging LED on the drive is not an indicator of the absence of DC bus voltage. It only indicates when the capacitor is fully charged.



Opening the drive to access terminals

Procedure

1 Any procedure in this section must be performed when product is powered off.

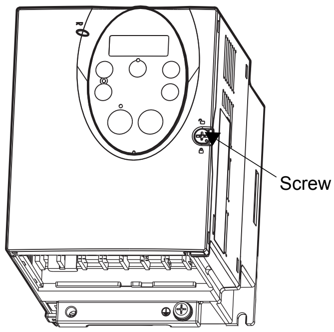
DANGER
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH
Read and understand the instructions in "before you begin" chapter, before performing the procedure in this section.
Failure to follow these instructions will result in death or serious injury.

2 Open the ATV212 front cover.

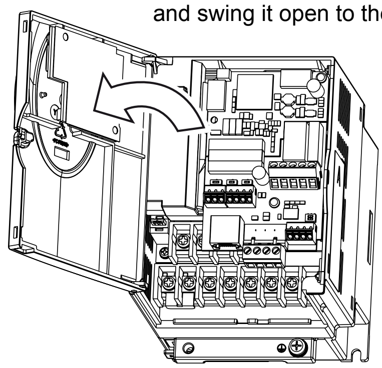
ATV212H products up to 22 kW

Turn the screw on the front panel 90° counter-clockwise to align the dot on the screw with the unlock position.

To avoid damaging the screw, do not apply excessive force or turn the screw more than 90°.

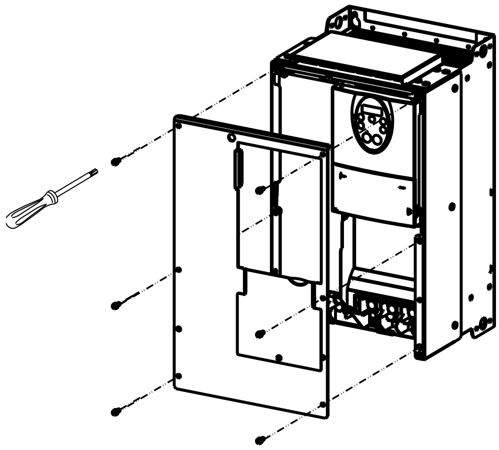


Pull the front panel toward you and swing it open to the left

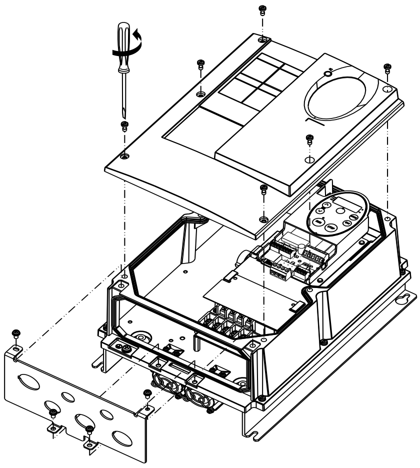


ATV212H products from 22 kW

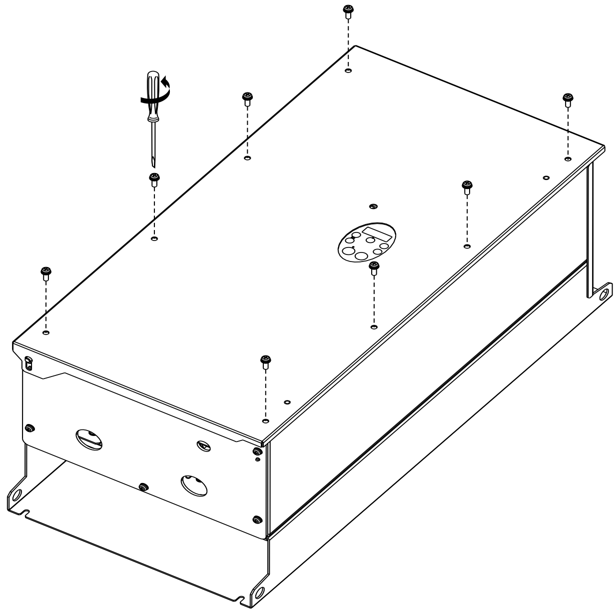
Remove the screws.
Lift off the cover.



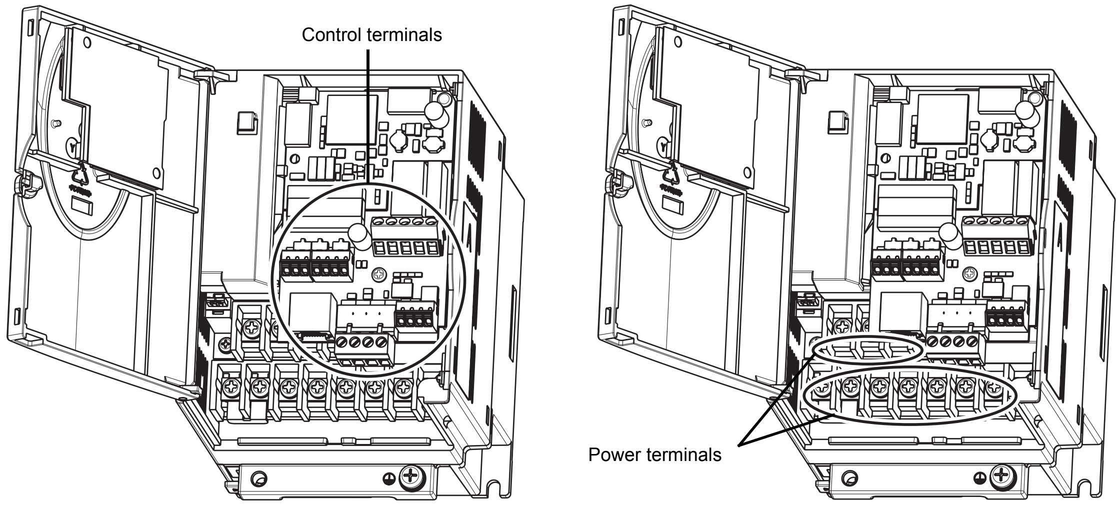
ATV212W up to 7.5 kW



ATV212W above 7.5 kW



Terminal location on ATV212H



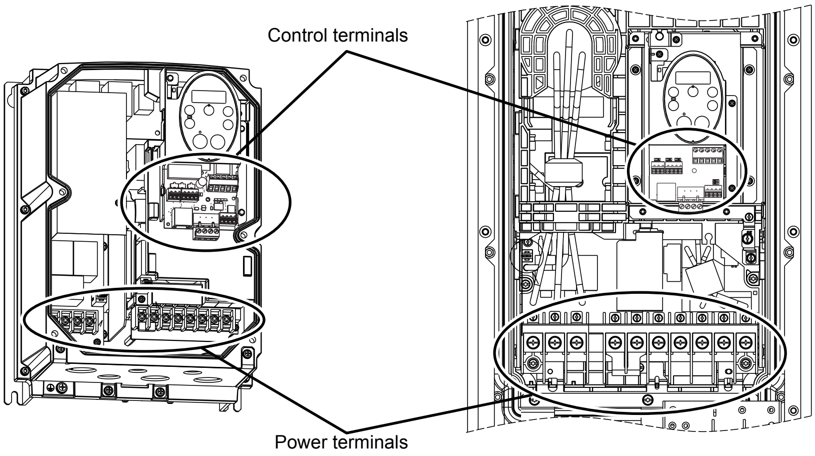
On drives ATV212H075M3X...U22N4 (page 7) first remove control board to access power terminals.

1 Remove the terminal board mounting screw and take off the ATV212 standard terminal board. Be careful not to lose the terminal board mounting screw.
2 Connect the power terminals
3 Reinstall the terminal board and fit the board mounting screw (M3 tapping type) and tighten to 0.7 to 0.8Nm.

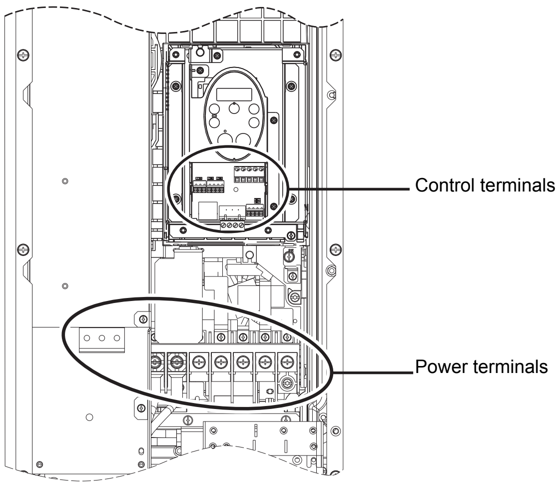
Terminal location on ATV212W

Example ATV212WU55N4C

Example ATV212WD15N4



Example ATV212WD18N4C



Wiring recommendations

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- To avoid overheating or loss of contact, connections must be carried out according to the cable sizes and tightening torques given in this document.
- The use of multi-wire cable without a lug is forbidden for the mains connection.
- Carry-out a pull out test to check that terminal screws are correctly tighten.

Failure to follow these instructions will result in death or serious injury.

Power and circuit protection

The drive must be grounded to conform with the regulations concerning high leakage currents (over 3.5 mA).

Where local and national codes require upstream protection by means of a residual current device, use a type A device for single-phase drives and a type B device for three-phase drives as defined in the IEC Standard 60755.

Choose a suitable model integrating:

- High frequency current filtering,
- A time delay that helps to prevent tripping caused by the load from stray capacitance on power-up.
  The time delay is not possible for 30 mA devices; in this case, choose devices with immunity against nuisance tripping.

If the installation includes several drives, provide one "residual current device" per drive.

Keep the power cables separate from circuits in the installation with low-level signals (detectors, PLCs, measuring apparatus, video, telephone).

If you are using cables longer than 50 m (164 ft) between the drive and the motor, add output filters (for more details please refer to the catalog).

Control

Keep the control circuits away from the power cables. For control and speed reference circuits, we recommend using shielded twisted cables with a pitch of between 25 and 50 mm (1 and 2 in.), connecting the shielding to ground at each end.

Equipment Grounding

Ground the drive according to local and national code requirements. A minimum wire size of 10 mm² (6 AWG) may be required to meet standards limiting leakage current.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- The drive panel must be properly grounded before power is applied.
- Use the provided ground connecting point as shown in the figure.

Failure to follow these instructions will result in death or serious injury.

WARNING

INADEQUATE OVERCURRENT PROTECTION

- Overcurrent protective devices must be properly coordinated.
- The Canadian Electrical Code and the National Electrical Code require branch circuit protection. Use the recommendations in the ATV212 Quick Start Annex document, reference S1A73476 provided with the product.
- Do not connect the drive to a power feeder whose short-circuit capacity exceeds the maximum prospective line Isc listed in this manual.

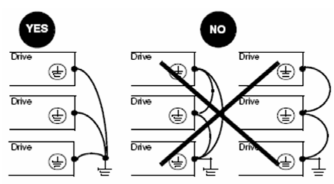
Failure to follow these instructions can result in death, serious injury, or equipment damage.

CAUTION

RISK OF DAMAGE TO THE DRIVE

- The drive will be damaged if input line voltage is applied to the output terminals (U/T1,V/T2,W/T3).
- Check the power connections before energizing the drive.
- If replacing the existing drive by another drive, verify that all wiring connections to the drive comply with wiring instructions in this manual

Failure to follow these instructions can result in equipment damage.

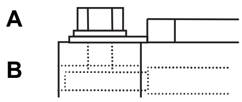


- Ensure that the resistance of the ground is one ohm or less.
- When grounding several drives, you must connect each one directly, as shown in the figure to the left.
- Do not loop the ground cables or connect them in series.

Power terminals

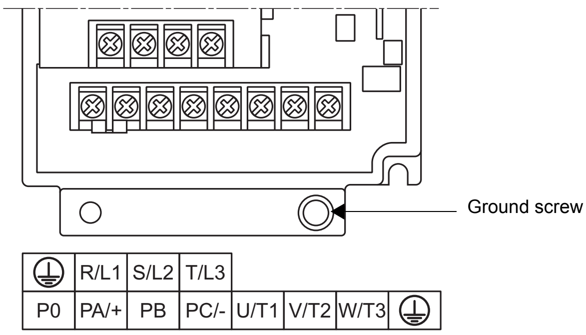
ATV212H - Arrangement and characteristics of the power terminals

Connect the power terminals before connecting the control terminals.



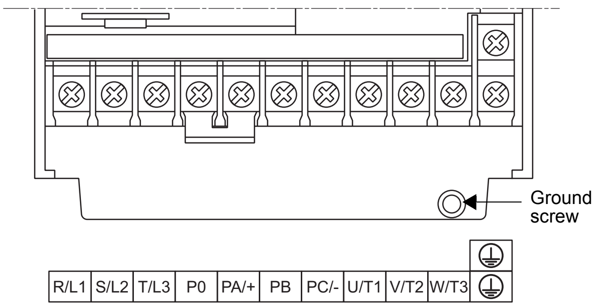
Each power terminal has the structure shown in the figure at left. Connect a cable to **A** if it has a ring terminal or to **B** if it does not have a terminal (bare wire).

Parts A and B can accommodate different cable sizes.

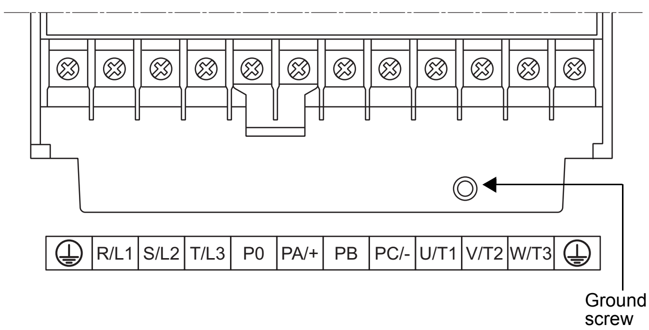


ATV212H	Maximum wire size		Tightening torque
(1)	mm^2	AWG	N·m (lb-in)
075M3X, U15M3X, U22M3X, U30M3X, U40M3X 075N4, U15N4, U22N4, U30N4, U40N4	6	10	1.3 (11.5)

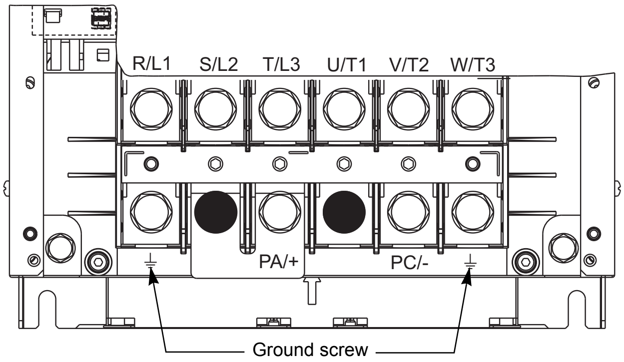
(1) On drives ATV212H075M3X...U55N4 first remove control board to access power terminals.



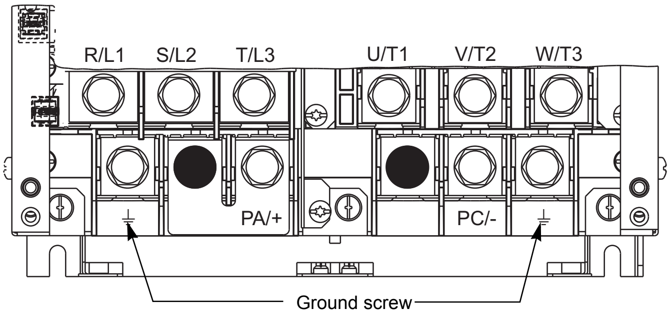
ATV212H	Maximum wire size		Tightening torque
(1)	mm^2	AWG	N·m (lb-in)
U55N4	6	10	1.3 (11.5)
U55M3X, U75M3X U75N4 D11N4	16	6	2.5 (22.0)



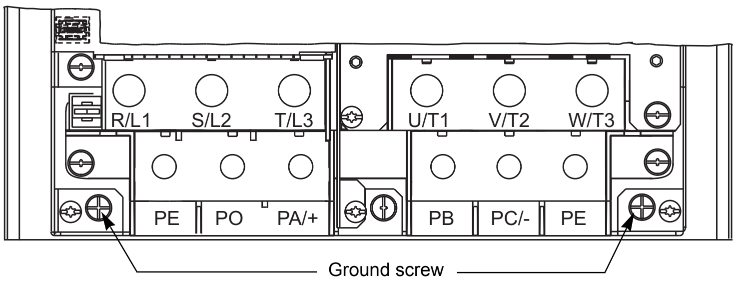
ATV212H	Maximum wire size		Tightening torque
	mm^2	AWG	N·m (lb-in)
D11M3X, D15M3X, D18M3X D15N4, D18N4, D22N4S	25	3	4.5 (40.0)



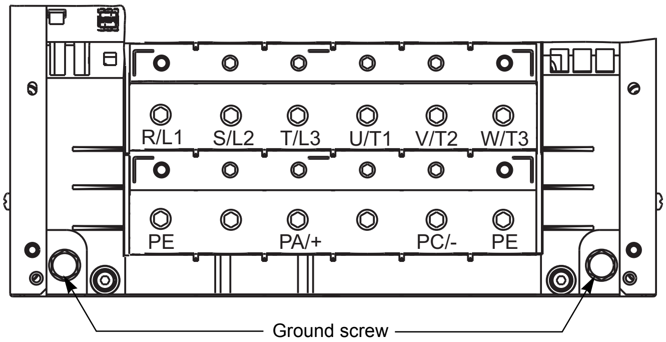
ATV212H	Maximum wire size		Tightening torque
	mm^2	AWG	N·m (lb-in)
D22M3X D22N4, D30N4	50	1/0	24 (212.0)



ATV212H	Maximum wire size		Tightening torque
	mm^2	kcmils	N·m (lb-in)
D30M3X	150	300	41 (363.0)



ATV212H	Maximum wire size		Tightening torque
	mm^2	AWG	N·m (lb-in)
D37N4, D45N4	50	1/0	24 (212.0)



ATV212H	Maximum wire size		Tightening torque
	mm^2	kcmils	N·m (lb-in)
D55N4, D75N4	150	300	41 (363.0)

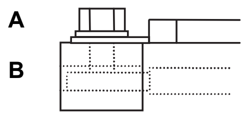
Characteristics

Terminal	Function
⏚	Ground terminal
R/L1 S/L2 T/L3	Power supply
U/T1 V/T2 W/T3	Outputs to the motor
PO (2)	DC bus (+) polarity (do not use)
PA/+ (2) (3)	DC bus (+) polarity
PB	DC bus connection (do not use)
PC/– (3)	DC bus (–) polarity

(1) ATV212 drives have two ground terminals, one on the power terminal strip and one on the heatsink.
(2) Never remove the jumper between PO and PA/+.
(3) The PA/+ and PC/– terminals can only be used to measure the DC bus voltage.

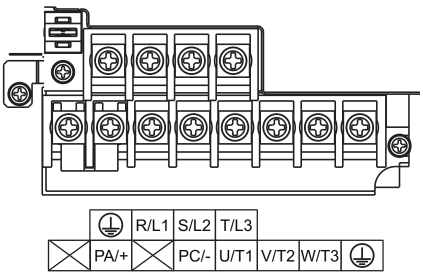
ATV212W - Arrangement and characteristics of the power terminals

Connect the power terminals before connecting the control terminals.

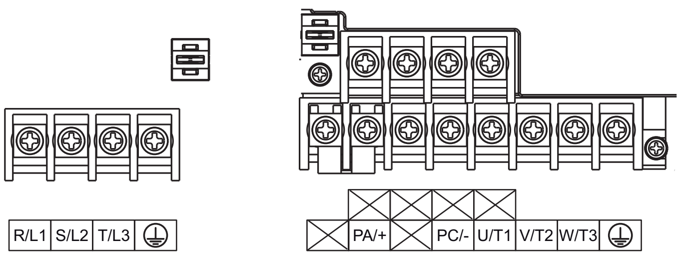


Each power terminal has the structure shown in the figure at left. Connect a cable to **A** if it has a ring terminal or to **B** if it does not have a terminal (bare wire).

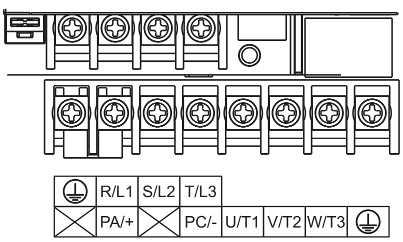
Parts A and B can accommodate different cable sizes.



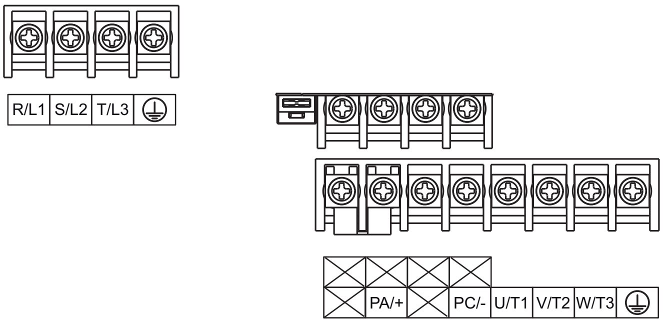
ATV212W	Maximum wire size		Tightening torque
	mm^2	AWG	N·m (lb-in)
075N4, U15N4, U22N4	6	10	1.3 (11.5)



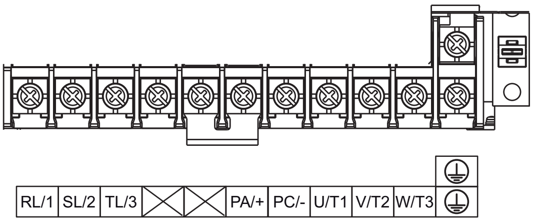
ATV212W	Maximum wire size		Tightening torque
	mm^2	AWG	N·m (lb-in)
075N4C, U15N4C, U22N4C	6	10	1.3 (11.5)



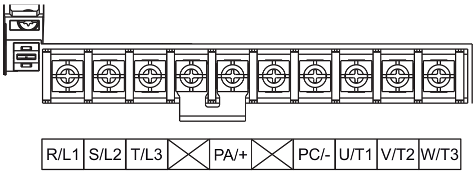
ATV212W	Maximum wire size		Tightening torque
	mm^2	AWG	N·m (lb-in)
U30N4, U40N4, U55N4,	6	10	1.3 (11.5)



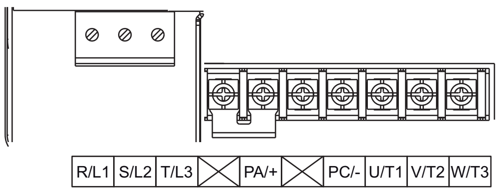
ATV212W	Maximum wire size		Tightening torque
	mm^2	AWG	N·m (lb-in)
U30N4C, U40N4C, U55N4C,	6	10	1.3 (11.5)



ATV212W	Maximum wire size		Tightening torque
	mm^2	AWG	N·m (lb-in)
U75N4, U75N4C	16	6	2.5 (22)

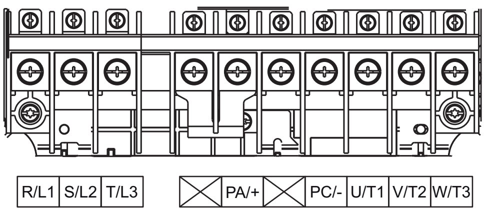


ATV212W	Maximum wire size		Tightening torque
	mm^2	AWG	N·m (lb-in)
D11N4, D15N4	16	4	3 (26.5)



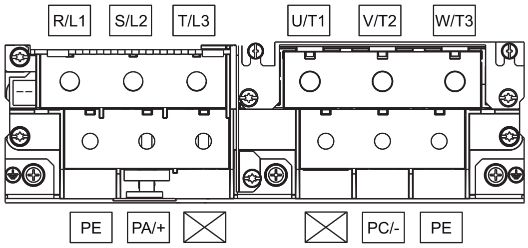
ATV212W	Maximum wire size		Tightening torque
	mm^2	AWG	N·m (lb-in)
D11N4C, D15N4C	16	4	3 (26.5)
D11N4C, D15N4C	*10*	*6*	*4.5 (40.0)*

Values in italics are for terminals R/L1, S/L2, T/L3 terminals only.



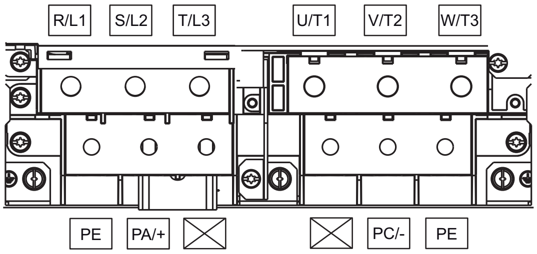
ATV212W	Maximum wire size		Tightening torque
	mm^2	AWG	N·m (lb-in)
D18N4, D18N4C	25	3	5.4 (48)
D18N4C	*16*	*4*	*2.2 (19.5)*

Values in italics are for terminals R/L1, S/L2, T/L3 terminals only.



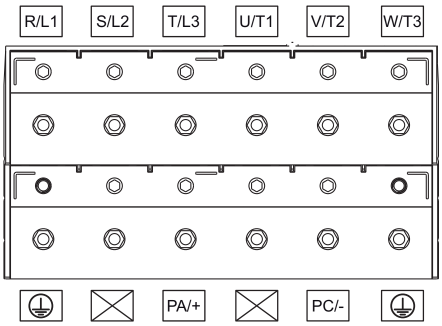
ATV212W	Maximum wire size		Tightening torque
	mm^2	AWG	N·m (lb-in)
D22N4, D22N4C D30N4, D30N4C	50	1/0	24 (212)
D22N4C, D30N4C	*25*	*3*	*4.3 (38)*

Values in italics are for terminals R/L1, S/L2, T/L3 terminals only.

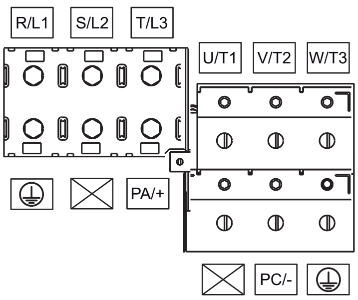


ATV212W	Maximum wire size		Tightening torque
	mm^2	AWG	N·m (lb-in)
D37N4, D37N4C D45N4, D45N4C	50	1/0	24 (212)
D37N4C, D45N4C	-	-	*7 (62)*

Values in italics are for terminals R/L1, S/L2, T/L3 terminals only.



ATV212W	Maximum wire size		Tightening torque
	mm^2	kcmils	N·m (lb-in)
D55N4, D75N4,	150	300	41 (360)



ATV212W	Maximum wire size		Tightening torque
	mm^2	kcmils	N·m (lb-in)
D55N4C, D75N4C	150	300	41 (360)
	130	*250*	*16 (142)*

Values in italics are for terminals R/L1, S/L2, T/L3 terminals only.

Control terminals and switches

Preliminary recommendations

Connect the control terminals after connecting the power terminals.

The logic input switch SW102 assigns the logic input type to either 24 V (source logic) or 0 V (sink logic).

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

- Prevent accidental grounding of logic inputs configured for sink logic. Accidental grounding can result in unintended activation of drive functions.
- Protect the signal conductors against damage that could result in unintentional conductor grounding.
- Follow NFPA 79 and EN 60204 guidelines for proper control circuit grounding practices

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

- Modify only the setting of switches when the product is switched off.
- Do not change the setting of switch SW102 unless your system is wired for sink logic.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

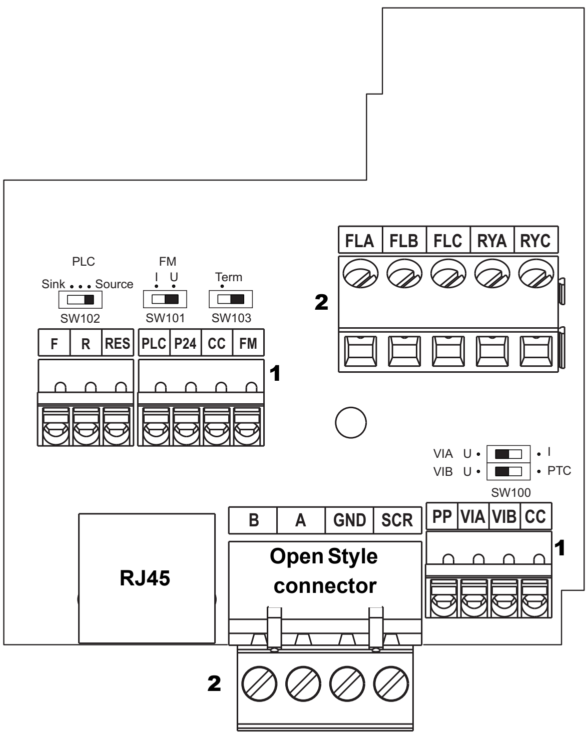
RISK OF BODY INJURY

use a screwdriver to change the position of the switches.

Failure to follow these instructions can result in injury or equipment damage.

Refer to “Logic Input Switch” on page 23 for recommended circuit diagrams for source and sink logic.

Arrangement



1 spring terminals
2 screw terminals

Switch	Factory Setting
SW100 VIA voltage/current selection VIB voltage/PTC selection (1)	 Voltage (U) Voltage (U)
SW101 (FM voltage/ current selection)	Voltage (U)
SW102 Selection of logic type	Source
SW103 Selection of communication terminal resistor (2)	Term no resistor

Control terminal wire size and torque:
Applicable wire size:
- Screw terminals : 0.75 to 2.5 mm² (AWG 18 to 14)
- Spring terminals : 0.2 to 1 mm² (AWG 24 to 16)
Tightening torque:
0.5 to 0.6 N·m (4.4 to 5.3 lb-in)

(1) When SW100 is set to PTC, VIB is configured as PTC input connected to the 3.3 kΩ internal resistor. Connect the PTC probe between CC and VIB terminals.
If the 3.3 kΩ internal resistor does not suit the installation, regarding to the PTC resistor value, set SW100 to VIB, connect the PTC probe between CC and VIB terminals and add an external resistor between PP and VIB terminals.

(2) When SW103 is set to Term, internal 120 Ω termination resistor is connected between A and B terminals.

Characteristics

Terminals	Function	Characteristics	Default function setting
PLC	External power supply input	+24 Vdc input for external power supply for logic inputs Max. permissible voltage: 50 Vdc	—
P24	Internal supply	Short-circuit and overload protection: 24 Vdc supply (min. 21 Vdc, max. 27 Vdc), maximum current: 200 mA	
CC	Common	0 Vdc common (2 terminals)	
FLA, FLB, FLC	Configurable relay outputs	1 relay logic output, 1 N/C contact, and 1 N/O contact with common point Minimum switching capacity: 10 mA for 5 Vdc Maximum switching capacity: • On resistive load (cos φ = 1): 5 A for 250 Vac or 30 Vdc • On inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 Vac or 30 Vdc Max. response time: 10 ms	Fault relay
RYA, RYC		1 relay logic output, 1 N/O contact Minimum switching capacity: 3 mA for 24 Vdc Maximum switching capacity: • On resistive load (cos φ = 1): 3 A for 250 Vac or 30 Vdc • On inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 Vac or 30 Vdc Max. response time: 7 ms ± 0.5 ms	Speed attained
F R RES	Configurable logic inputs	3 programmable logic inputs, 24 Vdc, compatible with level 1 PLC, IEC 65A-68 standard Impedance: 4.7 kΩ Maximum voltage: 30 Vdc Max. sampling time: 2 ms ±0.5 ms Multiple assignment makes it possible to configure several functions on one input	F: Run forward (2-wire control) R: Preset speed 1 command (15 Hz) RES: Clear trip
		Positive logic (Source): State 0 if ⩽ 5 Vdc or logic input not wired, state 1 if ⩾ 11 Vdc	
		Negative logic (Sink): State 0 if ⩾ 16 Vdc or logic input not wired, state 1 if ⩽ 10 Vdc	
FM	Configurable analog output	1 switch-configurable (SW101) voltage or current analog output: • Voltage analog output 0–10 Vdc, minimum load impedance 7.62 kΩ • Current analog output X–Y mA by programming X and Y from 0 to 20 mA, maximum load impedance: 970 Ω Max. sampling time: 2 ms ±0.5 ms Resolution: 10 bits Accuracy: ±1 % for a temperature variation of 60 °C Linearity: ±0.2%	Output frequency
PP	Internal supply available	Short-circuit and overload protection: One 10.5 Vdc ± 5% supply for the reference potentiometer (1 to 10 kΩ), maximum current: 10 mA	—
VIA	Configurable analog/logic input	Switch-configurable voltage or current analog input: • Voltage analog input 0–10 Vdc, impedance 30 kΩ maximum voltage: 24 Vdc • Analog current input X–Y mA by programming X and Y from 0 to 20 mA, with impedance 250 Ω Max. sampling time: 3.5 ms ±0.5 ms Resolution: 10 bits Accuracy: ±0.6% for a temperature variation of 60 °C Linearity: ±0.15% of the maximum value This analog input is also configurable as a logic input. Consult the Altivar 212 Programming Manual for more information.	Primary speed reference, 0–10 V
VIB	Configurable analog input	Voltage analog input, configurable as an analog input or as a PTC probe input. Voltage analog input: • 0–10 Vdc, impedance 30 kΩ max. voltage 24 Vdc • Max. sampling time: 22 ms ±0.5 ms • Resolution: 10 bits • Accuracy: ±0.6% for a temperature variation of 60 °C • Linearity: ±0.15% of the maximum value PTC probe input: • 6 probes max. mounted in series • Nominal value < 1.5 kΩ • Trip resistance 3 kΩ, reset value 1.8 kΩ • Short-circuit detection threshold < 50 Ω	Secondary speed reference, 1–10 V
RJ45	Graphic display terminal or Modbus	Used to connect graphic display terminal or connect the drive to a Modbus fieldbus. **Note:** For using Modbus on the RJ45, modify parameter F807. See Modbus manual.	
Open Style connector	Fieldbus	Refer to communication manual related to the fieldbus.	

Installing option card

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Read and understand the instructions in "before you begin" chapter, before performing the procedure in this section.

Failure to follow these instructions will result in death or serious injury.

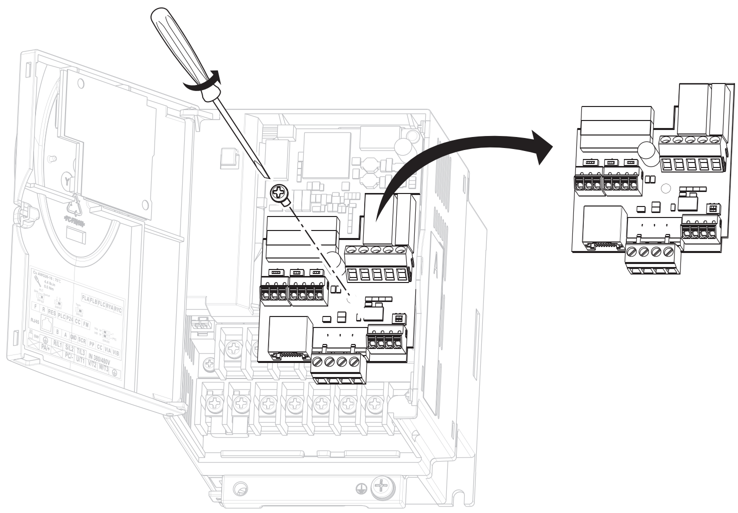
⚠ DANGER

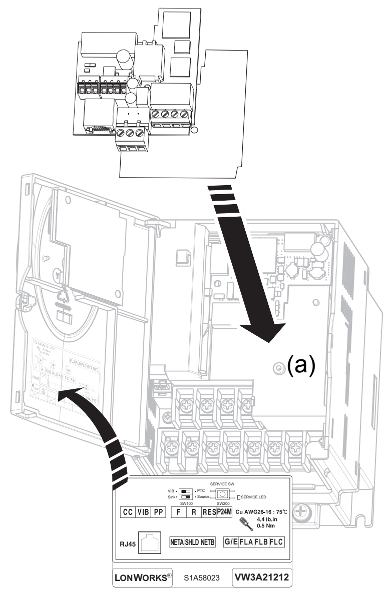
UNINTENDED EQUIPMENT OPERATION

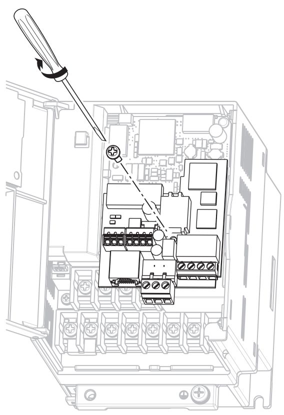
- Do not plug or unplug the terminal board while drive is powered.
- Check the tightening of the mounting screw after any manipulation on the terminal board.

Failure to follow these instructions will result in death or serious injury.

Example for installing the LONWORKS communication card in ATV212.







1 Open the ATV212 front cover, remove the terminal board mounting screw and take off the ATV212 standard terminal board. See paragraph How to open the front cover, page 35. Be careful not to lose the terminal board mounting screw when removed since it may be used again. On drives from 0.75 to 2.2 kW the board features a plastic tag to hold the mounting screw in place.

2 Attach the insulating sheet in ATV212. Fix to the terminal board mounting screw hole and ATV212 catch pin (a).

3 Install the LONWORKS communication card over the insulating sheet. Fit the board mounting screw (M3 tapping type) and tighten to 0.7 to 0.8 Nm.

4 Make the power and control wiring connections. For size 1 products (see page 7), connect power terminals before step 3.

5 Stick the cabling label for communication card on the standard cabling label stuck on front cover (internal side) ATV212. And stick the communication card nameplate close to the standard nameplate. Be careful not to cover slits on the ATV212 enclosure.

Note: To install or remove the terminal board, make it slide in or out in parallel with board.

Use on an impedance grounded (IT) system

Principle

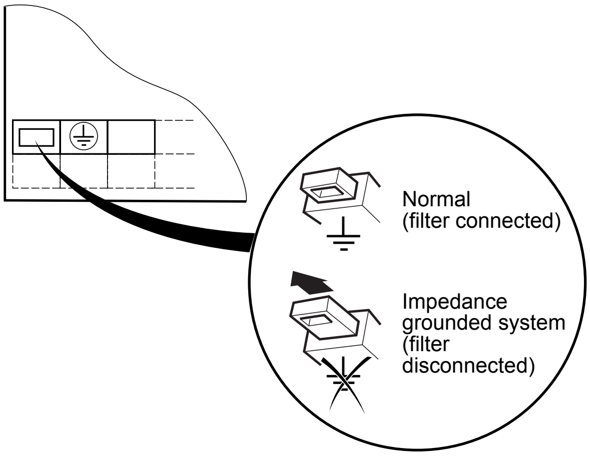
When using the ATV212 drive on a system with an isolated or impedance grounded neutral, use a permanent insulation monitor compatible with non-linear loads, such as a XM200 type or equivalent.

DANGER
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH
Read and understand the instructions in "before you begin" chapter, before performing the procedure in this section.
Failure to follow these instructions will result in death or serious injury.

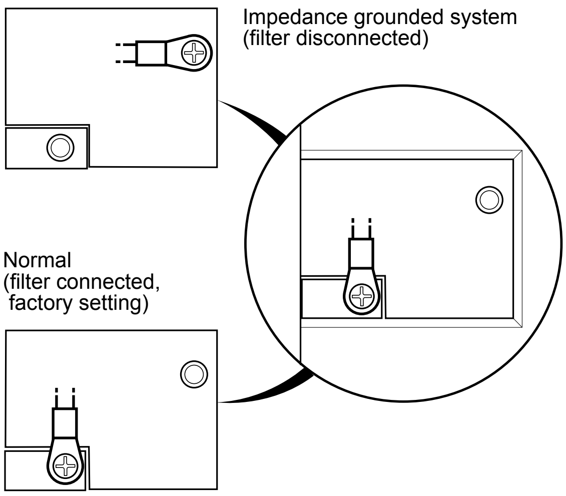
ATV212 480 V rated drives feature built-in radio frequency interference (RFI) filters with grounded capacitors. When using the drive on an impedance grounded system, we recommend that you isolate the RFI filters from ground to help prevent reduction of their operating life.

Jumper Location

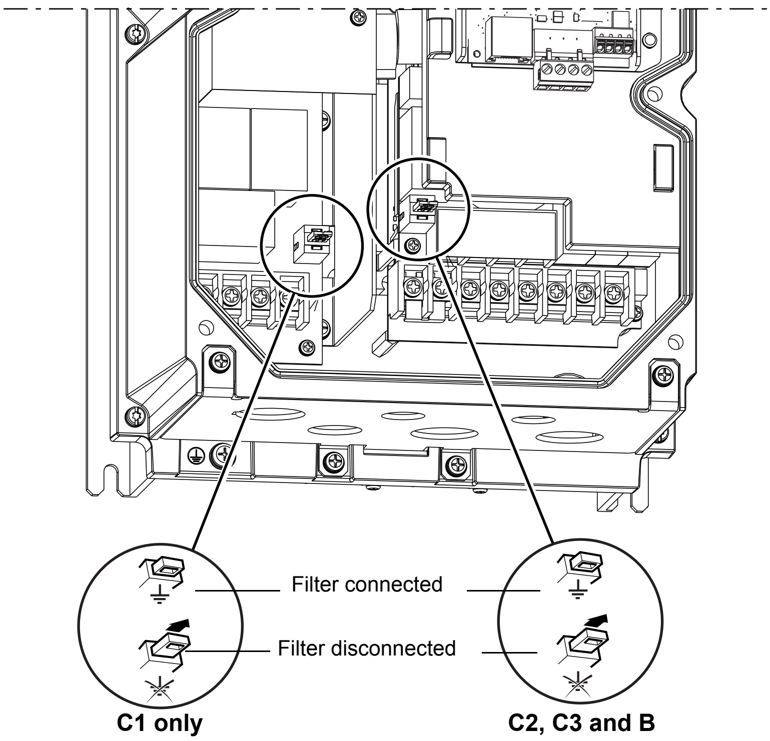
- ATV212H075N4 to U55N4, ATV212H D22N4 to D30N4:
  Pull out the jumper to the left of the ground terminal as illustrated below to isolate the RFI filters.



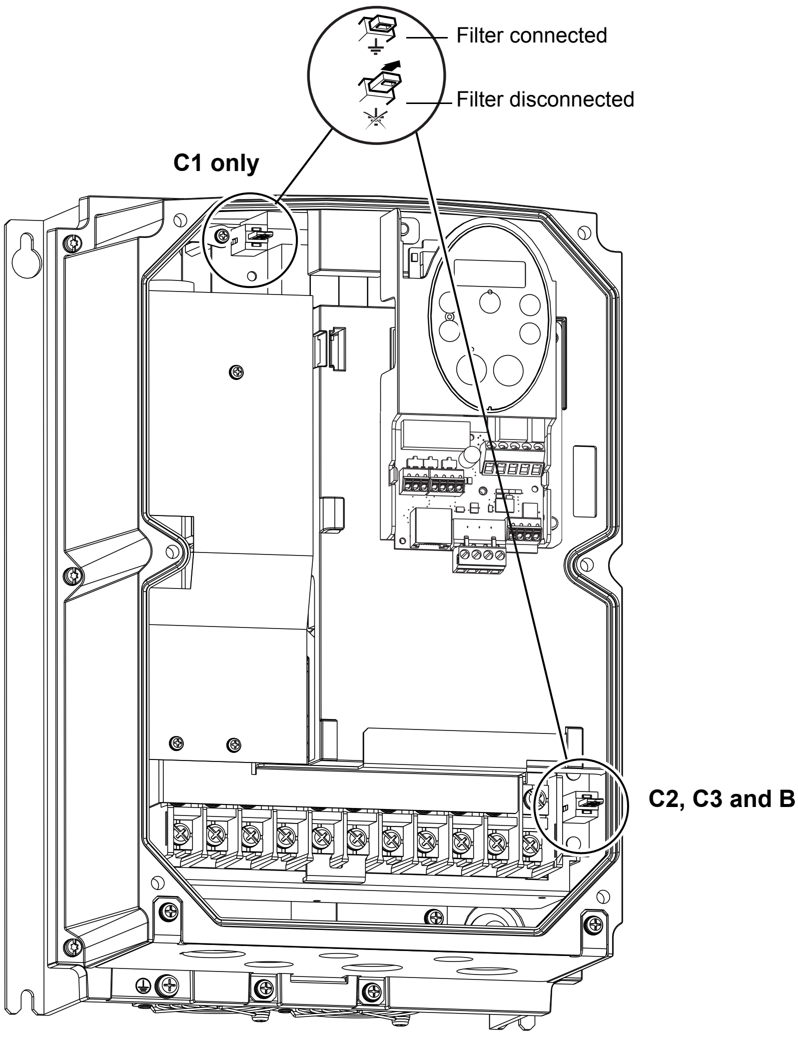
- ATV212HU75N4 to D22N4S:
  Connect the cable to the top left of the power terminals as illustrated below to isolate the filters.



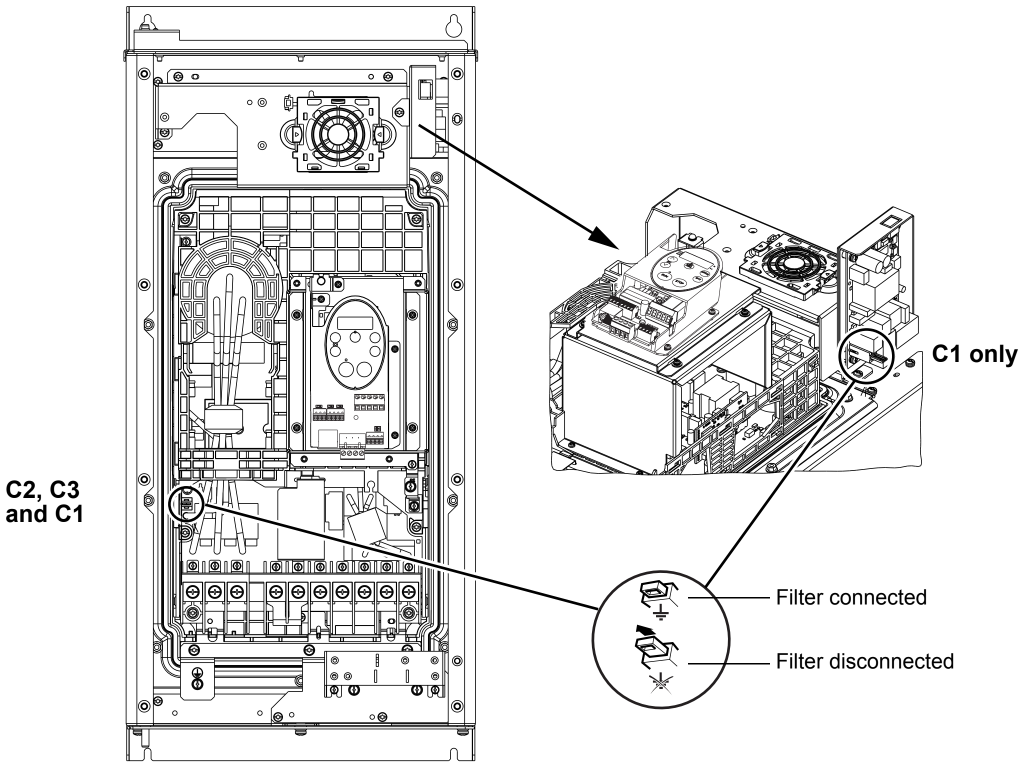
- ATV212W075N4 to U55N4 (C2, C3) and ATV212W075N4C to U55N4C (C1)



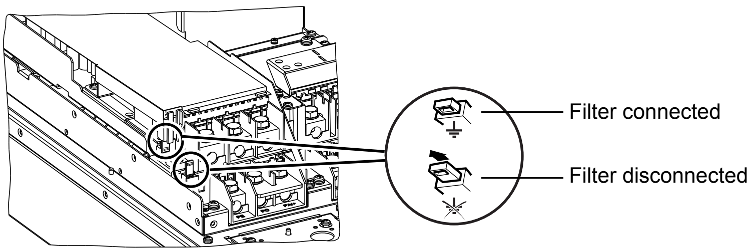
- ATV212WU75N4 (C2, C3) and ATV212WU75N4C (C1)



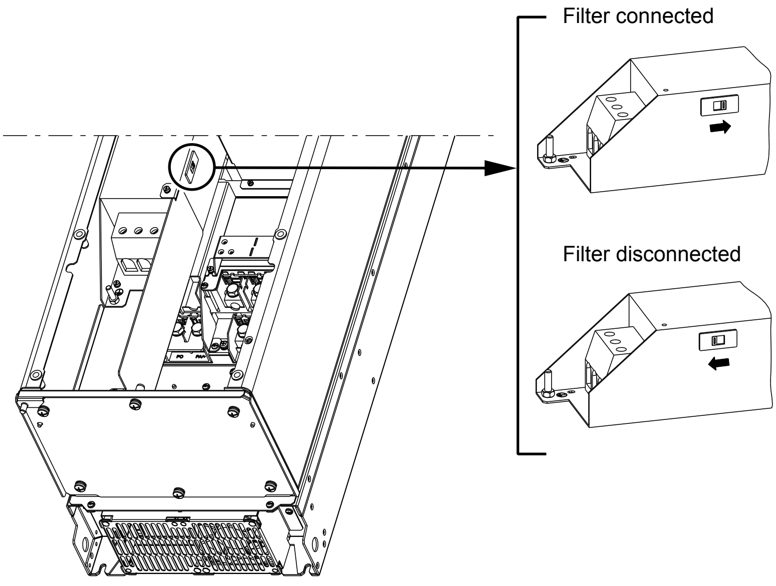
- ATV212WD11N4 to D18N4 (C2, C3) and ATV212WD11N4C to D18N4C (C1)



- ATV212WD22N4 to D75N4 (C2, C3)



- ATV212WD22N4C to D75N4C (C1)



Electromagnetic compatibility (EMC)

NOTE: The high frequency equipotential ground connection between the drive, motor, and cable shielding does not eliminate the need to connect the ground (PE) conductors (green-yellow) to the appropriate terminals on each unit.

Principle and precautions

- Grounds between the drive, motor, and cable shielding must have high frequency equipotentiality.
- When using shielded cable for the motor, use a 4-conductor cable so that one wire will be the ground connection between the motor and the drive. Size of the ground conductor must be selected in compliance with local and national codes. The shield can then be grounded at both cable ends. Metal ducting or conduit can be used for part or all of the shielding length, provided there is no break in continuity.
- When using shielded cable for Dynamic Brake (DB) resistors, use a 3-conductor cable so that one wire will be the ground connection between the DB resistor assembly and the drive. The size of the ground conductor must be selected in compliance with local and national codes. The shield can then be grounded at both cable ends. Metal ducting or conduit can be used for part or all of the shielding length, provided there is no break in continuity.
- When using shielded cable for control signals, if the cable is connecting equipment that is close together and the grounds are bonded together, then both ends of the shield can be grounded. If the cable is connected to equipment that may have a different ground potential, then ground the shield at one end only to help prevent large currents from flowing in the shield. The shield on the ungrounded end may be tied to ground with a capacitor (for example: 10 nF, 100 V or higher) in order to provide a path for the higher frequency noise. Keep the control circuits away from the power circuits. For control and speed reference circuits, we recommend using shielded twisted cables with a pitch of between 25 and 50 mm (1 and 2 in.) Keep the control circuits away from the power circuits.
- Ensure maximum separation between the power supply cable (line supply) and the motor cable.
- The motor cables must be at least 0.5 m (20 in.) long.
- Do not use surge arresters or power factor correction capacitors on the variable speed drive output.
- If using an additional input filter, it should be mounted as closed as possible to the drive and connected directly to the line supply via an unshielded cable. Link on the drive is via the filter output cable.
- For installation of the EMC plate and instructions for meeting IEC 61800-3 standard, refer to the section entitled “Installing the EMC plates”.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Do not expose cable shielding except where connected to ground at the metal cable glands and underneath the grounding clamps.
- Ensure that there is no risk of the shielding coming into contact with live components.

Failure to follow these instructions will result in death or serious injury.

Mains impedance

CAUTION

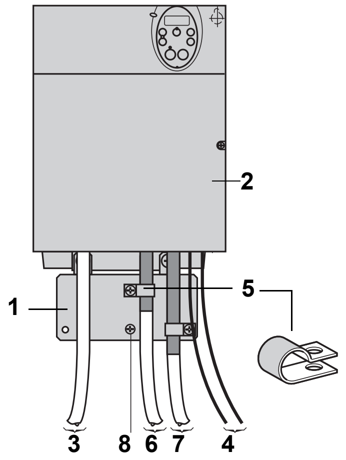
RISK OF LIFE DURATION AND EMC PERFORMANCES DECREASE

- Do not connect the drive to a low impedance network.
- The input withstand current must not exceed the value in the table defined in the ATV212 Quick Start Annex document, reference S1A73476 provided with the product.
- Installation and supply greater than this value will require an additional inductance.

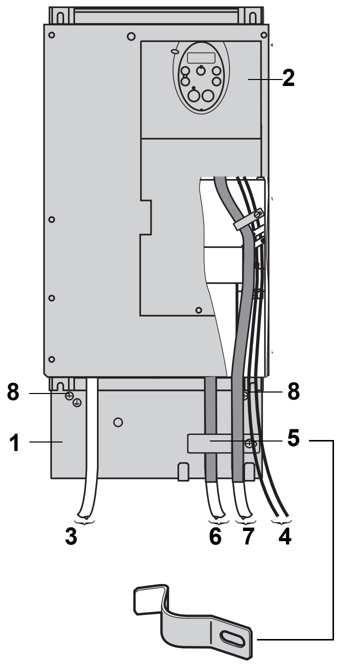
Failure to follow these instructions can result in equipment damage.

EMC Plate and cable arrangement on ATV212H drives

ATV212H 075M3X to D18M3X
ATV212H 075N4 to D22N4S



AV212H D22M3X to D30M3X
ATV212H D22N4 to D75N4



1 EMC plate supplied with the ATV212 drive.

2 ATV212 drive.

3 Non-shielded power supply wires or cables.

4 Non-shielded wires for the output of the relay contacts.

5 The shields for cables 6 and 7 must be securely attached to the EMC plate with stainless steel clamps not supplied with the product. See catalog to order the clamps (ref. TM200RSRCEMC). Strip cables 6 and 7 to expose the shields. Apply appropriately-sized clamps around the stripped portion of the cables and fasten them to the EMC plate.

6 Shielded cable for connection to the motor, with shield connected to ground at both ends. This shield must not be interrupted. If intermediate terminal blocks are used, they must be in EMC-shielded metal boxes.

7 Shielded cable for connection to control/command devices. For applications which require a large number of conductors, small cross-sections must be used (0.5 mm^2, 20 AWG). This shield must not be interrupted. If intermediate terminal blocks are used, they must be in EMC-shielded metal boxes.

8 Ground screw. Use this screw for the motor cables on the low power rated drives, as the ground screw on the heatsink is inaccessible.

If using an additional input filter, connect it directly to the line supply with an unshielded cable. Then make connection 3 on the drive using the filter output cable.

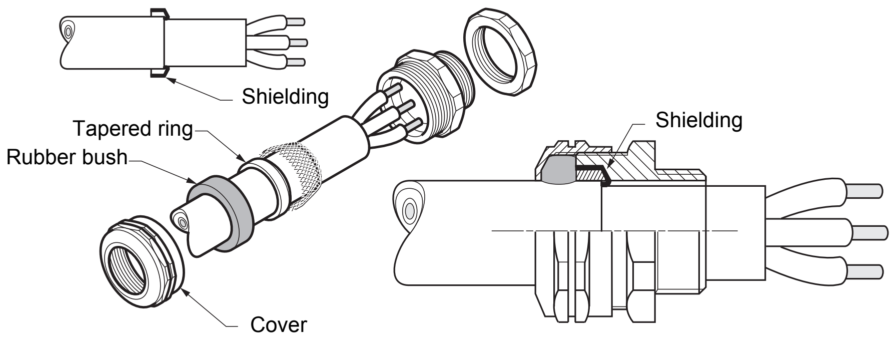
Although there is a high frequency equipotential ground connection between the drive, motor, and cable shielding, you must still connect the PE protective conductors (green-yellow) to the appropriate terminals on each of the devices. You may also need to disconnect the shield at the motor end for very long cable runs to alleviate noise generation.

ATV212W connection plates

There are connection plates on the lower sections of the variable speed drives. These plates are drilled in order to allow cables to be routed through them via cable glands. Cable glands must be ordered separately; **they are not supplied with the drive.**

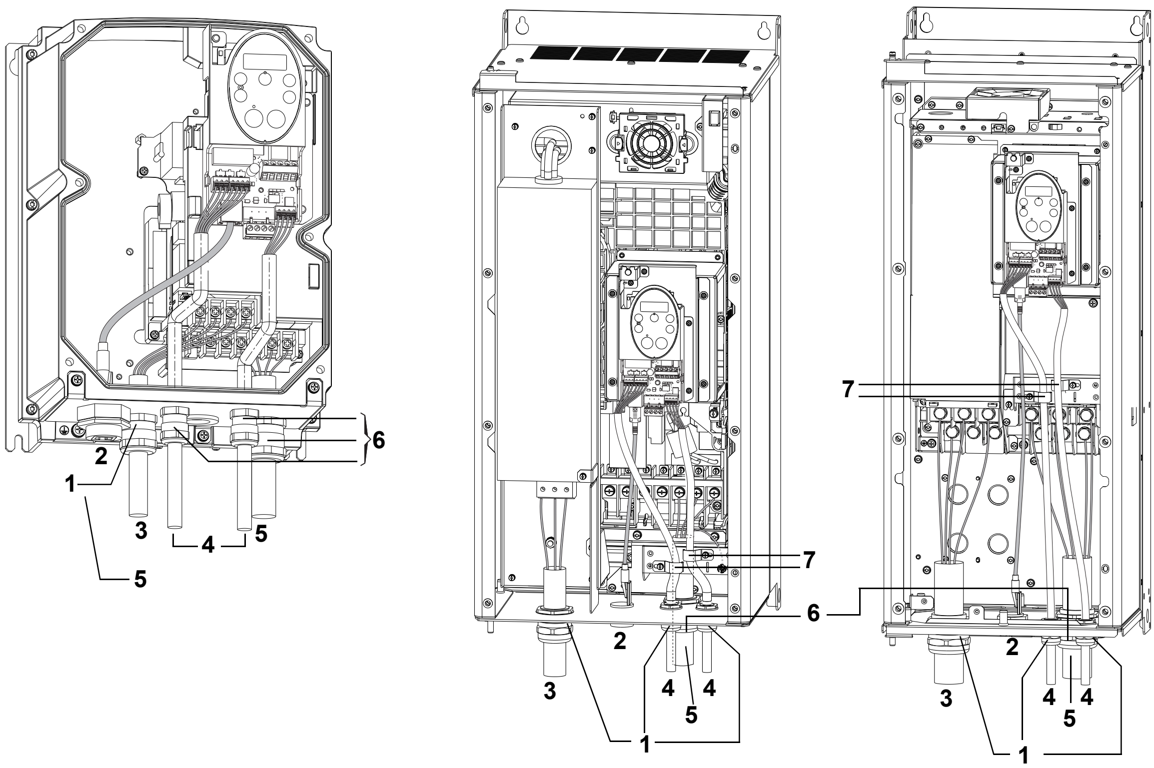
Mounting and connecting a shielded motor cable with metal cable gland (not supplied with the drive)

- Prepare the shielded cable by stripping both ends ready for connection.
- Loosen the cover of the cable gland.
- Attach the shielded cable to the cable gland ensuring it is fully in contact (throughout 360°).
- Fold back the shielding and clamp it between the ring and the body of the cable gland, and tighten the cover.



EMC Plate and cable arrangement on ATV212W drives

ATV212W075N4C to U55N4C



1 Standard cable gland (not supplied with the drive)

2 RJ45 connector

3 Unshielded power supply cable

4 Shielded control cables

5 Shielded motor cable

6 Metal cable glands (not supplied with the drive) for shielded control and motor cables

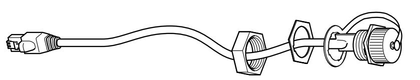
7 Metal clamps for grounding control cable shielding (shielding should be stripped)

Using the RJ45 socket

For example, ATV212W075N4 to U75N4

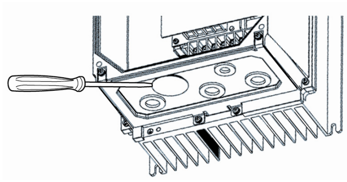
Using the dust and damp proof (UL Type 12/IP55) RJ45 cable VW3A01500 and cable VW3A01501.

VW3A01500

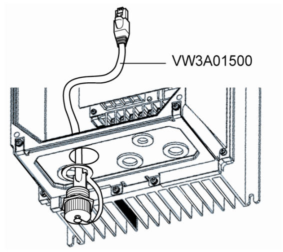


VW3A01501

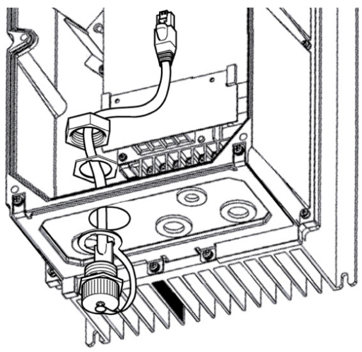
1)



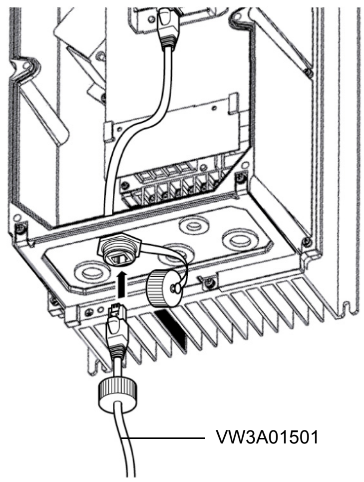
2)



3)



4)



Maintenance

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Read and understand the instructions in "before you begin" chapter, before performing the procedure in this section.

Failure to follow these instructions will result in death or serious injury.

Limitation of Warranty

The warranty does not apply if the product has been opened, except by Schneider Electric services.

Servicing

CAUTION

RISK OF DAMAGE TO THE DRIVE

Adapt the following recommendations according to the environment conditions: temperature, chemical, dust, vibration.

Failure to follow these instructions can result in equipment damage.

It is recommended to do the following in order to optimize continuity of operation.

Environment	Part concerned	Action	Periodicity
Knock on the product	Housing - control block (led - display)	Check the drive visual aspect	At least each year
Corrosion	Terminals - connector - screws - EMC plate	Inspect and clean if required	
Dust	Terminals - fans - blowholes		
Temperature	Around the product	Check and correct if required	
Vibration	Terminal connections	Check tightening at recommended torque	At least each year

Spares and repairs

Serviceable product. Please refer to your Customer Care Centre.

Long time storage

The product capacitor performances after a long time storage above 2 years can be degraded. See page 13.

Recommended branch circuit protection devices

Please refer to the ATV212 Quick Start Annex document, reference S1A73476 : Short Circuit Current Ratings (SCCR) and branch circuit protection.

This document is delivered with the product, and you can download it on www.schneider-electric.com.

Migration ATV21 --> ATV212

6

What's in this Chapter?

This chapter contains the following topics:

Generalities

The ATV212 is compatible with the ATV21 (latest version), nevertheless some differences exist between both drives.

Differentiating points

Power part

The power connections are identical to that of ATV21

Control part overview

The control terminals are arranged and marked differently.

Furthermore ATV21 used to offer 5 different cards:

- a standard I/O card,
- 4 dedicated cards for BACnet, Metasys N2, APOGEE and LONWORKS fieldbuses.

ATV212 offers:

- as standard a communication card intended to Modbus, BACnet, Metasys N2 and APOGEE FLNP1 fieldbuses,
- a LONWORKS option card.

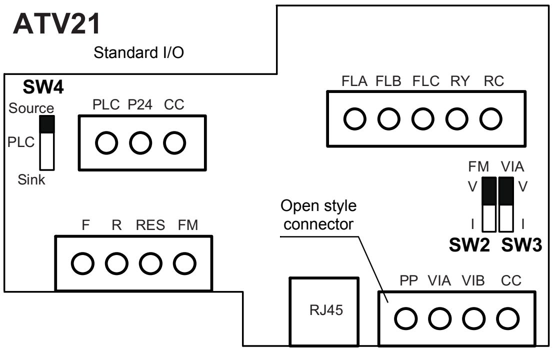
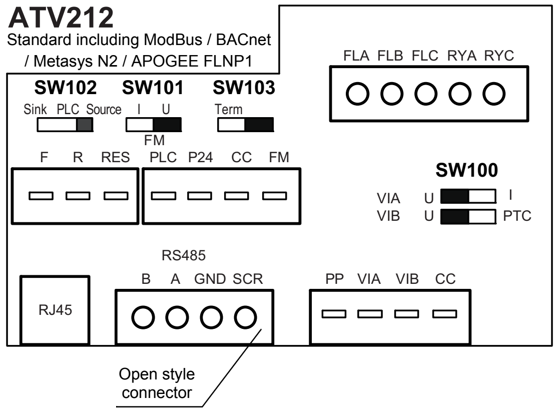
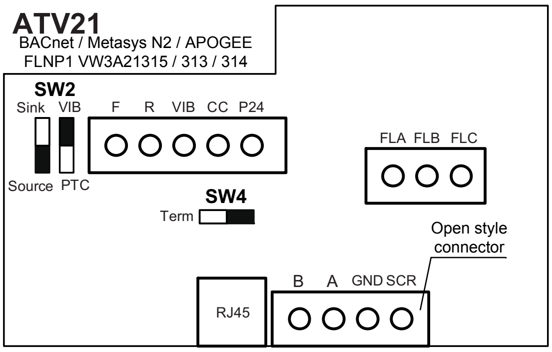
Switches

ATV21 Standard I/O		**ATV212 Modbus BACnet, Metasys N2, APOGEE**	
Selection of logic type	SW4	Selection of logic type	SW102
FM voltage/ current selection	SW2	FM voltage/ current selection	SW101

ATV21 BACnet, Metasys N2, APOGEE		**ATV212 Modbus BACnet, Metasys N2, APOGEE**	
Selection of logic type	SW2	Selection of logic type	SW102
VIB function		VIB function	SW100
Selection of communication terminal resistor	SW4	Selection of communication terminal resistor	SW103

ATV21 LONWORKS		**ATV212 LONWORKS**	
Selection of logic type	SW1	Selection of logic type	SW100
VIB function		VIB function	

Terminal and switches arrangement comparison

<table>
<tr><th>ATV21 former cards</th><th>ATV212 new cards</th></tr>
<tr><td>Standard I/O card</td><td>Standard Modbus/BACnet/Metasys N2/APOGEE FLNP1 card</td></tr>
<tr><td>
</td><td>RJ45 factory setting:
● on ATV21, to connect Modbus
● on ATV212, to connect graphic display option.
For ATV212, use the open style connector to connect the drive to Modbus, BACnet, APOGEE FLNP1 and Metasys N2 fieldbuses.
Using RJ45 to connect Modbus fieldbus is still possible but requires to modify parameter F807 factory setting. See programming manual.

</td></tr>
<tr><td></td><td></td></tr>
<tr><td>BACnet / Metasys N2 / APOGEE option card</td><td></td></tr>
<tr><td>
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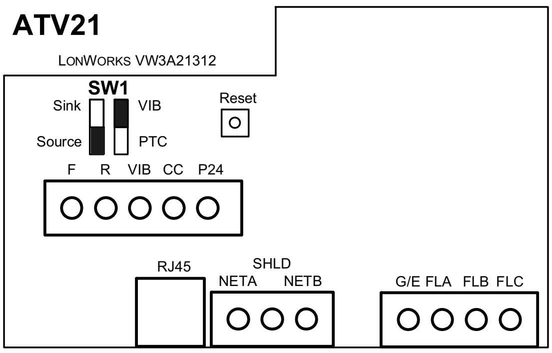
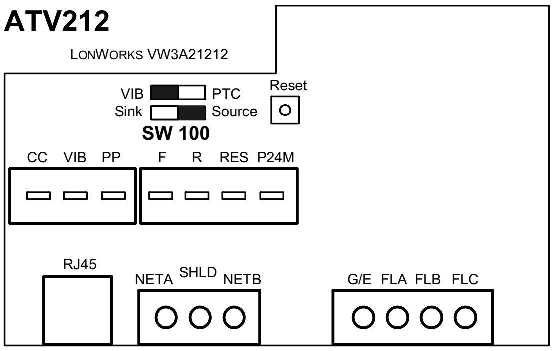
<tr><td></td><td></td></tr>
<tr><td>LONWORKS option card</td><td>LONWORKS option card</td></tr>
<tr><td>
</td><td>
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