

Basic Bypass Panels

FRENIC-EcoPAK



Safety Precautions

Read this manual thoroughly before proceeding with installation, connections (wiring), or maintenance and inspection. Ensure you have sound knowledge of the device and familiarize yourself with all safety information and precautions before proceeding to operate the drive. Refer to the **FRENIC-Eco** drive instruction manual (INR-SI47-1225-E) for further safety information.

Safety precautions are classified into the following two categories in this manual.



Failure to heed the information indicated by this symbol may lead to dangerous conditions, possibly resulting in death or serious bodily injuries.



Failure to heed the information indicated by this symbol may lead to dangerous conditions, possibly resulting in minor or light bodily injuries and/or substantial property damage.

FRENIC-EcoPAK Bypass Panel Overview


The **FRENIC-EcoPAK** bypass panel is a packaged drive solution in a Type 3R enclosure with bypass control.

Features

- Type 3R enclosure
- Metallic enclosures to reduce radio frequency interference (RFI)
- Integral main disconnect with branch circuit protection, including a padlockable through-the-door operator handle mechanically interlocked with the enclosure door
- 3% AC line reactor provided as standard below 100HP to minimize harmonics and provide transient voltage protection for the drive, with the option of a 5% AC line reactor. At 100HP and above, a DC link reactor is provided, with the option for adding a 3% or 5% AC line reactor
- Control power transformer with primary & secondary fusing
- Door mounted drive keypad with backlit LCD and LED displays for drive set-up, troubleshooting, local operation control, maintenance indication, and operational indication
- Run and Enable inputs
- Built-in communications, user selectable between Modbus RTU, Metasys[®] N2, or APOGEE[®] FLN (P1), with additional communication options including: LONWORKS[®], BACnet, DeviceNet, and Profibus DP
- Bypass packages additionally include:
 - Mechanically & electrically interlocked drive output and bypass contactors
 - Class 10 overload relay for motor thermal protection in bypass mode
 - Drive isolation contactor
 - Control terminal strip for easy input and output control wiring
 - Door mounted operator controls and indication for “Power On”, “Bypass Run” and “Motor Overload” (during bypass mode)
 - Bypass Run Status Output
- UL/cUL Listed

APOGEE is a registered trademark of Siemens Building Technologies, Inc.
LONWORKS is a registered trademark of Echelon Corporation.
Metasys is a registered trademark of Johnson Controls, Inc.

Panel Identification

 Fuji Electric <small>inverter solutions</small>	
Model Nbr:	PNL020F1/1-46U-31BDCX
Serial Nbr:	F08-0000
Input Ratings	
Voltage:	460
Total FLA:	29.0
Phase:	3
Hz:	60
Output Ratings	
Voltage:	0-460
Max / Motor FLA:	28.0
Phase:	3
Hz:	0-120
Short Circuit Current:	5 kA rms symmetrical
	480 V maximum
Enclosure Type:	1
Elementary Drawing:	ROA100010
Outline/Layout Drawing:	ROA300004
Installation Instructions:	INR-SI47-1206-E
UL FILE # E105691	

Each **FRENIC-EcoPAK** bypass panel has a nameplate label, like the example pictured above, which contains important information about the panel. This label is located on the inside of the hinged door on the enclosure.

CAUTION

- Refer to the nameplate label to determine the panel input voltage and current requirements prior to installation and wiring.
- Refer to the nameplate label for the correct wiring diagram (Elementary Drawing).
- Sizing of field wiring conductors should be based upon the current ratings listed on the nameplate label.

Installation



The **FRENIC-EcoPAK** bypass panel should be located:

- Away from flammable or combustible liquids, gases, and other materials
- Away from sources of dust, metal shavings, or other particulate material
- Away from corrosive liquids, spray, or mist
- Away from sources of heat
- Where the ambient temperature will remain between -10°C (14°F) and 40°C (104°F)

Wall-mount panels must be mounted on a non-flammable heat-resistant surface that is capable of supporting the weight of the panel.

Refer to the dimensional drawing that shipped with the panel for required clearances.

Routing of field wiring should be planned in coordination with choosing a mounting location.

Wiring Overview

The **FRENIC-EcoPAK** bypass panel must be connected to an input power source, a motor (output power), and control signals.

WARNING

- Wiring should be performed by a qualified electrician using standard practices as specified by local and national codes.
- Always make sure the input power source is OFF before connecting or disconnecting any power input, output, or control wiring.
- Ground the panel, as specified by local and national codes, using the provided grounding lugs or bus bar.
- Make sure that the input power source (phases, voltage, and current capacity) matches the requirements of the panel as stated on the nameplate.
- Never connect line voltage to the drive output terminals (U, V, and W).
- When making holes for conduit fittings, be sure to completely cover the drive and other components to protect them from metal shavings.
- Conduit fittings must maintain 3R rating.

CAUTION

- All field wiring should be copper with a minimum insulation rating of 75°C.
- Sizing of field wiring conductors should be based upon the current ratings listed on the nameplate label, in accordance with local and national codes.

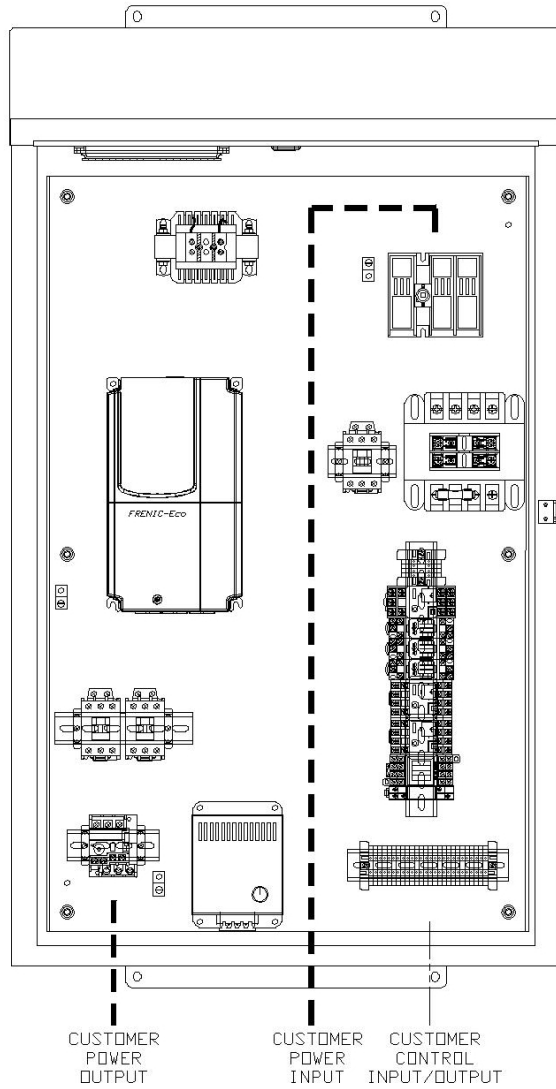
Refer to the wiring diagram that shipped with this panel and the torque table in this instruction manual.

Refer to the diagrams on the following pages for general component layout and for general routing of power input, power output (motor connections), and control wiring for your panel. Power input wiring should be routed away from power output wiring, and both should enter the panel from separate conduit. Control wiring should be routed away from power wiring, and should enter the panel from separate conduit. All panels require holes to be punched in the field. Refer to the panel outline drawing provided for recommended conduit locations.

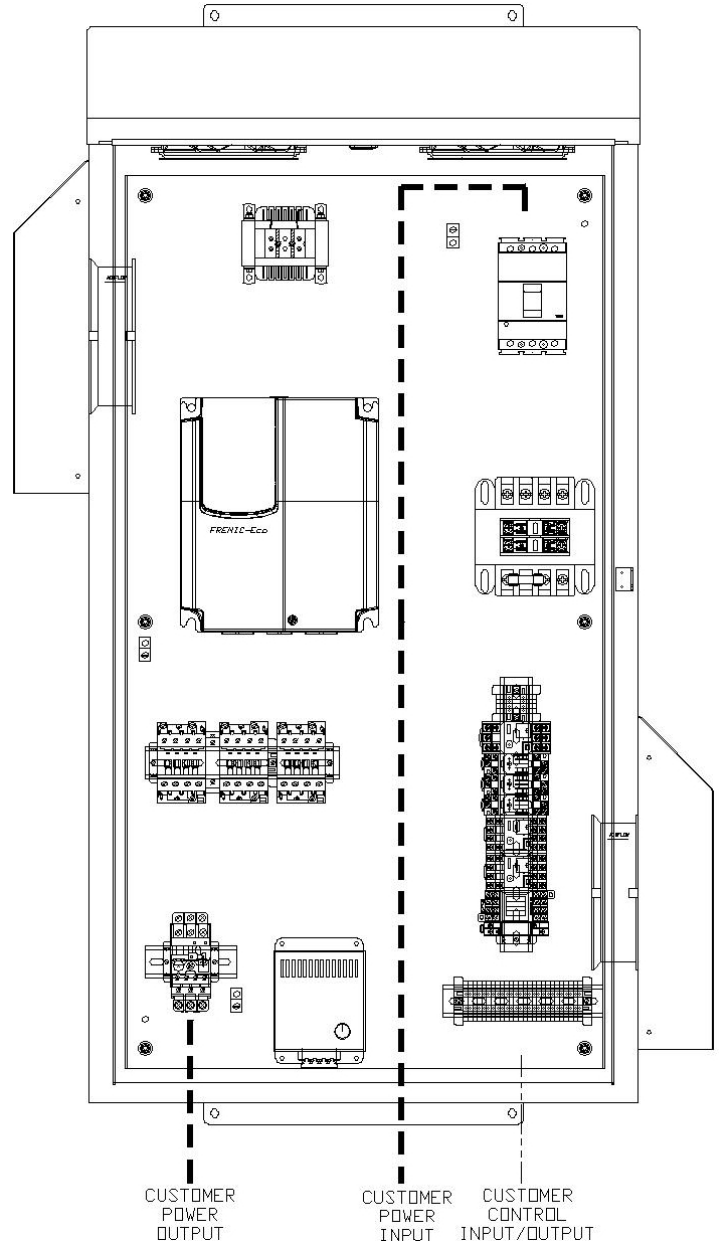
Refer to the following section **Control Wiring** for descriptions of the control connections.

Wiring Overview (cont'd)

2-5Hp @ 208V
2-7.5Hp @ 460V



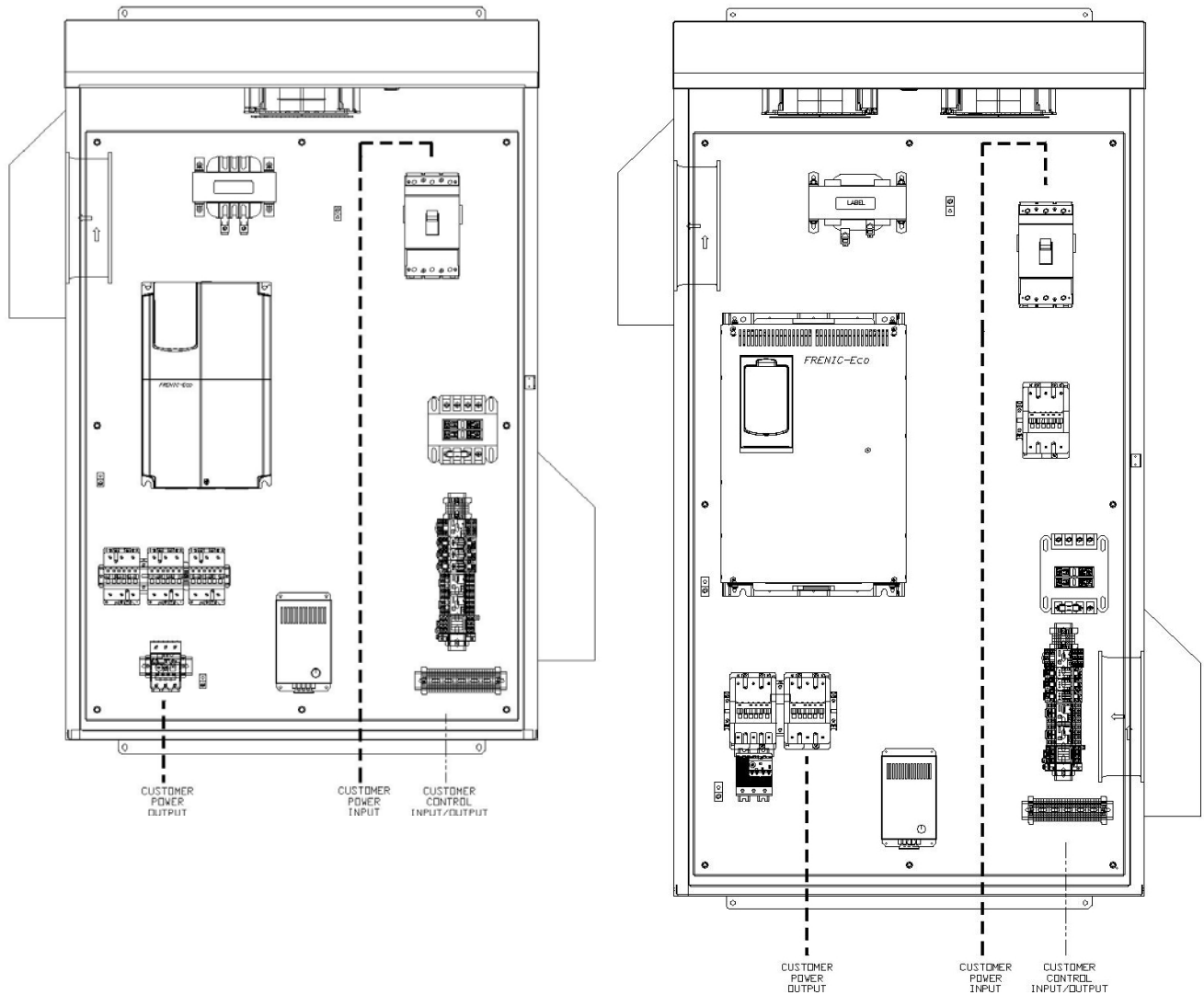
7.5-15 Hp @ 208V
10-20Hp @ 460V



Wiring Overview (cont'd)

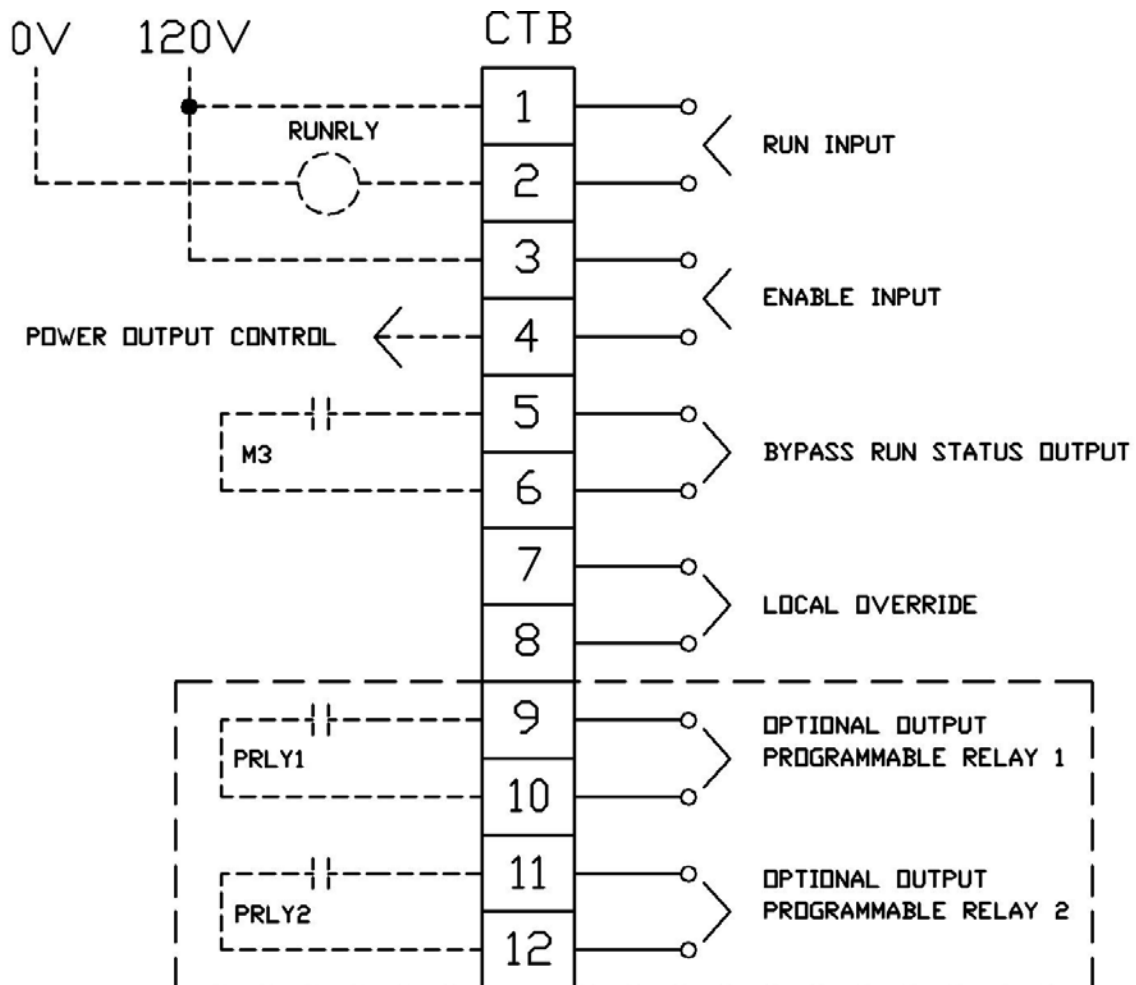
20-25Hp @ 208V
25-40Hp @ 460V

30Hp @ 208V
50-75Hp @ 460V



Control Wiring

Terminal blocks, marked CTB, are provided for customer control wiring connections. The following diagram shows control connections that are available on **FRENIC-EcoPAK** basic bypass panels:



Control Wiring (cont'd)

Description of Control Connections

All discrete inputs and outputs should be dry-contact type rated for 120VAC.

- **Run input** (RUNRLY):
 - CTB 1-2
 - Must be closed to run in both Drive and Bypass modes
- **Enable input** (ENRLY):
 - CTB 3-4
 - Must be closed to run in both Drive and Bypass modes
- **Bypass output** (M3):
 - CTB 5-6 for NO contacts rated for 5A @ 230VAC max
 - Used for monitoring bypass run status
- **Local Override input**:
 - CTB 7-8
 - Closure allows run in bypass mode without external **Run** input

Options

- **Programmable Relay 1 output** (PRLY1):
 - CTB 9-10 for NO contacts rated for 1A @ 230VAC max
 - Provides a dry-contact output equivalent to the drive output signal Y1, which is user-selectable
- **Programmable Relay 2 output** (PRLY2):
 - CTB 11-12 for NO contacts rated for 1A @ 230VAC max
 - Provides a dry-contact output equivalent to the drive output signal Y2, which is user-selectable

Field Wiring Torque and Wire Size Values for *FRENIC-EcoPAK 208/230V*

HP	Circuit Breaker 'CB'	Fusible Disconnect 'FUSDISC'	Output Contactor 'M2'	Overload 'OL'	Terminal Blocks 'CTB'
2	n/a	17 in.lb. 18-8 AWG	n/a	12 in.lb. 2x 14-10 AWG	4.5 in.lb. 22-12 AWG
3	n/a	17 in.lb. 18-8 AWG	n/a	12 in.lb. 2x 14-10 AWG	4.5 in.lb. 22-12 AWG
5	n/a	17 in.lb. 18-8 AWG	n/a	12 in.lb. 2x 14-10 AWG	4.5 in.lb. 22-12 AWG
7.5	62 in.lb. 14-1 AWG	30 in.lb. 14-4 AWG	n/a	20 in.lb. 2x 14-10 AWG	4.5 in.lb. 22-12 AWG
10	62 in.lb. 14-1 AWG	30 in.lb. 14-4 AWG	n/a	32 in.lb. 1x 12-4 AWG 2x 12-6 AWG	4.5 in.lb. 22-12 AWG
15	62 in.lb. 14-1 AWG	120 in.lb. 14-2/0 AWG	n/a	32 in.lb. 1x 12-4 AWG 2x 12-6 AWG	4.5 in.lb. 22-12 AWG
20	62 in.lb. 14-1 AWG	120 in.lb. 14-2/0 AWG	n/a	32 in.lb. 1x 12-4 AWG 2x 12-6 AWG	4.5 in.lb. 22-12 AWG
25	88 in.lb. 14 AWG to 300kcm	275 in.lb. 4 AWG to 300kcm	n/a	53 in.lb. 1x 12-4 AWG 2x 12-6 AWG	4.5 in.lb. 22-12 AWG
30	88 in.lb. 14 AWG to 300kcm	275 in.lb. 4 AWG to 300kcm	53 in.lb. 8-2/0 AWG	n/a	4.5 in.lb. 22-12 AWG

Note: Wire ranges provided indicate conductor sizes that the device terminal or lug will accept. Follow local and national codes for proper conductor sizing.

Field Wiring Torque and Wire Size Values for *FRENIC-EcoPAK 460V*

HP	Circuit Breaker 'CB'	Fusible Disconnect 'FUSDISC'	Output Contactor 'M2'	Overload 'OL'	Terminal Blocks 'CTB'
2	n/a	17 in.lb. 18-8 AWG	n/a	12 in.lb. 2x 14-10 AWG	4.5 in.lb. 22-12 AWG
3	n/a	17 in.lb. 18-8 AWG	n/a	12 in.lb. 2x 14-10 AWG	4.5 in.lb. 22-12 AWG
5	n/a	17 in.lb. 18-8 AWG	n/a	12 in.lb. 2x 14-10 AWG	4.5 in.lb. 22-12 AWG
7.5	n/a	17 in.lb. 18-8 AWG	n/a	12 in.lb. 2x 14-10 AWG	4.5 in.lb. 22-12 AWG
10	n/a	17 in.lb. 18-8 AWG	n/a	12 in.lb. 2x 14-10 AWG	4.5 in.lb. 22-12 AWG
15	62 in.lb. 14-1 AWG	30 in.lb. 14-4 AWG	n/a	20 in.lb. 2x 14-10 AWG	4.5 in.lb. 22-12 AWG
20	62 in.lb. 14-1 AWG	30 in.lb. 14-4 AWG	n/a	20 in.lb. 2x 14-10 AWG	4.5 in.lb. 22-12 AWG
25	62 in.lb. 14-1 AWG	30 in.lb. 14-4 AWG	n/a	32 in.lb. 1x 12-4 AWG 2x 12-6 AWG	4.5 in.lb. 22-12 AWG
30	62 in.lb. 14-1 AWG	120 in.lb. 14-2/0 AWG	n/a	32 in.lb. 1x 12-4 AWG 2x 12-6 AWG	4.5 in.lb. 22-12 AWG
40	62 in.lb. 14-1 AWG	120 in.lb. 14-2/0 AWG	n/a	32 in.lb. 1x 12-4 AWG 2x 12-6 AWG	4.5 in.lb. 22-12 AWG
50	62 in.lb. 14-1 AWG	120 in.lb. 14-2/0 AWG	35 in.lb. 8-2 AWG	n/a	4.5 in.lb. 22-12 AWG
60	88 in.lb. 14 AWG to 300kcm	275 in.lb. 4 AWG to 300kcm	35 in.lb. 8-2 AWG	n/a	4.5 in.lb. 22-12 AWG
75	88 in.lb. 14 AWG to 300kcm	275 in.lb. 4 AWG to 300kcm	53 in.lb. 8-2/0 AWG	n/a	4.5 in.lb. 22-12 AWG

Note: Wire ranges provided indicate conductor sizes that the device terminal or lug will accept. Follow local and national codes for proper conductor sizing.

BASIC BYPASS PANEL STARTUP

This startup guide assumes that the **FRENIC-EcoPAK** panel has been integrated into a building automation control system. If direct local control is required, refer to the following section **Setting Up Local Control**.



- Make sure all power and control wiring is completed before proceeding.
 - As with all electrical equipment installations, insure all safety/wiring instructions have been followed in accordance with this product's manuals and local and national codes.
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1. Set panel operator switches to the following positions:
 - a. 'Isolate-Normal' switch to 'Isolate' (where applicable)
 - b. 'Drive-Off-Bypass' switch to 'Off'
 2. Energize panel by turning the main disconnect device to the 'ON' position.
 3. Confirm 'Power ON' light energized.
 4. Set panel operator switches to 'Normal' and 'Drive'.
 5. Set drive parameters for the connected motor (refer to the section **Common Parameter Settings** on page 15).
 6. Send a remote 'Run' signal to the drive (close CTB 1-2), then an 'Enable' signal (close CTB 3-4).
 7. Check that the motor rotates in the correct direction (see step 10).
 8. Set the 'Drive-Off-Bypass' switch to 'Bypass' and allow the motor to restart.
 9. Check direction of motor rotation. To change, refer to the **Troubleshooting** section in this manual.
 10. Measure and record motor FLA while in bypass mode if required. Allow motor to run at full speed for a sufficient time to insure panel-mounted overloads are properly set. Adjust, if necessary.
 11. Set the 'Drive-Off-Bypass' switch to 'Off' and allow the motor to come to a complete stop.
 12. Set the 'Drive-Off-Bypass' switch to 'Drive'.
 13. Vary the remote speed signal (if applicable) and check for correct drive operation.
 14. When correct remote operation has been verified, remove the remote 'Enable' signal.
 15. Set the 'Drive-Off-Bypass' switch to 'Off' and de-energize panel.
 16. Record startup data and change any parameters as necessary per the application requirements.

Setting Up Local Control

Also refer to the following section **Programming the FRENIC-Eco Drive** and the **FRENIC-Eco** drive instruction manual (INR-SI47-1225-E) for more information.

The **FRENIC-EcoPAK** bypass panel was intended to be integrated into a building automation system and controlled by remote signals. If these signals are not available, the bypass panel can be set up to be operated locally. Follow these steps to set the panel up for local operation:

1. Install a wire jumper for the Run input (CTB 1-2).
2. Install a wire jumper for the Enable input (CTB 3-4).
3. Set drive function code F01 to 0.
4. Set drive function code F02 to 2.
5. Set drive function code H96 to 3.

The bypass panel can now be operated directly using the door-mounted operator switches and the drive keypad.

COMMON PARAMETER SETTINGS

Also refer to the **FRENIC-Eco** drive instruction manual (INR-SI47-1225-E) for more information.

Factory-set drive parameters and settings

These parameters and settings are pre-set from the factory for the bypass panel to be operational. If, for some reason, the drive parameters are reinitialized, these parameters must be reset for correct bypass panel operation.

Drive function codes:

- F01 = 3
- F02 = 1
- F05 = 230 (for 230V panels only - default otherwise)
- F11 = nameplate output current
- F16 = 3
- E01 = 1007
- E20 = 55
- E21 = 0
- E22 = 0
- E24 = 0
- H96 = 0

Drive switches:

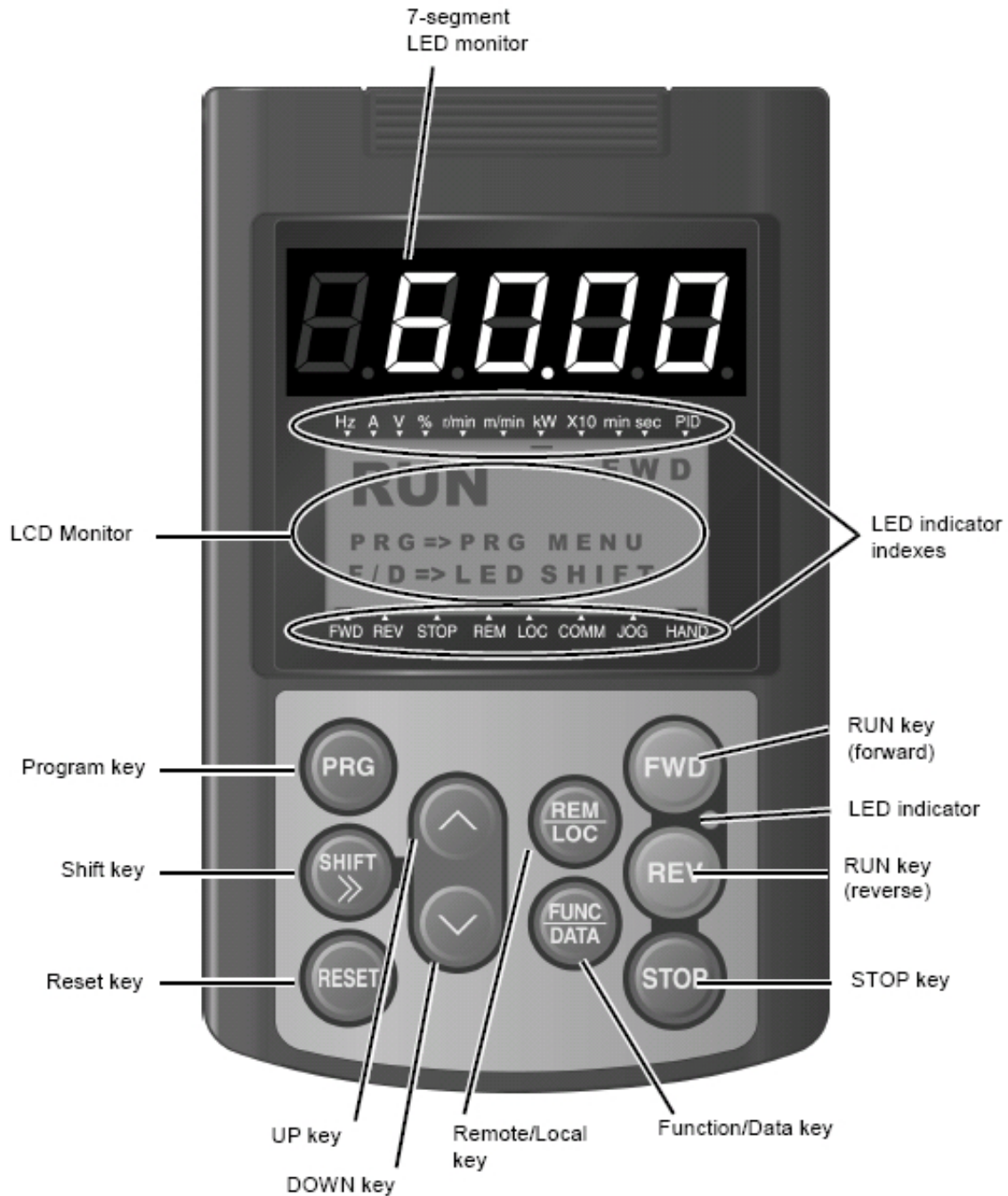
- SW1 set to SINK
- SW5 set to V2

Hardware settings:

- OL trip type set to Manual
- OL trip level set to nameplate output current
- Fan thermostat set to 90°F
- Heater thermostat set to 70°F (if equipped)

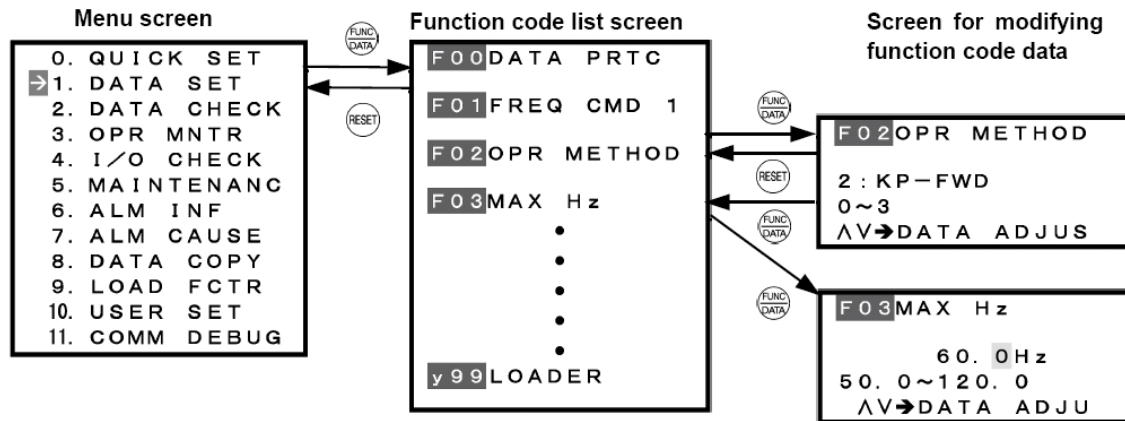
Programming the *FRENIC-Eco* Drive

Also refer to Chapter 3 in the *FRENIC-Eco* drive instruction manual (INR-SI47-1225-E) for more information.



Programming the *FRENIC-Eco* Drive (cont'd)

To set drive parameters using the keypad, first make sure the drive is stopped. Most parameters cannot be changed while the drive is running. To enter the programming menu, press the Program Key (PRG) on the keypad. To return to the previous screen, press either (PRG) or (RESET). To select a menu item, use the (UP) and (DOWN) keys on the keypad, then press the (FUNC/DATA) key to go to that screen. Refer to the diagram below for an example of navigating the menu:



Function code settings can be changed using the (UP) and (DOWN) keys on the keypad. Pressing (FUNC/DATA) saves the changes, while pressing (RESET) discards the changes, and both return to the previous menu.

The most frequently modified parameters can be accessed in the 'Quick-Set' menu (item 0 on the programming menu screen). All parameters can be accessed in the 'Data-Set' menu (item 1 on the programming menu screen).

Recommended user-set drive parameters

*These parameters are all in the **FRENIC-Eco** drive Quick-Set menu for easy access. Also refer to the **FRENIC-Eco** drive instruction manual (INR-SI47-1225-E) for more details*

- F07 Acceleration Time.
- F08 Deceleration Time.
- F10 Electronic Overload (motor characteristics).
- F11 Electronic overload (detection level)
- F14 Restart Settings.
- F26 Motor Sound (carrier frequency).
- P02 Motor Capacity (HP).
- P03 Motor FLA.
- P04 Motor Tuning.

OPERATION

Operator Controls

The **FRENIC-EcoPAK** bypass panel includes the following controls for local operation and monitoring:

- Main power disconnect
- Drive keypad
- Drive-Off-Bypass selector switch
- Isolate-Normal selector switch
- Power On indicator
- Bypass indicator
- Motor Overload indicator

The **FRENIC-EcoPAK** bypass panel includes the following controls for remote operation and monitoring:

- Run *input*
- Enable *input*
- Bypass *output*

Operation Modes

Off Mode

When the *Drive-Off-Bypass* switch is in the *Off* position, the connected motor will not run, even though the panel and drive may be energized. Both the drive output and the line are disconnected from the motor.

Drive Mode

When the *Drive-Off-Bypass* switch is in the *Drive* position, the drive controls motor operation. The **FRENIC-EcoPAK** bypass panel is intended to be operated in *Drive* mode most of the time. The drive's output voltage and frequency can be varied to better match the motor's load and provide more efficient operation. The drive keypad provides an interface for controlling drive operation, setting parameters, and monitoring. The drive also provides an interface for remote control and monitoring, via either discrete I/O or a common communication protocol. Refer to the **FRENIC-Eco** drive instruction manual (INR-SI47-1225-E) for further information.

OPERATION (cont'd)

Bypass Mode

When the *Drive-Off-Bypass* switch is in the *Bypass* position the connected motor runs across the line with no speed control. The drive output is disconnected and has no effect on motor operation.



- When using the *Drive-Off-Bypass* to switch from *Drive* mode to *Bypass* mode, switch to *Off* and wait at least five seconds before switching to *Bypass*. This time delay allows the motor flux to decay before connecting across the line, which is likely to be out of phase with the existing motor flux. This helps to prevent damage to the motor and its load.

Isolate Mode

The drive can be isolated from the input power source when in *Bypass* mode by setting the *Isolate-Normal* switch to *Isolate*. When in *Isolate* mode, the drive will not have power and the drive keypad will not be lit up.

Status Indicators

- **Power On:** This light is on when there is control power to the panel. The drive may or may not have power and the motor may or may not be running.
- **Bypass:** This light is on when the panel is in *Bypass* mode and the motor is running across the line.
- **Motor Overload:** This light comes on when the motor overload relay trips.

MAINTENANCE

Periodic Maintenance

The following items require periodic inspection and maintenance:

- Fans should be checked for proper operation and filters checked and/or replaced on a schedule that suits local conditions.
- Power wiring connections should be checked and re-torqued every six months.
- Refer to the **FRENIC-Eco** drive instruction manual (INR-SI47-1225-E) for drive maintenance requirements and schedule.

Fans and Filters

For replacement top exhaust fans (out of warranty period) and expanded aluminum mesh filter media, consult Hoffman at www.hoffmanonline.com with the enclosure catalog number (found on the label on the inside of the hinged door).

For replacement side fans (out of warranty period) and filter media, refer to the following tables:

208/230V		Filter		Fan	
HP	Location	Manufacturer	Part Number	Manufacturer	Part Number
2-15	All	Orion	LG172B	Orion	OA172AP-11-1TB
20-30	All	Orion	LG254B	Orion	OA254AN-11-1TBXC

460V		Filter		Fan	
HP	Location	Manufacturer	Part Number	Manufacturer	Part Number
2-20	All	Orion	LG172B	Orion	OA172AP-11-1TB
25-75	All	Orion	LG254B	Orion	OA254AN-11-1TBXC

Replacement fans and filter media can be found at the following sites:

- www.alliedelec.com for Orion fans and filters

Maintenance (cont'd)

Fuses

The **FRENIC-EcoPAK** panel has labels, located on the inside of the hinged door, which list the correct size and type of fuses to be used for that panel. For reference, the following table lists the main power fuse sizes (applicable to models with fusible disconnect):

MAIN POWER	208/230V	460V
HP	Class J	Class J
2	15	8
3	20	10
5	30	15
7.5	45	20
10	50	30
15	80	40
20	100	50
25	125	60
30	150	70
40	n/a	90
50	n/a	100
60	n/a	125
75	n/a	175

Fuse Reference - Ferraz Shawmut series (type)

Main Power: AJT (Time-delay Class J)

CPT Primary: ATQR (Time-delay Class CC)

CPT Secondary: TRM (Time-delay Midget)

TROUBLESHOOTING

Drive

For drive-specific issues, refer to the **FRENIC-Eco** drive instruction manual (INR-SI47-1225-E).

Motor Rotation

- Problem: Motor turns correctly in Bypass mode and incorrectly in Drive mode
Solution: Swap two of the three input power connections AND two of the three motor output connections.
- Problem: Motor turns correctly in Drive mode and incorrectly in Bypass mode
Solution: Swap two of the three input power connections
- Problem: Motor turns incorrectly in both Drive mode and Bypass mode
Solution: Swap two of the three motor output connections