Nidec

All for dreams

Installation and Commissioning Guide

HMI Bypass Controller

HVAC Drive H300

Part Number: PSD-H300HMIBP-ICG
Issue: 2.0

CONTROL TECHNIQUES™

Contents

Safety and Precautions

1. Read this manual in its entirety before installing or operating the HMI bypass package. This manual applies to HMI bypass packages with the Nidec Control Techniques HVAC Drive H300 variable frequency drive.
2. Do not connect or disconnect wiring, or perform signal checks while the power supply is turned ON.
3. The internal capacitor of the installed drive may be charged even after the power supply has been turned OFF. To prevent electrical shock, disconnect all power before servicing the HMI bypass. Wait at least 10 minutes after the power supply has been disconnected and all LEDs have been extinguished.
4. Do not perform a voltage withstand test on the HMI bypass or the installed drive. This electronic equipment uses semiconductors and is vulnerable to high voltage. Severe damage to the equipment may occur.
5. The HMI bypass is suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical Amperes, 240 volts maximum (230 Volt class units), 480 Volts maximum (460 Volt Class units), 600 Volts maximum (575 Volt Class units).
6. Static sensitive printed circuit boards are installed in the HMI bypass package. Damage may occur due to Electrostatic Discharge (ESD). DO NOT handle any components without following proper ESD precautions.

Failure to observe these and other precautions highlighted in this manual will expose the user to high voltages, resulting in equipment damage, serious injury or death.

Section 1 - Introduction

Thank you for purchasing your Nidec Control Techniques HMI bypass package. This manual provides information concerning the installation, wiring and general startup procedures for the HVAC Drive H300 line of HMI bypass packages. The HMI bypass is a complete integrated HVAC control system which employs the latest Variable Frequency Drive (VFD) technology and incorporates a dedicated micro-processor based controller for HVAC applications. The HMI bypass package uses a dedicated LCD touchscreen Human Machine Interface (HMI) that clearly shows the system operating status. The HMI bypass is designed for ease of installation and startup.

Please follow this instruction manual's guidelines for proper installation and programming of your HMI bypass package.

HVAC Drive H300

LCD touchscreen HMI bypass

Lower enclosure

Disconnect handle
(padlockable)
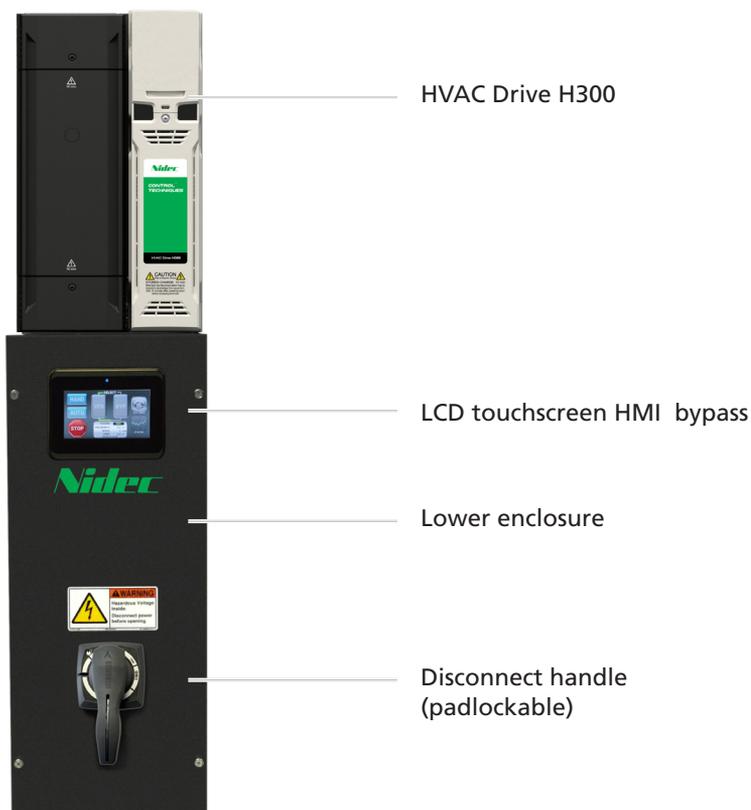
Section 2 - Installation Instructions

2.1 Receiving

After unpacking the HMI bypass package:

✓ Verify that the part numbers on the package match the numbers on your purchase order, packing slip or tagging information.

✓ Check the unit for physical damage which may have occurred during shipping. If any part of the package is missing or damaged, notify the carrier and your Nidec Control Techniques representative immediately.

✓ Verify that all internal hardware (i.e. components, screws, etc.) is properly seated and fastened securely.

2.2 Nameplate Information

The HMI bypass package has two nameplates for identification. The main label is located on the inside of the enclosure. This nameplate provides information on the entire package. The second nameplate is located on the VFD. This nameplate contains information related to the VFD only. The nameplate information should be recorded and kept in a safe location. This information is required for any service or repair.

2.2.1 Labels

2.2.1.1 HMI Bypass Package Label

2.2.1.2 Typical Standard VFD Rating Label

Key to approvals

CE	CE approval	Europe
RCM	RCM regulatory compliance mark	Australia
UL / cUL	UL / cUL approval	USA & Canada
RoHS Compliant	RoHS compliant	Europe
FUNCTIONAL SAFETY UL LISTED	Functional safety	USA & Canada
EAC	Eurasian conformity	Eurasia
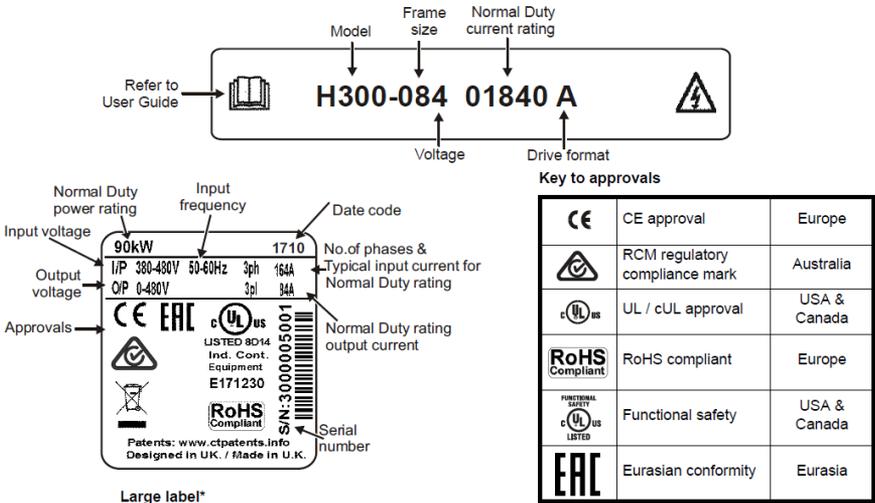
Large label*
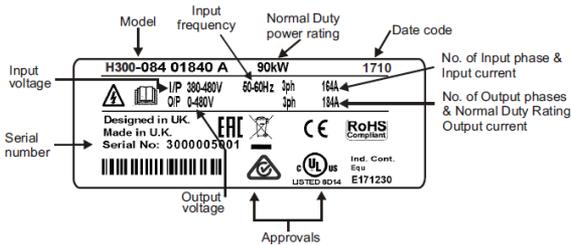
* This label is only applicable to VFD size 7 and above.
Refer to the following page **Section 2.3 Part Number Identification** for further information relating to the labels.

2.3 Part Number Identification

Packaged HVAC/R Drives from 1 to 600 hp

BASE ORDER CODE										POWER & DOOR OPERATOR OPTIONS									CONTROL OPTIONS										
P	X	XXXX	N	X	X	X		X	0	X	X	X	X	X	0	-	X	X	X	X	0	X	X	X	X	X
1	2	3 - 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

[Order Code digit number] →

[1] Package Types
G = Pre-Engineered, New Generation
P = Pre-Engineered
S = Seismic*
C = Custom*
*Contact Factory

[2] Voltage Ratings
8 = 208 Vac
2 = 230 Vac
4 = 460 Vac
5 = 575 Vac

[3] - [6] Horsepower Ratings
0001 = 1 HP	0060 = 60 HP
01P5 = 1.5 HP	0075 = 75 HP
0002 = 2 HP	0100 = 100 HP
0003 = 3 HP	0125 = 125 HP
0005 = 5 HP	0150 = 150 HP
0007 = 7.5 HP	0200 = 200 HP
0010 = 10 HP	0250 = 250 HP
0015 = 15 HP	0300 = 300 HP
0020 = 20 HP	0350 = 350 HP
0025 = 25 HP	0400 = 400 HP
0030 = 30 HP	0450 = 450 HP
0040 = 40 HP	0500 = 500 HP
0050 = 50 HP	0600 = 600 HP

[7] Duty Ratings
N = Normal Duty

[8] Enclosure Styles
1 = NEMA 1
2 = NEMA 12
3 = NEMA 3R
4 = NEMA 4X
B = NEMA 1 (Bypass Only)
F = NEMA 1 (Disconnect with Fusing)

[9] Input Power Connections
1 = Circuit Breaker (25 kAIC)
2 = Disconnect Switch with Fusing
3 = Circuit Breaker (65 kAIC)
4 = Circuit Breaker (100 kAIC)
5 = Fused Disconnect (100 kAIC)
Input fuses for drives are included as standard for all input power options

[10] Products
A = Affinity Active Front End
B = Affinity Drive
2 = Unidrive M200
3 = HVAC Drive H300
X = HVAC Drive H300 AFE

[12] Bypass Options
0 = No Bypass
1 = Electronic 3-Contactor Bypass
2 = Manual Bypass
3 = HMI 2-Contactor Bypass with VFD Service Switch
4 = HMI 2-Contactor Bypass
6 = Soft Starter 3-Contactor Bypass

[14] Door-Mounted Keypad/HMI
0 = None
C = LCD Keypad
E = LED Keypad
H = Door-mounted Touchscreen HMI
E = LED Keypad
Unidrive M200 includes LED keypad as standard.
Affinity BA includes LCD keypad as standard.

[15] Input Filtering
0 = None
1 = Input Reactor 3%
2 = Input Reactor 5%
3 = RFI Filter
4 = Input Reactor 3% + RFI Filter
5 = Input Reactor 5% + RFI Filter
6 = Matrix AP Filter
Enclosure size considerations. Addition of one or multiple filtering options may change the size and/or style of the enclosure.
Matrix filter - consult factory.

[16] Output Filtering
0 = None
1 = Output Reactor 3%
2 = dV/dt Filter
3 = Sine Filter
4 = Output Reactor 1.5%

[17] Multiple Motors
0 = None Drive Protected
2 = Two Manual Motor Protectors (MMP)
3 = Three Manual Motor Protectors
4 = Four Manual Motor Protectors
5 = Five Manual Motor Protectors
6 = Six Manual Motor Protectors
Cumulative amp ratings of motors must not exceed the drive rating. Each motor must have its own overload protection. Multiple Manual Motor Protectors are of equal size.

[18] Space Heater**
0 = None
2 = 200 W
4 = 400 W
Larger heaters can be chosen for extremely cold ambient temperatures.

[21] - [23] Option Modules
0 = None
A = SM-APPS-LITE-V2
C = SM-BIPOLAR
D = SM-CANOPEN
E = SM-DEVICENET
H = SM-ETHERCAT
I = SM-ETHERNET
K = SM-I/O-120V
L = SM-I/O-24V
M = SM-I/O-32
N = SM-I/O-LITE
P = SM-I/O-PLUS
Q = SM-I/O-TIMER
R = SM-INTERBUS
S = SM-LON
T = SM-PROFIBUS-DP
V = SM-REGISTER
W = SI-I/O*
Y = AI-485-ADAPTOR*
Z = KI-485-ADAPTOR*
1 = SI-PROFIBUS*
2 = SI-ETHERNET*
3 = SI-DEVICENET*
4 = SI-CANOPEN*
5 = SI-PROFINET-V2*
6 = SI-ETHERCAT*
Unidrive M200 has 1 option module slot only, Affinity has 2 option module slots, HVAC Drive H300 has 3 option slots

[24] Phase Loss Monitor
0 = None
1 = Yes

[26] Temperature Controller***
0 = None
1 = Thermocouple
2 = RTD

[27] Basin Heater**
0 = None	A = 10 kW
1 = 1 kW	B = 11 kW
2 = 2 kW	C = 12 kW
3 = 3 kW	D = 13 kW
4 = 4 kW	E = 14 kW
5 = 5 kW	F = 15 kW
6 = 6 kW	G = 16 kW
7 = 7 kW	H = 17 kW
8 = 8 kW	I = 18 kW
9 = 9 kW	J = 19 kW
	K = 20 kW

[28] Spray Pump***
0 = None
1 = 1 HP
2 = 2 HP
3 = 3 HP
5 = 5 HP
7 = 7 HP
A = 10 HP
B = 15 HP

[29] De-icer / Sun Shield***
0 = None
1 = De-icer
2 = Sun Shield
3 = De-icer & Sun Shield

[30] Siemens FLN
0 = None
1 = Yes

*SI options used with Unidrive M200 & HVAC Drive H300

**Available with NEMA 3R enclosure only

***Selection of options 26-29 require a cooling tower NEMA 3R enclosure.

NOTE:
For options not included in the Order Code Configurator, please consult factory for a custom quote.

2.4 Mounting & Clearances

Install the HMI bypass package on a vertical surface and allow the following minimum clearances for normal heat dissipation.

TOP **SIDE-TO-SIDE**

Air Flow
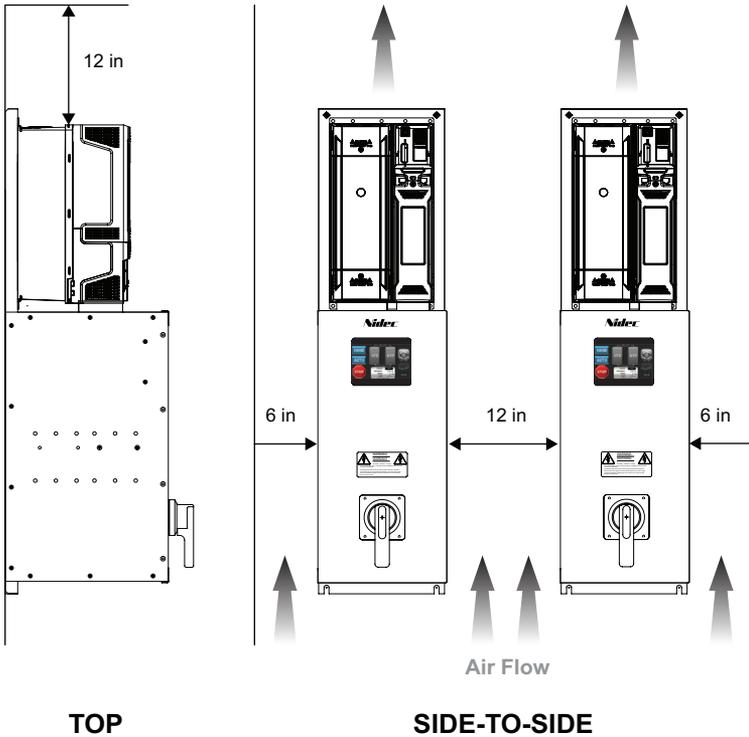
Notes:

- Ambient operating temperature; 32 °F to 104 °F (0 °C to 40 °C)
- Install the unit in a dry environment free from oil mist and dust
- Install the unit in a location free from radioactive materials, combustible materials, harmful gases or liquids
- Do not install the unit in a location susceptible to excessive vibrations
- Do not install in direct sunlight
- During installation, protect the unit from foreign particles such as metal shavings produced by drilling
- Failure to follow these notes could void the warranty

2.5 Wiring and Precautions

2.5.1 General

1. DO NOT connect or disconnect wiring or perform signal checks while the power supply is turned ON.

2. Connect the power supply wiring to the HMI bypass input terminals L1, L2 and L3 on the main circuit disconnect device.

3. Connect the motor wiring to the bypass output terminals T1, T2 and T3 at the Class 20 Motor O/L or the output reactor if installed.

4. Never touch the output circuit directly or place the output line in contact with the package enclosure.

5. DO NOT connect power factor correction capacitors on the output circuit.

6. Power supply wiring and motor wiring must be in separate conduits with separate ground conductors. (DO NOT use conduits as ground).

7. Control wiring must be in conduit separate from both power supply and motor wiring.

8. Tighten the screws on the main circuit disconnect (if provided) and control circuit terminals.

9. Observe national and local codes when wiring electrical devices.

Failure to observe these precautions may result in equipment damage or improper operation and may not be covered under warranty.

2.5.2 Input Wiring

The HMI bypass package may be supplied with several different input device options. These input options include protective devices as well as non–protective devices. It is the responsibility of the installing parties to ensure that requirements for branch circuit protection of the appropriate size and location are observed. All incoming power is connected to terminals L1, L2, and L3. The following input options are available.

- » Fused disconnect
- » Circuit breaker
- » Input line reactor
- » Input RFI filter

Connect the main power supply, motor and control wiring using the following recommended conduit locations. The input phase sequence does not affect the output phase sequence of the VFD. It will affect bypass sequence and motor rotation direction.

Recommended conduit entrances

control wiring

incoming supply

motor connection
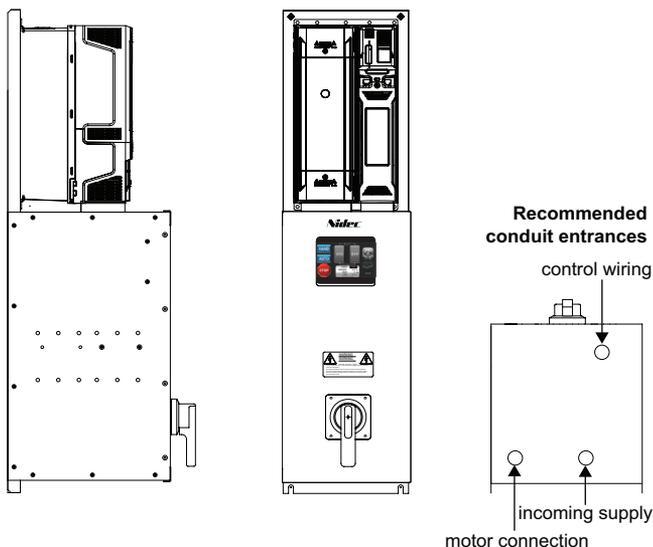
2.5.3 Output Wiring

The HMI bypass package is always supplied with a Class 20 motor O/L on its output. However, the unit may be supplied with several different output options. The following output options are available.

- Single motor O/L (Terminals T1, T2, and T3)
- Dual motor O/L (Terminals (Motor 1 – T1, T2, and T3)
  (Motor 2 – T4, T5, and T6))
- Output reactor

Note: All contactors and relays supplied in the HMI bypass package are suppressed with R/C snubbers. If adding additional inductive loads (i.e. magnetic contactors, magnetic relays, magnetic valves, solenoids, magnetic brakes, etc.) in or near the HMI bypass package, use an appropriate surge suppressor across the coils to limit the transients on the supply lines.

2.5.4 Control Circuit Wiring

2.5.4.1 Analog Input

A 4 to 20 mA analog input signal is available by connecting to the customer terminals 5 (+) and 4 (-).

Terminal No.	Description
4	0V Common Analog
5	Speed/Frequency Reference

2.5.4.2 Digital Inputs

The HMI bypass combines digital inputs from the HVAC H300 VFD and SI-I/O option module. As per the following table, the HMI bypass control provides ten (10) digital inputs.

There are ten (10) digital inputs. (24 Vdc).

Terminal No.	Description
1 (3 positions)	0V Common
22	Fireman's Override
23	Damper Feedback
24	Fire Alarm
25	Customer Reset
27	Auto Run
29	Enable
203	Safety
204	Relay Output Select (223)
207	Remote Bypass Select
208	Remote VFD Select

Terminal 204 is used as an input signal to control terminal 223 relay output when terminal 223 is set to "T204 24V Input". All digital inputs are dry contacts (voltage free).

2.5.4.3 Relay Outputs

There are two (2) form A relay outputs.

Terminal No.	Description
221	System Fault
222	0V Common for dry contacts 221 & 223
223	System On or 204 24V Input

When Relay Output Select is set up for "204 24V Input" terminal 223 will be controlled by the input on terminal 204.

There is one (1) form C relay output.

Terminal No.	Description
71	0V Damper Control Contact Common
74	Damper Control Contact (NO)

2.5.4.4 Digital Output

There is one (1) digital output. (24 Vdc).

Terminal No.	Description
202	Auto Mode Selected

2.5.4.5 Additional HVAC H300 VFD Connections

Additional analog inputs and outputs are available by making connections directly to the HVAC H300 VFD. The following connections are located on the VFD and not the customer connection terminal block.

VFD Terminal No.	Description
4	0V Common Analog Input
6	Analog PID Feedback

VFD Terminal No.	Description
7	Speed/Frequency Output
8	Analog Torque Output
9	0V Common Analog Output

For further information see HVAC Drive H300 User Guide.

2.5.4.6 Additional SI-I/O Connections

Additional Analog I/O and Digital I/O can be made by making connections directly to the SI-I/O module mounted in slot 3 of the HVAC Drive H300. The following connections are not found on the customer connection terminal block.

SI-I/O Terminal No.	Description
205	Digital Input/Output 4
206	0V Common SI-I/O
209	Analog Input 3/Digital Input 7
210	0V Common SI-I/O
211	Analog Output 1/Digital Input 8

2.5.5 Grounding

Never ground the HMI bypass package in common with welding machines, motors or other high current electrical equipment. Run all ground wires in a separate conduit.

When using several electronic bypass packages side by side, ground as shown below.
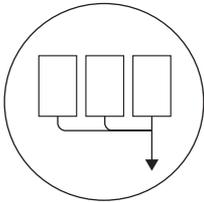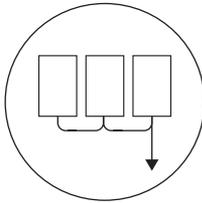
√ (a) Acceptable   √ (b) Acceptable   X (c) Not Acceptable
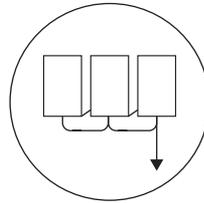
2.5.6 Customer Connection Terminals

All control circuit connections are made through the Customer Connection terminal block. There are connections between the Customer Terminal block, the HVAC Drive H300, and the SI-I/O module. These connections are made at the factory and are for reference only. DO NOT change this wiring as it will cause the HMI bypass to operate improperly or not at all.

See following page for Customer Connection Terminal diagram.

2.5.6.1 Emergency Bypass Operation

In situations requiring Emergency Bypass operation (i.e. drive removal or +24 Vdc supply failure) bypass contactor can be engaged to run the motor across the line by moving Jumper (41-100) to (44-EB). Note the thermal overload protection is protecting the motor.

2.5.7 Customer Connection Diagram

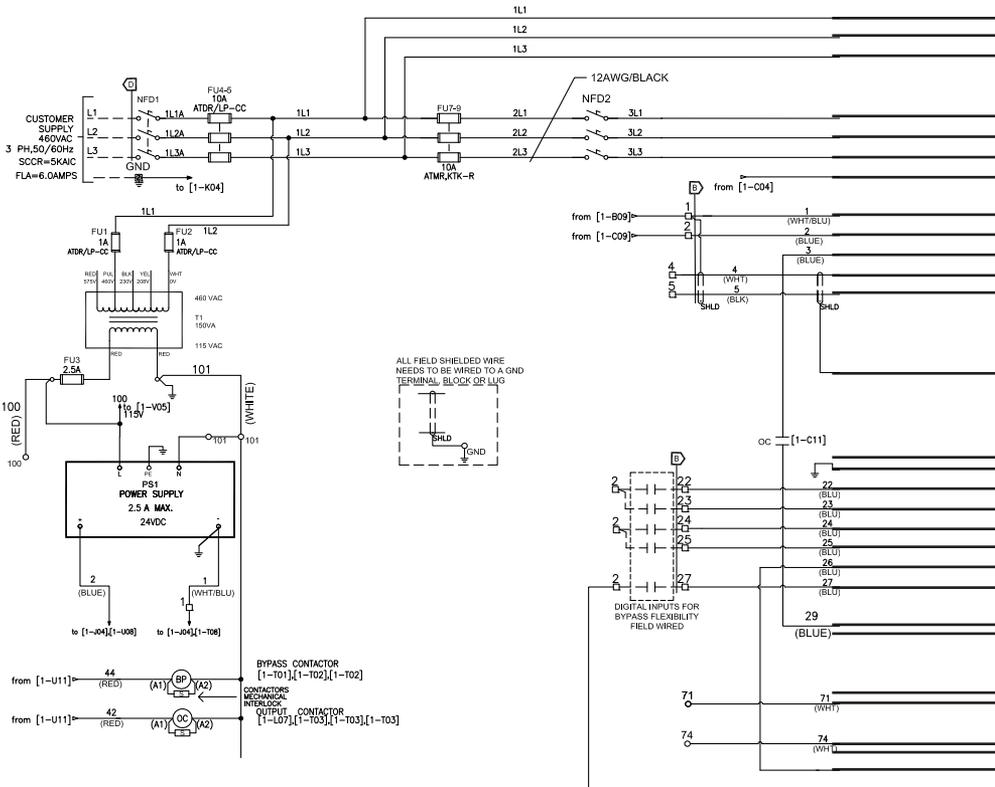| Left wire label	Terminal	Right label
(2 X 16AWG) (GRN/YELLW)	GND	GND
(WHT/BLUE) →		24VDC(-)
(WHT/BLUE) →		24VDC(-)
(WHT/BLUE) →		24VDC(-)
(BLUE)	2	24VDC(+)
(BLUE)	2	24VDC(+)
(BLUE)	2	24VDC(+)
(BLUE)	2	24VDC(+)
	2	24VDC(+)
(WHT)	4	0V SIGNAL COMMON (ANALOG)
(BLK)	5	ANALOG SPEED/FREQUENCY REF 1 NON-INVERTING IN - DEFAULT (4-20mA)
(BLUE)	22	FIREMAN'S OVERRIDE INPUT
(BLUE)	23	DAMPER FEEDBACK INPUT
(BLUE)	24	FIRE ALARM (INPUT)
(BLUE)	25	CUSTOMER RESET INPUT
(BLUE)	27	AUTO RUN INPUT
(RED)	41	SEE NOTE
(2 X RED)	44	SEE NOTE
(WHT)	71	DAMPER CONTROL CONTACT COMMON
(WHT)	74	DAMPER CONTROL CONTACT (NO)
(RED)	EB	SEE NOTE
(RED)	100	115VAC
	101	GND
(2 X WHT)	101	GND
(BLUE)	202	AUTO MODE SELECTED
	203	SAFETY
(BLUE)	203	SAFETY
(BLUE)	204	RELAY OUTPUT SELECT (223)
(BLUE)	207	BYPASS SELECT (INPUT)
(BLUE)	208	VFD SELECT (INPUT)
(WHT)	221	SYSTEM FAULT (OUTPUT)
(WHT)	222	COMMON FOR DRY CONTACT 221 & 223
(WHT)	223	SYSTEM ON OR T204 24V INPUT

2-WIRE SHIELDED CABLE RUN SHIELD TO TERM 1

(BLUE)

(RED)

NOTE: For Emergency Bypass Operation (i.e. drive removal or +24 Vdc supply failure) bypass contactor can be engaged to run the motor across the line by moving Jumper (41-100) to (44-EB). Note the thermal overload protection is protecting the motor.
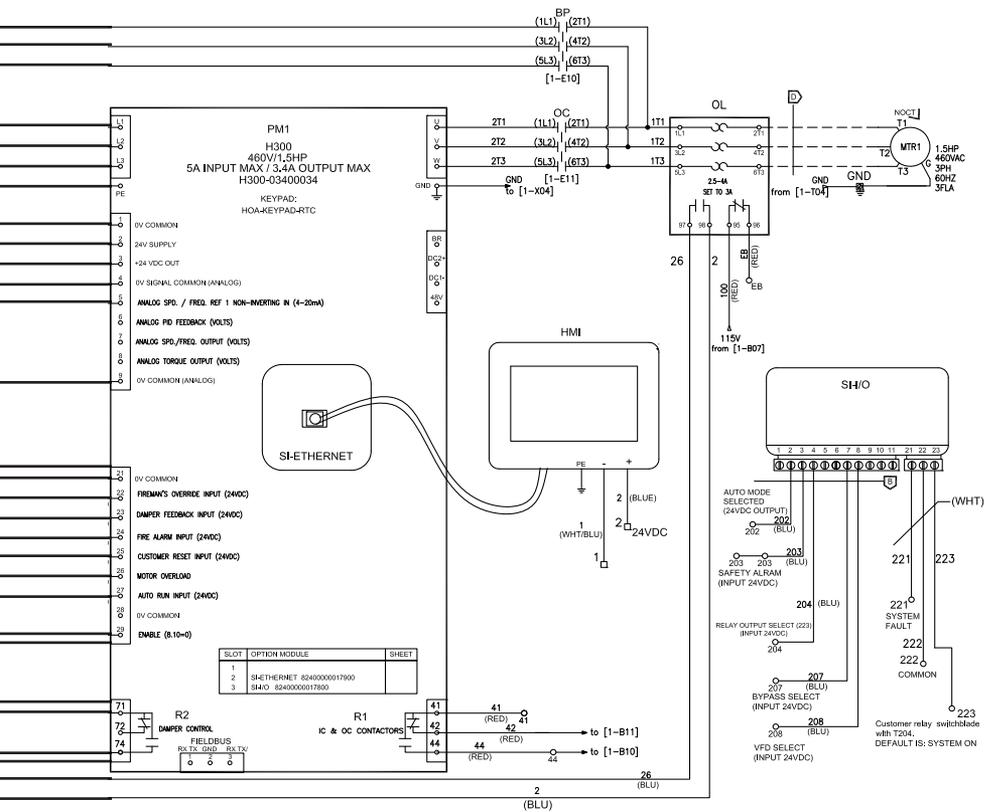
2.5.8 HVAC Drive H300 HMI Bypass Schematic

PM1
H300
460V/1.5HP
5A INPUT MAX / 3.4A OUTPUT MAX
H300-03400034
KEYPAD:
HOA-KEYPAD-RTC

L1
L2
L3
PE

0V COMMON
24V SUPPLY
+24 VDC OUT
0V SIGNAL COMMON (ANALOG)
ANALOG SPD. / FREQ. REF 1 NON−INVERTING IN (4−20mA)
ANALOG PID FEEDBACK (VOLTS)
ANALOG SPD./FREQ. OUTPUT (VOLTS)
ANALOG TORQUE OUTPUT (VOLTS)
0V COMMON (ANALOG)

0V COMMON
FIREMAN'S OVERRIDE INPUT (24VDC)
DAMPER FEEDBACK INPUT (24VDC)
FIRE ALARM INPUT (24VDC)
CUSTOMER RESET INPUT (24VDC)
MOTOR OVERLOAD
AUTO RUN INPUT (24VDC)
0V COMMON
ENABLE (8.10=0)

SI-ETHERNET

71
72
74
R2
DAMPER CONTROL
FIELDBUS
RX TX GND RX TX/

SLOT | OPTION MODULE | SHEET
1 | |
2 | SI−ETHERNET 82400000017900 |
3 | SI/O 82400000017800 |

BP
(1L1)   (2T1)
(3L2)   (4T2)
(5L3)   (6T3)
[1−E10]

OC
2T1 (1L1) (2T1)   1T1
2T2 (3L2) (4T2)   1T2
2T3 (5L3) (6T3)   1T3
GND   [1−E11]
GND
to [1−X04]

BR
DC2+
DC1−
48V

OL
1L1   2T1
3L2   4T2
5L3   6T3
2.5−4A
SET TO 3A
from [1−T04]
97 98   95 96

D

NOCT
T1
MTR1   1.5HP
T2   460VAC
T3   3PH
GND   60HZ
        3FLA

26   2
EB (RED)
EB
100 (RED)
115V
from [1−B07]

HMI

PE − +
2 (BLUE)
2 24VDC
1
1 (WHT/BLU)

SH/O
1 2 3 4 5 6 7 8 9 10 11 21 22 23

AUTO MODE
SELECTED
(24VDC OUTPUT)
202 (BLU)
202

203 (BLU)
203 203
SAFETY ALARM
(INPUT 24VDC)

204 (BLU)
RELAY OUTPUT SELECT (223)
(INPUT 24VDC)
204

207 (BLU)
207
BYPASS SELECT
(INPUT 24VDC)
208 (BLU)
208
VFD SELECT
(INPUT 24VDC)

(WHT)
221 223
221
SYSTEM
FAULT
222
222
COMMON
223
Customer relay switchblade
with T204.
DEFAULT IS: SYSTEM ON

R1
IC & OC CONTACTORS
41
42
44
41 (RED) 41
42 (RED)
44 (RED) 44
to [1−B11]
to [1−B10]
26 (BLU)
2 (BLU)

2.6 Inspection

Once all wiring is complete, verify that:

1. All wiring is installed.
2. Excess screws, metal filings and wire clippings are removed from inside the unit(s).
3. Screws and fasteners are securely tightened.
4. Exposed wiring has no contact with other wiring or terminals.

Section 3 – Overview of the HMI bypass

All start/stop, safety, fire alarm inputs and VFD analog output are routed to the inputs of the VFD and IO module via customer terminal connections.

The analog input is factory set to accept a 4–20 mA speed reference signal.

All control wiring must be run in a separate conduit from ANY high voltage or power wiring. The wiring should also be properly grounded and shielded when necessary to ensure proper operation.

## 3.1 HMI Bypass Touchscreen Functions

3.1.1 Splash Screen

Upon initial power-up or any power cycle the LCD touchscreen HMI will reset to the splash screen. If the HMI Bypass has been setup, operation will continue in the same state as it was before shutdown/power loss.

CONTINUE: Navigate to the main control screen.

SETUP WIZARD: Begins the bypass configuration process. Users must enter the security pin number before changing system settings. See section 4.1 for HMI bypass commissioning using the setup wizard.

3.1.2 Main Control Screen
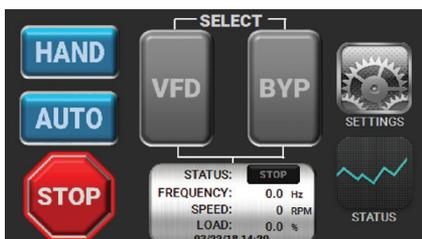
From the main screen, users can control the state of the bypass system and navigate to system configuration (settings) and status menus.

HAND: Pressing this icon will put the bypass system in Hand Mode. In VFD and Hand Mode, the system will run at a manually selected frequency and the bypass contactor will automatically close if BYP (Bypass Mode) is selected and the VFD output is off.

AUTO: Pressing this icon puts the bypass system in Auto Mode. In Auto Mode, the system will require the "Auto Run Input" on terminal 27 to be active in order to run the motor. If VFD Mode is also selected, the system will follow the analog speed reference on terminal 5 (4-20 mA). If BYP is selected, the system will run at line frequency, but still requires the "Auto Run Input" (terminal 27).

STOP: This button will stop the motor and also acts as a reset.

Note: If a Remote Bypass, Remote VFD, or Fireman's Override command is present on the digital inputs, the STOP icon will not stop the motor.

VFD: Puts the system in VFD Mode. The output contactor is closed and the motor is powered by the VFD.
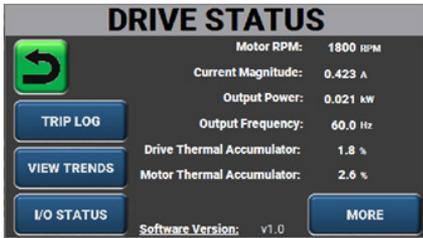
BYP: Puts the system in Bypass Mode. The bypass contactor will close and the motor will rotate at line frequency.

Note: If you are in Hand|Auto "VFD" Mode and want to switch To Bypass "BYP" Mode, serlect Bypass Mode "BYP" and then reselect HAND or AUTO.

3.1.3 Drive Status and System Diagnostics

3.1.3.1 General Status

The drive status screen displays basic VFD information.

Motor RPM: Displays the estimated speed of the motor.

Current Magnitude: The instantaneous drive output current scaled so that it represents the r.m.s. phase current in Amps under steady-state conditions.

Output Power: Displays the current power output of the VFD.

Output Frequency: Displays the frequency applied to the motor.

Drive Thermal Accumulator: Displays the percentage of the thermal trip level of the drive.

Motor Thermal Accumulator: Displays the level of the motor overload accumulator.

Software Version: Displays the current software version of the LCD touchscreen HMI program.

**More**: Navigates to an additional Drive Status page.

Trip Log: Navigates to the system fault log.

View Trends: Displays the Graphical Trend Viewer for Motor RPM, Motor Load %, and Motor Thermal Overload %.

I/O Status: Shows the current status of all digital inputs, outputs and relays.

3.1.3.2 Additional Drive Status

This screen displays the estimated total running cost of the HMI bypass system and filter change reminders.
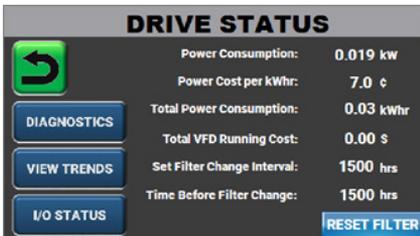
Power Consumption: Displays the current power consumption of the VFD.

Power Cost per kWhr: Defines the cost of energy per kWh in cents.

Total Power Consumption: Displays the accumulated VFD power consumption.

Total Running Cost: Uses the Total Power Consumption and Power Cost per kWhr to calculate Total Running Cost.

3.1.3.3 Trip Log

The previous 5 system faults are recorded and displayed. For accurate timestamps, the time must be manually set in the HMI settings menu.

Clear Log: Pressing this button will clear the recorded fault list.

- **Motor Overload/PL: Motor thermal overload relay (resettable) or phase loss monitor (if fitted) is tripped connecting 24V to terminal 26 or VFD parameter 18.035 is set to 1 via serial communications.**
  Recommended actions:
  - » Check Motor
  - » Check Insulation, phase to phase, and phase to ground
  - » Check Bearings
  - » Check Load/transmission
  - » Check for Phase loss or phase loss monitor (if fitted)
  - » Reduce Starts per hour
  - » Check Motor winding configuration (delta or wye)

If all above checks are good, attempt to reset the overload relay using the overload reset button.

- **Fire Alarm**: A 24V input signal on Fire Alarm input (24) is present. Recommended action:
  - » If an external fire alarm is not present, verify customer terminal block wiring.
- **Damper Timeout**: A 24V input signal on Damper Feedback (23) is present, Damper Fault Response is "ENABLED," and Damper Timeout has expired. Recommended action:
  - » Check operation of the customer damper and verify customer terminal block wiring.
- **Safety Input**: A 24V input signal on Safety input (203) is present Recommended action:
  - » If an external Safety input is not present, verify customer terminal block wiring.
- **Watchdog**: External VFD trip due to loss of communication between VFD and HMI. Recommended action:
  - » Verify physical Ethernet connection between VFD and LCD touchscreen HMI. Verify IP address of LCD touchscreen HMI and VFD are on the same network.

Notes: If the fault cannot be cleared from the LCD touch screen HMI with a reset it may be required to access the HVAC Drive H300 VFD directly with a keypad or through Connect VFD configuration software.

For a full explanation of VFD faults, refer to the HVAC Drive H300 VFD User Guide.

3.1.3.4 Graphical Trend Viewer

Historical view of Motor RPM, Motor Load (0-100%), and Motor Thermal Overload (0-100%) going back 8 minutes. Use the left and right arrows to navigate between the graphs.
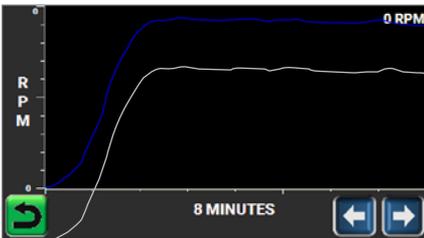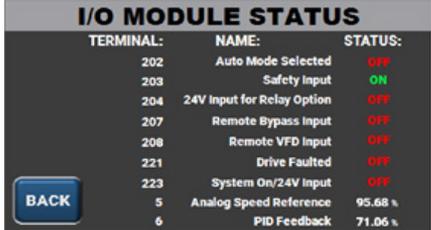
3.1.3.5 I/O Status

Displays the status of inputs, outputs, and relays in the system, terminals 22 through 74.

MORE: Navigates to the second I/O status page. The second I/O status page displays the SI-I/O expansion module I/O, terminals 202 through 223 and analog input terminals 5 and 6.

3.2 System Settings

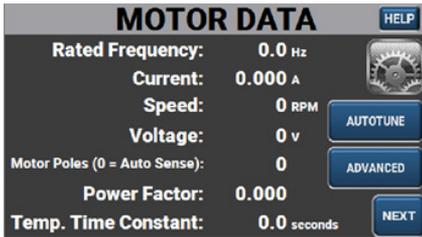From this screen, users can access the configuration menus for the bypass system.

Default Settings: After confirmation, all system settings will revert to default values.

Setup Wizard: Begins the commissioning process starting with motor data.

3.2.1 Motor Map

The HMI Bypass motor data can be found or entered in the Motor Data screen. The Motor Data screen also allows access to the autotune feature and Advanced VFD settings. Motor data can usually be found on the nameplate of the motor.

MOTOR DATA		HELP
Rated Frequency:	0.0 Hz	
Current:	0.000 A	
Speed:	0 RPM	AUTOTUNE
Voltage:	0 V	
Motor Poles (0 = Auto Sense):	0	ADVANCED
Power Factor:	0.000	
Temp. Time Constant:	0.0 seconds	NEXT

Rated Frequency: Set to the rated frequency of the motor (nameplate value).

Current: Set to the rated current of the motor (nameplate value).

Speed: Set to the rated speed of the motor (nameplate value).

Voltage: Set to the rated voltage of the motor (nameplate value).

Motor Poles: Set to the number of poles of the motor. If motor poles are set to "0", the number of motor poles will be calculated automatically.

Power Factor: Set to the motor power factor (nameplate value). If the power factor is not known, it can be automatically calculated by performing a rotating autotune.

Note: If the power factor is calculated using the autotune function the user will not be able to manually change the value.

Autotune: Navigates to the autotune feature page. autotune is not necessary to run the motor, but doing so will result in improved performance and efficiency.

Advanced: Navigates to the advanced motor settings.

3.2.2 Autotune

The VFD is able to perform either a stationary or a rotating autotune. The motor must be at a standstill before an autotune is enabled. A rotating autotune should be used whenever possible, so the measured value of power factor of the motor is used by the drive.
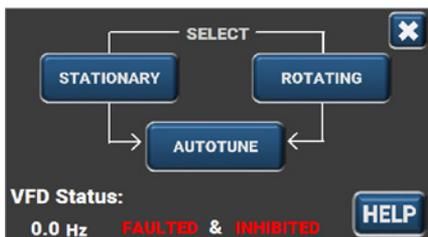
Autotune: is an algorithm that the VFD uses to detect physical characteristics of the motor in order to improve control and efficiency.

To perform an autotune, first select either STATIONARY or ROTATING (recommended) and then hit the AUTOTUNE button. The motor must be at a standstill before an autotune is enabled.

Note: The drive will not perform an autotune if there is an existing fault or if the STO input is not closed.

Note: A rotating autotune should only be used if the motor is uncoupled. To clear incorrect values calculated from a coupled rotating autotune perform a stationary autotune. Performing a stationary autotune will clear the incorrect values and reset motor rated power factor to factory default (0.85).
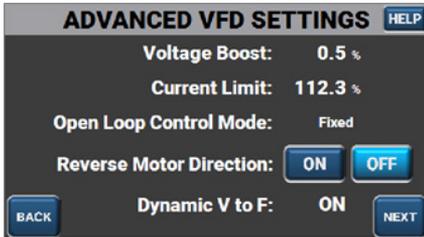
⚠ WARNING

A rotating autotune will cause the motor to accelerate up to 40 Hz in the direction selected regardless of the reference provided. Once complete the motor will coast to a stop.

3.2.3 Advanced VFD Settings

The Advanced VFD Settings menu allows access to advanced settings of the VFD.

Voltage Boost: Defines the level of voltage boost at 0Hz when using a fixed V to F relationship.

Current Limit: Limits the current when the motor is being accelerated or decelerated.

Open-Loop Control Mode: Defines the VFD output mode. The default setting for Open-Loop Control Mode is "Fixed" or V/Hz.

- **Ur S**: Resistance compensation, stator resistance measured at each start.
- **Ur**: Resistance compensation with no stator resistance measurement.
- **Fixed**: (Default) Fixed boost with a linear characteristic. Also known as V/Hz Boost mode.
- **UR Auto**: Resistance compensation, stator resistance measured on the first start.
- **Ur I**: Resistance compensation, stator resistance measured at power-up. Also known as Open-Loop Vector mode.
- **Square**: Fixed boost with square characteristic. Also known as Quadratic Motor V/Hz mode.
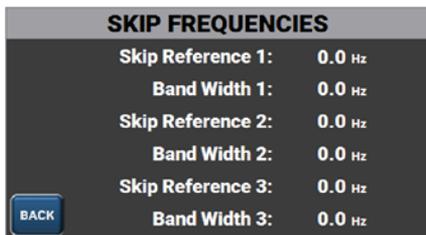- **Current 1P**: Single phase current output.

Note: For further information on Open-Loop control modes refer to the HVAC H300 User Guide.

Reverse Motor Direction: If Reverse Motor Direction is on, the output phase sequence is reversed so that the phase sequence in W-V-U for positive frequencies and U-V-W for negative frequencies.

Dynamic V to F: Dynamic V to F is intended for applications where power loss should be kept to a minimum under low load conditions, but dynamic performance is not important. The setting is enabled by default.

3.2.4 Skip Frequencies

The skip reference functions are available to prevent continuous operation within a specified speed range (i.e., where mechanical resonance may occur). The HMI Bypass allows up to three (3) speed/frequencies to be skipped.
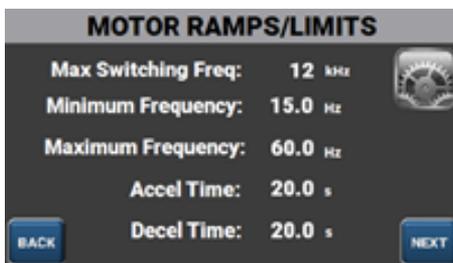
SKIP FREQUENCIES	
Skip Reference 1:	0.0 Hz
Band Width 1:	0.0 Hz
Skip Reference 2:	0.0 Hz
Band Width 2:	0.0 Hz
Skip Reference 3:	0.0 Hz
Band Width 3:	0.0 Hz

Skip Reference: Sets the center point of the speed/frequency reference the VFD should skip.

Band Width: Defines the range which speed/frequency references are rejected in either direction. The actual reference band is, therefore, twice that defined in the Band Width, with Skip Reference as the center of the band.

3.2.5 Motor Ramp/Limits

The Motor Ramps/Limits screen allows configuration of speed/frequency limits as well as acceleration and deceleration values the VFD will use during motor start and stop.

MOTOR RAMPS/LIMITS	
Max Switching Freq:	12 kHz
Minimum Frequency:	15.0 Hz
Maximum Frequency:	60.0 Hz
Accel Time:	20.0 s
Decel Time:	20.0 s

Max Switching Freq: Defines the maximum switching frequency used by the drive. If drive will operate at this frequency unless the inverter becomes too hot. Under these conditions the drive will reduce switching frequency to avoid tripping.

**Minimum Frequency**: Defines the minimum value for the reference.

Maximum Frequency: Defines the maximum value for the reference. Generally set to 60 Hz or less.

Accel Time: Defines the rate of acceleration. This is the time to accelerate from minimum frequency to maximum frequency.

Decel Time: Defines the rate of deceleration. This is the time to decelerate from maximum frequency to minimum frequency.

3.2.6 I/O Settings

The I/O Setting screen allows the setup of the system I/O.
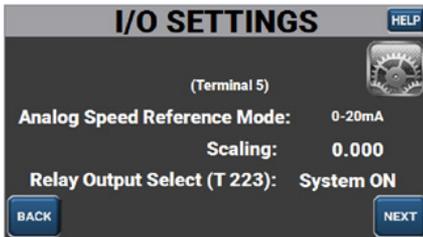
Analog Speed Reference Mode: Defines the input mode for analog input speed/frequency reference (5). The following list provides a brief explanation of the available settings. For further information see HVAC H300 User Guide.

- **0-20 mA:** 0-20 mA
- **20-0 mA:** 20-0 mA
- **4-20 mA Trip:** 4-20mA trip on current loss
- **20-4 mA Trip:** 20-4mA trip on current loss
- **4-20 mA (default):** 4-20mA no action on loss
- **20-4 mA:** 20-4mA no action on loss
- **0-10 Vdc:** 0-10Vdc no action on loss

**Scaling**: The analog input will be multiplied by a factor between 0.000 to 10.000.

Relay Output Select (T223): Select between "System On" and "T204 24V Input" The HMI Bypass default is "System ON."

System ON: Configures relay terminal 223 to close when the HMI Bypass has power

T204 24V Input: Configures relay terminal 223 to close dependent on the signal input to terminal 204.

3.2.7 Auto-Reset Setup

This screen defines the VFD behavior when tripped/faulted.
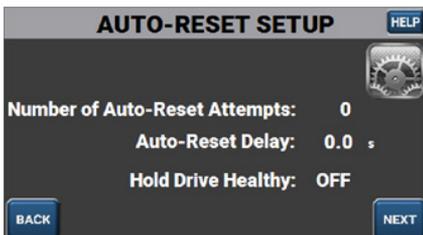
Auto-Reset Delay: The time interval between reset attempts. The HMI Bypass default is 5 seconds.

Hold Drive Healthy: If set to "ON," the fault alarm relay will not close until all reset attempts have been exhausted.

Note: If Hold Drive Healthy is set to "ON" and if Number of Auto-Reset Attempts is set to "6" (infinite) the Drive Healthy status will always remain "Healthy."

3.2.8 Remote Control

The Remote Control screen defines whether the HMI Bypass is controlled by the customer terminal block inputs or serial fieldbus communications.
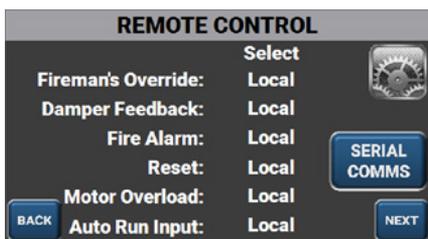
This screen allows you to select either "Local" or "Remote" (Serial/Ethernet communications) control for each individual input. If Remote is selected, the bypass system will be controlled by the corresponding bit in the VFD rather than the digital input. Parameter's referenced below can only be accessed directly from the HVAC Drive H300 with a keypad or with Connect VFD configuration software. For further information on Remote setup see the HVAC Drive H300 User Guide.

| Input	Remote Parameter	Local Terminal
Fireman Override*	18.031	22
Damper Feedback	18.032	23
Fire Alarm	18.033	24
Reset	18.034	25
Forward/Reverse**	18.037	-
Motor Overload	18.035	26
Auto Run	18.036	27

*Remote Fireman's Override is only available if Fireman's Override VFD mode is off. Remote control will then initiate a bypass run.
**Foreword/Reverse is a remote parameter only used to reverse a running motor using configured ramps.
SERIAL COMMS: Navigates to the serial communication configuration screens.

3.2.9 Serial Communications

This screen allows for the configuration of settings needed for serial communication.
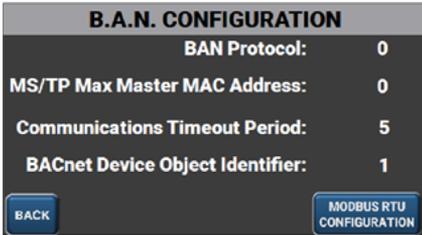
BAN (Building Automation Network) Protocol: Selects the network protocol.

> 0 = Modbus RTU
> 1 = BACnet
> 2 = Metasys N2 Open

MS/TP Max Master Mac Address: (BACnet use only) this is the highest address that the bypass system will use when looking for the next master on the network with which token passing can be achieved. Range 0-127

Communications Timeout Period: The period in seconds that the system will wait to see a valid communications frame on the network.

NOTE: See HVAC Drive H300 User Guide for further serial communications setup details.

3.2.10 Modbus RTU Configuration

This screen allows for the configuration of settings needed for serial communication.
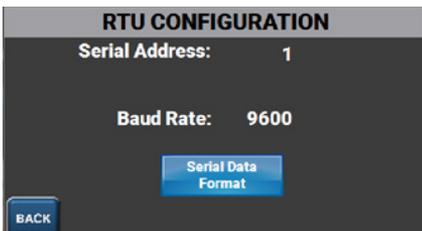
Serial Address: Defines the node address for the serial communications interface range from 1 to 247.

Note: It is necessary to perform a reset by hitting the "RESET" button on the previous page for this setting to take effect.

Baud Rate: Defines the baud rate used by the serial communications interface.
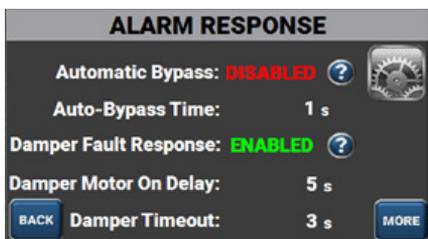
3.2.10.1 Serial Data Format

Defines how the serial data packets are formatted. Stop bits, parity, and standard/modified address schemes.

SERIAL DATA FORMAT		
Data Bits	**Register Mode**	**Stop Bits and Parity**
7 Bits	Standard	2 Stop Bits, no Parity
		1 Stop Bit, no Parity
8 Bits	Modified	1 Stop Bit, even Parity
BACK		1 Stop Bit, odd Parity

3.2.11 Alarm Response

The Alarm Response screen allows for the configuration of the Automatic Bypass and Damper Fault Response features.

ALARM RESPONSE	
Automatic Bypass: DISABLED ?	
Auto-Bypass Time:	1 s
Damper Fault Response: ENABLED ?	
Damper Motor On Delay:	5 s
BACK Damper Timeout:	3 s MORE

Automatic Bypass: When enabled, the system will automatically go into Bypass Mode after a fault is detected and after "Auto-Bypass Time" has elapsed.

Auto-Bypass Time: This is the delay between the VFD fault detection and closing the bypass contactor.

Damper Fault Response: When enabled, a damper feedback signal will be required to run the motor. If no signal is detected after the "Damper Timeout" window has elapsed, a Damper Timeout fault will be triggered.

Damper Timeout: The window of time during which the bypass system will wait for a damper feedback signal. If this time has elapsed and no damper feedback is detected, a damper timeout fault is triggered.

Damper Motor On Delay: The time delay between when a motor run signal is received (VFD or Bypass) and when the motor starts. This time is typically adjusted to allow for damper operation.

3.2.12 Alarm Response - Fireman's Override

This Alarm Response screen allows for the configuration of the Fireman's

Fireman's Override: When enabled, a fireman override command will ignore "Motor Overload" and "Damper Timeout" faults. The system will still wait for a damper feedback, but if no feedback is detected and a timeout is triggered, the system will bypass anyway. The system will run to destruction as long as the override command and safety input (terminal 203) are present.

Note: When disabled, "Motor Overload" and "Damper Timeout" will stop the motor.

Firemans's Override (VFD mode): If ON, a Fireman's Override command will initiate VFD operatin rater than turning the bypass contactor on.

VFD Override Setpoint: Determines the frequency reference used by the VFD when in override mode.

Fireman's Override PID Control: Allows PID control loop to regulate frequency reference in override mode (ignores VFD Setpoint frequency).
Note: Fireman's Override (VFD mode) must be ON for Fireman's Override PID Control to function (requires analog input to terminal 6 of VFD).

3.2.13 Advanced I/O Settings

The Advanced, I/O Settings screen, allows the setup of the I/O settings needed for the onboard PID feature
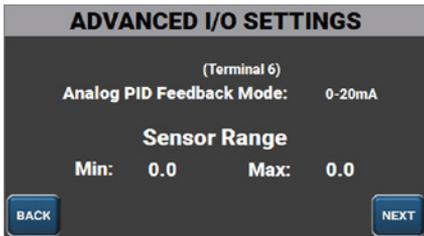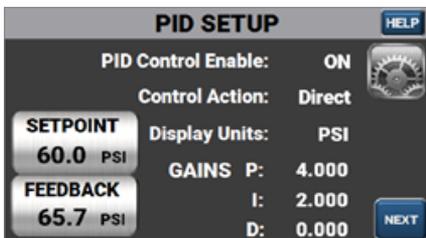

Analog PID Feedback Mode: Defines the input mode for analog input 2 (PID feedback input) VFD terminal 6.

Sensor Range: Defines the operating range of the feedback sensor. This information can be found in the documentation provided with your sensor.

3.2.14 PID Setup

The PID setup screen allows for the configuration of the onboard PID feature.

Control Action: Direct control means that as the PID error increases, the speed reference also increases. A common application for direct control is a cooling/heating fan. Reverse control will decrease the speed reference as the PID error increases. A common application for reverse PID control is a pump with pressure feedback.

Display Units: Determines the display units for PID setpoint and feedback. Does not affect PID operation. An example would be "F" or "psi."**Gains**: Determines the gains for the internal PID controller.

3.2.14.1 PID Setup - Sleep/Wake Function

This screen allows the setup of the Sleep/Wake Threshold feature.
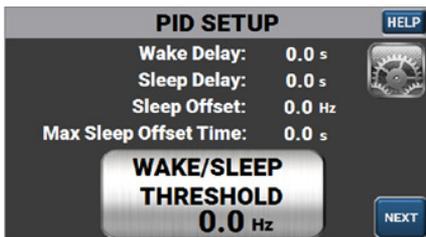
The Sleep/Wake function is used to stop the motor if the frequency or speed reference falls below a specified level so that the system does not run inefficiently at low speeds.

If the reference is greater than the Sleep/Wake Threshold for longer than the Wake Delay, then the motor is enabled. If the reference falls below the (Sleep/Wake Threshold - Sleep Offset) for longer than the Sleep Delay, then the motor is disabled.

Sleep/Wake Threshold: This is the threshold that the speed reference is compared against. A value of zero will disable the Sleep/Wake function.

Wake Delay: Defines the elapsed time before the system restarts the motor if the wake function is active.

Sleep Delay: Defines the elapsed time before the system stops the motor if the sleep function is active.

Max Sleep Offset time: Defines the maximum amount of time that the Sleep Offset function can be active.

3.2.15 Miscellaneous

The miscellaneous screen is used to setup the security pin feature and read/write HVAC H300 VFD parameters.

Security Pin Protection: Determines whether the security pin is enabled or disabled. If it is disabled, users will no longer be prompted to enter security pin when entering system settings. By default, the HMI Bypass will ship with Security Pin Protection Enabled with a Security Pin of "1111".

Set Security Pin: Set the security pin to any 4-digit number.

Smartcard Parameter Cloning: With a Control Techniques' Smartcard in the VFD Smartcard slot, users can read and write parameter files to the Smartcard to easily duplicate or backup settings.

3.3 Touchscreen HMI Settings

Select the HMI SETTINGS button to navigate to the Internal HMI menu screen where you can set/update Date/Time from the default (Central Standard Time "CT"). HMI Backlight and Ethernet settings can also be accessed from this screen.
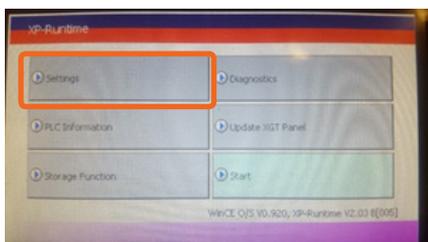
Note: It is recommended that the HMI SETTINGS menu be accessed for Date/Time setting and Backlight setting only. Changing any other HMI settings may prevent the HMI Bypass from operating satisfactorily.
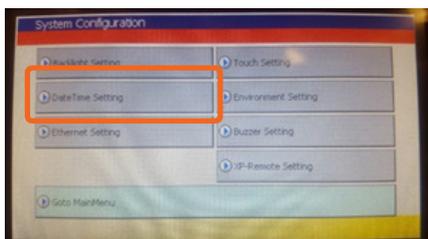

In order to navigate to the HMI Settings menu, click YES.
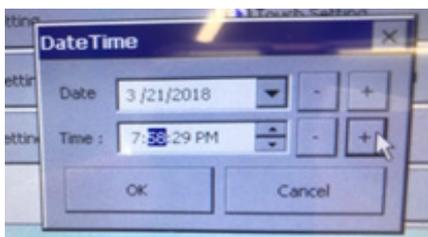
3.3.1 Setting the Date and Time

LCD Touchscreen HMI XP-Runtime Menu

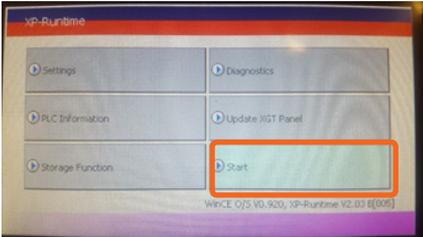Press the "Settings" icon to navigate to the HMI Settings menu.

Select DateTime Setting.

A window will appear with date and time. Set values to current date and time. Press "OK" when complete.

To return to the HMI Bypass menus press the "Start" icon from the XP-Runtime menu.

To navigate back to the HMI Bypass menus press the "Start" icon from the XP-Runtime menu

3.4 Touchscreen LCD HMI Software Update Procedure

To update the LCD touchscreen HMI program from a portable USB drive:

1. Start with a USB drive that has the correctly formatted file and file directory.
   - Drive:\XP_Project\[name]
   - The program should be saved as a compiled .xpdz file using the XP-Builder software.
2. Ensure that USB flash drive has been fitted into the USB host port on the back of the eXP20 HMI.
3. To access the XP-Runtime menu, hit the "HMI Settings" button in the system menu and press yes to confirm.
4. Select "Storage Function"
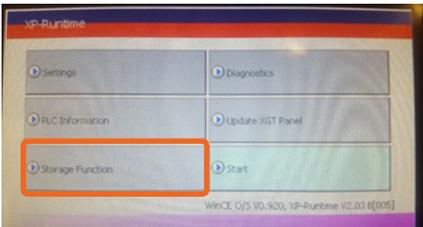
5. Select "Project Download"
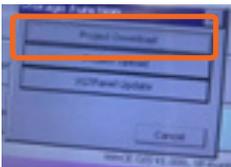
6. Choose the correct file name from the list and hit "OK"
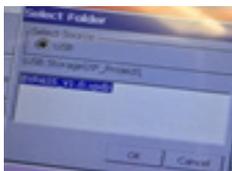
7. Wait while the HMI extracts and installs the new project file.

Section 4 – Startup

This section provides guidance on how to setup an HVAC Drive H300 HMI Bypass. It is recommended that before the initial HMI Bypass setup process begins that the HVAC H300 HMI Bypass Installation and Commissioning Guide is read in its entirety and the steps in Section 2.1 through 2.6 are completed.
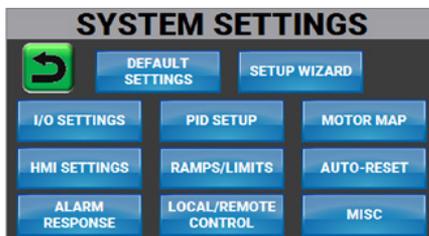
It is recommended that initial setup of the HMI Bypass is completed using the Setup Wizard. The Setup Wizard can be accessed from the Splash Screen upon system power up or from the System Settings menu.

The Setup Wizard will step you through the basic HMI Bypass setup screens.

4.1 Setup Wizard Process
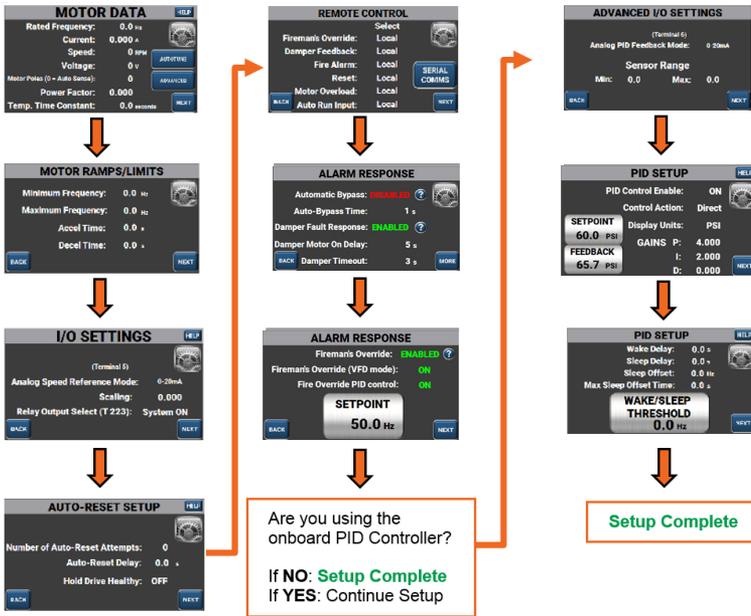
The Setup Wizard will step you through the Motor Data, Motor Ramps/Limits, I/O Settings, Auto-Reset Setup, Remote Control, Alarm Response – Automatic Bypass, and Alarm Response – Fireman's Override setup screens. If the PID Controller is to be used, upon selection, it will step you through the Advanced I/O Settings, PID Setup, and PID Setup – Sleep/Wake screens.

4.2 Setup Wizard - Step-by-Step Instructions

The following steps provide a basic step-by-step guides for initial setup of the HMI Bypass.

Step 1 – Start Setup Wizard: Press the Setup Wizard Icon on the Splash Screen or System Settings screen.

Step 2 – Motor Data: Enter motor nameplate information in the following settings.
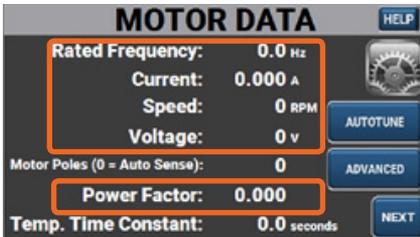
- **Rated Frequency**: Motor nameplate value
- **Current**: Motor nameplate value
- **Speed**: Motor nameplate value
- **Voltage**: Motor nameplate value
- **Power Factor**: Motor nameplate value

Once complete press the "NEXT" icon.

Step 3 – Motor Ramps/Limits: Enter the necessary settings for the application.
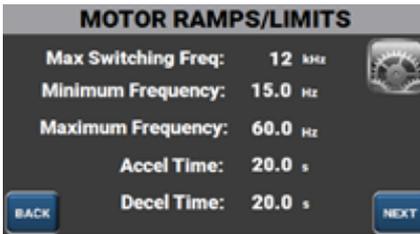
Once complete press the "NEXT" icon.

Step 4 – I/O Settings: Verify the Analog Speed Reference mode matches the HMI Bypass system analog speed/frequency reference type.

Once complete press the "NEXT" icon.

Step 5 - Auto-Reset Setup:
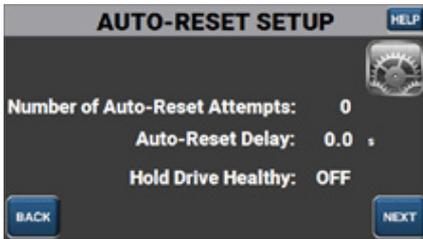
If Auto-Reset feature is desired, set the number auto-reset attempts and the delay between attempts when the VFD trips. Setting Hold Drive Healthy to "ON" will hold the VFD drive health status to "Healthy" until the Auto-Reset attempts are complete.

Once complete press the "NEXT" icon.

Step 6 – Remote Control:

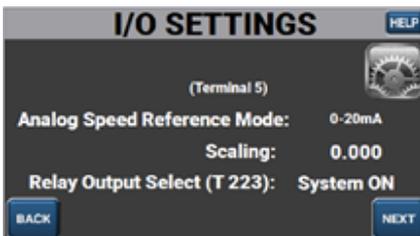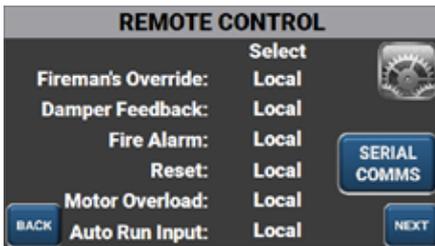Select whether the HMI Bypass function is to be controlled by Remote serial communications or Local customer terminals. By default the HMI Bypass will be set for Local control via the customer terminals.

Once complete press the "NEXT" icon.

Step 7 – Alarm Response – Automatic Bypass:
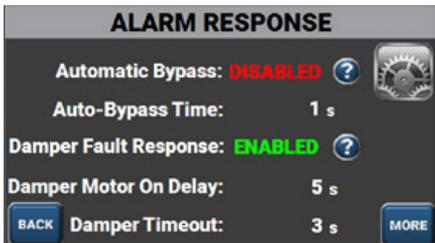
If the application requires the HMI Bypass to automatically transfer to Bypass mode upon VFD trip set Automatic Bypass to "ENABLE". The HMI Bypass will transfer to Bypass Mode after the Auto-Bypass time has elapsed.

If the application requires the HMI Bypass to disable in the case of loss of Damper Feedback input (terminal 23) and enable the Damper Timeout trip, then the Damper Fault Response should be set to "ENABLED." If enabled, set Damper Timeout for the time between loss of Damper Feedback input (terminal 23) and when the HMI Bypass initiates a Damper Timeout trip.

Once complete press the "MORE" icon.

Step 8 - Alarm Response - Fireman's Override:
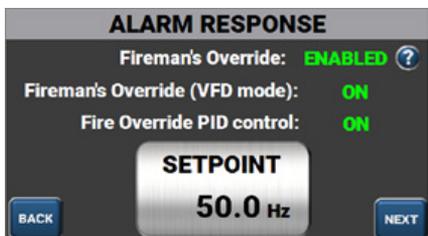
Set Fireman's Override (VFD mode) to "ON" if you require the VFD to run at a fixed frequency when the Fireman's Override is ENABLED. The fixed speed setting is adjusted in the SETPOINT window. Setting to "OFF" will result in the system running in Bypass Mode when the Fireman's Override is ENABLED

Note: To adjust the setpoint Fireman's Override (VFD mode) must be "ON." Once set, return Fireman's Override (VFD mode) to "OFF" for normal HMI Bypass operation.

Set Fireman's Override PID Control to "ON" if you require the VFD to run from PID control frequency reference.

Note: This feature requires the PID controller to be setup and ignores VFD Setpoint frequency.

Once complete press the "NEXT" icon.

Step 9 - PID Controller: The Setup Wizard will prompt the question, "Are you using the onboard PID controller?"
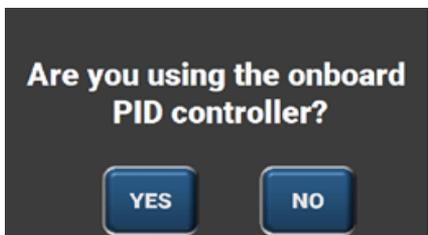
If "NO" then setup the HMI Bypass basic setup is complete and the Setup Wizard will return to the System Settings screen.

If "YES" the Setup Wizard will continue to the optional PID setup screen.

Optional Step - Onboard PID Controller: If the Onboard PID Controller will be used, the Setup Wizard will continue to the Advanced I/O Settings, PID Setup, and PID Setup – Sleep/Wake screens. For further information regarding the setup of these screens refer to section 4.2.14.

4.3 Checking Motor Rotation

Before attempting a trial operation of the HMI bypass package, ensure that the enclosure door is securely closed. Also, ensure all personnel are clear of the connected load as this operation will energize and rotate the motor. After applying 3 phase power to the HMI bypass package, ensure that the HMI is illuminated. If any alarms are present, refer to the trip log and troubleshooting sections.

⚠ **WARNING**

There is no standard for the rotational direction of an induction motor based on the motor lead markings. This, plus the uncertainty of the phase rotation of the utility power being applied to the HMI bypass package terminals, requires that the motor rotation direction be checked and be correct in both VFD and Bypass Modes. Failure to confirm rotation may cause severe damage to the HMI bypass package, motor or the driven equipment.

4.3.1 Check #1: Rotation on VFD power

Place the VFD package in Hand (local) Mode control by pressing the VFD and HAND icons on the HMI bypass touchscreen. The VFD icon will turn blue indicating that the bypass is in VFD Mode and the HAND icon will be highlighted indicating that the bypass is in local control. Use the up arrow on the touchscreen HMI to increase the speed reference of the VFD or the down arrow on to decrease the speed reference of the VFD.

Note the direction of rotation as the motor shaft begins to rotate as compared to the required rotation direction.

To stop the VFD/Motor, press the STOP icon on the HMI touchscreen.

4.3.2 Check #2: Rotation on Bypass power

NOTE: This operation will start the motor across the line. Place the HMI bypass in the Bypass Mode by pressing the BYP icon on the HMI bypass LCD touchscreen. The BYP icon will be highlighted green indicating the HMI bypass is in Bypass Mode.

Press the HAND icon on the HMI bypass touchscreen. The HAND icon will be highlighted indicating the HMI bypass is in local control. This will start the motor across the line. Check motor rotation.

To stop the motor press STOP on the HMI touchscreen.

Note the direction of rotation as the motor shaft begins to rotate as compared to the required rotation direction.

		Motor Rotation Correction		
VFD	Correct	Correct	Incorrect	Incorrect
Bypass	Correct	Incorrect	Correct	Incorrect
Action	No Action	Change any two power leads at input disconnect	Change any two leads at input disconnect, and change any two leads at the output of the motor overload	Change any two leads at output of motor overload

4.4 Normal Operation

There are two (2) buttons used to select the modes of operation available:

1. VFD (VFD Mode) – Energizes the VFD output contactor
2. BYP (Bypass Mode) – Allows bypass operation
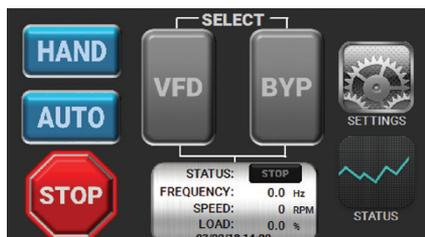
Stop (reset) Button
The STOP button section will stop motor operation in either the VFD or Bypass modes.   This button will also reset any faults indicated by the system.

4.4.1 Current System Status

The One-line diagram on the main screen will indicate if the motor is being run by the VFD or across the line (bypass) by highlighting the active control in green. The VFD or the BYP icon will highlighted green and the One-line diagram will indicate the motor status.

4.4.2 Starting Operation

There are two (2) basic steps required to begin operation.

Step 1 – Select the operation mode by pressing the VFD or BYP (bypass) icon. You must select one of these modes. For VFD operation, press the VFD icon. For bypass operation press the BYP (bypass) icon. Upon selection the selected icon will be highlighted in green.

Step 2 – Select the start mode by pressing either the HAND or AUTO icon. Upon selection the selected icon will be highlighted. Selecting HAND allows an immediate start in VFD or Bypass Mode; whichever was selected in step 1. RUN will not occur until the customer-supplied run contact closes between terminals 27 and 1 (AUTO RUN INPUT and 24 Vdc). The RUN status indication will illuminate when the contact closes.

4.4.3 Ending Operation

Press STOP/(reset) icon once – Cancels the start mode of operation.
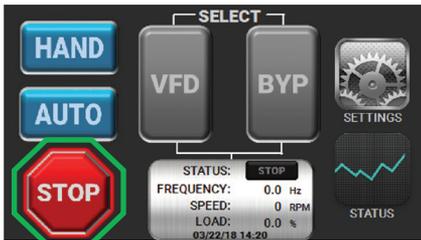
Section 5 - Troubleshooting

The HMI will annunciate VFD and system alarms and trips when supply and control power is applied.

The chart below is intended to assist with troubleshooting a system when the HMI is not illuminated or no fault is indicated.

Symptom	Indications	Corrective Actions
Power disconnect is ON, the HMI display does not illuminate when the screen is tapped	HMI is OFF	- Check power lights on 24 Vdc power supply - If power lights on, check 24 Vdc connections to HMI - If no power lights, check the 24 Vdc power supply and control transformer fusing and connections
Motor does not rotate when VFD mode is selected and HAND is pressed or AUTO is pressed and the Auto-Run input is ON	HMI Bypass status displays "VFD FAULT DETECTED"	- Check Trip log in HMI (see Section 3.1.3.3 for instructions) - If no fault is indicated on the HMI connect to the drive using a plug in keypad or Connect software and record the trip code. Refer to the drive manual for further assistance or download the diagnostic APP from www.controltechniques.us
	VFD and BYP are not visible and/or HMI displayed "Timeout"	- Check that the optional VFD service switch is ON - Check the VFD input fusing - Check Ethernet cable connection between HMI and VFD SI-ETHERNET module - Check HMI IP address is 192.168.0.2 (see Section 3.3 for instructions) - Check VFD SI-ETHERNET module connection status lights (see Section 6.4 for instructions)
	VFD and BYP are green and status displays "RUN"	- Check mechanical motor to load couplings are intact - Ensure that motor connections are made and no VFD to motor disconnects are open - If VFD contactor is not closed check control transformer and contactor coil - Check I/O status screen Terminal 29 STO status is "ON" - If Terminal 29 STO status is "OFF," check OC [1-C11] auxiliary contactor and connections

Symptom	Indications	Corrective Actions
Motor does not rotate when Bypass mode is selected and HAND is pressed or AUTO is pressed and the Auto-Run input is ON		- Check mechanical motor to load couplings are intact - Ensure that motor connections are made and no bypass to motor disconnects are open - Check that the mechanical load is not binding - If Bypass contactor is not closed check control transformer and contactor coil
Fuses blow on power up		- Check VFD input wiring - Replace VFD (see Section 6.4 for instructions)
Input circuit breaker trips on power up		- Check control transformer - If fuses are blown see "Fuses blow" on power up
Input circuit breaker trips when a Bypass run is initiated		- Check motor cables - Check motor direction - Check motor

Section 6 - Additional Information

6.1 Specifications - HVAC Drive H300 HMI Bypass

The HMI bypass package features a user-friendly application-specific full-color live-graphics LCD touch screen HMI (Human Machine Interface) to simplify operation and provide status indication.

6.1.1 Approvals

- VFD Section – UL508C
  - » UL Plenum rated
- Bypass Section – UL508A

6.1.2 Design

- 2 contactor bypass with optional VFD service switch
- NEMA 1, NEMA 12, NEMA 3R, and NEMA 4X enclosure options
- LCD Color touch screen HMI
- 32-bit microprocessor
- MODBUS RTU, BACnet, and Metasys N2 communications
- EtherNet/IP and Modbus TCP/IP
- HAND/OFF/AUTO selection icons
- VFD/BYPASS selection icons
- Auto transfer to bypass on VFD fault (selectable)
- Damper Mode (programmable)
- Damper actuator control (5 A @ 125 Vac relay contact)
- Fire Alarm – programmable to:
  - » Fireman's Override
  - » Fireman's Override VFD Control
- PID controller
- Class 20 motor overload relay
- One (1) analog output:
  - » 0-10 Vdc, scalable
- Two (2) analog inputs – programmable for:
  - » 4-20 mA, scalable (default auto speed input)
  - » 0-10 Vdc, scalable (default onboard PID controller input)
- Speed search function
- 3 skip frequencies
- Digital manual speed control
- Bypass setup wizard

6.1.3 Operating Conditions

- Altitude: to 3,300 ft, higher with derating

- Ambient operating temp: +32 to +104 °F (0 to +40 ˚C)
- Storage temp: -40 to +140 ˚F (-40 to +60 ˚C)
- 95% relative humidity, non-condensing
- Input voltage: +10%, -10%; 208, 230, 460 and 575 Vac
- Protected from exposure to direct sunlight

6.1.4 Options

- Input fused disconnect
- Input circuit breaker
- Input or output reactors
- Multiple motor overloads
- Input RFI filter

6.2 Maintenance & Inspection

This section describes the basic periodic maintenance and inspection procedures for the electronic bypass.

⚠ **WARNING**

CAUTION! To prevent electrical shock and damage, disconnect all power before servicing the electronic bypass package. Then wait at least ten (10) minutes after the power supply is disconnected and all LEDs are extinguished.

The bypass system will function longer if kept clean, cool and dry, and if all precautions highlighted in this manual are observed. Periodically inspect the electronic bypass package as described in the table below to prevent accidents and to ensure high performance with high reliability.

| Component	Check	Corrective Action
External terminals, connectors, mounting screws, etc.	Loose screws or connectors	Secure / tighten
Heat sink	Build-up of dust and dirt	Blow with dry compressed air (4 to 6kg-cm2 pressure)
Printed Circuit Board (PCB)	Accumulation of conductive dust or oil	Blow with dry compressed air (4 to 6kg-cm2 pressure). If dust cannot be removed, replace the board.
Cooling fan	For abnormal noise and vibration	Replace the cooling fan
Power components	Accumulation of dust and dirt	Blow with dry compressed air (4 to 6kg-cm2 pressure)

6.3 VFD Parameter Access

The HVAC Drive H300 VFD parameters settings required for operation in a bypass system are set at the factory. Adjustments can be made to VFD parameters via the HMI for all standard applications. If there is a need to access advanced parameters not accessible via the HMI there are 2 methods available:

1. Remove the HVAC Drive H300 keypad cover and plug in a keypad, order code **HOA-KEYPAD-RTC**. For a complete list of parameters go to www.controltechniques.com

2. Connect a PC to the SI-ETHERNET module in the drive and use **"Connect" software** to access parameters. This software is available as a no charge download from www. controltechniques.com
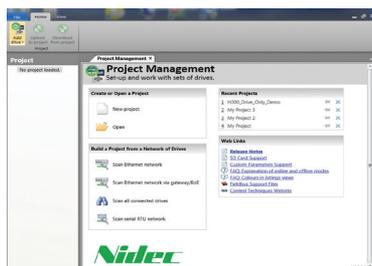
In order to successfully connect to the drive via the SI-ETHERNET module the PC Ethernet IP address needs to be set to 192.168.0.xxx where xxx is not = 010 and the subnet mask needs to be 255.255.255.0.

⚠ WARNING

CAUTION: Changes made to VFD parameters may result in unintended motor operation and damage to equipment.

6.4 VFD Replacement

If the VFD has to be replaced, it is recommended that the SI-ETHERNET module in the existing drive is re-used and fitted to the replacement drive. If a new SI-ETHERNET MODULE is needed, order code **HMI-BYP-SI-ETHERNET** is pre-configured at the factory for HVAC Drive H300 HMI Bypass settings. If

a new SI-ETHERNET module is fitted it is necessary to set the IP address of the module to 192.168.0.010 and the subnet mask to 255.255.255.0. A VFD keypad or Connect software is required to set the address.

To configure a drive to HVAC Drive H300 HMI Bypass factory defaults (examples: replacement VFD or existing VFD that is reset to HVAC Drive H300 defaults), from the System Settings screen select the **Default Settings** icon.
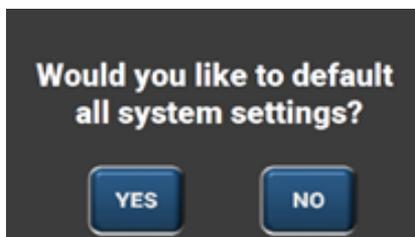
Select "YES" to restore the HVAC Drive H300 HMI Bypass to system defaults. Select "NO" to return to the SYSTEM SETTINGS Screen.

Warning: Selecting "YES" will reset the HVAC Drive HMI Bypass to factory default settings and the Setup Wizard must be completed again.

6.5 HVAC Drive H300 HMI Bypass Parameter Defaults

The following table represents the parameter differences of an HVAC Drive H300 HMI Bypass and a standalone HVAC Drive H300 parameter defaults. These do not include user settable HMI Bypass settings.

VFD Paremeter	Parameter Description	HMI Bypass Value	HVAC Drive H300 Default
01.014	Reference Selector	A2 Preset	A1 A2
01.021	Preset Reference 1	15.0 Hz	0.0 Hz
01.023	Preset Reference 3	20.0 Hz	0.0 Hz
01.052	Hand/Off/Auto Operating Mode	0	1
01.053	Fire Mode Reference	40.0 Hz	0.0 Hz
02.004	Ramp Mode	Std boost	Standard
02.008	Standard Ramp Voltage	Drive rating	Drive rating
02.011	Acceleration Rate 1	20.0 s	10.0 s
02.021	Deceleration Rate 1	20.0 s	10.0 s
04.015	Motor Thermal Time Constant 1	120.0 s	89.0 s
04.016	Thermal Protection Mode	0x0	0x1
04.037	Motor Thermal Time Constant 2	50.0 s	89.0 s
05.007	Rated Current	Drive rating	Drive rating
05.008	Rated Speed	Drive rating	Drive rating

VFD Paremeter	Parameter Description	HMI Bypass Value	HVAC Drive H300 Default
05.009	Rated Voltage	Drive rating	Drive rating
05.018	Maximum Switching Frequency	3 kHz	3 kHz
05.027	Enable Slip Compensation	Off	On
06.015	Drive Enable	Off	On
06.019	Date/Time Selector	Acc Powered	Local Keypad
06.043	Control Word Enable	On	Off
06.048	Supply Loss Detection Level	Drive rating	Drive rating
06.065	Standard Under Voltage Threshold	Drive rating	Drive rating
06.066	Low Under Voltage Threshold	Drive rating	Drive rating
07.010	Analog Input 1 Destination	1.037	1.036
07.014	Analog Input 2 Destination	18.018	1.037
07.022	Analog Output 2 Source	10.001	4.002
07.040	Analog Input 1 Minimum	0.05 %	0.00 %
07.041	Analog Input 2 Minimum	0.05 %	0.00 %
08.021	Digital I/O 01 Source/Destination	1.054	10.002
08.022	Digital I/O 02 Source/Destination	0.000	10.033
08.023	Digital I/O 03 Source/Destination	0.000	6.030
08.024	Digital Input 04 Destination	10.033	1.054
08.025	Digital Input 05 Destination	0.000	1.041
08.027	Relay Output Source	0.000	10.001
08.031	Digital I/O 01 Output Select	Off	On
08.071	Digital I/O Output Enable Register 1	0xFF7F	0x0000
09.004	Logic Function 1 Source 1	19.031	0.000
09.005	Logic Function 1 Source 1 Invert	On	Off
09.006	Logic Function 1 Source 2	9.002	0.000
09.007	Logic Function 1 Source 2 Invert	On	Off
09.008	Logic Function 1 Output Invert	On	Off
09.009	Logic Function 1 Delay	8.0 s	0.0 s
09.010	Logic Function 1 Destination	10.032	0.000
09.014	Logic Function 2 Source 1	19.031	0.000
09.015	Logic Function 2 Source 1 Invert	On	Off
09.016	Logic Function 2 Source 2	19.041	0.000
09.017	Logic Function 2 Source 2 Invert	On	Off
10.030	Braking Resistor Rated Power	0.000 kW	0.050 kW
10.031	Braking Resistor Thermal Time Constant	0.000 s	3.300 s
10.034	Number of Auto reset Attempts	None	5
10.035	Auto reset Delay	10.0 s	5.0 s
10.061	Braking Resistor Resistance	22.00	5.0 s

VFD Paremeter	Parameter Description	HMI Bypass Value	HVAC Drive H300 Default
10.034	Number Of Auto-reset Attempts	None	5
10.035	Auto-reset Delay	10.0 s	5.0 s
10.061	Braking Resistor Resistance	00.00 Ω	75.00 Ω
11.024	Serial Mode	7 1 NP	8 2 NP
11.044	User Security Status	All Menus	
12.010	Variable Selector 1 Mode	Subtract	Input 1
12.028	Variable Selector 2 Source 1	18.021	0.000
12.031	Variable Selector 2 Destination	1.053	0.000
14.003	PID1 Reference Source	18.017	0.000
14.004	PID1 Feedback Source	18.018	0.000
14.014	PID1 Output Lower Limit	0.01 %	-100.00 %
18.013	Application Menu 1 Read-write Integer 13	2	0
18.017	Application Menu 1 Read-write Integer 17	750	0
18.019	Application Menu 1 Read-write Integer 19	1111	0
18.020	Application Menu 1 Read-write Integer 20	32727	0
18.021	Application Menu 1 Read-write Integer 21	24545	0
18.031	Application Menu 1 Read-write bit 31	On	Off
20.001	Application Menu 3 Read-write Integer 1	20839	0
29.010	User Selectable Parameter 1	18.029	0.000
29.011	User Selectable Parameter 2	18.030	0.000
29.012	User Selectable Parameter 3	1.021	0.000
2.02.005	DHCP Enable	Off	On
2.02.006	IP Address	192.168.0.10	192.168.1.100
2.02.007	Subnet Mask	255.255.0.0	255.255.255.0
2.02.008	Default Gateway	0.0.0.0	192.168.1.254
3.01.011	T2 Digital I/O 1 Mode	Digital Output	Digital Input
3.01.015	T7 Digital Input 5, Analog Input 1 Mode	Digital Input	Volt In
3.01.016	T8 Digital Input 6, Analog Input 2 Mode	Digital Input	Volt In
3.01.017	T9 Digital Input 7, Analog Input 3 Mode	Digital Input	Volt In
3.01.019	Collective Digital I/O Mode	CDIO Mappings	CDIO Disabled
3.02.031	Collective Digital Input Destination	0.18.013	0.00.000
3.02.032	Collective Digital Output Source	0.18.022	0.00.000

The HMI IP address can be accessed through the HMI Settings icon and should not be changed from the default IP address (192.168.0.2) or the HMI Bypass will not function.

Notes:

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