H-Max Series Variable Frequency Drives
HVAC Application Configuration

This document is created to help our customers quickly set up the H-Max Series variable frequency drive (VFD) for different HVAC setup configurations based on application requirements. This document includes input and output wiring configurations and parameter configurations for multiple applications.

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1. Introduction

The Eaton HMAX is broken up into 3 applications; Standard, PID, and Multi-Pump. With these 3 applications Multi-Pump will allow setting up basically any function desired in the drive but to simplify things the other applications remove some undesired parameters to simplify operation. The default I/O setup is the same no matter the application selected shown in Figure 1.

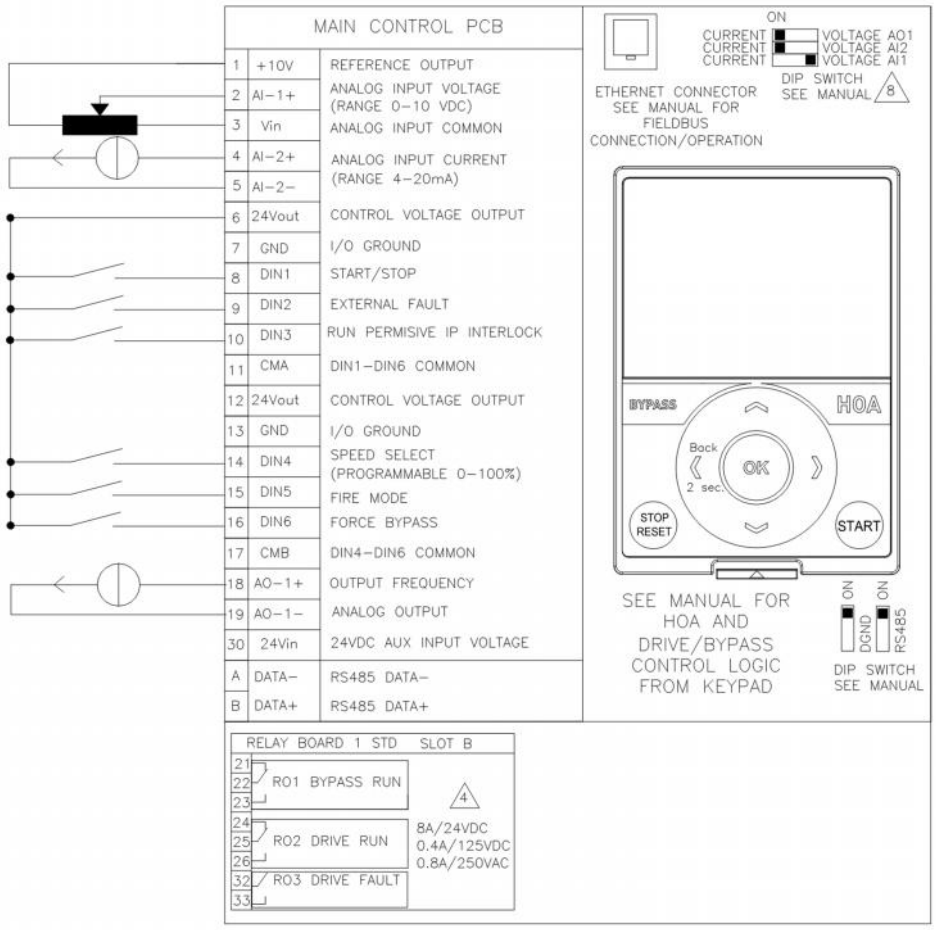
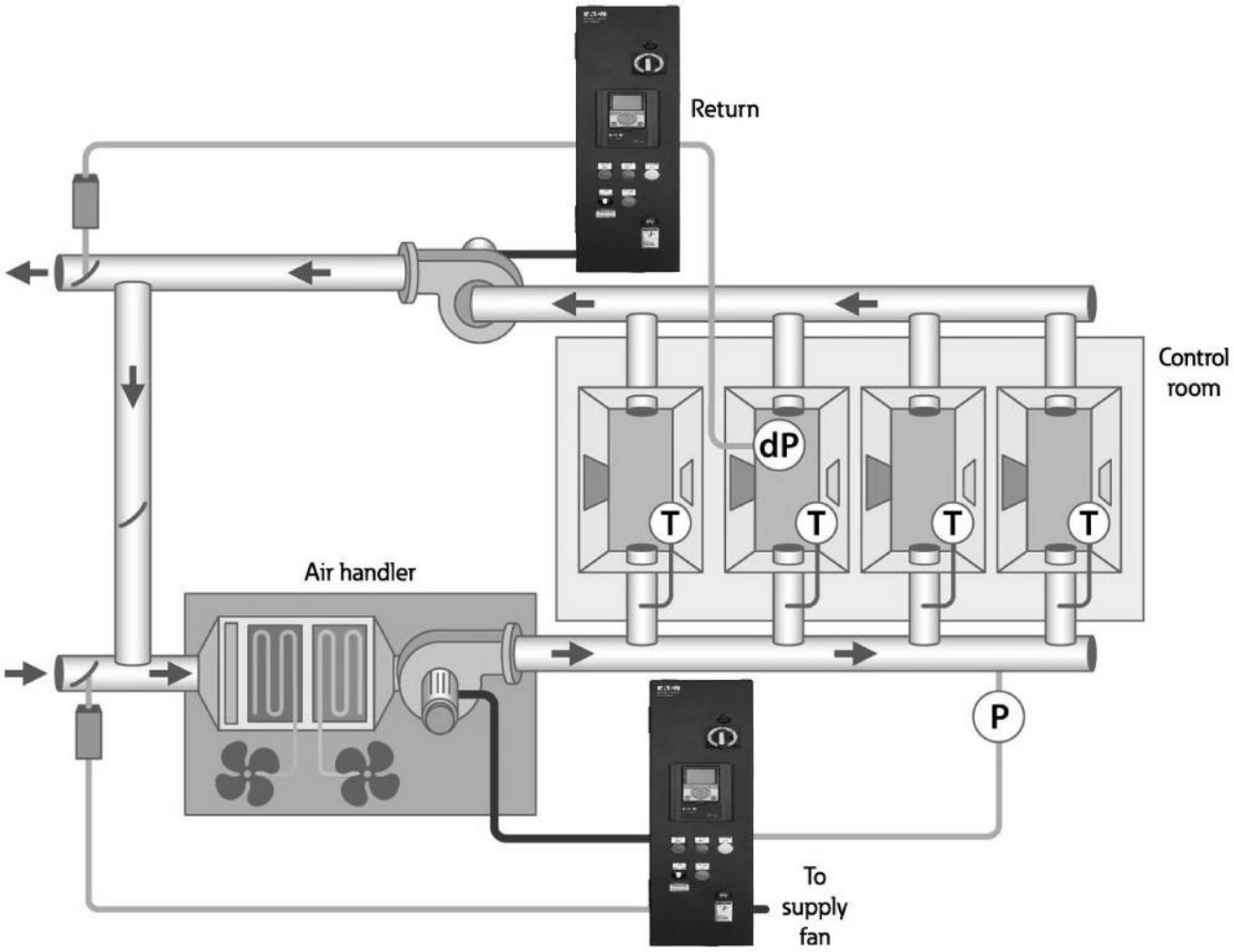


Figure 1. Standard I/O setup of HMAX

2. Specific Applications/Control Setup

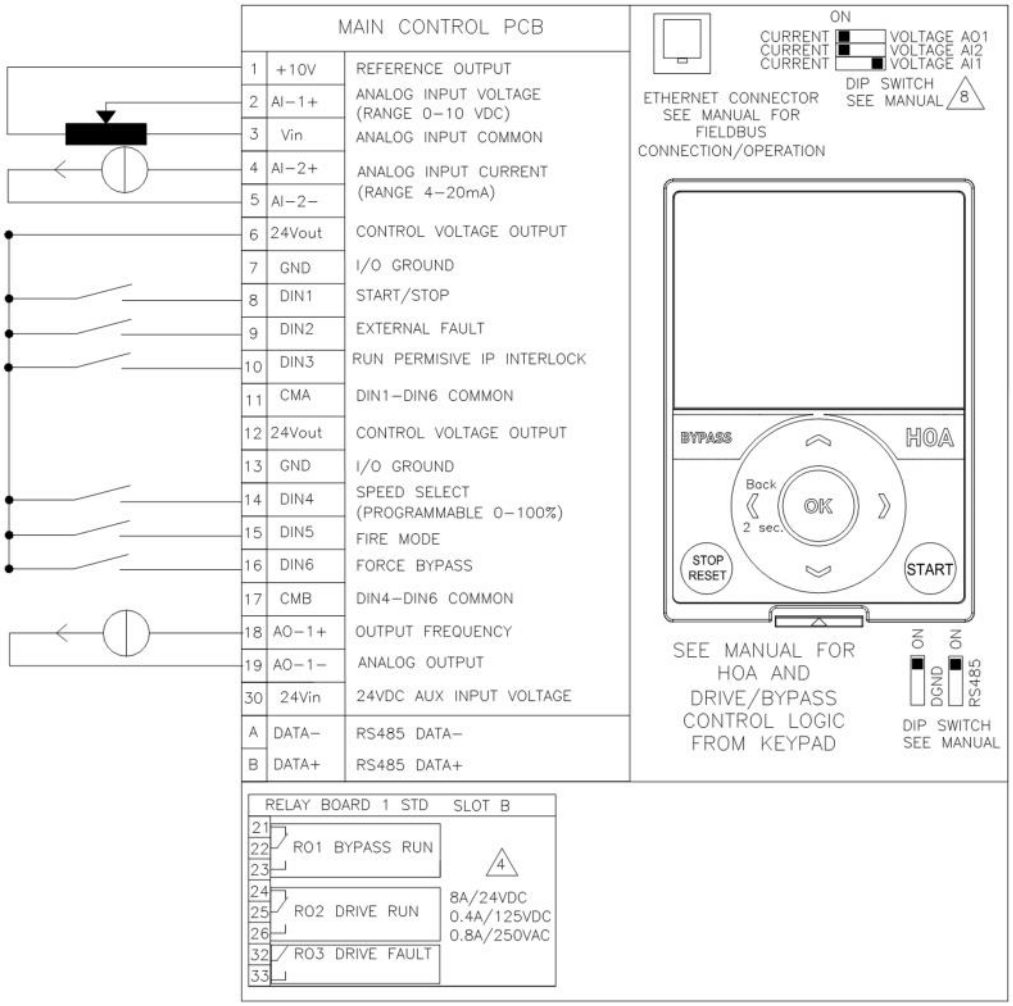
I. Supply fan (VAV)

In a supply fan application the fan is bringing fresh air into a room based off the desired pressure or temperature setpoint and a transducer that sends back the actual measured value and adjust the drive to maintain the desired level, this can be done by the drive or with an external controller. This would be considered a PI(D) loop system for setup in many cases but it could be controlled via a direct frequency reference, where the transducer or reference is just sent to the drive as a value to run at, we will show both.



Direct Frequency Setup

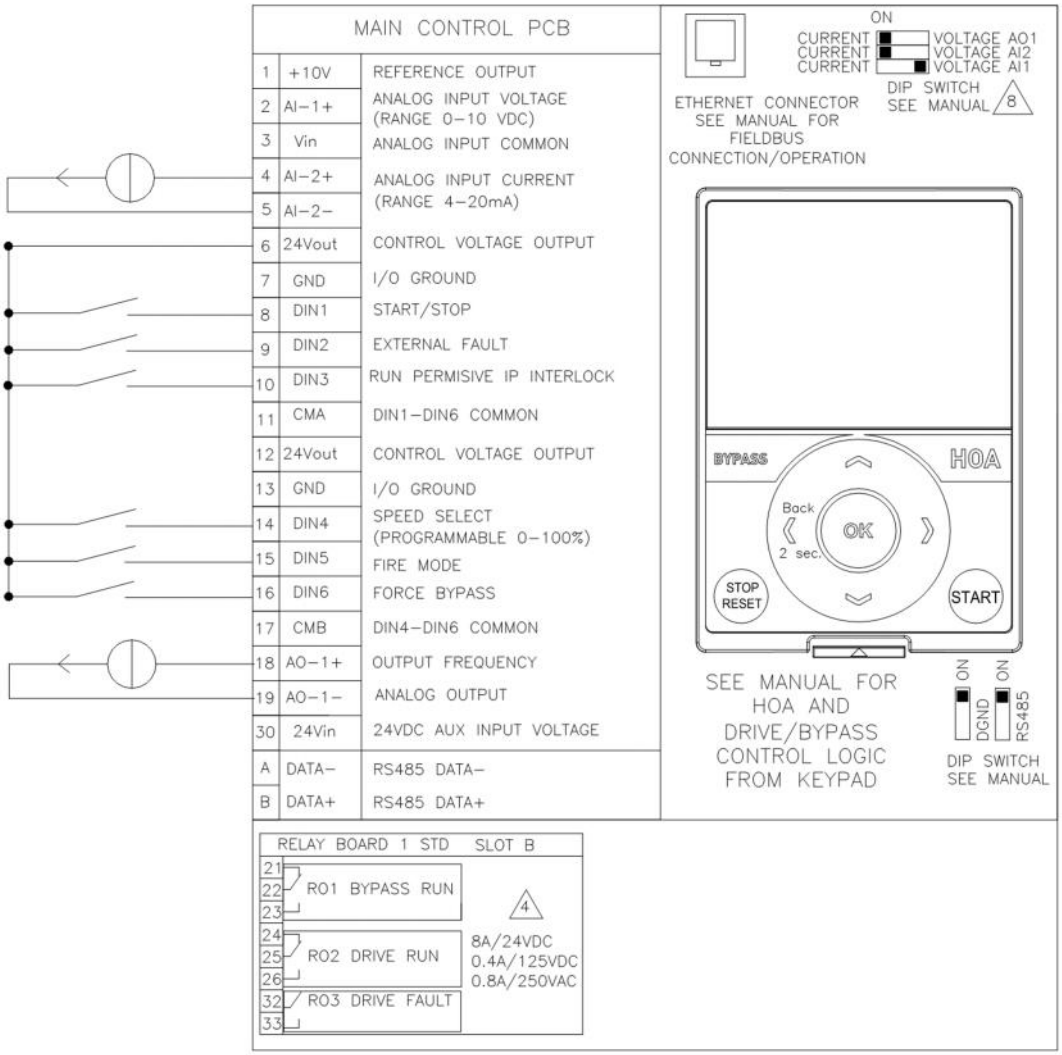
Using the Direct frequency setup on the HMAX it would be advisable to use the Standard Application where the frequency reference comes in as one of the analog current input as AI2 or voltage as AI1. Typically in this setup a single start/stop signal is given to DIN1 for the Auto Control location with an external PID Controller as the Ref with one of the analog inputs. Hand mode would be assigned to the keypad for direct speed control. Stepping through the Standard Quick Start wizard will get the application setup and running. The relay outputs can be configured to control mechanical dampers as well with a feedback to indicate they are open before starting, but in this case this will be controlled by external source and fed into DIN3 interlock.



Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	0 = Standard	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Disable	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	keypad Ref	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	4 = AI1	AI1	Keypad Ref	PID1 Activated		1303

PID Setup

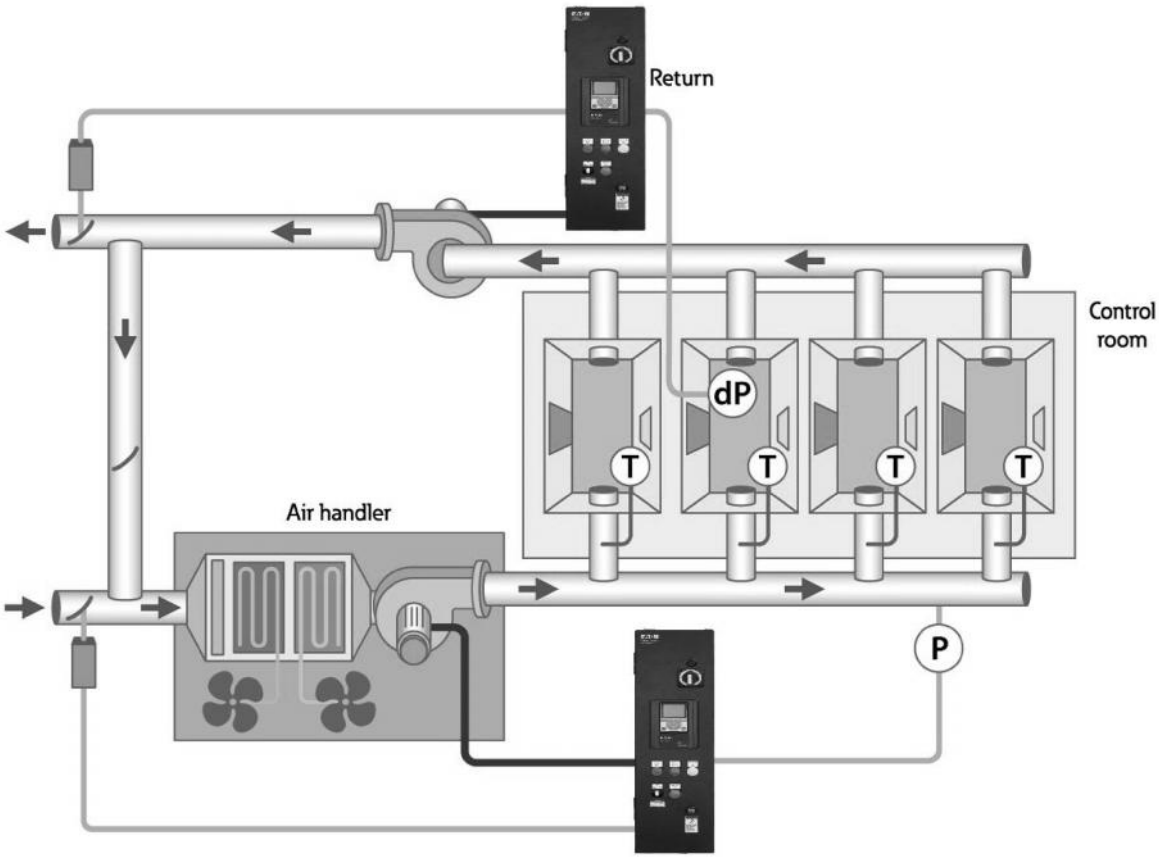
Using the PID setup on the HMAX it would be advisable to select the PID application. Typically in this setup a single start/stop signal is given to DIN1 for the Auto Control location with PID Controller as the Ref and the set point is set via the keypad. Hand mode would be assigned to the keypad for direct speed control. Stepping through the PID Start wizard will get the application setup and running for the most part, below are possible parameters settings that would be made. The relay outputs can be configured to control mechanical dampers as well with a feedback to indicate they are open before starting, but in this case this will be controlled by external source and fed into DIN3 interlock.



Parameters							
Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	1 = PID	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Enabled	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	PC	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	7 = PID1 Activated	PC	Keypad Ref	PID1 Activated		1303
PID Controller							
PID Controller 1							
Basic Settings							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.1.1	P-Gain	100	100	0	200	%	118
P 2.9.1.1.2	Integration Time	1	1	0	600	s	119
P 2.9.1.1.3	Derivation Time	0	0	0	100	s	132
P 2.9.1.1.4	ProcessUnitSel.	1 = %		%	°F		1036
P 2.9.1.1.5	ProcessUnitMin	0	0	-99999.99	99999.99	%	1033
P 2.9.1.1.6	ProcessUnitMax	100	0	-99999.99	99999.99	%	1034
P 2.9.1.1.7	ProcessUnitDeci.	2	2	0	4		1035
P 2.9.1.1.8	Error Inversion	0 = Normal	Normal	Normal	Inverted		340
Setpoints							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.2.1	Keypad SetPt1	50	0	0	100	%	167
Feedbacks							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.3.1	Function	1 = Source1	0	Source1	MEAN		333
P 2.9.1.3.2	Gain	100	0	-1000	1000	%	1058
P 2.9.1.3.3	FeedBack1 Srce	2 = AI2	Not Used	Not Used	ProceDataIn8		334

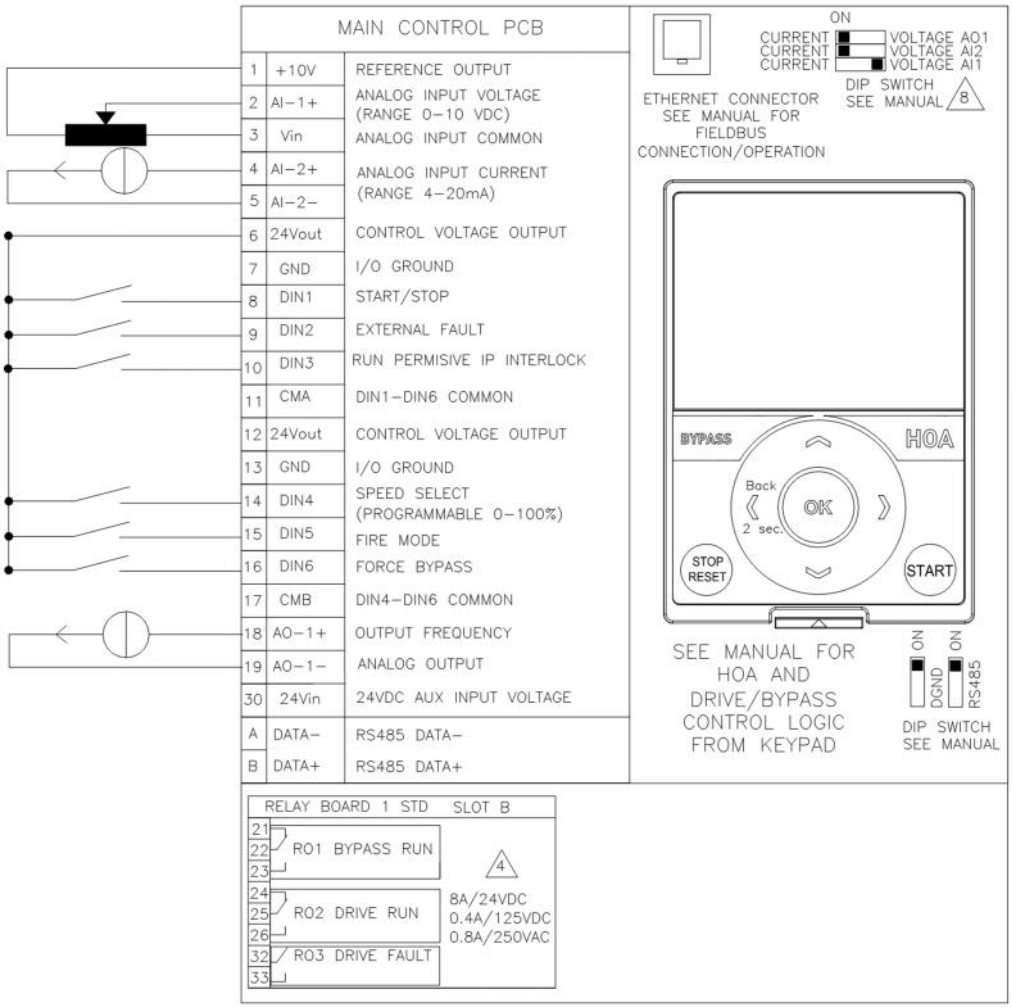
II. Return Fan (VAV)

In a Return fan application the fan is removing old air from a room, it is typically based off the desired pressure or temperature setpoint and a transducer that sends back the actual measured value and adjust the drive to maintain the desired level, this can be done by the drive or with an external controller. This would be considered a PI(D) loop system for setup in many cases but it could be controlled via a direct frequency reference, where the transducer or reference is just sent to the drive as a value to run at, we will show both.



Direct Frequency Setup

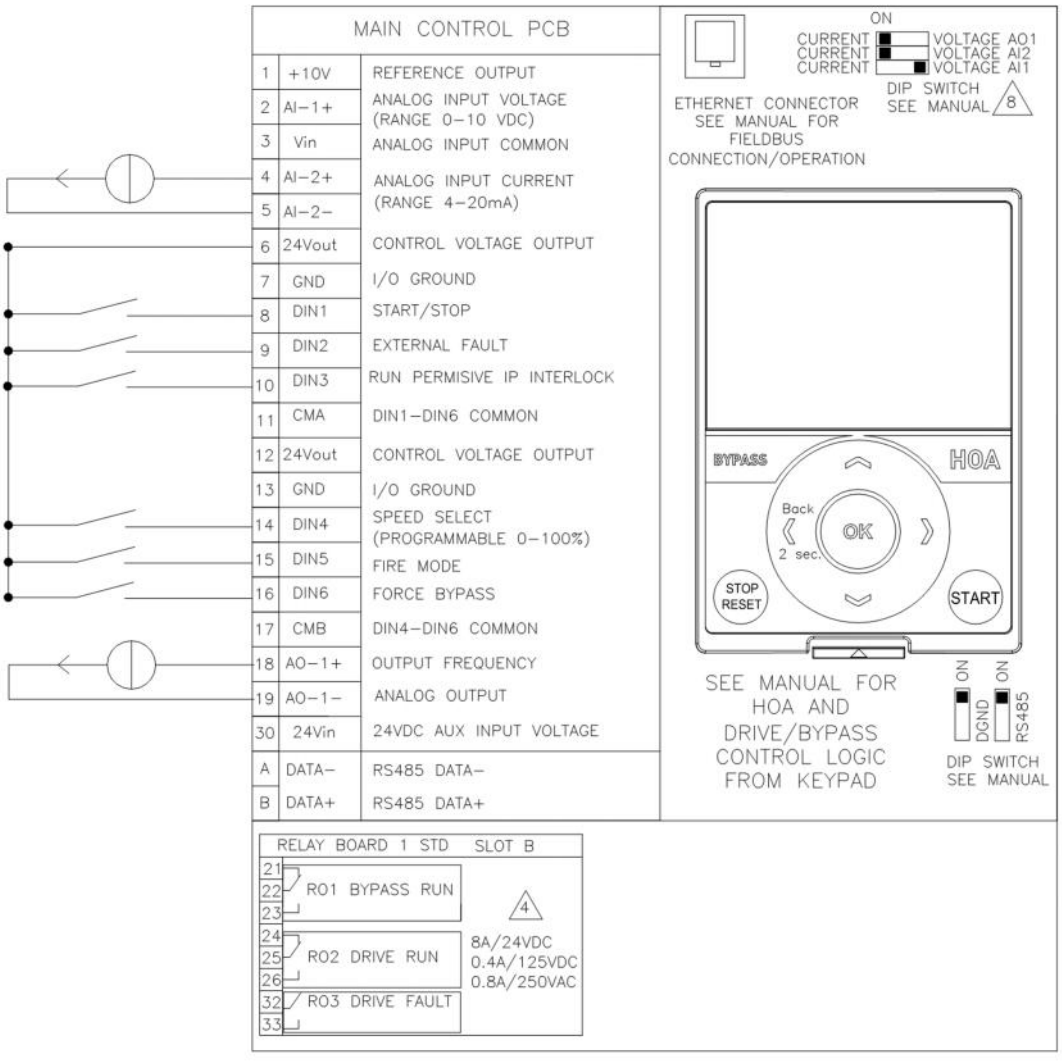
Using the Direct frequency setup on the HMAX it would be advisable to use the Standard Application where the frequency reference comes in as one of the analog current input as AI2 or voltage as AI1. Typically in this setup a single start/stop signal is given to DIN1 for the Auto Control location with an external PID Controller as the Ref with one of the analog inputs. Hand mode would be assigned to the keypad for direct speed control. Stepping through the Standard Quick Start wizard will get the application setup and running. The relay outputs can be configured to control mechanical dampers as well with a feedback to indicate they are open before starting, but in this case this will be controlled by external source and fed into DIN3 interlock.



Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	0 = Standard	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Disable	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	keypad Ref	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	4 = AI1	AI1	Keypad Ref	PID1 Activated		1303

PID Setup

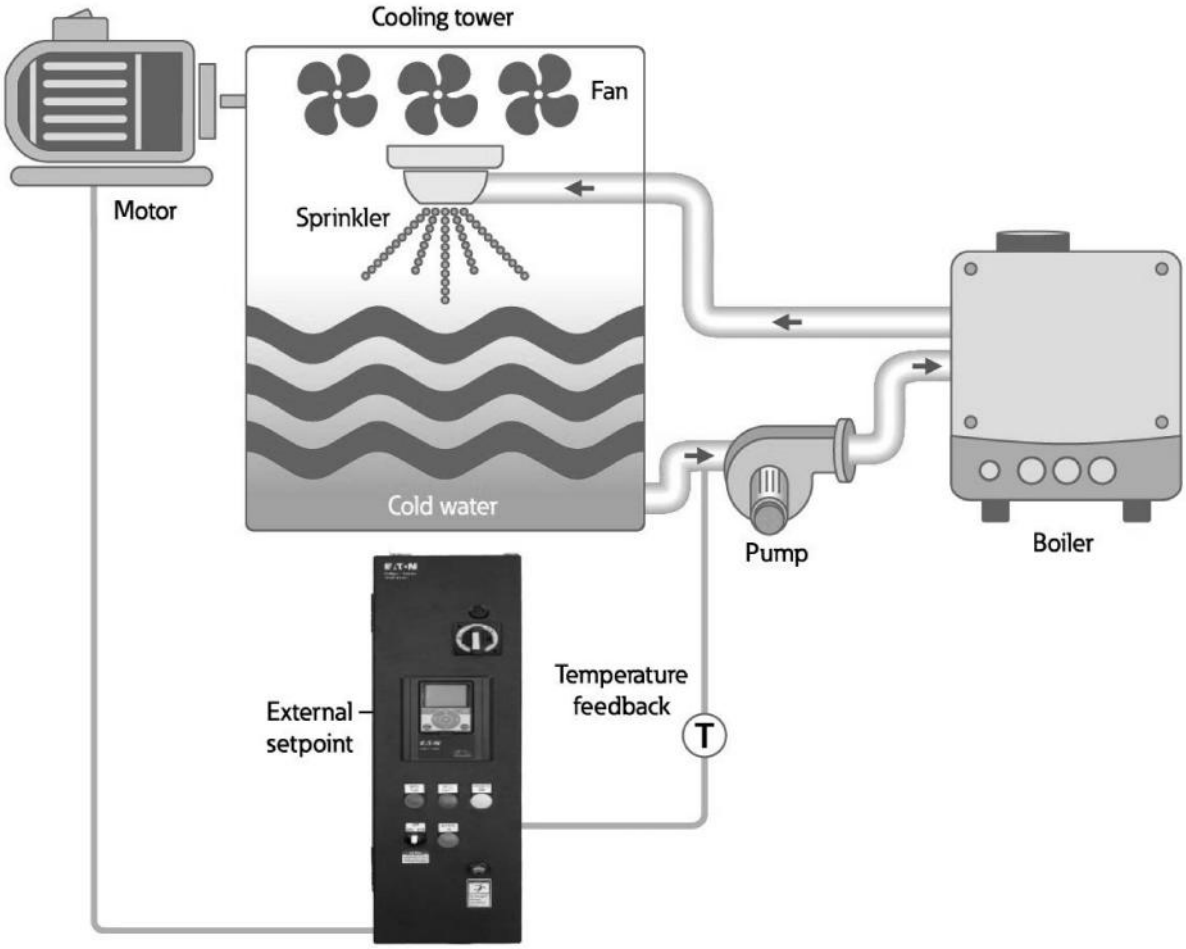
Using the PID setup on the HMAX it would be advisable to select the PID application. Typically in this setup a single start/stop signal is given to DIN1 for the Auto Control location with PID Controller as the Ref and the set point is set via the keypad. Hand mode would be assigned to the keypad for direct speed control. Stepping through the PID Start wizard will get the application setup and running for the most part, below are possible parameters settings that would be made. The relay outputs can be configured to control mechanical dampers as well with a feedback to indicate they are open before starting, but in this case this will be controlled by external source and fed into DIN3 interlock.



Parameters							
Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	1 = PID	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Enabled	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	PC	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	7 = PID1 Activated	PC	Keypad Ref	PID1 Activated		1303
PID Controller							
PID Controller 1							
Basic Settings							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.1.1	P-Gain	100	100	0	200	%	118
P 2.9.1.1.2	Integration Time	1	1	0	600	s	119
P 2.9.1.1.3	Derivation Time	0	0	0	100	s	132
P 2.9.1.1.4	ProcessUnitSel.	1 = %		%	°F		1036
P 2.9.1.1.5	ProcessUnitMin	0	0	-99999.99	99999.99	%	1033
P 2.9.1.1.6	ProcessUnitMax	100	0	-99999.99	99999.99	%	1034
P 2.9.1.1.7	ProcessUnitDeci.	2	2	0	4		1035
P 2.9.1.1.8	Error Inversion	0 = Normal	Normal	Normal	Inverted		340
Setpoints							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.2.1	Keypad SetPt1	50	0	0	100	%	167
Feedbacks							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.3.1	Function	1 = Source1	0	Source1	MEAN		333
P 2.9.1.3.2	Gain	100	0	-1000	1000	%	1058
P 2.9.1.3.3	FeedBack1 Srce	2 = AI2	Not Used	Not Used	ProceDataIn8		334

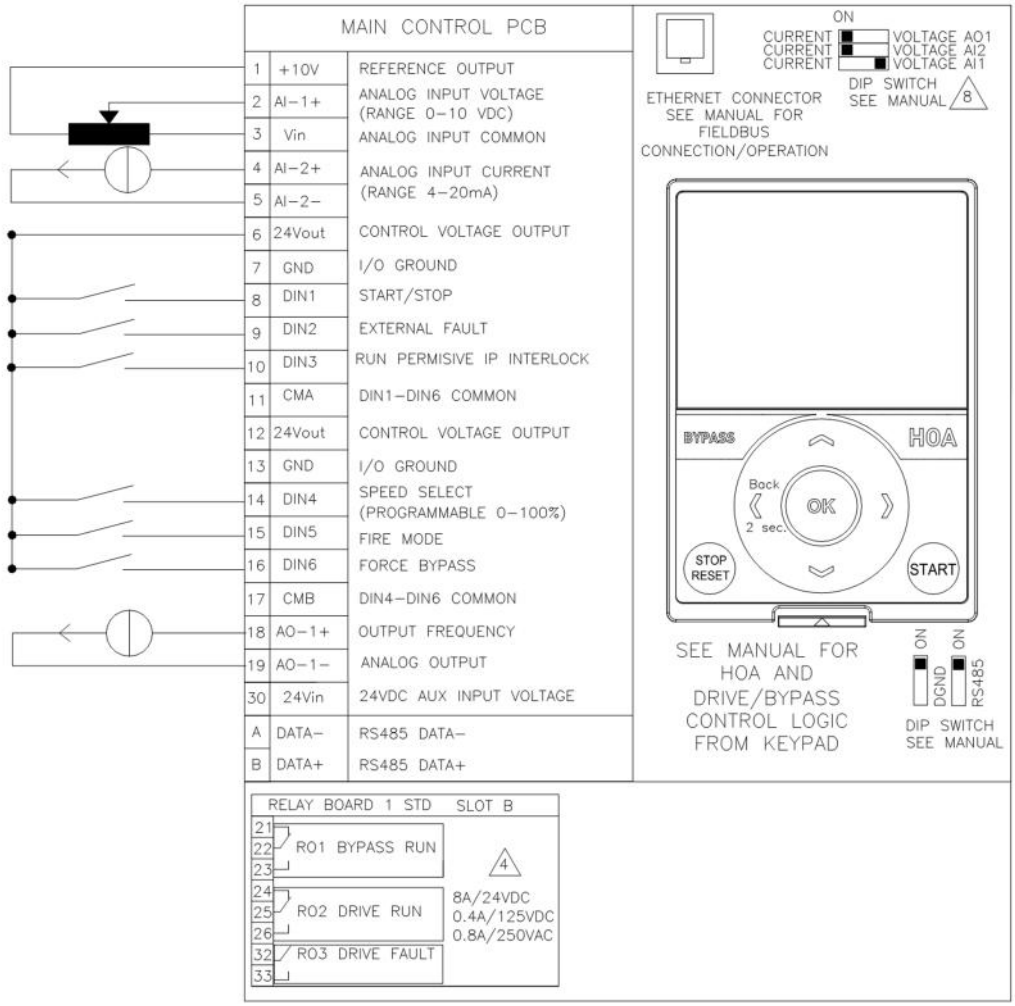
III. Cooling tower fan

A. In a Cooling tower Fan application the fan is blowing air across some water sprinklers, it is typically based off the desired pressure or temperature setpoint in the system and a transducer sends back the actual measured value and adjust the drive to maintain the desired level, this can be done by the drive or with an external controller. This would be considered a PI(D) loop system for setup in many cases but it could be controlled via a direct frequency reference, where the transducer or reference is just sent to the drive as a value to run at, we will show both.



Direct Frequency Setup

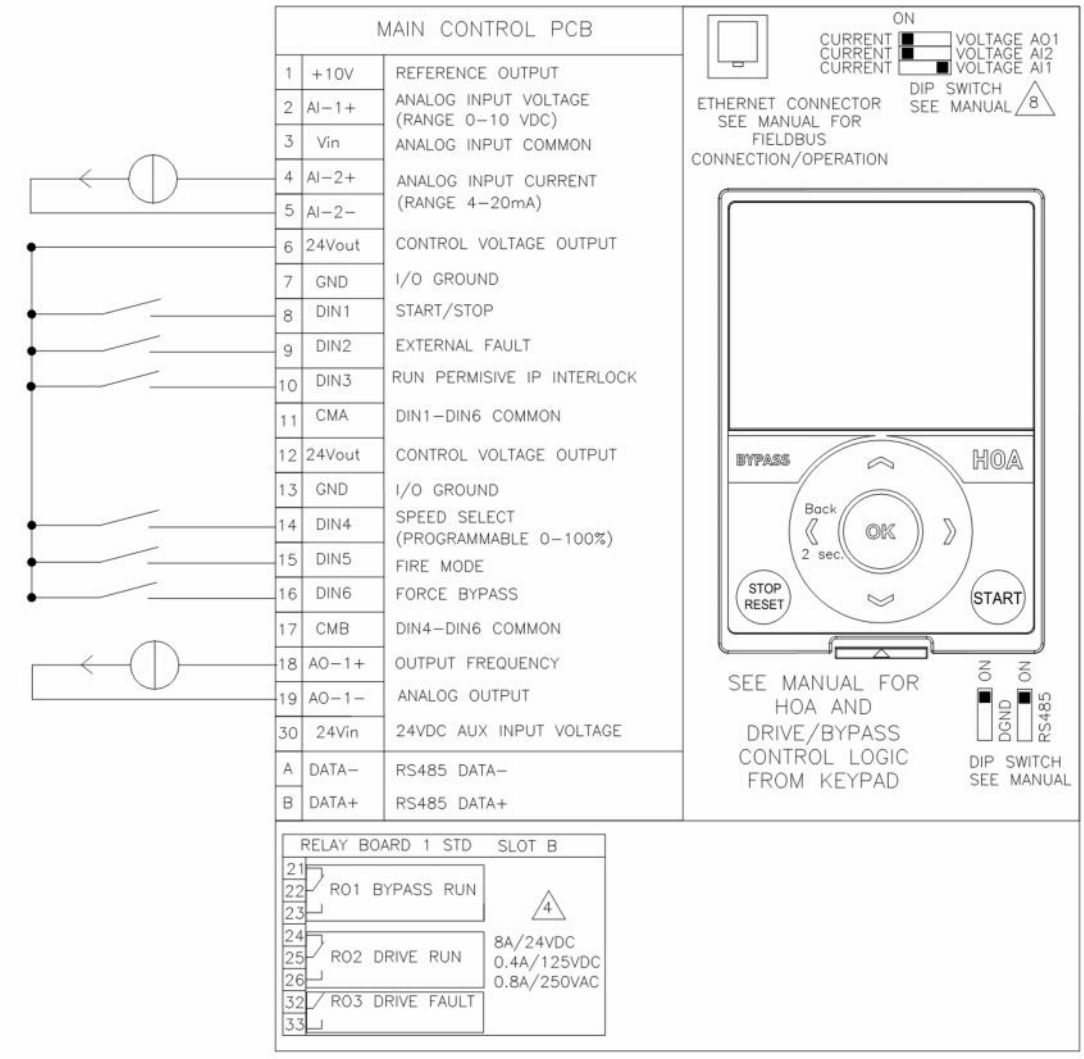
Using the Direct frequency setup on the HMAX it would be advisable to use the Standard Application where the frequency reference comes in as one of the analog current input as AI2 or voltage as AI1. Typically in this setup a single start/stop signal is given to DIN1 for the Auto Control location with an external PID Controller as the Ref with one of the analog inputs. Hand mode would be assigned to the keypad for direct speed control. Stepping through the Standard Quick Start wizard will get the application setup and running. DIN3 interlock is a safety input required to start in either Hand or Auto, it can be jumpered if not desired.



Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	0 = Standard	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Disable	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	keypad Ref	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	4 = AI1	AI1	Keypad Ref	PID1 Activated		1303

PID Setup

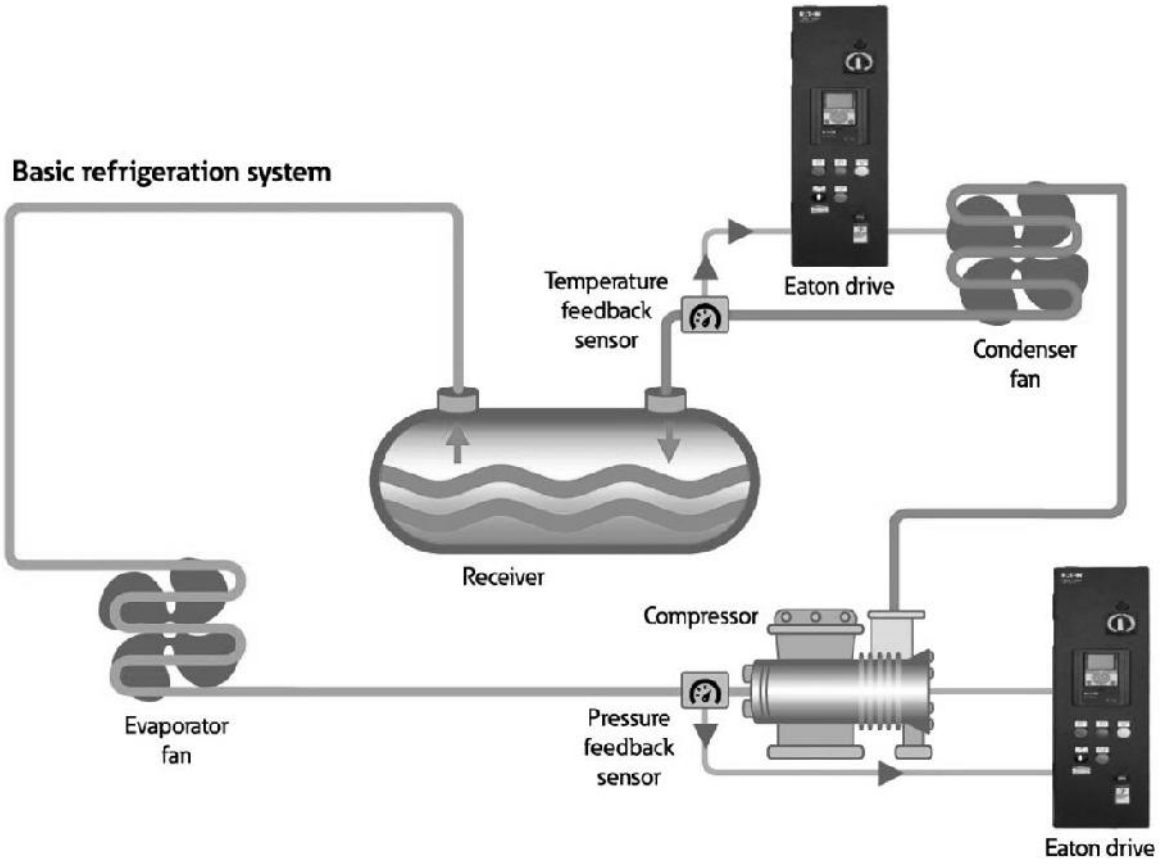
Using the PID setup on the HMAX it would be advisable to select the PID application. Typically in this setup a single start/stop signal is given to DIN1 for the Auto Control location with PID Controller as the Ref and the set point is set via the keypad. Hand mode would be assigned to the keypad for direct speed control. Stepping through the PID Start wizard will get the application setup and running for the most part, below are possible parameters settings that would be made. DIN3 interlock is a safety input required to start in either Hand or Auto, it can be jumpered if not desired.



Parameters							
Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	1 = PID	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Enabled	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	PC	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	7 = PID1 Activated	PC	Keypad Ref	PID1 Activated		1303
PID Controller							
PID Controller 1							
Basic Settings							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.1.1	P-Gain	100	100	0	200	%	118
P 2.9.1.1.2	Integration Time	1	1	0	600	s	119
P 2.9.1.1.3	Derivation Time	0	0	0	100	s	132
P 2.9.1.1.4	ProcessUnitSel.	1 = %		%	°F		1036
P 2.9.1.1.5	ProcessUnitMin	0	0	-99999.99	99999.99	%	1033
P 2.9.1.1.6	ProcessUnitMax	100	0	-99999.99	99999.99	%	1034
P 2.9.1.1.7	ProcessUnitDeci.	2	2	0	4		1035
P 2.9.1.1.8	Error Inversion	0 = Normal	Normal	Normal	Inverted		340
Setpoints							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.2.1	Keypad SetPt1	50	0	0	100	%	167
Feedbacks							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.3.1	Function	1 = Source1	0	Source1	MEAN		333
P 2.9.1.3.2	Gain	100	0	-1000	1000	%	1058
P 2.9.1.3.3	FeedBack1 Srce	2 = AI2	Not Used	Not Used	ProceDataIn8		334

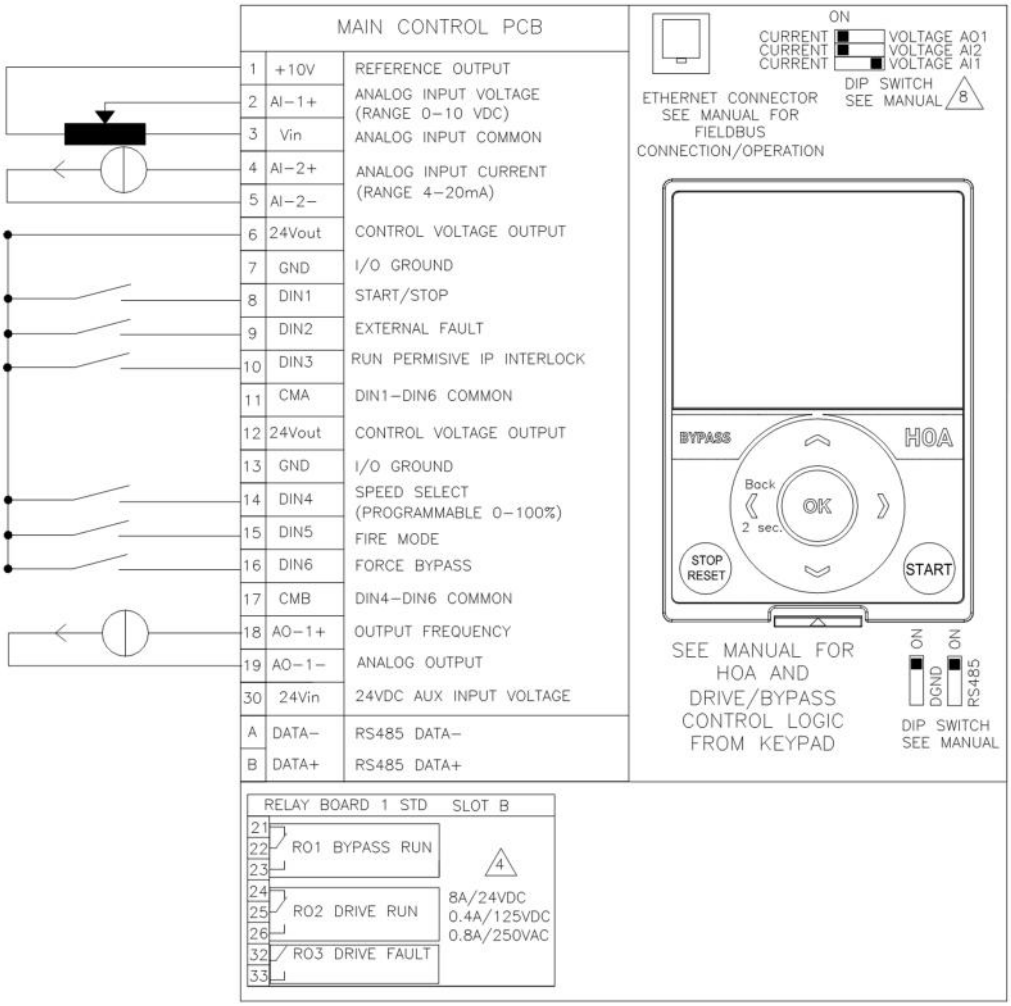
IV. Condenser/Compressor System

In a Condenser Fan or Liquid Cooler application the fan is blowing air across a set of liquid coils to cool it, it is typically based off the desired pressure or temperature setpoint in the system and a transducer sends back the actual measured value and adjust the drive to maintain the desired level, this can be done by the drive or with an external controller, a compressor drive is used to heat up the water after it has cooled. Both of these apps would be considered a PI(D) loop system for setup in many cases but it could be controlled via a direct frequency reference, where the transducer or reference is just sent to the drive as a value to run at, we will show both.



Direct Frequency Setup

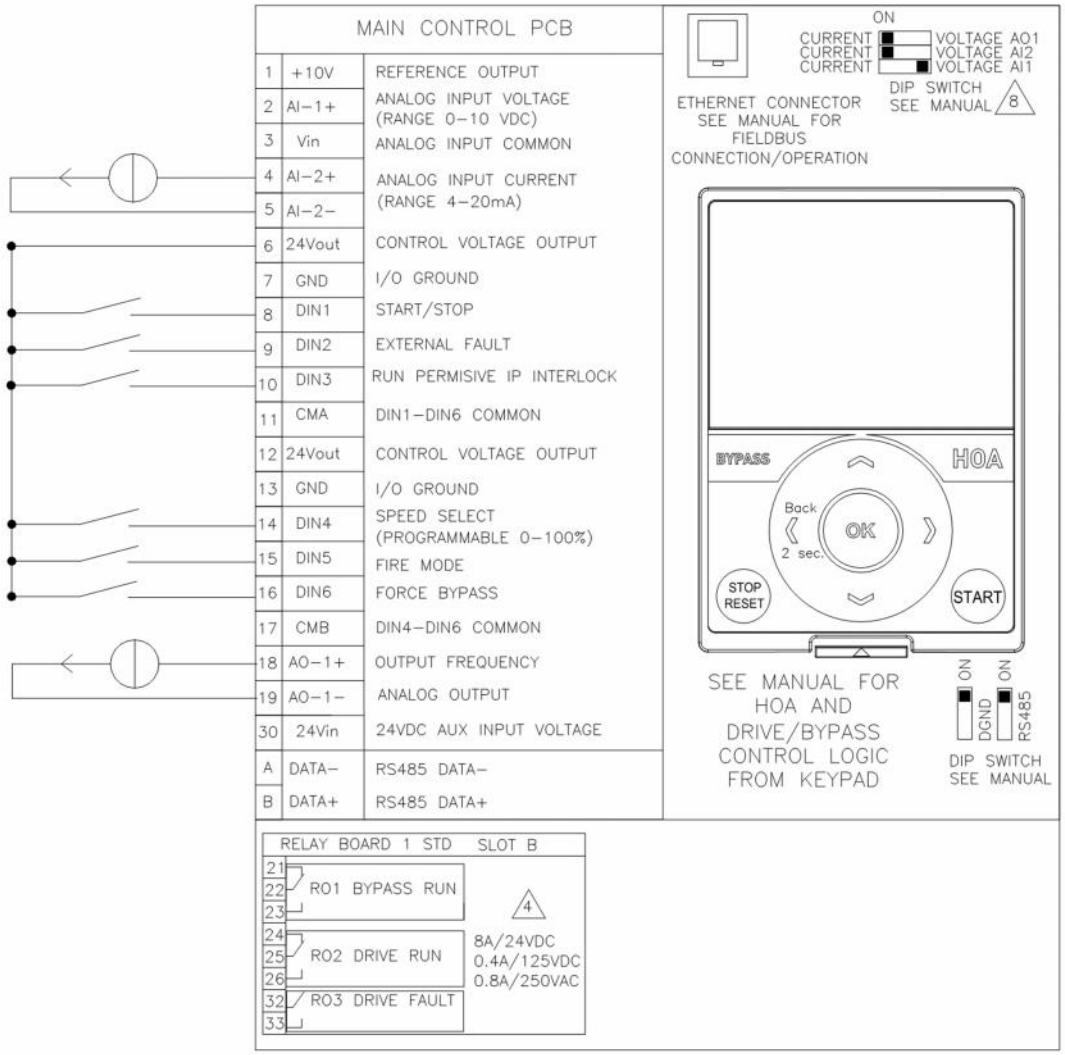
Using the Direct frequency setup on the HMAX it would be advisable to use the Standard Application where the frequency reference comes in as one of the analog current input as AI2 or voltage as AI1. Typically in this setup a single start/stop signal is given to DIN1 for the Auto Control location with an external PID Controller as the Ref with one of the analog inputs. Hand mode would be assigned to the keypad for direct speed control. Stepping through the Standard Quick Start wizard will get the application setup and running. DIN3 interlock is a safety input required to start in either Hand or Auto, it can be jumpered if not desired.



Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	0 = Standard	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Disable	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	keypad Ref	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	4 = AI1	AI1	Keypad Ref	PID1 Activated		1303

PID Setup

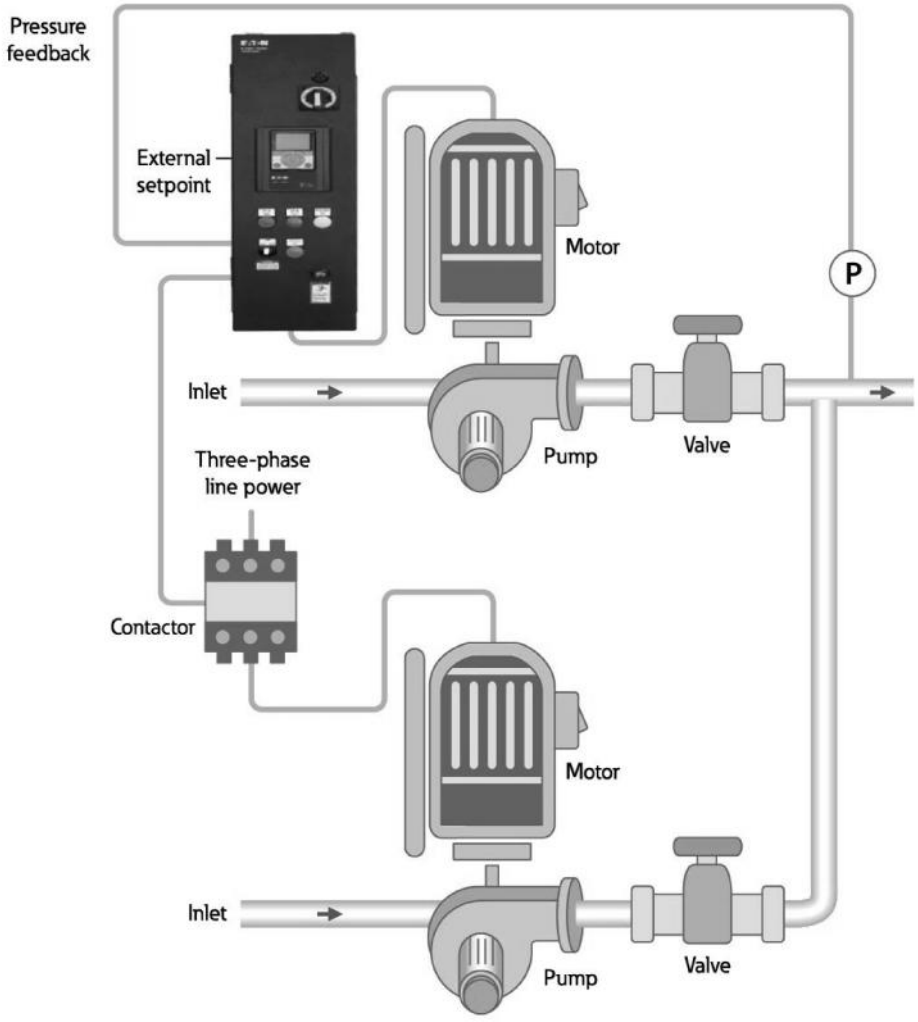
Using the PID setup on the HMAX it would be advisable to select the PID application. Typically in this setup a single start/stop signal is given to DIN1 for the Auto Control location with PID Controller as the Ref and the set point is set via the keypad. Hand mode would be assigned to the keypad for direct speed control. Stepping through the PID Start wizard will get the application setup and running for the most part, below are possible parameters settings that would be made. DIN3 interlock is a safety input required to start in either Hand or Auto, it can be jumpered if not desired.



Parameters							
Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	1 = PID	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Enabled	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	PC	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	7 = PID1 Activated	PC	Keypad Ref	PID1 Activated		1303
PID Controller							
PID Controller 1							
Basic Settings							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.1.1	P-Gain	100	100	0	200	%	118
P 2.9.1.1.2	Integration Time	1	1	0	600	s	119
P 2.9.1.1.3	Derivation Time	0	0	0	100	s	132
P 2.9.1.1.4	ProcessUnitSel.	1 = %		%	°F		1036
P 2.9.1.1.5	ProcessUnitMin	0	0	-99999.99	99999.99	%	1033
P 2.9.1.1.6	ProcessUnitMax	100	0	-99999.99	99999.99	%	1034
P 2.9.1.1.7	ProcessUnitDeci.	2	2	0	4		1035
P 2.9.1.1.8	Error Inversion	0 = Normal	Normal	Normal	Inverted		340
Setpoints							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.2.1	Keypad SetPt1	50	0	0	100	%	167
Feedbacks							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.3.1	Function	1 = Source1	0	Source1	MEAN		333
P 2.9.1.3.2	Gain	100	0	-1000	1000	%	1058
P 2.9.1.3.3	FeedBack1 Srce	2 = AI2	Not Used	Not Used	ProceDataIn8		334

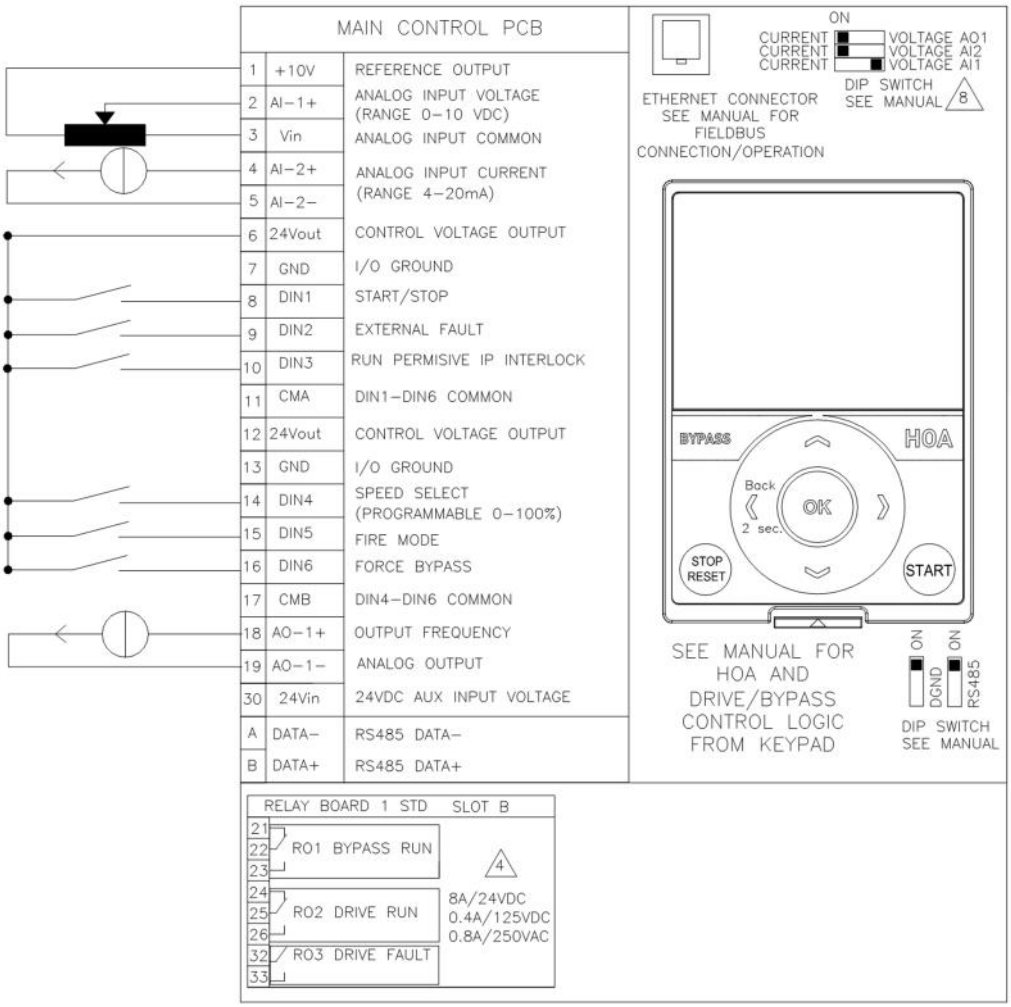
V. Booster Pump

In a Booster pump application the drive is running a pump that is setup in parallel to the supply line to boost the pressure ion the outgoing line., it is typically based off the desired pressure setpoint in the system and a transducer sends back the actual measured value and adjust the drive to maintain the desired level, this can be done by the drive or with an external controller. This would be considered a PI(D) loop system for setup in many cases but it could be controlled via a direct frequency reference, where the transducer or reference is just sent to the drive as a value to run at, we will show both.



Direct Frequency Setup

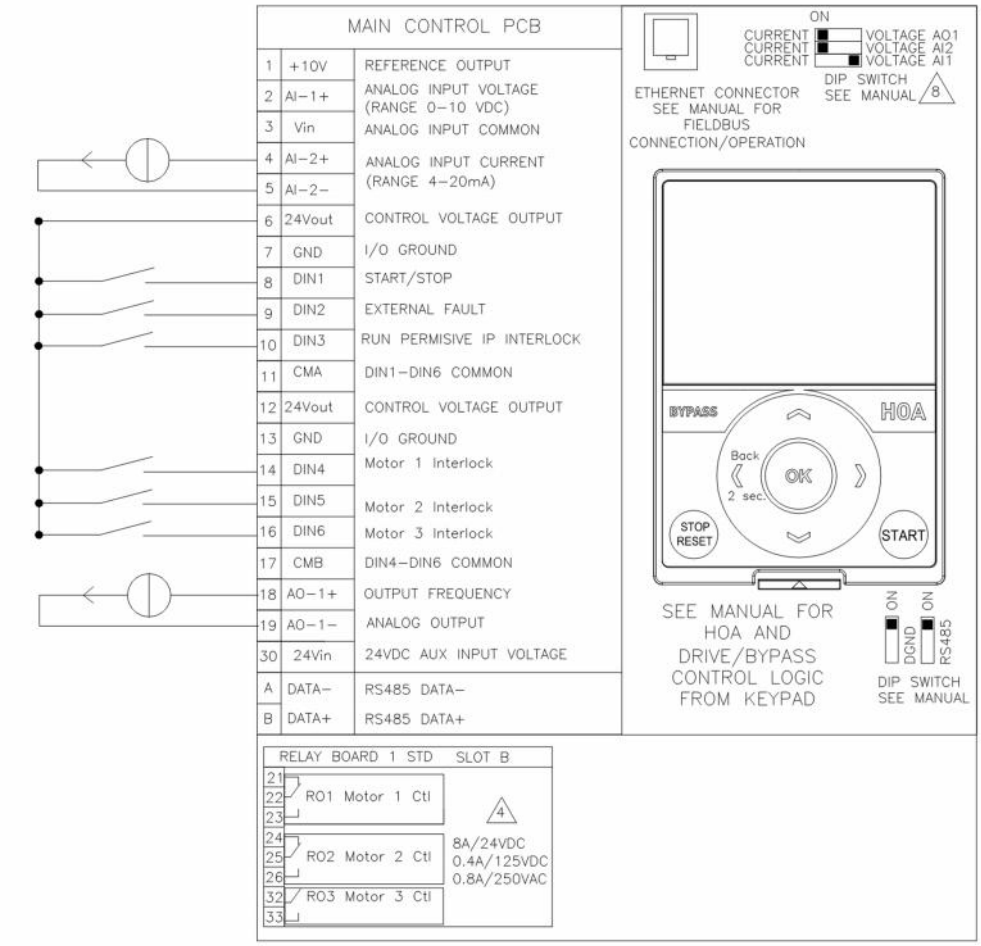
Using the Direct frequency setup on the HMAX it would be advisable to use the Standard Application where the frequency reference comes in as one of the analog current input as AI2 or voltage as AI1. Typically in this setup a single start/stop signal is given to DIN1 for the Auto Control location with an external PID Controller as the Ref with one of the analog inputs. Hand mode would be assigned to the keypad for direct speed control. Stepping through the Standard Quick Start wizard will get the application setup and running. DIN3 interlock is a safety input required to start in either Hand or Auto, it can be jumpered if not desired.



Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	0 = Standard	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Disable	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	keypad Ref	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	4 = AI1	AI1	Keypad Ref	PID1 Activated		1303

PID Setup

Using the PID setup on the HMAX it would be advisable to select the Multi-Pump and Fan application. Typically in this setup a single start/stop signal is given to DIN1 for the Remote Control location with PID Controller as the Ref and the set point is set via the keypad. Hand mode would be assigned to the keypad for direct speed control. Stepping through the Multi-Pump Quick Start wizard will get the application setup and running for the most part, below are possible parameters settings that would be made. DIN3 interlock is a safety input required to start in either Hand or Auto, it can be jumpered if not desired. DIN4 through 6 along with the relay outputs are used to control the external motors.

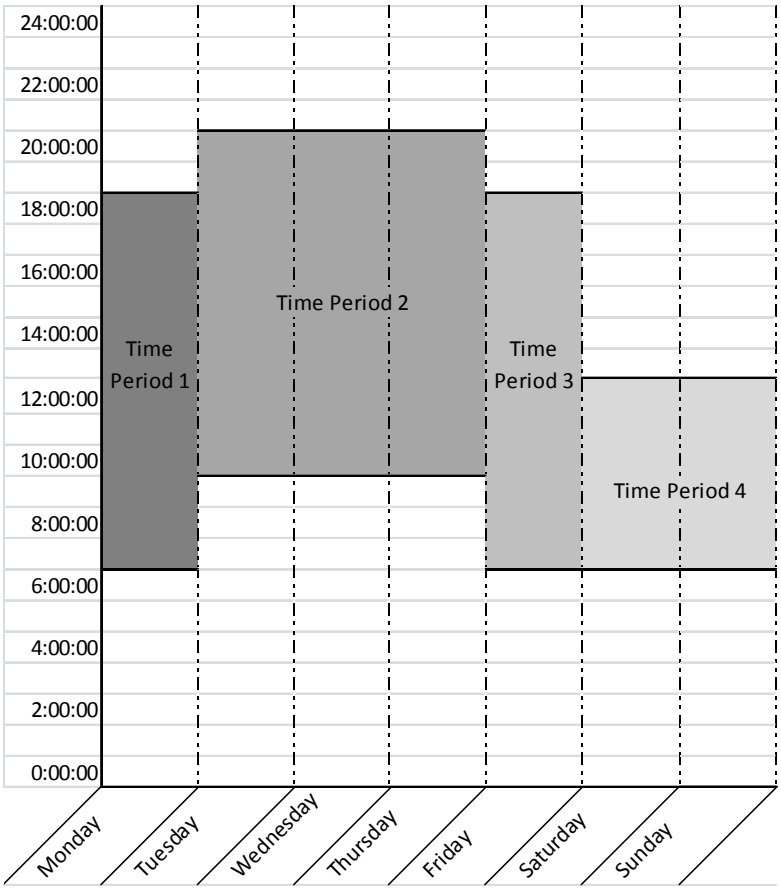


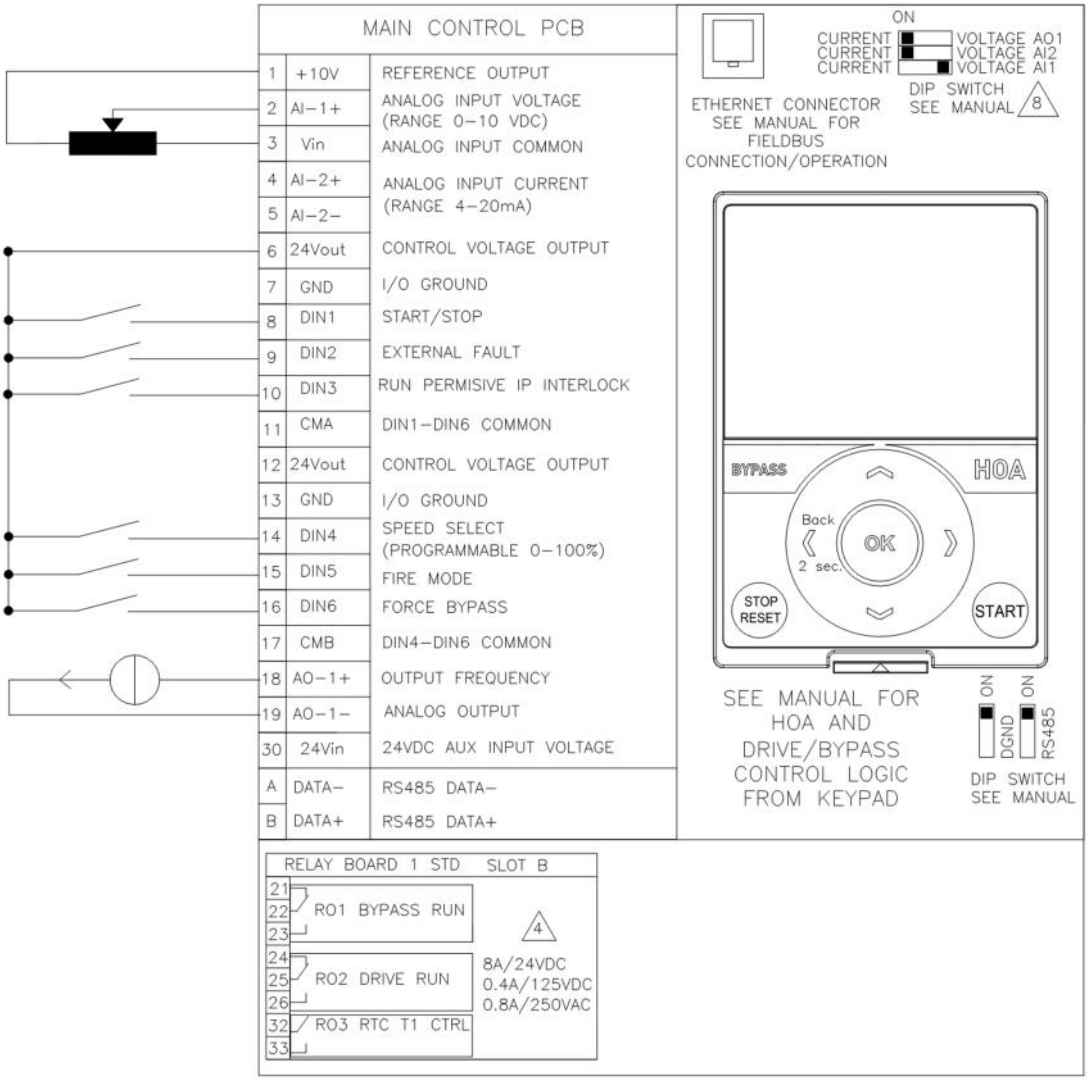
Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	2 = Multi-Pump	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Enabled	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	PC	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	7 = PID1 Activated	PC	Keypad Ref	PID1 Activated		1303
Digital Inputs							
Digital Input 4							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.3.4.1	DI4 Open Invert	0 = Normally Open	Normally Open	Normally Open	Normally Closed		1421
P 2.3.4.2	DI4 Function	26 = Motor 1 Interlock	Not Used	Not Used	Fire Mode Reverse		1322
Digital Input 5							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.3.5.1	DI5 Open Invert	0 = Normally Open	Normally Open	Normally Open	Normally Closed		1422
P 2.3.5.2	DI5 Function	27 = Motor 2 Interlock	Not Used	Not Used	Fire Mode Reverse		1323
Digital Input 6							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.3.6.1	DI6 Open Invert	0 = Normally Open	Normally Open	Normally Open	Normally Closed		1423
P 2.3.6.2	DI6 Function	28 = Motor 3 Interlock	Not Used	Not Used	Fire Mode Reverse		1324
Digital Outputs							
Digital Output 1							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.5.1.1	RO1 Function	31 = Motor 1 Control	None	None	Fault Reset		11001
P 2.5.1.2	RO1 Invert	0 = No	No	No	Yes		11020
P 2.5.1.3	R01 ON Delay	0	0	0	320	s	11002
P 2.5.1.4	R01 OFF Delay	0	0	0	320	s	11003
Digital Output 2							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.5.2.1	RO2 Function	32 = Motor 2 Control	None	None	Fault Reset		11004
P 2.5.2.2	RO2 Invert	0 = No	No	No	Yes		11021
P 2.5.2.3	R02 ON Delay	0	0	0	320	s	11005
P 2.5.2.4	R02 OFF Delay	0	0	0	320	s	11006
Digital Output 3							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.5.3.1	RO3 Function	33 = Motor 3 Control	None	None	Fault Reset		11007
PID Controller							
PID Controller 1							
Basic Settings							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.1.1	P-Gain	100	100	0	200	%	118
P 2.9.1.1.2	Integration Time	1	1	0	600	s	119
P 2.9.1.1.3	Derivation Time	0	0	0	100	s	132
P 2.9.1.1.4	ProcessUnitSel.	1 = %		%	°F		1036
P 2.9.1.1.5	ProcessUnitMin	0	0	-99999.99	99999.99	%	1033
P 2.9.1.1.6	ProcessUnitMax	100	0	-99999.99	99999.99	%	1034
P 2.9.1.1.7	ProcessUnitDeci.	2	2	0	4		1035
P 2.9.1.1.8	Error Inversion	0 = Normal	Normal	Normal	Inverted		340

Setpoints							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.2.1	Keypad SetPt1	50	0	0	100	%	167
P 2.9.1.2.3	Ramp Time	0	0	0	300	s	1068
P 2.9.1.2.4	SetPt1 Source	1 = Keypad SP 1	Not Used	Not Used	ProceDataIn8		332
P 2.9.1.2.5	SetPt1 Minimum	0	0	-199.9999	200	%	1069
P 2.9.1.2.6	SetPt1 Maximum	100	0	-199.9999	200	%	1070
Feedbacks							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.3.1	Function	1 = Source1	0	Source1	MEAN		333
P 2.9.1.3.2	Gain	100	0	-1000	1000	%	1058
P 2.9.1.3.3	FeedBack1 Srce	2 = AI2	Not Used	Not Used	ProceDataIn8		334
P 2.9.1.3.4	FeedBack1 Min	0	0	-199.9999	200	%	336
P 2.9.1.3.5	FeedBack1 Max	100	0	-199.9999	200	%	337
Multi-Pump							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.12.1	Number Of Motors	3	0	1	4		1001
P 2.12.2	Interlock Funct.	1 = Enabled	Not Used	Not Used	Enabled		1032
P 2.12.3	Include FC	1 = Enabled	Disabled	Disabled	Enabled		1028
P 2.12.4	Autochange	0 = Disabled	Disabled	Disabled	Enabled		1027
P 2.12.5	Autoch Interval	48	0	0	3000	h	1029
P 2.12.6	Autoch:FreqLim	25	0	12	50	Hz	1031
P 2.12.7	AutochMotorLimit	1	1	0	4		1030
P 2.12.8	Bandwidth	10	0	0	100	%	1097
P 2.12.9	Bandwidth Delay	10	0	0	3600	s	1098

VI. Internal Timer Function

For the Internal timer function application the drive has the ability to control based on a calendar schedule using the Real Time Clock. To perform this application it will require using Standard application on the HMAX drive. The interval function has 5 available intervals that can be controlled as a weekly setup or a daily setup. Each desired time interval can be assigned to a time channel 1 to 3 that can be used when the interval is active it enables the assigned Time channel. This can then be used in the digital inputs group to a parameter. These Time channels can also be assigned to a relay output to control external controls as well. The speed reference can be assigned to either a direct frequency reference or to a PID control loop. In the below example we will assign speed reference to AI1 for direct frequency control and the Start command is tied to DIN1 for the Remote control location. When in local the speed reference and start will be given through the keypad. Relay 3 is setup for RTC T1 Ctrl which will be fed into DIN3 interlock via an interposing relay. If PID is used than the typical setup is assigning AI2 as the feedback location and the setpoint is given through the keypad.

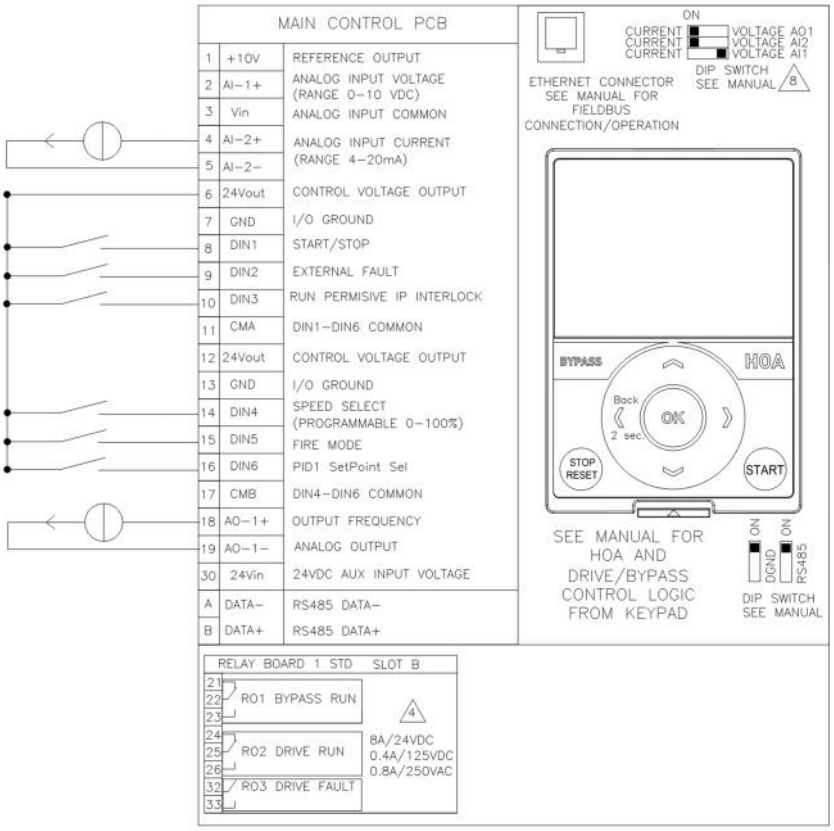



MAIN CONTROL PCB
1 +10V REFERENCE OUTPUT
2 AI−1+ ANALOG INPUT VOLTAGE (RANGE 0−10 VDC)
3 Vin ANALOG INPUT COMMON
4 AI−2+ ANALOG INPUT CURRENT (RANGE 4−20mA)
5 AI−2−
6 24Vout CONTROL VOLTAGE OUTPUT
7 GND I/O GROUND
8 DIN1 START/STOP
9 DIN2 EXTERNAL FAULT
10 DIN3 RUN PERMISIVE IP INTERLOCK
11 CMA DIN1−DIN6 COMMON
12 24Vout CONTROL VOLTAGE OUTPUT
13 GND I/O GROUND
14 DIN4 SPEED SELECT (PROGRAMMABLE 0−100%)
15 DIN5 FIRE MODE
16 DIN6 FORCE BYPASS
17 CMB DIN4−DIN6 COMMON
18 AO−1+ OUTPUT FREQUENCY
19 AO−1− ANALOG OUTPUT
30 24Vin 24VDC AUX INPUT VOLTAGE
A DATA− RS485 DATA−
B DATA+ RS485 DATA+
ON
CURRENT VOLTAGE AO1
CURRENT VOLTAGE AI2
CURRENT VOLTAGE AI1
DIP SWITCH SEE MANUAL 8
ETHERNET CONNECTOR SEE MANUAL FOR FIELDBUS CONNECTION/OPERATION
BYPASS
HOA
Back
OK
2 sec.
STOP RESET
START
SEE MANUAL FOR HOA AND DRIVE/BYPASS CONTROL LOGIC FROM KEYPAD
ON
DGND
ON
RS485
DIP SWITCH SEE MANUAL
RELAY BOARD 1 STD SLOT B
21 22 23 RO1 BYPASS RUN
24 25 26 RO2 DRIVE RUN
32 33 RO3 RTC T1 CTRL
4
8A/24VDC
0.4A/125VDC
0.8A/250VAC

Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	0 = Standard	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Enabled	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	PC	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	4 = AI1	PC	Keypad Ref	PID1 Activated		1303
Digital Outputs							
Digital Output 3							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.5.3.1	RO3 Function	15 = RTC T1 CTRL	None	None	Fault Reset		####
Timer Functions							
Interval 1							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.16.1.1	ON Time	7:00:00	0	0:00:00	23:59:59		1670
P 2.16.1.2	OFF Time	19:00:00	0	0:00:00	23:59:59		1671
P 2.16.1.3	From Day	1 = Monday	Sunday	Sunday	Saturday		1672
P 2.16.1.4	To Day	1 = Monday	Sunday	Sunday	Saturday		1673
P 2.16.1.5	AssignToChannel	1 = Time Channel 1	Not Used	Not Used	TimeChannel3		1674
Interval 2							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.16.2.1	ON Time	10:00:00	0	0:00:00	23:59:59		1675
P 2.16.2.2	OFF Time	21:00:00	0	0:00:00	23:59:59		1676
P 2.16.2.3	From Day	2 = Tuesday	Sunday	Sunday	Saturday		1677
P 2.16.2.4	To Day	2 = Tuseday	Sunday	Sunday	Saturday		1678
P 2.16.2.5	AssignToChannel	1 = Time Channel 1	Not Used	Not Used	TimeChannel3		1679
Interval 3							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.16.3.1	ON Time	10:00:00	0	0:00:00	23:59:59		1680
P 2.16.3.2	OFF Time	21:00:00	0	0:00:00	23:59:59		1681
P 2.16.3.3	From Day	3 = Wednesday	Sunday	Sunday	Saturday		1682
P 2.16.3.4	To Day	3 = Wednesday	Sunday	Sunday	Saturday		1683
P 2.16.3.5	AssignToChannel	1 = Time Channel 1	Not Used	Not Used	TimeChannel3		1684
Interval 4							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.16.4.1	ON Time	10:00:00	0	0:00:00	23:59:59		1685
P 2.16.4.2	OFF Time	21:00:00	0	0:00:00	23:59:59		1686
P 2.16.4.3	From Day	4 = Thursday	Sunday	Sunday	Saturday		1687
P 2.16.4.4	To Day	4 = Thursday	Sunday	Sunday	Saturday		1688
P 2.16.4.5	AssignToChannel	1 = Time Channel 1	Not Used	Not Used	TimeChannel3		1689
Interval 5							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.16.5.1	ON Time	7:00:00	0	0:00:00	23:59:59		1690
P 2.16.5.2	OFF Time	19:00:00	0	0:00:00	23:59:59		1691
P 2.16.5.3	From Day	5 = Friday	Sunday	Sunday	Saturday		1692
P 2.16.5.4	To Day	5 = Friday	Sunday	Sunday	Saturday		1693
P 2.16.5.5	AssignToChannel	1 = Time Channel 1	Not Used	Not Used	TimeChannel3		1694

VII. Dual Setpoint with PID

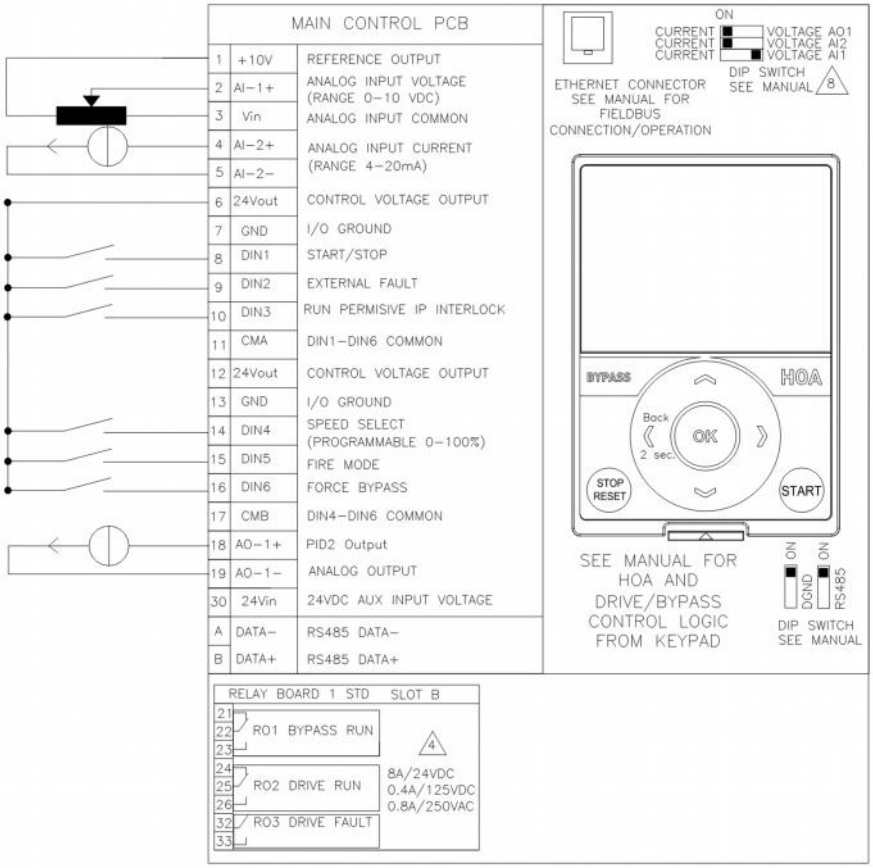
For a Dual setpoint with PID application, the standard PID control setup is used, with 2 setpoint that are selected via a digital input, when the input is open the drive will follow setpoint1 and when the input closes it will follow Setpoint 2. The process unit setpoints are set via parameters in the PID Controller loop. When in direct frequency control mode this function does not take affect it is only when setup for a PID Controller reference that this function is used. Using the HMAX the PID application will be used. In Remote, the speed reference will be PID Controller 1 with I/O terminals as the start location. In local keypad will be used for control with keypad as the direct frequency reference. The process feedback for the PID loop will be wired to AI2 for a current feedback and the setpoints will typically come from the keypad setpoints.



Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	1 = PID	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Enabled	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	PC	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	7 = PID1 Activated	PC	Keypad Ref	PID1 Activated		1303
Digital Input 6							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.3.6.1	DI6 Open Invert	0 = Normally Open	Normally Open	Normally Open	Normally Closed		1423
P 2.3.6.2	DI6 Function	27 = PID1 Setpoint Sel	Not Used	Not Used	Fire Mode Reverse		1324
PID Controller							
PID Controller 1							
Basic Settings							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.1.1	P-Gain	100	100	0	200	%	118
P 2.9.1.1.2	Integration Time	1	1	0	600	s	119
P 2.9.1.1.3	Derivation Time	0	0	0	100	s	132
P 2.9.1.1.4	ProcessUnitSel.	1 = %		%	°F		1036
P 2.9.1.1.5	ProcessUnitMin	0	0	-99999.99	99999.99	%	1033
P 2.9.1.1.6	ProcessUnitMax	100	0	-99999.99	99999.99	%	1034
P 2.9.1.1.7	ProcessUnitDeci.	2	2	0	4		1035
P 2.9.1.1.8	Error Inversion	0 = Normal	Normal	Normal	Inverted		340
Setpoints							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.2.1	Keypad SetPt1	50	0	0	100	%	167
P 2.9.1.2.2	Keypad SetPt2	75	0	0	100	%	168
P 2.9.1.2.3	Ramp Time	0	0	0	300	s	1068
P 2.9.1.2.4	SetPt1 Source	1 = Keypad SP 1	Not Used	Not Used	ProceDataIn8		332
P 2.9.1.2.5	SetPt1 Minimum	0	0	-199.9999	200	%	1069
P 2.9.1.2.6	SetPt1 Maximum	100	0	-199.9999	200	%	1070
P 2.9.1.2.11	SetPt2 Source	2 = Keypad SP 2	Not Used	Not Used	ProceDataIn8		431
P 2.9.1.2.12	SetPt2 Minimum	0	0	-199.9999	200	%	1073
P 2.9.1.2.13	SetPt2 Maximum	100	0	-199.9999	200	%	1074
Feedbacks							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.3.1	Function	1 = Source1	0	Source1	MEAN		333
P 2.9.1.3.2	Gain	100	0	-1000	1000	%	1058
P 2.9.1.3.3	FeedBack1 Srce	2 = AI2	Not Used	Not Used	ProceDataIn8		334
P 2.9.1.3.4	FeedBack1 Min	0	0	-199.9999	200	%	336
P 2.9.1.3.5	FeedBack1 Max	100	0	-199.9999	200	%	337

VIII. Dual PID

For a Dual PID application, it is desired to have the drive handle the PID control of the motor application but also have another feedback coming into the drive and being sent out of the analog output to control some other process, sometimes a damper. Setup is performed similar to any application that uses a single PID control when referencing the control of the motor, the difference comes in when adding a 2nd PID loop which uses either the same setpoint and feedback or different ones and provides a completely separate control that is then feed out of an analog output to another device. Using the HMAX would use the PID application where it provides 2 PID loops. The primary PID loop being whichever one desired but in this setup we will use PID1 for the motor control and PID2 for the external control. In the Remote control place PID1 Controller will be the Reference with a start signal coming from DIN1. In Local the Keypad will be the reference. AI1 will be the feedback for PID2 either voltage or current and AI2 will be the feedback for the main PID1 control. AO1 will be assigned to PID Output 2.

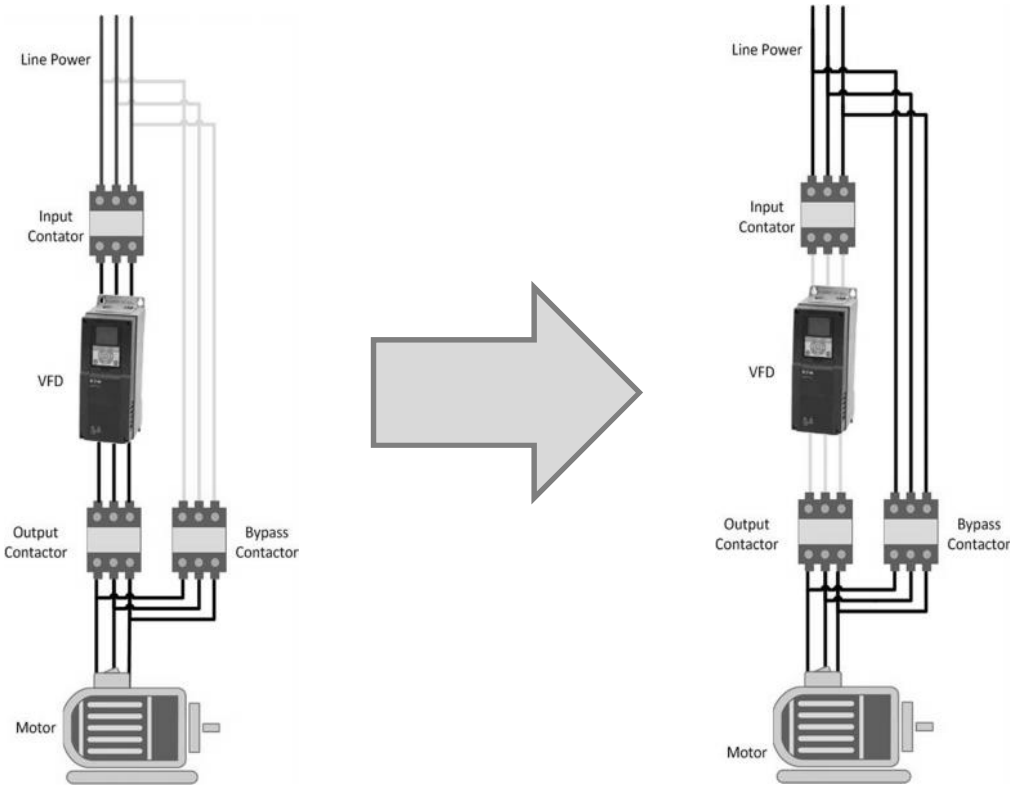


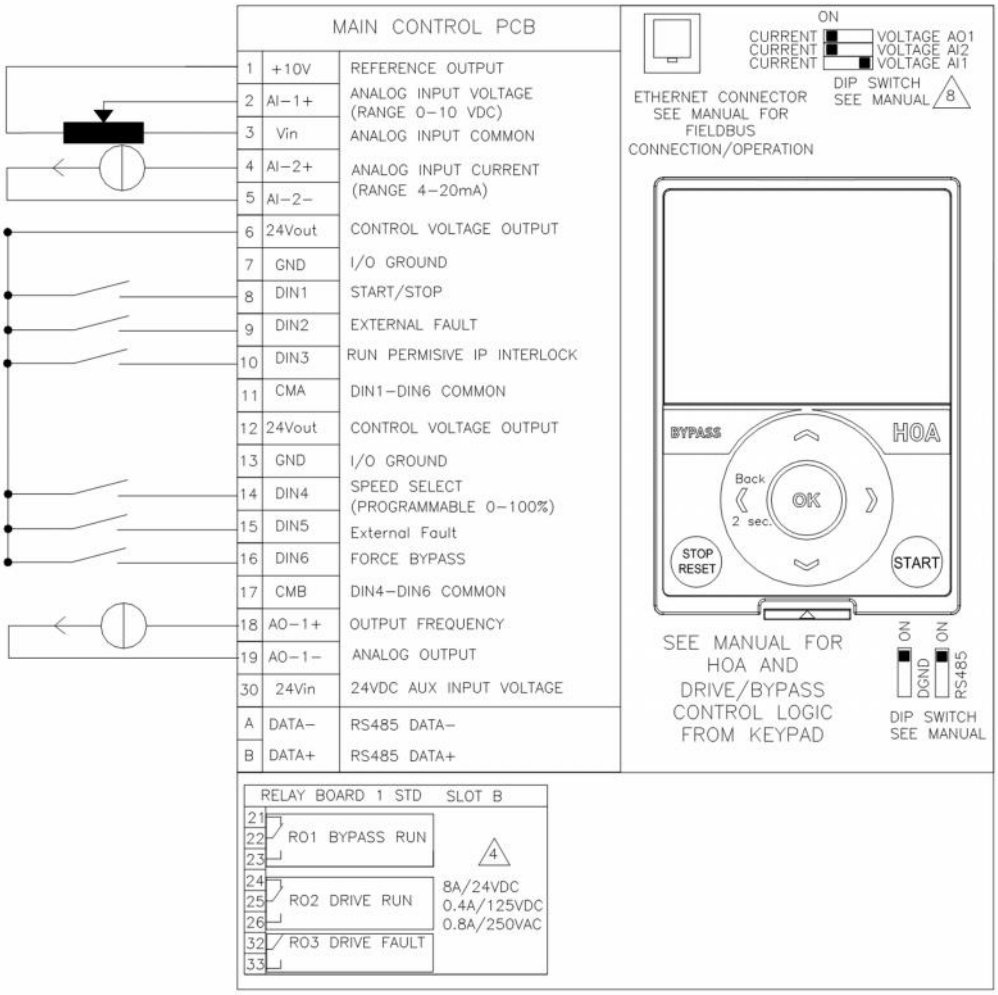
Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	1 = PID	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Enabled	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	PC	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	7 = PID1 Activated	PC	Keypad Ref	PID1 Activated		1303
Analog Outputs							
Analog Output 1							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.4.1.1	AO1 Function	11 = PID2 Output	Forced 0%	Forced 0%	PID1 Error		10050
P 2.4.1.2	AO1 Filter Time	1	0	0	300	s	10051
P 2.4.1.3	AO1 Min Signal	0 = 0 mA / 0V	0 mA / 0V	0 mA / 0V	4mA / 2V		10052
P 2.4.1.4	AO1 MinScale	0	0	-214748.3593	214748.3593	Hz	10053
P 2.4.1.5	AO1 MaxScale	0	0	-214748.3593	214748.3593	Hz	10054
P 2.4.1.6	AO1 Invert	0 = No Inversion	No Inversion	No Inversion	Inverted		10060
PID Controller							
PID Controller 1							
Basic Settings							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.1.1	P-Gain	100	100	0	200	%	118
P 2.9.1.1.2	Integration Time	1	1	0	600	s	119
P 2.9.1.1.3	Derivation Time	0	0	0	100	s	132
P 2.9.1.1.4	ProcessUnitSel.	1 = %		%	°F		1036
P 2.9.1.1.5	ProcessUnitMin	0	0	-99999.99	99999.99	%	1033
P 2.9.1.1.6	ProcessUnitMax	100	0	-99999.99	99999.99	%	1034
P 2.9.1.1.7	ProcessUnitDeci.	2	2	0	4		1035
P 2.9.1.1.8	Error Inversion	0 = Normal	Normal	Normal	Inverted		340
Setpoints							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.2.1	Keypad SetPt1	50	0	0	100	%	167
P 2.9.1.2.4	SetPt1 Source	1 = Keypad SP 1	Not Used	Not Used	ProceDataIn8		332
P 2.9.1.2.5	SetPt1 Minimum	0	0	-199.9999	200	%	1069
P 2.9.1.2.6	SetPt1 Maximum	100	0	-199.9999	200	%	1070
Feedbacks							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.1.3.1	Function	1 = Source1	0	Source1	MEAN		333
P 2.9.1.3.2	Gain	100	0	-1000	1000	%	1058
P 2.9.1.3.3	FeedBack1 Srce	2 = AI2	Not Used	Not Used	ProceDataIn8		334
P 2.9.1.3.4	FeedBack1 Min	0	0	-199.9999	200	%	336
P 2.9.1.3.5	FeedBack1 Max	100	0	-199.9999	200	%	337

PID Controller 2							
Basic Settings							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.2.1.1	Enable PID	0 = Disabled	Disabled	Disabled	Enabled		1630
P 2.9.2.1.2	P-Gain	100	0	0	200	%	1631
P 2.9.2.1.3	Integration Time	1	0	0	600	s	1632
P 2.9.2.1.4	Derivation Time	0	0	0	100	s	1633
P 2.9.2.1.5	ProcessUnitSel.	1 = %		%	°F		1635
P 2.9.2.1.6	ProcessUnitMin	0	0	-99999.99	99999.99	%	1664
P 2.9.2.1.7	ProcessUnitMax	100	0	-99999.99	99999.99	%	1665
P 2.9.2.1.8	ProcessUnitDeci.	2	2	0	4		1666
P 2.9.2.1.9	Error Inversion	0 = Normal	Normal	Normal	Inverted		1636
Setpoints							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.2.2.1	Keypad SetPt1	75	0	0	100	%	1640
P 2.9.2.2.4	SetPt1 Source	1 = Keypad SP 1	Not Used	Not Used	ProceDataIn8		1643
P 2.9.2.2.5	SetPt1 Minimum	0	0	-199.9999	200	%	1644
P 2.9.2.2.6	SetPt1 Maximum	100	0	-199.9999	200	%	1645
Feedbacks							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.9.2.3.1	Function	1 = Source1	0	Source1	MEAN		1650
P 2.9.2.3.2	Gain	100	0	-1000	1000	%	1651
P 2.9.2.3.3	FeedBack1 Srce	1 = AI1	Not Used	Not Used	ProceDataIn8		1652
P 2.9.2.3.4	FeedBack1 Min	0	0	-199.9999	200	%	1653
P 2.9.2.3.5	FeedBack1 Max	100	0	-199.9999	200	%	1654

IX. Bypass Control

In a bypass control application the drive control can be defined to operate a relay to enable bypassing of the drive and running the motor across the line. This can be performed based on a input change which is the typical setup or via the drive faulting. This mode will function no matter what mode of operation the drive is in, that being said it could be in a PID control or in a standard direct frequency control. The Start signal to enable the bypass run will follow the set drive control place. Using the HMAX drive the bypass setup can be done via the Standard application. The standard setup will be done for setup via direct frequency control or PID, with Remote being set for direct frequency control via AI1 and the start from DIN1. In Local the keypad will be the control and reference location. DIN6 will be assigned for Force bypass via a digital input and we will also enable fault control as well. DIN5 will be used for the bypass overload input in the case the external overload block trips the drive will stop. RO1 will be used in the drive to indicate it is in bypass and then the RO2 relay will indicate it is running the motor.

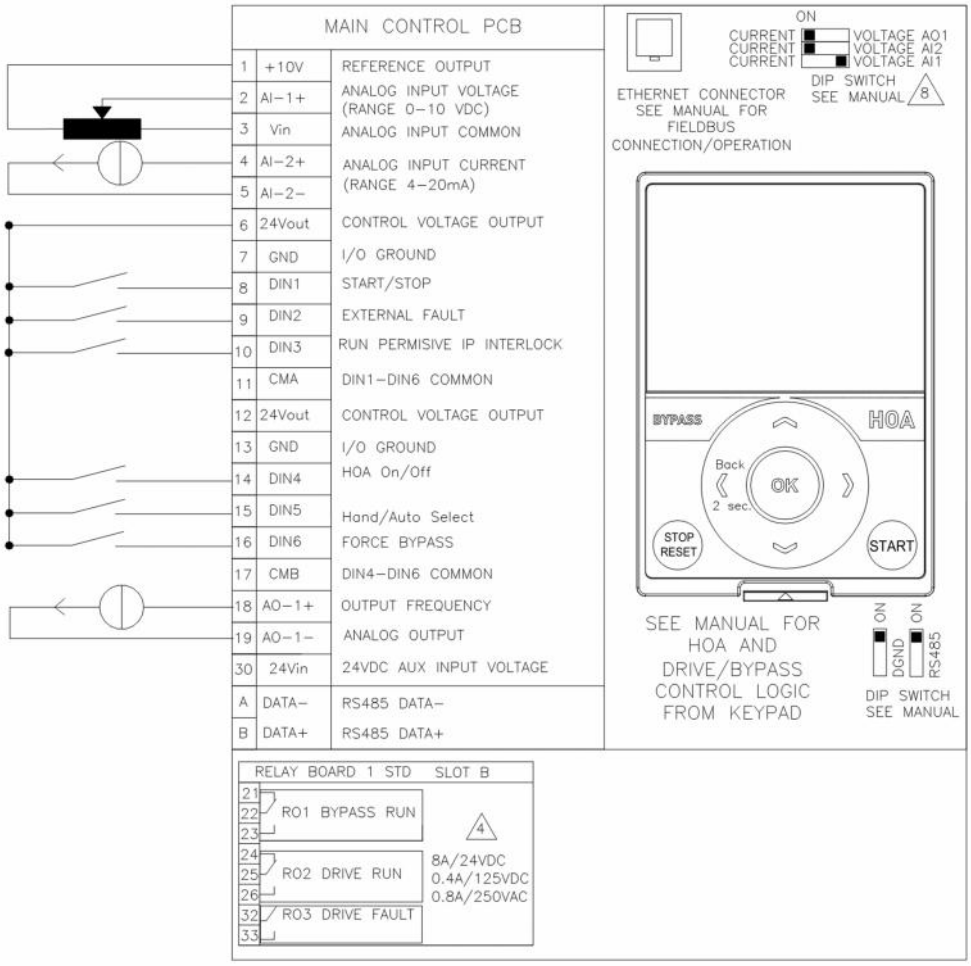



MAIN CONTROL PCB
1 +10V REFERENCE OUTPUT
2 AI−1+ ANALOG INPUT VOLTAGE (RANGE 0−10 VDC)
3 Vin ANALOG INPUT COMMON
4 AI−2+ ANALOG INPUT CURRENT (RANGE 4−20mA)
5 AI−2−
6 24Vout CONTROL VOLTAGE OUTPUT
7 GND I/O GROUND
8 DIN1 START/STOP
9 DIN2 EXTERNAL FAULT
10 DIN3 RUN PERMISIVE IP INTERLOCK
11 CMA DIN1−DIN6 COMMON
12 24Vout CONTROL VOLTAGE OUTPUT
13 GND I/O GROUND
14 DIN4 SPEED SELECT (PROGRAMMABLE 0−100%)
15 DIN5 External Fault
16 DIN6 FORCE BYPASS
17 CMB DIN4−DIN6 COMMON
18 AO−1+ OUTPUT FREQUENCY
19 AO−1− ANALOG OUTPUT
30 24Vin 24VDC AUX INPUT VOLTAGE
A DATA− RS485 DATA−
B DATA+ RS485 DATA+
ON
CURRENT VOLTAGE AQ1
CURRENT VOLTAGE AI2
CURRENT VOLTAGE AI1
DIP SWITCH SEE MANUAL 8
ETHERNET CONNECTOR SEE MANUAL FOR FIELDBUS CONNECTION/OPERATION
BYPASS
HOA
Back
OK
2 sec.
STOP RESET
START
SEE MANUAL FOR HOA AND DRIVE/BYPASS CONTROL LOGIC FROM KEYPAD
ON DGND ON RS485
DIP SWITCH SEE MANUAL
RELAY BOARD 1 STD SLOT B
21 22 23 RO1 BYPASS RUN
24 25 26 RO2 DRIVE RUN
32 33 RO3 DRIVE FAULT
4
8A/24VDC
0.4A/125VDC
0.8A/250VAC

Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	0 = Standard	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Disable	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	keypad Ref	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	4 = AI1	AI1	Keypad Ref	PID1 Activated		1303
Digital Inputs							
Digital Input 5							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.3.5.1	DI5 Open Invert	0 = Normally Open	Normally Ope	Normally Open	Normally Closed		1422
P 2.3.5.2	DI5 Function	3 = External Fault	Not Used	Not Used	Fire Mode Reverse		1323

X. Hand Control

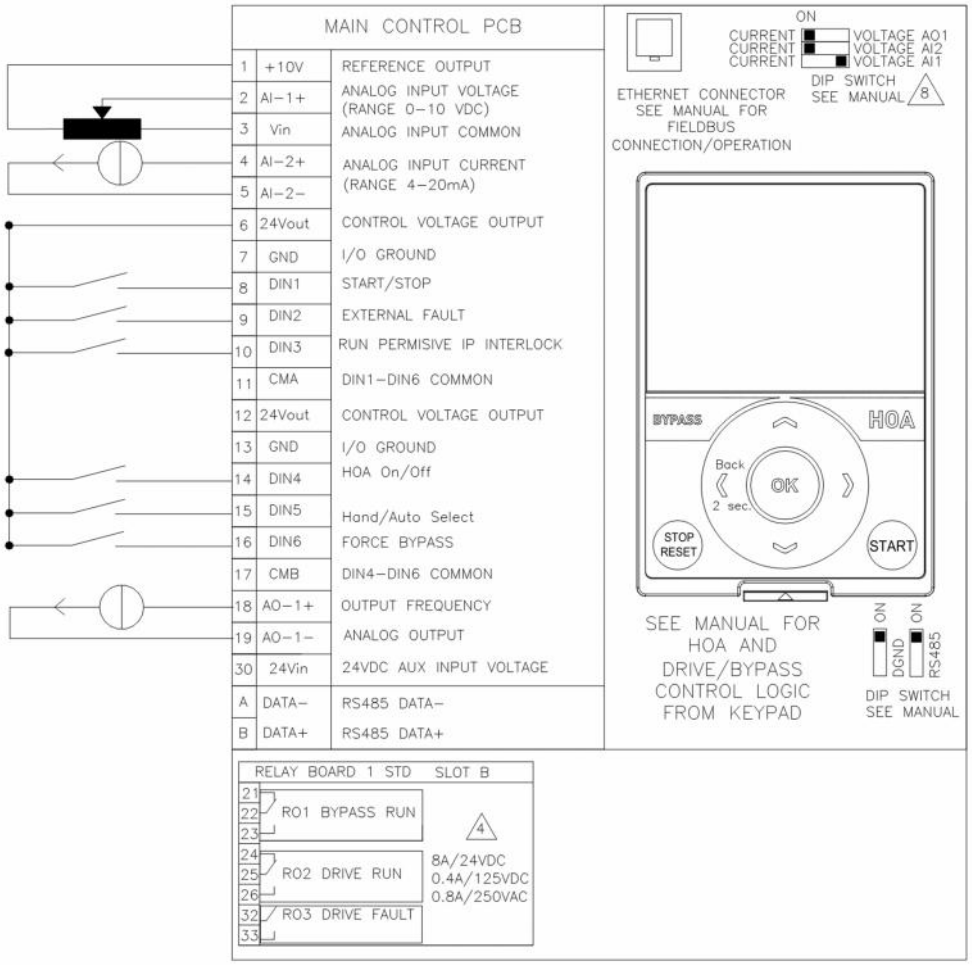
In a Hand control applications typically refer to applications that are controlled locally to the unit. This condition is typically seen as the keypad of the drive but can sometimes be referenced to panel mounted speed pot and push buttons mounted on the door of a cabinet. With the HMAX this setup can be used in any application but Local could have the setting of being something that is remote as well. In the example we will use the Standard Application with the Local Control place as the Keypad. Using the HOA button on the keypad will switch between the local and remote control place. With the Digital inputs using the Hand/Auto Select command when it is not active it will be in Hand and follow the place it was in on the keypad. If desired the HOA button on the keypad can be disabled to prevent incorrect control location.



Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	0 = Standard	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Disable	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	keypad Ref	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	4 = AI1	AI1	Keypad Ref	PID1 Activated		1303
Digital Inputs							
Digital Input 4							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.3.4.1	DI4 Open Invert	0 = Normally Open	Normally Open	Normally Open	Normally Closed		1421
P 2.3.4.2	DI4 Function	6 = HOA On/Off	Not Used	Not Used	Fire Mode Reverse		1322
Digital Input 5							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.3.5.1	DI5 Open Invert	0 = Normally Open	Normally Open	Normally Open	Normally Closed		1422
P 2.3.5.2	DI5 Function	7 = Hand/Auto Sel	Not Used	Not Used	Fire Mode Reverse		1323

XI. Hand/Off/Auto

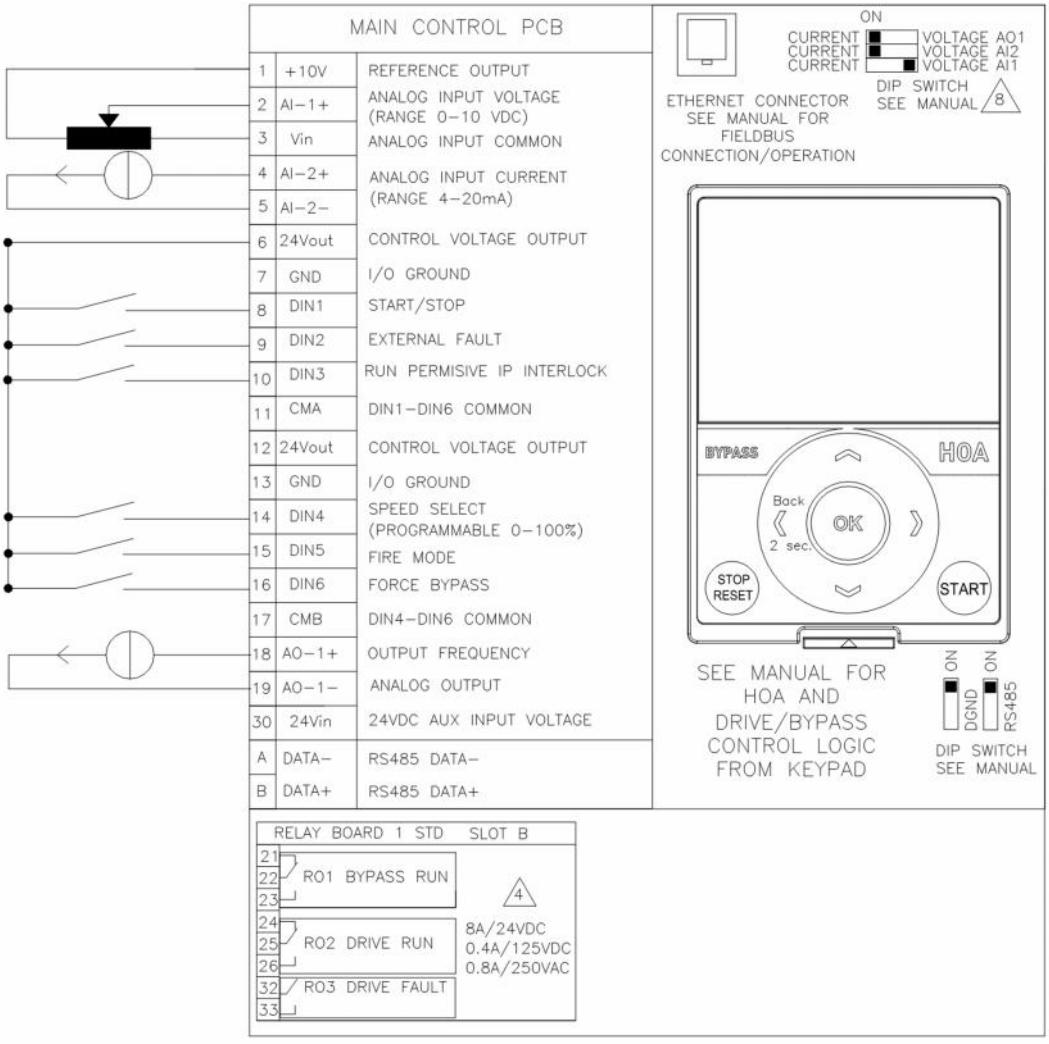
In a Hand/Off/Auto control applications are typically designed that the Hand control place is typically the keypad or a door mounted speed pot with start/stop push buttons. Then in Auto the reference is coming from a SCADA system/PLC which could be hardwired I/O or via a communication bus. With the HMAX this setup can be used in any application but Hand could have the setting of being something that is Auto as well and same goes for Hand. In the example we will use the Standard Application with the Hand Control place as the Keypad. Using the HOA button on the keypad will switch between the Hand, Off and Auto control place. With the Digital inputs using the HOA On/Off will be used to select between Hand/Auto or Off and then the Hand/Auto Sel will select the Hand or Auto location. If desired the HOA button on the keypad can be disabled to prevent incorrect control location. This case would be the same if controlled over a communication bus.



Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	0 = Standard	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Disable	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	keypad Ref	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	4 = AI1	AI1	Keypad Ref	PID1 Activated		1303
Digital Inputs							
Digital Input 4							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.3.4.1	DI4 Open Invert	0 = Normally Open	Normally Open	Normally Open	Normally Closed		1421
P 2.3.4.2	DI4 Function	6 = HOA On/Off	Not Used	Not Used	Fire Mode Reverse		1322
Digital Input 5							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.3.5.1	DI5 Open Invert	0 = Normally Open	Normally Open	Normally Open	Normally Closed		1422
P 2.3.5.2	DI5 Function	7 = Hand/Auto Sel	Not Used	Not Used	Fire Mode Reverse		1323

XII. Fire mode

In HVAC applications in some cases it is a desire for external control systems to enable the drive in the condition that a fire alarm is sounding, to go into a Fire Mode system that would override many of the major faults and allow the drive to run at either a fixed speed with multiple speed single or multiple speed levels or following a PID Control loop. This function can be enabled off an open or closed input for the desired system safeties. When 2 speed steps are required another digital input is used to enable the 2nd input. The Fire Mode function is meant to run the drive to the point where it dies in a fire condition or someone comes and shuts it off. Using the HMAX this would be accomplished using the Standard application with a Direct frequency control or another source the standard control scheme in Auto. Hand would follow the keypad. DIN7 would be assigned to the Fire Mode preset that when the input opens the drive would go into Fire Mode.



Parameters							
Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	0 = Standar	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Disable	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad	keypad Ref	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Ter	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	4 = AI1	AI1	Keypad Ref	PID1 Activated		1303
Fire Mode							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.11.1	FireMode Frequency	50	0	0	50	Hz	1598
P 2.11.2	FireMode Freq Source	0 = Fire Mc	Fire Mode frequency	Fire Mode frequency	PID1 Activated		1617

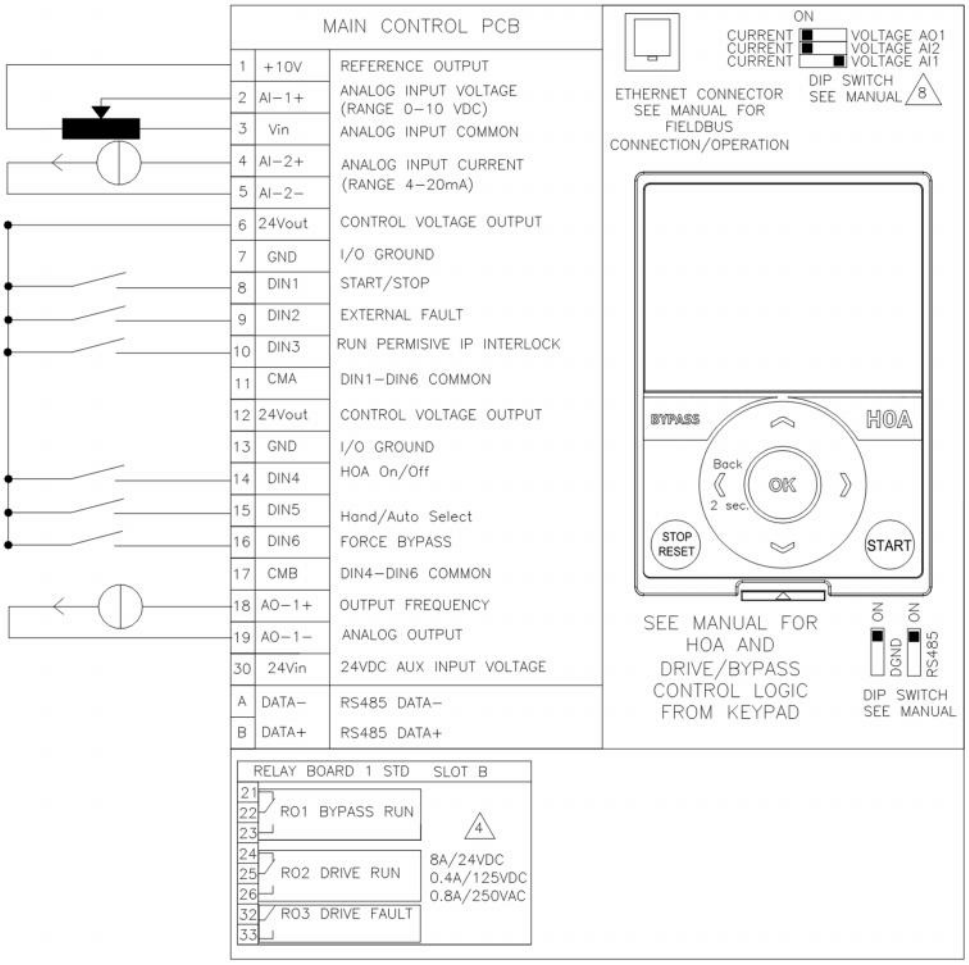
XIII. Preheat Mode

In applications that have a potential for requiring a drive that is mounted outside. For many cabinets users require heaters to operate when the drive is not running to prevent this the HMAX has a feature that will enable the output of the drive at a low frequency and voltage when the drive is stopped to keep it and the motor warm. When a run command is received the drive will begin to operate like normal. This feature can be enabled based off two conditions; based off drive temperature and off a digital input. With the drive temp selection there is an assigned off and on temperature level. When digital input is used an external source would be used to enable.

Braking							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.13.6	Preheat Function	2 = Temp Limit	Not Used	Not Used	Temp Limit		1601
P 2.13.7	Preheat Current	2	0	0	varies	A	1335
P 2.13.8	PreheatTempOff	5	5	-10	25	°C	1602
P 2.13.9	PreheatTempOn	0	0	-10	25	°C	1603

XIV. 2 – wire Control

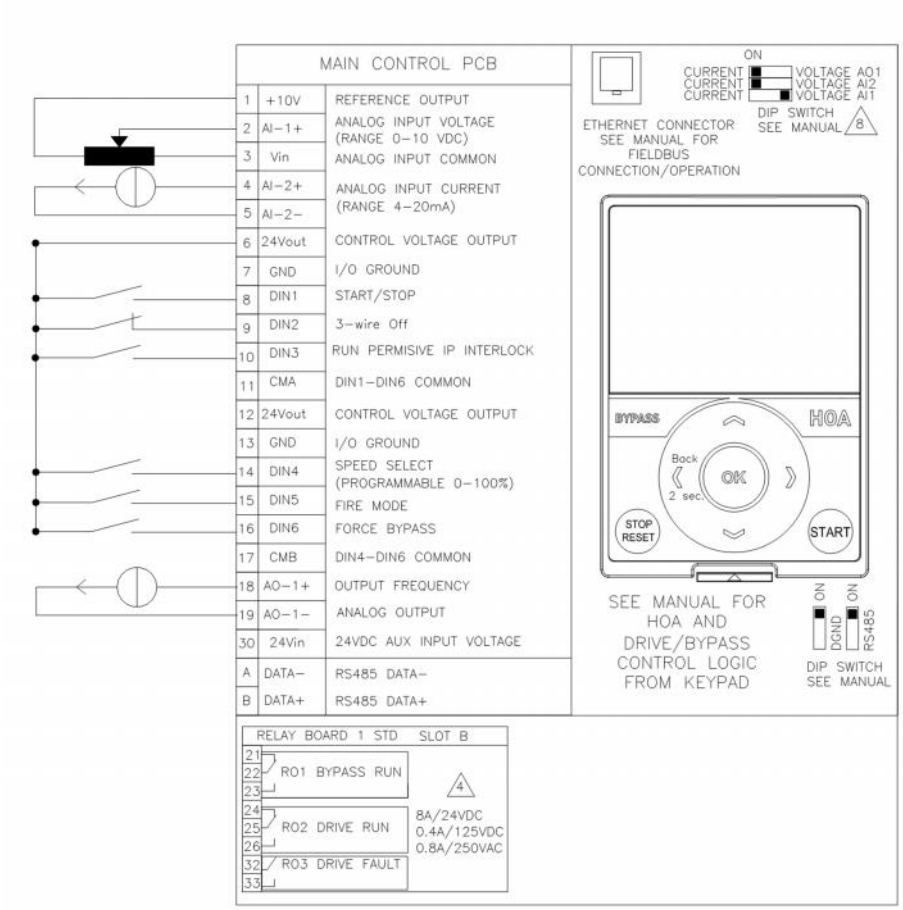
In applications that are reference a 2-wire control scheme they are referring to how the start command/control place is given to the drive, it will have one wire going back to a 24V output typically using the drive and then another wire is going back to the Digital input. The 2 wires would go across a dry contactor or push button. With the HMAX this is the standard default setup for control, DIN1 is the Start/Stop Forward command. The 2nd wire will be fed back to 24V output on the drive and the CMA/CMB will be connected to a GND input internally on control board. In the case where user wants to close to ground the 24V can be wired to the CMA/CMB and then Ground is passed through the input.



Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	0 = Standard	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Disable	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	keypad Ref	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	4 = AI1	AI1	Keypad Ref	PID1 Activated		1303
Digital Inputs							
Digital Input 4							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.3.4.1	DI4 Open Invert	0 = Normally Open	Normally Open	Normally Open	Normally Closed		1421
P 2.3.4.2	DI4 Function	6 = HOA On/Off	Not Used	Not Used	Fire Mode Reverse		1322
Digital Input 5							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.3.5.1	DI5 Open Invert	0 = Normally Open	Normally Open	Normally Open	Normally Closed		1422
P 2.3.5.2	DI5 Function	7 = Hand/Auto Sel	Not Used	Not Used	Fire Mode Reverse		1323

XV. 3 – wire Control

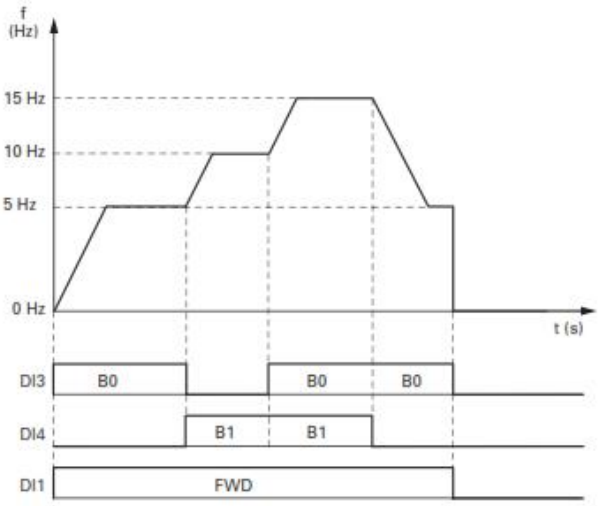
In application that reference a 3-wire control scheme they are referring to how the start and stop commands come into the drive. One wire is assigned to the 24V or common supply wire and then there is a wire/input used for splitting the start and stop commands. The 2 input wires for start and stop would go across dry contacts with a NO start contact and a NC stop contact. On the drive it would be setup for a pulsed input to switch with this control. With the HMAX this would be assigned via the DIN1 and DIN2 setup where DIN1 is the start and DIN2 is the stop, with the standard I/O terminal start 1 setup for the control place. A separate contact input would be used to program forward/reverse switching. The signal could be fed with 24V applied to an input or GND, depending on the method used CMA and CMB would be connected to the appropriate terminals to complete the circuit.



Parameters							
Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	0 = Standard	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Disable	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	keypad Ref	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	4 = AI1	AI1	Keypad Ref	PID1 Activated		1303
Digital Inputs							
Digital Input 2							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.3.2.1	DI2 Open Invert	0 = Normally Open	Normally Open	Normally Open	Normally Closed		1419
P 2.3.2.2	DI2 Function	1 = 3-wire Off	Not Used	Not Used	Fire Mode Reverse		1320

XVI. Constant speed Control

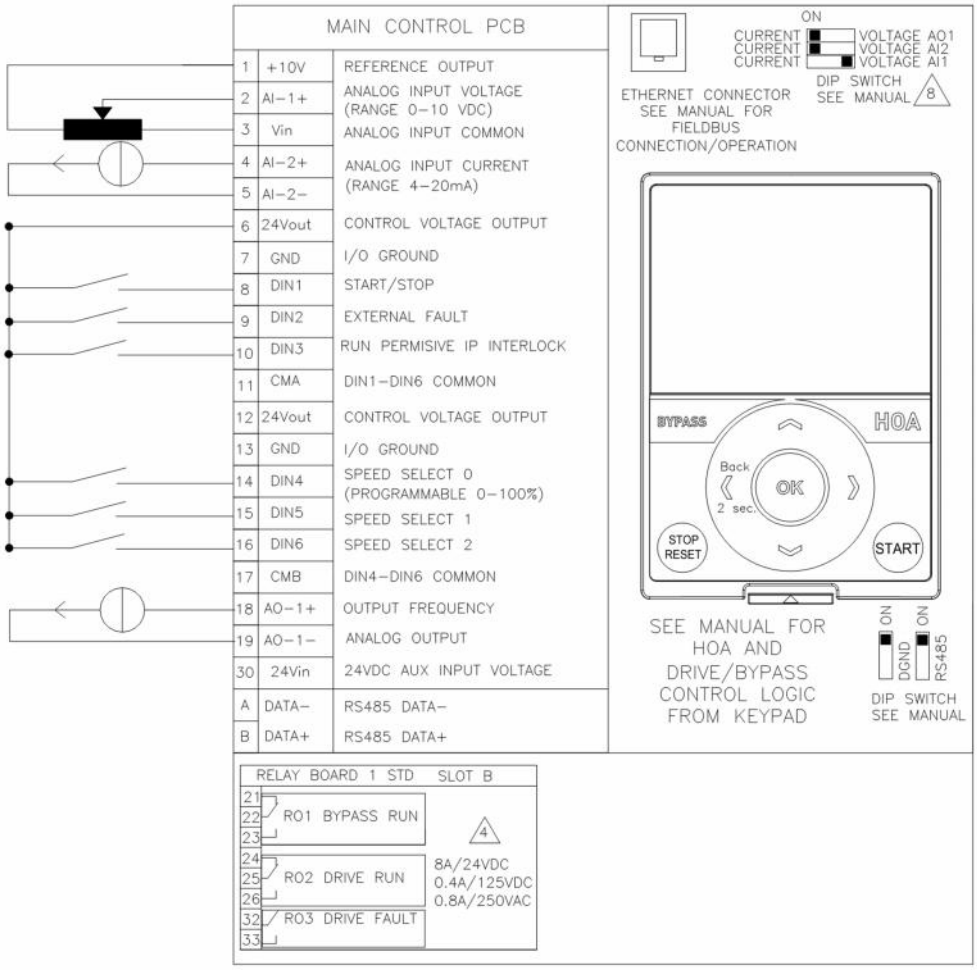
In applications that require multiple preset or constant speed controls that have no analog speed reference control then a drive can perform these with enabling digital inputs. The HMAX has 8 preset speeds that can be assigned to 8 different frequencies. The active frequency is controlled by 3 digital inputs, depending on the combination of inputs on will correlate to the preset frequency. Digital inputs can be set for a Preset B0 through B2, when all the inputs are off the drive will operate at the minimum frequency until an input is active.



Fixed frequency

Input (Binary)			Fixed frequency
B0	B1	B2	(Factory setting)
X	—	—	Preset Speed 1,
—	X	—	Preset Speed 2,
X	X	—	Preset Speed 3,
—	—	X	Preset Speed 4,
X	—	X	Preset Speed 5,
—	X	X	Preset Speed 6,
X	X	X	Preset Speed 7,

Note: When inputs are all 0 drive will follow control place reference command.


MAIN CONTROL PCB
1 +10V REFERENCE OUTPUT
2 AI-1+ ANALOG INPUT VOLTAGE (RANGE 0-10 VDC)
3 Vin ANALOG INPUT COMMON
4 AI-2+ ANALOG INPUT CURRENT (RANGE 4-20mA)
5 AI-2-
6 24Vout CONTROL VOLTAGE OUTPUT
7 GND I/O GROUND
8 DIN1 START/STOP
9 DIN2 EXTERNAL FAULT
10 DIN3 RUN PERMISIVE IP INTERLOCK
11 CMA DIN1-DIN6 COMMON
12 24Vout CONTROL VOLTAGE OUTPUT
13 GND I/O GROUND
14 DIN4 SPEED SELECT 0 (PROGRAMMABLE 0-100%)
15 DIN5 SPEED SELECT 1
16 DIN6 SPEED SELECT 2
17 CMB DIN4-DIN6 COMMON
18 AO-1+ OUTPUT FREQUENCY
19 AO-1- ANALOG OUTPUT
30 24Vin 24VDC AUX INPUT VOLTAGE
A DATA- RS485 DATA-
B DATA+ RS485 DATA+
ON
CURRENT VOLTAGE AO1
CURRENT VOLTAGE AI2
CURRENT VOLTAGE AI1
DIP SWITCH SEE MANUAL 8
ETHERNET CONNECTOR SEE MANUAL FOR FIELDBUS CONNECTION/OPERATION
BYPASS
HOA
Back
OK
2 sec.
STOP RESET
START
SEE MANUAL FOR HOA AND DRIVE/BYPASS CONTROL LOGIC FROM KEYPAD
ON DGND ON RS485
DIP SWITCH SEE MANUAL
RELAY BOARD 1 STD SLOT B
21 22 23 RO1 BYPASS RUN
24 25 26 RO2 DRIVE RUN
32 33 RO3 DRIVE FAULT
4
8A/24VDC
0.4A/125VDC
0.8A/250VAC

Basic Parameters							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.1.1	Application	0 = Standard	Standard	Standard	Multi-Pump		213
P 2.1.2	ByPass	1 = Disable	Disabled	Disabled	Enabled		214
P 2.1.3	HOAControlSource	0 = Keypad CTRL	Keypad CTRL	Keypad CTRL	I/O Terminal		1359
P 2.1.4	StartSourceHand	0 = Keypad	Keypad	Keypad	FieldbusCTRL		1300
P 2.1.5	SpeedSetptHand	2 = Keypad Ref	keypad Ref	Keypad Ref	PID1 Activated		1301
P 2.1.6	StartSourceAuto	1 = I/O Terminal	Keypad	Keypad	FieldbusCTRL		1302
P 2.1.7	SpeedSetptAuto	4 = AI1	AI1	Keypad Ref	PID1 Activated		1303
Digital Inputs							
Digital Input 4							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.3.4.1	DI4 Open Invert	0 = Normally Open	Normally Open	Normally Open	Normally Closed		1421
P 2.3.4.2	DI4 Function	8 = Preset Freq Sel0	Not Used	Not Used	Fire Mode Reverse		1322
Digital Input 5							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.3.5.1	DI5 Open Invert	0 = Normally Open	Normally Open	Normally Open	Normally Closed		1422
P 2.3.5.2	DI5 Function	9 = Preset Freq Sel1	Not Used	Not Used	Fire Mode Reverse		1323
Digital Input 6							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.3.6.1	DI6 Open Invert	0 = Normally Open	Normally Open	Normally Open	Normally Closed		1423
P 2.3.6.2	DI6 Function	10 = Preset Freq Sel2	Not Used	Not Used	Fire Mode Reverse		1324
Fixed Frequencies							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.10.1	Fixed Frequency 1	10	0	0	50	Hz	105
P 2.10.2	Fixed Frequency 2	15	0	0	50	Hz	106
P 2.10.3	Fixed Frequency 3	20	0	0	50	Hz	126
P 2.10.4	Fixed Frequency 4	25	0	0	50	Hz	127
P 2.10.5	Fixed Frequency 5	30	0	0	50	Hz	128
P 2.10.6	Fixed Frequency 6	40	0	0	50	Hz	129
P 2.10.7	Fixed Frequency 7	50	0	0	50	Hz	130

XVII. Active Energy Control

The active energy control is a function that when used with Fans or pumps where constant flow is typically desired when this is enabled the drive will provide some additional energy savings by reducing the output voltage to the motor but still maintaining the desired speed. In turn this allows the output current to drop causing the system to perform at the desired level and save an additional 5-10% in energy consumption. If the load condition or speed would require change the drive will jump itself back up to the optimal V/Hz position to meet new condition and then go back into this saving condition if allowed. In the HMAX this feature has been implemented as a setting in the V/Hz Ratio selection for any of the applications. When set for Active Energy Control this enables the option, it is enabled out of the box. No additional settings are required other than the standard settings for motor name plate and drive control settings.

Motor Control							
Panel Code	Parameter Name	Value	Default	Min	Max	Unit	ID
P 2.7.1	V/Hz Ratio Select	3 = Active Energy Control	Active Energy Control	Linear	Active Energy Control		108

4. Additional Help

In the US or Canada: please contact the Technical Resource Center at 1-877-ETN-CARE or 1-877-326-2273 option 2.

All other supporting documentation is located on the Eaton web site at www.eaton.com/HMAX

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