INSTRUCTION MANUAL

PHOENIX

7.5 TO 3500 HP
SENSORLESS VECTOR AC DRIVE

US DRIVES, INC.

Made In the U.S.A.

Thank You

We at US Drives would like to say thank you for purchasing our product. We believe the Phoenix AC Drive Series is the most problem free product in the market today. If you have any questions or comments please feel free to call us. On behalf of all of us here once again thank you.

Recording Drive Information

It is a good idea to record all product nameplate information for future reference. The nameplate is usually mounted on the side of the drive. The following tables should be filled in during starting or prior to starting the drive.

Drive Part Number P/N	
Drive Serial Number S/N	
Software Revision Level SRL	

Free Software

Free software for setting and storing of parameters is available to all owners of the Phoenix AC Inverter Series.

Mounting Location of the Drive

The drive should be installed in a well ventilated, moisture free area. If there are: fumes; vapors; dirt; lint;, liquids or gases that can interact with the drive, then a clean air supply must be provided. The ambient temperature should not exceed the range of 14 F to 122 F (-10 C to 50 C). If the drive will be subject to vibration then the enclosure should be shock mounted.

Safety Warnings

AC drives, like all electrical equipment in industry, if not properly installed and operated can cause personal injury. Always use common sense when working around electrical equipment. Make sure you read this manual ***before*** any work on the drive begins. Never work on this drive if you are tired or under the influence of any drug. The drive must be grounded and installed in accordance with National Electrical Codes (NEC) and any local codes. Make sure that all power is disconnected, before working on the drive. ***Always*** measure the incoming voltage at the drive to make sure it is zero after disconnecting the power. Make sure all air passages are clear for proper cooling of the drive. After the drive is energized lethal voltages are present. ***Wait at least 5 minutes after disconnecting power before working on the drive,*** since high voltages will still be present. Call us if you have any questions.

Branch Circuit Protection

Branch circuit protection must be provided by the end user. In this manual you will find recommended fuse sizes and types for each module size.

Maintenance

If the enclosure is subject to foreign material, clean the enclosure and check any filters for build up of debris. If the inside of the enclosure needs cleaning, a low pressure vacuum cleaner is recommended. Do not use an air hose because of the possible oil vapor in the compressed air and its high pressure.

1.0 INTRODUCTION

1.1 MANUAL OBJECTIVES

The purpose of this manual is to provide the user with the necessary information to install, program, start-up and maintain the PHOENIX Digital AC Drive. This manual should be read thoroughly before operating, servicing or setting up the PHOENIX Drive.

1.1.1 Who Should Use this Manual

This manual is intended for qualified service personnel responsible for setting up and servicing the PHOENIX AC Drive. You must have previous experience with and a basic understanding of electrical terminology, programming procedures, required equipment and safety precautions before attempting and service on the PHOENIX Drive.

1.2 SAFETY

1.2.1 General Safety Precautions

WARNING

Only personnel familiar with the PHOENIX Drive and the associated machinery should plan or implement the installation, start-up, and subsequent maintenance of the Drive. Failure to comply may result in personnel injury and/or equipment damage.

WARNING

An incorrectly applied or installed Drive can result in component damage or a reduction in product life. Wiring or application errors such as undersizing the motor, incorrect or inadequate AC supply or excessive ambient temperatures may result in damage to the Drive or motor.

WARNING

This Drive contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, please consult with the factory.

1.3 MODEL RATINGS

The following tables 1-1 through 1-3 show the PHOENIX model ratings for size 1 through size 4 for class 200, class 400 and class 500 units.

1.5 SPECIFICATIONS AND FEATURES

Electrical Specifications:

Rated Input Voltage:	200-250Vac, 380-500Vac, 500-600Vac -10% of minimum, +10% of maximum.
Frequency Tolerance:	48-63 Hz
Number of Phases:	3
Displacement Power Factor:	.95 or greater
Efficiency:	97% or greater at rated current
Max. Short Circuit Current Rating:	200,000A rms symmetrical, 600 volts (when used with AC input line fuses specified in tables 1-1 to 1-3).

Control Specifications:

Control Method:	Sine coded PWM with programmable carrier. Space Vector control.
Output Voltage:	0 to rated voltage.
Output Frequency Range:	0 to 400 Hz.
Frequency accuracy:	Analog reference: 0.1% of max frequency. Digital reference: 0.01% of max frequency.
Frequency resolution:	Analog reference: 0.06Hz at 60Hz. Digital reference: 0.0005Hz at 60Hz.
Accel/Decel:	0.1 to 3600 sec.
Drive overload:	At Constant Torque: 150% of drive rated output for 2 minutes. At Variable Torque: 120% of drive rated output for 2 minutes.
Inverse Time Overload:	Programmable for class10, 20 and 30 protection with speed sensitive protection to comply with N.E.C. Article 430
Current limit:	Proactive current limit programmable in % of motor rated current.
Braking torque:	Approximately 20%.
V/Hz curves:	Custom curve programming plus 9 preprogrammed standard patterns.
Maximum connected motor:	2 times rated drive horsepower.
Control power ride-thru:	2 seconds or greater, depending on load.

Environmental Specifications:

Ambient Temperature:	-10°C to 50°C (14°F to 122°F) Nema type 1 enclosed.
Storage Temperature:	-40°C to 70°C (-40°F to 158°F) Nema type 1 enclosed.
Altitude:	Sea level to 3000 Feet [1000m] without derating.
Humidity:	95% relative humidity non-condensing.
Vibration:	$9.8m/sec^2$ (1.0G) peak.
Immunity:	IEEE C62.41-1991 Category B (Formally known as IEEE 587)
Input R.F.I. Filter:	standard on all models.

Physical attributes:

Mounting:	Though hole or panel mount for size 1 to size 3 drives. Size 4 drives are free standing enclosure.
Nema Rating:	Type 1 (IP20) as standard, Type 12 (IP54) optional.
Construction:	Steel construction (reduces E.M.I.)

Protective Features:

- Speed sensitive programmable motor overload protection to comply with N.E.C. Article 430.
- Drive overload protection to protect inverter.
- Motor stall protection at acceleration /deceleration and constant speed operation.
- Peak output current monitoring to protect against line-to-line shorts and line-to-ground shorts.
- Ground fault monitoring.
- Heatsink over-temperature monitoring.
- AC line overvoltage protection.
- DC bus over-voltage protection.
- DC bus under-voltage protection.
- Programmable stall protection.
- Control power ride-thru 2 seconds or greater, depending on load.
- Internal power supply monitoring.
- AC power loss detection.
- Critical speed rejection with programmable 3 points with bandwidth to avoid mechanical resonance.
- Flycatcher “catch a spinning motor”.

Control I/O:

- 8 Digital Inputs: 6 user programmable inputs and 2 dedicated inputs for “Reset” and “External Fault” rated for 24Vdc logic control.
- 5 Digital Outputs: 3 programmable dry contacts rated 115Vac @ 5A; 30Vdc @ 3.5A. 2 open collector outputs rated 24Vdc @ 100mA. - programmable.
- 3 analog inputs: -10 to +10V (10 bits) with input impedance: 125KΩ, or 4-20 mA @ 250Ω - Programmable.
- 2 analog outputs: -10 to +10V (10 bits) @ 2 mA max; output impedance = 100Ω. - Programmable.
- 1 meter output: Use with 100μA movement analog meter - Programmable.
- 2 voltage references: +10Vdc reference and -10Vdc reference @ 5 mA max.
- 24Vdc source: Use to power operator pushbuttons and US Drives option boards: 24Vdc @ 100 mA max.

Standard Drives Features:

- Third generation IBGT.
- Nema type 1 (IP20) as standard for all models.
- 50°C ambient with standard Nema type 1 (IP20) enclosure.
- High voltage ratings: 250Vac+10% , 500Vac+10% models, and 600Vac+10% models
- Built-in power factor correction DC reactor for all models.
- Standard electrically isolated communications port: RS422/485.
- Input line suppression: Metal oxide varistors for line-to-line and line-to-ground voltage surge protection.
- Built-in radio frequency filter.
- Real Time Clock.
- Nonvolatile parameter storage.
- All parameters are saved in Battery backed R.A.M. and in EEPROM (nonvolatile).
- Digital chart recorder: eight independent channels with time/date stamp user programmable.
- Autologging fault history: twelve last faults recorded in order of occurrence (time/date stamped).
- Internal control diagnostics.
- Simple programming through the Real-time Operator module (R.O.M.) with all data entries and monitoring in engineering units with English descriptions.
- Setpoint Control P.I.D.
- DC Braking.
- Critical speed rejection.
- Programmable autorestart.
- Fixed or variable carrier (programmable).
- Two-real-time timers with alarms for customer use.
- Programmable “AC Power On Time” accumulator.
- Programmable “Total Drive Run Time” accumulator.
- Custom V/Hz programming plus 9 preprogrammed curves patterns.
- 2 levels of parameter security codes.
- User definable displays with programmable format and parameter scaling.
- 6 programmable digital inputs for custom setups. 2 inputs are dedicated: Reset, and external fault.

- 9 preprogrammed I/O setups: 8 popular HVAC setups plus 1 Industrial setup.
- Metering: AC line voltage, motor current, motor voltage, DC Bus voltage, Carrier frequency, and more…
- 8 programmable preset speeds.
- M.O.P. function.
- Programmable PWM carrier frequency, fixed or variable.

Options Kits:

Process Signal Follower: provides wide range of reference signals from the outside world. The output to the drive is electrically isolated. No external supply is required. This kit mounts inside the drive enclosure

INPUT	PROCESS CURRENT	PROCESS VOLTAGE
	4 to 20 mA	Up to 192 Vdc
OUTPUT	4 to 20 mA or 0 to 10Vdc	

0 to 15 PSI Follower: gives the drive the ability to accept a pneumatic pressure source as a reference signal. A 3/16 inch I.D. hose fitting is provided for customer connection.
The output to the drive can be either 4-20 mA or 0 to 10Vdc.
No external supply is required. This kit mounts inside the drive enclosure

115Vac Operator Interface: This board enables the customer to use 115Vac type operator interface.
Use this option. This kit mounts inside the drive enclosure.
External power 115Vac is required. This kit mounts inside the drive enclosure.

RS232 to RS 422 Converter: allows a standard PC to be connected to the serial port of the drive.
External power 115Vac is required. This kit mounts inside the drive enclosure

Remote Keypad (R.O.M.) kit: The standard R.O.M. can be mounted within 50 feet [15m], But with this kit the ROM can mounted up 4000 feet from the drive. External power 115Vac is required.

KW and Kwh Metering: Gives the ability to display Kw, Kwh and the cost of running the motor. The cost of power is entered for this calculation. No external supply is required.

Drive Software: This software is used to configure, and save drive data using a standard PC. The software is available to all customers who purchase a phoenix, **free of charge,** as long as the drive registration card is filled out and returned.

Table 1-1

Class 200 Drive Models (Typical Voltage 208/230/240 VAC)

200-250VAC (-10% to +10%)											
Frame Designation	**NEMA 1 (IP20) Catalog Number**	**Motor HP[1]**		**Continuous[2] OutputCurrent (Amps)**		**Output KVA[3]**		**Input Current (Amps)**		**Input KVA[3]**		**Maximum Recommended AC Line Fuses[4] (Amps)**
		CT	VT	CT	VT	CT	VT	CT	VT	CT	VT	
SIZE 1	0200-0010-N1	7.5	10	22	28	9	12	20	25	8	10	40
	0200-0015-N1	10	15	28	42	12	17	25	36	10	15	60
	0200-0020-N1	15	20	42	54	17	22	36	50	15	21	70
	0200-0025-N1	20	25	54	68	22	28	50	61	21	25	90
	0200-0030-N1	25	30	68	85	28	35	61	79	25	33	100
	0200-0030CT-N1	30	-	80	-	33	-	74	-	31	-	100
SIZE 2	0200-0040-N1	30	40	80	104	33	43	74	96	31	40	150
	0200-0050-N1	40	50	104	130	43	54	96	120	40	50	200
	0200-0060-N1	50	60	130	163	54	68	120	155	50	64	250
	0200-0075-N1	60	75	145	192	60	80	140	186	58	77	300
	0200-0100-N1	75	100	192	248	80	103	186	230	77	96	300
	0200-0100CT-N1	100	-	248	-	103	-	230	-	96	-	300
SIZE 3	0200-0125VT-N1	-	125	-	312	-	130	-	290	-	121	400
	0200-0125CT-N1	125	-	312	-	130	-	290	-	121	-	400
	0200-0150VT-N1	-	150	-	360	-	150	-	335	-	139	500
	0200-0150CT-N1	150	-	360	-	150	-	335	-	139	-	500
	0200-0200VT-N1	-	200	-	480	-	200	-	446	-	186	600
	0200-0200CT-N1	200	-	480	-	200	-	446	-	186	-	600
	0200-0250VT-N1	-	250	-	602	-	250	-	560	-	233	800
	0200-0250CT-N1	250	-	602	-	250	-	560	-	233	-	800

[1] Horsepower based on 220-240 Vac Motors.
[2] Constant Torque (CT) overload rating is 150% for two minutes; Variable Torque (VT) overload rating is 120 % for two minutes.
[3] Output and Input KVA at nominal 240Vac
[4] UL Class T, J, and Semiconductor Fuses (preferred): Gould Shawmut A50Q, Bussmann FWH.
[5] Built-in as standard

Table 1-2

Class 400 Drive Models (Typical Voltage 380/415/480 VAC)

380-500VAC (-10% to +10%)												
Frame Designation	NEMA 1 (IP20) Catalog Number	Motor HP[1]		Continuous[2] Output Current (Amps)		Output KVA[3]		Input Current (Amps)		Input KVA[3]		Maximum Recommended AC Line Fuses[4] (Amps)
		CT	VT	CT	VT	CT	VT	CT	VT	CT	VT	
SIZE 1	0400-0015-N1	10	15	14	21	12	17	13	18	11	15	35
	0400-0020-N1	15	20	21	27	17	22	18	24	15	20	40
	0400-0025-N1	20	25	27	34	22	28	26	31	22	26	50
	0400-0030-N1	25	30	34	43	28	36	31	38	26	32	60
	0400-0040-N1	30	40	40	52	33	43	36	48	30	40	70
	0400-0050-N1	40	50	52	66	43	55	48	56	40	47	90
	0400-0060-N1	50	60	65	82	54	68	56	72	47	60	100
	0400-0060CT-N1	60	-	77	-	64	-	67	-	56	-	100
SIZE 2	0400-0075-N1	60	75	77	97	64	81	67	83	56	69	125
	0400-0100-N1	75	100	96	124	80	103	86	110	71	91	175
	0400-0125-N1	100	125	124	156	103	130	110	139	91	116	200
	0400-0150-N1	125	150	156	180	130	150	139	163	116	136	250
	0400-0200-N1	150	200	180	240	150	200	167	223	139	186	350
	0400-0200CT-N1	200	-	240	-	200	-	223	-	186	-	350
SIZE 3	0400-0250VT-N1	-	250	-	302	-	251	-	281	-	234	400
	0400-0250CT-N1	250	-	302	-	251	-	281	-	234	-	400
	0400-0300VT-N1	-	300	-	361	-	300	-	336	-	279	500
	0400-0300CT-N1	300	-	361	-	300	-	336	-	279	-	500
	0400-0350VT-N1	-	350	-	414	-	344	-	385	-	320	600
	0400-0350CT-N1	350	-	414	-	344	-	385	-	320	-	600
	0400-0400VT-N1	-	400	-	477	-	397	-	444	-	369	700
	0400-0400CT-N1	400	-	477	-	397	-	444	-	369	-	700
	0400-0500VT-N1	-	500	-	600	-	499	-	558	-	464	800
	0400-0500CT-N1	500	-	600	-	499	-	558	-	464	-	800
SIZE 4	0400-0600VT-N1	-	600	-	720	-	599	-	670	-	557	-
	0400-0600CT-N1	600	-	720	-	599	-	670	-	557	-	[5]
	0400-0700VT-N1	-	700	-	840	-	698	-	781	-	649	[5]
	0400-0700CT-N1	700	-	840	-	698	-	781	-	649	-	[5]
	0400-0800VT-N1	-	800	-	960	-	798	-	893	-	742	[5]
	0400-0800CT-N1	800	-	960	-	798	-	893	-	742	-	[5]
	0400-0900VT-N1	-	900	-	1080	-	898	-	1004	-	835	[5]
	0400-0900CT-N1	900	-	1080	-	898	-	1004	-	835	-	[5]
	0400-1000VT-N1	-	1000	-	1200	-	998	-	1116	-	928	[5]
	0400-1000CT-N1	1000	-	1200	-	998	-	1116	-	928	-	[5]
	0400-1250VT-N1	-	1250	-	1500	-	1247	-	1395	-	1160	[5]
	0400-1250CT-N1	1250	-	1500	-	1247	-	1395	-	1160	-	[5]
	0400-1500VT-N1	-	1500	-	1800	-	1496	-	1674	-	1392	[5]
	0400-1500CT-N1	1500	-	1800	-	1496	-	1674	-	1392	-	[5]
	0400-1750VT-N1	-	1750	-	2100	-	1746	-	1953	-	1624	[5]
	0400-1750CT-N1	1750	-	2100	-	1746	-	1953	-	1624	-	[5]
	0400-2000VT-N1	-	2000	-	2400	-	1995	-	2232	-	1856	[5]
	0400-2000CT-N1	2000	-	2400	-	1995	-	2232	-	1856	-	[5]
	0400-2500VT-N1	-	2500	-	3000	-	2494	-	2790	-	2320	[5]
	0400-2500CT-N1	2500	-	3000	-	2494	-	2790	-	2320	-	[5]

THIS VOLTAGE SERIES HAS A MAXIMUM HP RATING OF 3,OOOHP.

[1] Horsepower based on 440-480 Vac Motors.

[2] Constant Torque (CT) overload rating is 150% for two minutes; Variable Torque (VT) overload rating is 120 % for two minutes.

[3] Output and Input KVA at nominal voltage 480Vac

[4] UL Class T, J, and Semiconductor Fuses (preferred): Gould Shawmut A50Q, Bussmann FWH.

[5] Built-in as standard

Table 1-3

Class 500 Drive Models (Typical Voltage 525/575/600 VAC)

500-600VAC (-10% to +10%)												
Frame Designation	NEMA 1 (IP20) Catalog Number	Motor HP[1]		Continuous[2] Output Current (Amps)		Output KVA[3]		Input Current (Amps)		Input KVA[3]		Maximum Recommended AC Line Fuses[4] (Amps)
		CT	VT	CT	VT	CT	VT	CT	VT	CT	VT	
SIZE 1	0500-0015-N1	10	15	11	17	11	17	12	17	12	17	30
	0500-0020-N1	15	20	17	22	17	22	17	21	17	21	35
	0500-0025-N1	20	25	22	28	22	28	22	28	22	28	40
	0500-0030-N1	25	30	27	34	27	34	27	34	27	34	50
	0500-0040-N1	30	40	32	41	32	41	32	40	32	40	60
	0500-0050-N1	40	50	41	52	41	52	40	48	40	48	70
	0500-0060-N1	50	60	52	65	52	65	54	61	54	61	90
	0500-0060CT-N1	60	-	62	-	62	-	58	-	58	-	90
SIZE 2	0500-0075-N1	60	75	62	78	62	78	58	72	58	72	100
	0500-0100-N1	75	100	77	99	77	99	75	96	75	96	150
	0500-0125-N1	100	125	99	125	99	124	96	124	96	123	175
	0500-0150-N1	125	150	125	157	124	156	124	154	123	153	200
	0500-0200-N1	150	200	144	192	143	191	142	191	141	190	300
	0500-0200CT-N1	200	-	192	-	191	-	191	-	190	-	300
SIZE 3	0500-0250VT-N1	-	250	-	242	-	241	-	240	-	239	350
	0500-0250CT-N1	250	-	242	-	241	-	240	-	239	-	350
	0500-0300VT-N1	-	300	-	289	-	288	-	286	-	285	400
	0500-0300CT-N1	300	-	289	-	288	-	286	-	285	-	400
	0500-0350VT-N1	-	350	-	336	-	335	-	333	-	331	500
	0500-0350CT-N1	350	-	336	-	335	-	333	-	331	-	500
	0500-0400VT-N1	-	400	-	382	-	380	-	378	-	377	600
	0500-0400CT-N1	400	-	382	-	380	-	378	-	377	-	600
	0500-0500VT-N1	-	500	-	500	-	498	-	495	-	493	700
	0500-0500CT-N1	500	-	500	-	498	-	495	-	493	-	700
	0500-0600VT-N1	-	600	-	600	-	598	-	594	-	592	800
	0500-0600CT-N1	600	-	600	-	598	-	594	-	592	-	800
SIZE 4	0500-0700VT-N1	-	700	-	750	-	697	-	693	-	690	[5]
	0500-0700CT-N1	700	-	750	-	697	-	693	-	690	-	[5]
	0500-0800VT-N1	-	800	-	800	-	797	-	792	-	789	[5]
	0500-0800CT-N1	800	-	800	-	797	-	792	-	789	-	[5]
	0500-0900VT-N1	-	900	-	900	-	896	-	891	-	887	[5]
	0500-0900CT-N1	900	-	900	-	896	-	891	-	887	-	[5]
	0500-1000VT-N1	-	1000	-	1000	-	996	-	990	-	986	[5]
	0500-1000CT-N1	1000	-	1000	-	996	-	990	-	986	-	[5]
	0500-1250VT-N1	-	1250	-	1250	-	1245	-	1238	-	1232	[5]
	0500-1250CT-N1	1250	-	1250	-	1245	-	1238	-	1232	-	[5]
	0500-1500VT-N1	-	1500	-	1500	-	1494	-	1485	-	1479	[5]
	0500-1500CT-N1	1500	-	1500	-	1494	-	1485	-	1479	-	[5]
	0500-1750VT-N1	-	1750	-	1750	-	1743	-	1733	-	1725	[5]
	0500-1750CT-N1	1750	-	1750	-	1743	-	1733	-	1725	-	[5]
	0500-2000VT-N1	-	2000	-	2000	-	1992	-	1980	-	1972	[5]
	0500-2000CT-N1	2000	-	2000	-	1992	-	1980	-	1972	-	[5]
	0500-2500VT-N1	-	2500	-	2500	-	2490	-	2475	-	2465	[5]
	0500-2500CT-N1	2500	-	2500	-	2490	-	2475	-	2465	-	[5]

THIS VOLTAGE SERIES HAS A MAXIMUM HP RATING OF 3,500HP.

[1] Horsepower based on 550-600 Vac Motors.

[2] Constant Torque (CT) overload rating is 150% for two minutes; Variable Torque (VT) overload rating is 120 % for two minutes.

[3] Output and Input KVA at nominal voltage 575Vac.

[4] UL Class T, CC, J, and Semiconductor Fuses (preferred): Gould Shawmut A70Q, Bussmann FWP.

[5] Built-in as standard

END INTRODUCTION SECTION

2.0 INSTALLATION AND WIRING

Section 2.0 provides the information needed to properly mount and wire the PHOENIX Drive. Since most start-up difficulties are the result of incorrect wiring, it is essential that the wiring is done as instructed. Read and understand this section in its entirety before actual installation begins.

2.1 SAFETY WARNINGS

WARNING

Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate or service this equipment.

WARNING

The control and its associated motors and operator control devices must be installed and grounded in accordance with all national and local codes (NEC, VDE 0160, BSI, etc.). To reduce the potential for electric shock, disconnect all power sources before initiating any maintenance or repairs. Keep fingers and foreign objects away from ventilation and other openings. Keep air passages clear. Potentially lethal voltages exist within the drive enclosure and connections. Use extreme caution during installation and start-up.

WARNING

The following information is only a guide for proper installation. US Drives cannot assume responsibility for the compliance or noncompliance to any code, national, local or otherwise for the proper installation of this drive or associated equipment. A hazard of personal injury and/or equipment damage exists if codes are ignored during the installation.

2.2 INITIAL CHECKS

Before installing the PHOENIX Drive, check the unit for physical damage sustained during shipment. If damaged, file a claim with the shipper and return for repair following the procedures outlined on the back cover. If no damage is observed, remove all shipping restraints and padding. Check drive nameplate data for conformance with the AC power source and motor.

2.3 DETERMINING CONTROL LOCATION

The PHOENIX Drive is suitable for most well-ventilated factory areas where industrial equipment is installed. Locations subject to steam vapors or excessive moisture, oil vapors, flammable or combustible vapors, chemical fumes, corrosive gases or liquids, or excessive dirt, dust or lint should be avoided unless an appropriate enclosure has been supplied or a source of clean air is supplied to the enclosure. The location should be dry and the ambient temperature should not exceed 122°F (50°C). If the mounting location is subject to vibration, the unit should be shock mounted.

2.4 MOUNTING

Figure 2-1 shows the minimum required surrounding air space for panel mounted PHOENIX Drives (size 1 through size 3 units). Note that the panel mounted units must be mounted in an upright position. Figure 2-2a shows dimensional information for size 1 through size 2 units. Figure 2-2b shows dimensional information for size 3 through size 4 units. If through panel mounting is chosen (available on size 1 through size 3 units), a suitable sealant should be applied to the mounting faces of the drive and the panel to prevent leakage.

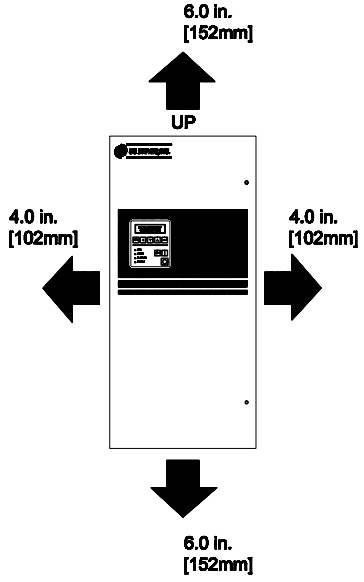
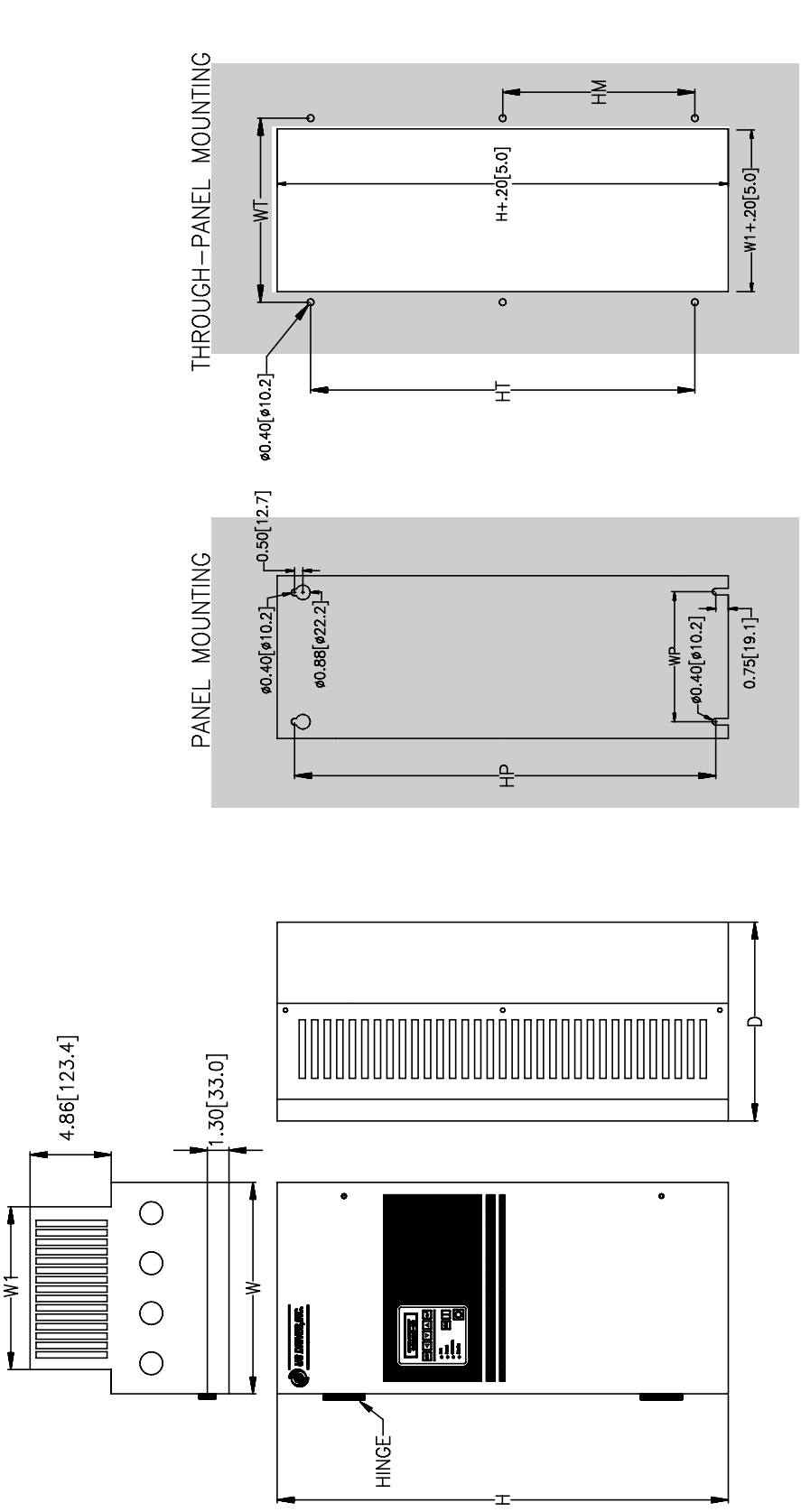


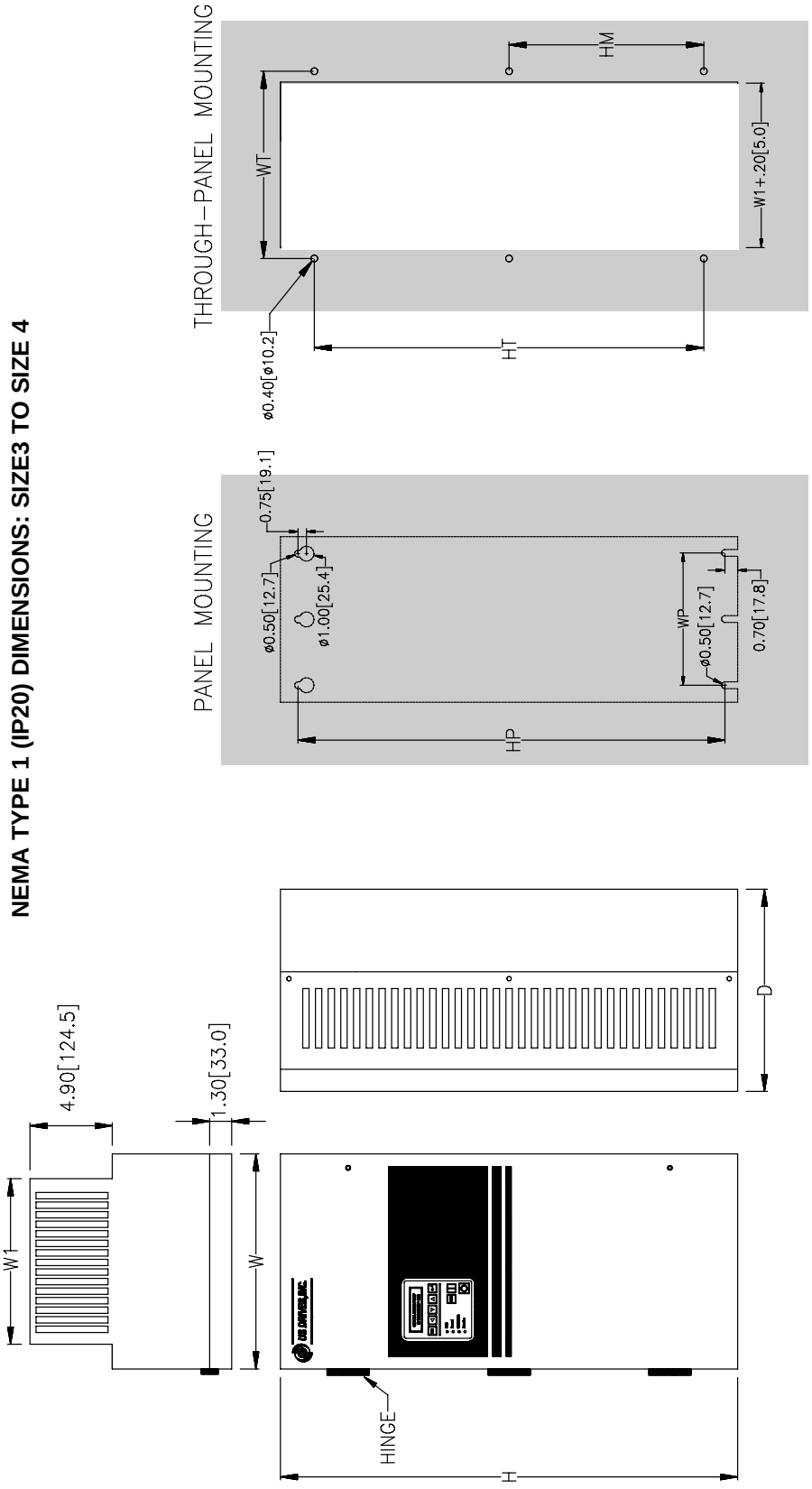
Figure 2-1
Minimum Required Surrounding Air Space for size 1 through size 3 PHOENIX Drives



Frame Designation	H Inches [mm]	W Inches [mm]	D Inches [mm]	W1 Inches [mm]	HP Inches [mm]	WP Inches [mm]	HT Inches [mm]	HM Inches [mm]	WT Inches [mm]	Knockouts	Weights Lbs [Kgs]
SIZE 1	27.00 [685.8]	12.67 [321.8]	11.91 [302.5]	9.75 [247.7]	25.21 [640.3]	7.75 [196.9]	23.00 [584.2]	12.5 [317.5]	11.03 [280.2]	Four 1.359" [34.5] DIA. Knockouts For 1" [25.4] Trade Size Conduits	75 [34]
SIZE 2	32.50 [825.5]	20.11 [510.8]	13.52 [343.4]	17.74 [450.6]	30.1 [764.5]	11.74 [298.2]	28.5 [723.9]	14.25 [362.0]	18.74 [476.0]	Three 3" [76.2] & Three 1.359" [34.5] DIA. Knockouts For 2.5" [63.5] & 1" [25.4] Trade Size Conduits	180 [82]

* Note: Top and bottom endplates are removable to gain access to mounting holes and to punch holes for conduits.

Figure 2-2a
PHOENIX Mounting Information: Size 1 Through Size 2 Units



* Note: Top and bottom endplates are removable to gain access to mounting holes and to punch holes for conduits.

Frame Designation	H Inches [mm]	W Inches [mm]	D Inches [mm]	W1 Inches [mm]	HP Inches [mm]	WP Inches [mm]	HT Inches [mm]	HM Inches [mm]	WT Inches [mm]	Weights Lbs [Kgs]
SIZE 3	44.16 [1121.7]	31.13 [790.7]	17.81 [452.37]	28.81 [731.7]	42.21 [1072.1	25.31 [642.8]	40 [1016]	21 [533.4]	29.72 [754.9]	500 [227]

Size 3 can also be free-standing with optional floor stand kit from US Drives.
All size 4 drives are free-standingenclosures.

Figure 2-2b
PHOENIX Mounting Information: Size 3 Through Size 4 Units

2.5 AC SUPPLY SOURCE

PHOENIX Drives are suitable for use on a power system capable of delivering up to a maximum of 200,000 rms symmetrical amperes, 250/500/600 +10% volts maximum when used with AC input line fuses specified in tables 1-1, 1-2 and 1-3 respectively.

WARNING

To guard against personal injury and/or equipment damage caused by improper fusing, use only the recommended line fuses specified in tables 1-1, 1-2 and 1-3.

2.5.1 Unbalanced Distribution Systems

The PHOENIX Drive is designed to operate on three-phase supply systems whose line voltages are symmetrical. Surge suppression devices are included to protect the drive from lightning induced overvoltages between line and ground. Where the potential exists for abnormally high phase-to-ground voltages (in excess of 125% of nominal), or where the supply ground is tied to another system or equipment that could cause the ground potential to vary with operation, suitable isolation is required for the drive. Where this condition exists, an isolation transformer is strongly recommended.

2.5.2 Ungrounded Distribution Systems

All PHOENIX Drives are equipped with an MOV (Metal Oxide Varistor) that provides voltage surge protection which is designed to meet IEEE 587. The MOV circuit is designed for surge suppression only (power line transient protection), not continuous operation.

With ungrounded distribution systems, the phase-to-ground MOV connection could become a continuous current path to ground where the phase-to-ground voltages are continuously above 125% of the nominal line to line voltage.

2.5.3 Input Power Conditioning

Since all PHOENIX Drives have a built in 3% bus reactor, an external line reactor or isolation transformer is generally not required. Under extreme conditions, however, an external line reactor or isolation transformer may be required.

The basic guidelines for determining if a line reactor or isolation transformer is required are as follows:

1. If the AC input power system does not have a neutral or one phase referenced to ground (see section 2.5.2), an isolation transformer with the neutral of the secondary grounded is **highly recommended**. If the line-to-ground voltages on any phase can exceed 125% of the nominal line-to-line voltage, an isolation transformer with the neutral of the secondary grounded, is **always required**.

2. If the AC line supplying the drive has power factor correction capacitors that are switched in and out, an isolation transformer or 3% line reactors are recommended between the drive and the capacitors.

3. If the AC line frequently experiences transient power interruptions or significant voltage spikes, an isolation transformer or 3% reactors are recommended.

2.5.4 Input Fusing

WARNING

PHOENIX Drives sizes 1 through 4 do not provide input power short circuit fusing. Maximum Recommended AC Line Fuses are shown in tables 1-1, 1-2 and 1-3. Note that branch circuit breakers or disconnect switches can not respond fast enough to provide the level of protection that the drive components require.

2.6 Input Devices

WARNING

Hardwired Stop Circuit

The drive start/stop control circuitry includes solid-state components. If hazards due to accidental contact with moving machinery or unintentional flow of liquid, gas or solids exist, an additional hardwired stop circuit is required to remove AC line power to the drive. When AC power is removed, the motor will coast to a stop. Consequently, an auxiliary braking method may be required.

WARNING

Motor Starters

The PHOENIX Drive is intended to be controlled by control input signals that will start and stop the motor. A device that routinely disconnects then reapplies line power to the drive for the purpose of starting and stopping the motor is not recommended.

WARNING

Bypass Contactors

An incorrectly applied or installed bypass system can result in Drive damage or reduction in product life. The most common mistakes are:

- Wiring the AC line to the Drive output or control terminals.
- Incorrect bypass or output circuits.
- Output circuits that do not directly connect to the motor.

2.7 ELECTRICAL INTERFERENCE (EMI/RFI)

2.7.1 Drive Immunity

The immunity of the PHOENIX Drives to externally generated interference is outstanding. No special precautions other than following the procedures outlined in this manual are required.

It is recommended that the coils of AC and DC energized contactors interfaced with the drives be suppressed with RC networks and diodes respectively or with similar devices. This is because non-suppressed coils (inductors) can generate high electrical transients.

In areas prone to frequent lightning strikes, the standard MOV's (Metal Oxide Varistors) supplied with the drive may need to be supplemented with additional surge suppression MOV's on the AC line feeding the drive

2.7.2 Drive Emissions

Care must be used in the routing of power and ground connections to the drive to avoid interference with sensitive equipment that may be nearby. The cable from the drive to the motor carries switched voltages and should be routed well clear of sensitive equipment. The ground conductor of the motor cable should be connected to the drive ground stud directly. Connecting this ground conductor to a cabinet ground point or ground bus bar may cause high frequency current to circulate in the ground system of the drive enclosure. The motor end of this ground conductor must be solidly connected to the motor case ground. See Figure 2-3.

Shielded or armored cable may be used to minimize radiated emissions from the motor cable. The shield or armor should be connected to the drive ground stud and to the motor ground as shown in Figure 2-3.

2.8 GROUNDING

Refer to the "Recommended Power Wiring" diagram in figure 2-3 for grounding instructions. The drive must be connected to AC system ground using the **power ground stud(s)** provided near the input and output power terminal blocks. All drives provide a separate power ground stud or terminal point for both the input AC power terminal blocks (L1, L2 and L3) and the output to motor terminal blocks (U, V, and W). Ground impedance must conform to requirements of national and local industrial codes (NEC, VDE 0160, BSI, etc.) and should be inspected and tested at regular intervals.

The outgoing motor cable ground wire connects directly to the power ground stud as well as incoming AC line system ground wire. **These ground wires must have a current rating in compliance with the above mentioned national and local codes**. This results in the motor frame ground to be solidly connected through the drive chassis to the AC system ground.

Note that the drive signal common **(COM)** should **not** be connected to the **power ground stud** directly. If desired, **one** of these commons may be connected to **earth ground** at a single point outside the drive enclosure - see section 2.8.3 for more details.

For multiple drive systems, if the signal common on each drive is to be grounded, they can be "daisy-chained" connected, using a single **COM** point on each drive. Note that this drive **COM** "bus" should only tie to **earth ground** at only one point.

2.8.1 Grounding Sensitive Circuits

It is critical to control the paths through which high frequency ground currents flow. Sensitive circuits should not share a path with such currents. Control and signal conductors should not be run near or parallel to power conductors.

2.8.2 Motor Cable Grounding

The ground conductor of the motor cable (drive end) must be connected to the **power ground stud** provided near the U, V and W output to motor terminals. Grounding directly to drive provides a direct path for high frequency current returning from the motor frame and ground conductor. At the motor end, the ground conductor should also be connected to the motor case ground. See Figure 2-3.

If armored or shielded cables are used, the armor/shield should be grounded at both ends per figure 2-3.

2.8.3 Control Logic and Signal Grounding

The control logic and signal wiring for the PHOENIX Drive is shown in Figure 2-4. If the control wires are short, and contained within a cabinet that has no sensitive circuits, the use of shielded control wiring is not necessary. For all configurations, it is strongly suggested that shielded wire be used for the signal wiring.

It is generally recommended that the drive control board signal common (COM) be connected to true earth ground at one point in a single or multi-drive system. For this case, a single #16AWG wire should be connected from **one** **COM** terminal on the control board to a single point outside of the drive enclosure. With this ground connection in place, shields from incoming signal cables may be grounded at the control board terminal block **COM** terminals. The remote end of the shielded signal cables should be taped off with no connection to earth ground.

CAUTION

Floating Signal Common

If the signal common (**COM**) on the drive control board is to be left floating (not connected to earth ground), the shields should be grounded only at the remote end. At the drive end, the shields should be taped off. For the case of a floating signal common on the drive control board, signal shields for external cables routed to the drive control board terminal blocks must not be connected to any of the **COM** terminals. This is so high frequency ground currents will not be injected into the control board signal common with no low impedance path to ground.

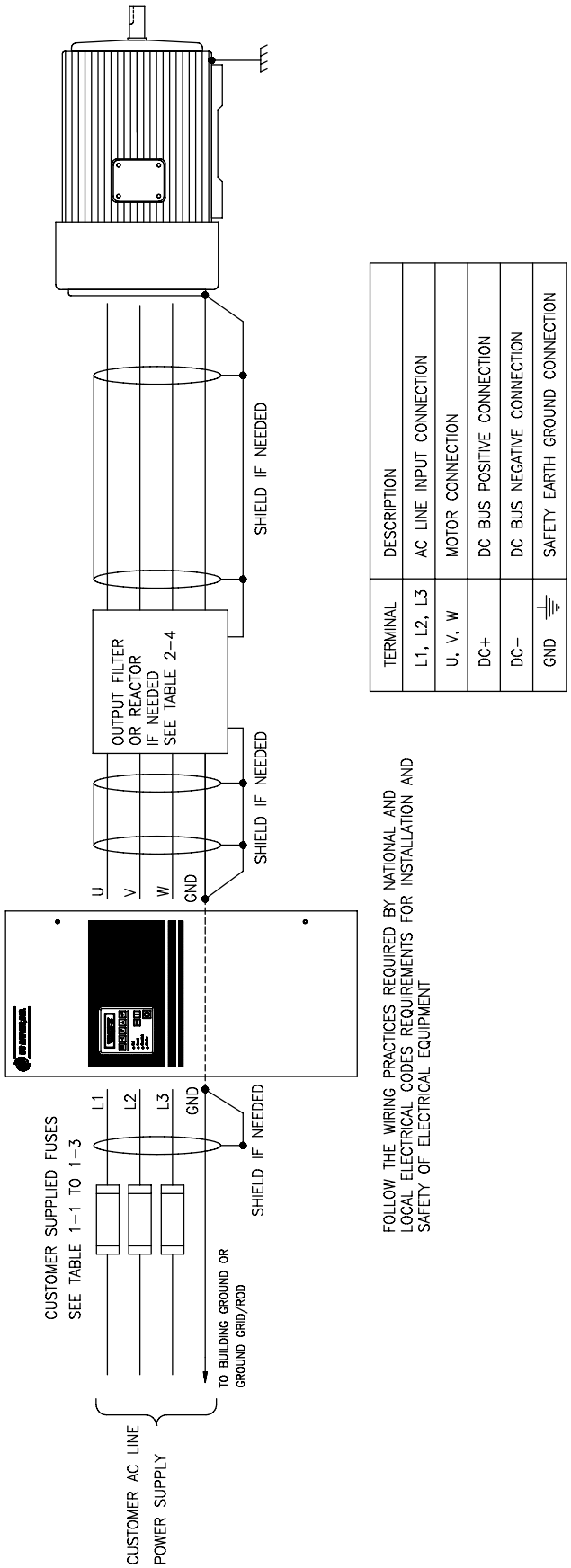


Figure 2-3
Recommended Power Wiring

2.9 Power Cabling

Input and Output power connections are made through the power terminal block and power ground stud. The actual drive label markings are shown in Table 2-1. Maximum torque values for terminal connections are also indicated on labels next to the connection points.

Table 2-1
Power Signal Description

Terminal	Description
GND	Power Earth Ground Stud
L1 L2 L3 AC LINE INPUT	AC Line Input Terminals
DC- DC+	DC Bus Terminals
U V W OUTPUT TO MOTOR	Motor Connection

2.9.1 Lug Kits

Tables 2-2a. through 2-2c. details the Lug kits that are available for the PHOENIX Drives to aid in making power terminations. When ordering note that the kits are grouped according to voltage classes.

Table 2-2a.
Lug Kits for Class 200 Drive Models

VOLTAGE RANGE 200-250VAC (-10% to +10%)						
Frame Designation	Drive Part Number	Motor HP		Continuous Output Current (Amps)		Lug Kit Part number
		CT	VT	CT	VT	
SIZE 1	0200-0010-N1	7.5	10	22	28	NOT REQUIRED
	0200-0015-N1	10	15	28	42	NOT REQUIRED
	0200-0020-N1	15	20	42	54	NOT REQUIRED
	0200-0025-N1	20	25	54	68	NOT REQUIRED
	0200-0030-N1	25	30	68	85	NOT REQUIRED
	0200-0030CT-N1	30	-	80	-	NOT REQUIRED
SIZE 2	0200-0040-N1	30	40	80	104	LUG-2
	0200-0050-N1	40	50	104	130	LUG-2
	0200-0060-N1	50	60	130	163	LUG-2
	0200-0075-N1	60	75	145	192	LUG-2
	0200-0100-N1	75	100	192	248	LUG-2
	0200-0100CT-N1	100	-	248	-	LUG-2
SIZE 3	0200-0125VT-N1	-	125	-	312	LUG-3
	0200-0125CT-N1	125	-	312	-	LUG-3
	0200-0150VT-N1	-	150	-	360	LUG-3
	0200-0150CT-N1	150	-	360	-	LUG-3
	0200-0200VT-N1	-	200	-	480	LUG-3
	0200-0200CT-N1	200	-	480	-	LUG-3
	0200-0250VT-N1	-	250	-	602	LUG-3
	0200-0250CT-N1	250	-	602	-	LUG-3

[1] Consult factory

Table 2-2b.
Lug Kits for Class 400 Drive Models

VOLTAGE RANGE 380-500VAC (-10% to +10%)						
Frame Designation	**Drive Part Number**	**Motor HP**		**Continuous Output Current (Amps)**		**Lug Kit Part Number**
		CT	VT	CT	VT	
SIZE 1	0400-0015-N1	10	15	14	21	NOT REQUIRED
	0400-0020-N1	15	20	21	27	NOT REQUIRED
	0400-0025-N1	20	25	27	34	NOT REQUIRED
	0400-0030-N1	25	30	34	43	NOT REQUIRED
	0400-0040-N1	30	40	40	52	NOT REQUIRED
	0400-0050-N1	40	50	52	66	NOT REQUIRED
	0400-0060-N1	50	60	65	82	NOT REQUIRED
	0400-0060CT-N1	60	-	77	-	NOT REQUIRED
SIZE 2	0400-0075-N1	60	75	77	97	LUG-2
	0400-0100-N1	75	100	96	124	LUG-2
	0400-0125-N1	100	125	124	156	LUG-2
	0400-0150-N1	125	150	156	180	LUG-2
	0400-0200-N1	150	200	180	240	LUG-2
	0400-0200CT-N1	200	-	240	-	LUG-2
SIZE3	0400-0250VT-N1	-	250	-	302	LUG-3
	0400-0250CT-N1	250	-	302	-	LUG-3
	0400-0300VT-N1	-	300	-	361	LUG-3
	0400-0300CT-N1	300	-	361	-	LUG-3
	0400-0350VT-N1	-	350	-	414	LUG-3
	0400-0350CT-N1	350	-	414	-	LUG-3
	0400-0400VT-N1	-	400	-	477	LUG-3
	0400-0400CT-N1	400	-	477	-	LUG-3
	0400-0500VT-N1	-	500	-	600	LUG-3
	0400-0500CT-N1	500	-	600	-	LUG-3
SIZE 4	0400-0600VT-N1	-	600	-	720	[1]
	0400-0600CT-N1	600	-	720	-	[1]
	0400-0700VT-N1	-	700	-	840	[1]
	0400-0700CT-N1	700	-	840	-	[1]
	0400-0800VT-N1	-	800	-	960	[1]
	0400-0800CT-N1	800	-	960	-	[1]
	0400-0900VT-N1	-	900	-	1080	[1]
	0400-0900CT-N1	900	-	1080	-	[1]
	0400-1000VT-N1	-	1000	-	1200	[1]
	0400-1000CT-N1	1000	-	1200	-	[1]
	0400-1250VT-N1	-	1250	-	1500	[1]
	0400-1250CT-N1	1250	-	1500	-	[1]
	0400-1500VT-N1	-	1500	-	1800	[1]
	0400-1500CT-N1	1500	-	1800	-	[1]
	0400-1750VT-N1	-	1750	-	2100	[1]
	0400-1750CT-N1	1750	-	2100	-	[1]
	0400-2000VT-N1	-	2000	-	2400	[1]
	0400-2000CT-N1	2000	-	2400	-	[1]
	0400-2500VT-N1	-	2500	-	3000	[1]
	0400-2500CT-N1	2500	-	3000	-	[1]

[1] Consult factory

Table 2-2c.
Lug Kits for Class 500 Drive Models

VOLTAGE RANGE 500-600VAC (-10% to +10%)						
Frame Designation	**Drive Part Number**	**Motor HP**		**Continuous Output Current (Amps)**		**Lug Kit Part Number**
		CT	VT	CT	VT	
SIZE 1	0500-0015-N1	10	15	11	17	NOT REQUIRED
	0500-0020-N1	15	20	17	22	NOT REQUIRED
	0500-0025-N1	20	25	22	28	NOT REQUIRED
	0500-0030-N1	25	30	27	34	NOT REQUIRED
	0500-0040-N1	30	40	32	41	NOT REQUIRED
	0500-0050-N1	40	50	41	52	NOT REQUIRED
	0500-0060-N1	50	60	52	65	NOT REQUIRED
	0500-0060CT-N1	60	-	62		NOT REQUIRED
SIZE 2	0500-0075-N1	60	75	62	78	LUG -2
	0500-0100-N1	75	100	77	99	LUG -2
	0500-0125-N1	100	125	99	125	LUG -2
	0500-0150-N1	125	150	125	157	LUG -2
	0500-0200-N1	150	200	144	192	LUG -2
	0500-0200CT-N1	200	-	192	-	LUG-2
SIZE 3	0500-0250VT-N1	-	250	-	242	LUG-3
	0500-0250CT-N1	250	-	242	-	LUG-3
	0500-0300VT-N1	-	300	-	289	LUG-3
	0500-0300CT-N1	300	-	289	-	LUG-3
	0500-0350VT-N1	-	350	-	336	LUG-3
	0500-0350CT-N1	350	-	336	-	LUG-3
	0500-0400VT-N1	-	400	-	382	LUG-3
	0500-0400CT-N1	400	-	382	-	LUG-3
	0500-0500VT-N1	-	500	-	500	LUG-3
	0500-0500CT-N1	500	-	500	-	LUG-3
	0500-0600VT-N1	-	600	-	600	LUG-3
	0500-0600CT-N1	600	-	600	-	LUG-3
SIZE 4	0500-0700VT-N1	-	700	-	700	[1]
	0500-0700CT-N1	700	-	700	-	[1]
	0500-0800VT-N1	-	800	-	800	[1]
	0500-0800CT-N1	800	-	800	-	[1]
	0500-0900VT-N1	-	900	-	900	[1]
	0500-0900CT-N1	900	-	900	-	[1]
	0500-1000VT-N1	-	1000	-	1000	[1]
	0500-1000CT-N1	1000	-	1000	-	[1]
	0500-1250VT-N1	-	1250	-	1250	[1]
	0500-1250CT-N1	1250	-	1250	-	[1]
	0500-1500VT-N1	-	1500	-	1500	[1]
	0500-1500CT-N1	1500	-	1500	-	[1]
	0500-1750VT-N1	-	1750	-	1750	[1]
	0500-1750CT-N1	1750	-	1750	-	[1]
	0500-2000VT-N1	-	2000	-	2000	[1]
	0500-2000CT-N1	2000	-	2000	-	[1]
	0500-2500VT-N1	-	2500	-	2500	[1]
	0500-2500CT-N1	2500	-	2500	-	[1]

[1] Consult factory

2.9.2 Motor Cables

There are a wide variety of cable types that are acceptable for drive installations. For many installations, unshielded motor cable is acceptable, providing that it can be separated from sensitive circuits. A good rule of thumb to use is to allow a spacing of one foot (0.3 meters) for every 33 feet (10 meters) of length. For all situations, long parallel runs must be avoided. Conform to requirements of national and local industrial codes (NEC, VDE 0160, BSI, etc.) when selecting the type and size of the motor cable.

The cable should be 4-conductor with the ground being connected directly to the drive power ground and the motor frame ground terminal.

2.9.2.1 Shielded Motor Cable

If the separation suggested in section 2.9.2 above cannot be maintained or if sensitive circuits or devices are mounted or connected to machinery driven by the motor, shielded motor cable is recommended. The shield must be connected to ground at both ends to minimize interference. At the motor end, the motor cable shield should be tied to the motor frame ground and the drive end, to the power ground stud or ground terminal.

Shielded cable is also recommended for multiple drive installations where cable trays or large conduits are to be used to route motor leads from more than one drive. The shielded cable reduces the emission and capture (cross coupling) of noise between the motor leads of different drives. The cable shield connected to ground at both the drive end and the motor end.

Armored cable can also be used effectively to shield the motor leads. If possible, it should only be grounded at the drive end and to the motor frame at the motor end. With PVC coated armored cable, if the armored cable is grounded at a user supplied cabinet entrance, shielded cable should be used within the cabinet if the power leads will run to close to control or signal wiring.

2.9.2.2 Conduit for Routing Motor Cables

If metal conduit is to be used for motor cable distribution, the following procedures must be adhered to.

- When drives are mounted in user supplied cabinets, ground connections should be made to a common point in the cabinet. When conduit is used, it is normally grounded at the motor frame ground (junction box) and the cabinet ground. This helps reduce noise emissions from the drive. Please note that this recommendation is strictly for noise reduction and does not concern safety grounding requirements which are dictated by national and local codes. See section 2.1 (SAFETY WARNINGS) for details.

- If possible, each conduit should contain only one set of motor leads to minimize “cross talk” between drives which degrades the noise suppression techniques described above. If this is not practical, under no conditions should more than three sets of motor leads be installed in a common conduit. If more than three sets of motor leads are to be run in a common conduit, shielded cable must be used as described above.

2.9.2.3 Motor Lead Lengths

Installations with long motor cables may require the addition of an output reactor, a *dv/dt* filter or a carrier suppression filter to limit voltage reflections that become additive at the motor. Refer to Table 2-4 for guidance in using various techniques to limit the voltage reflections.

2.10 Control and Signal Wiring

Terminal blocks TB1 through TB6 on the drive main control board are used for connecting control and signal wiring to the PHOENIX drive. See Figure 2-4 for terminal block physical location and Figure 2-5 for terminal point connections. A brief summary of the terminal block assignments are shown in Table 2-3.

Table 2-3
Drive Main Control Board Terminal Block Layout

TERMINAL BLOCK	DESCRIPTION
TB1	Programmable Output Contacts
TB2	Programmable Digital Outputs
TB3	Control Logic Inputs (start, stop, jog, etc.)
TB4	Programmable Analog Outputs
TB5	Analog Reference Inputs (speed refs., PID setpoints, etc.)
TB6	Isolated RS422/485 Connections

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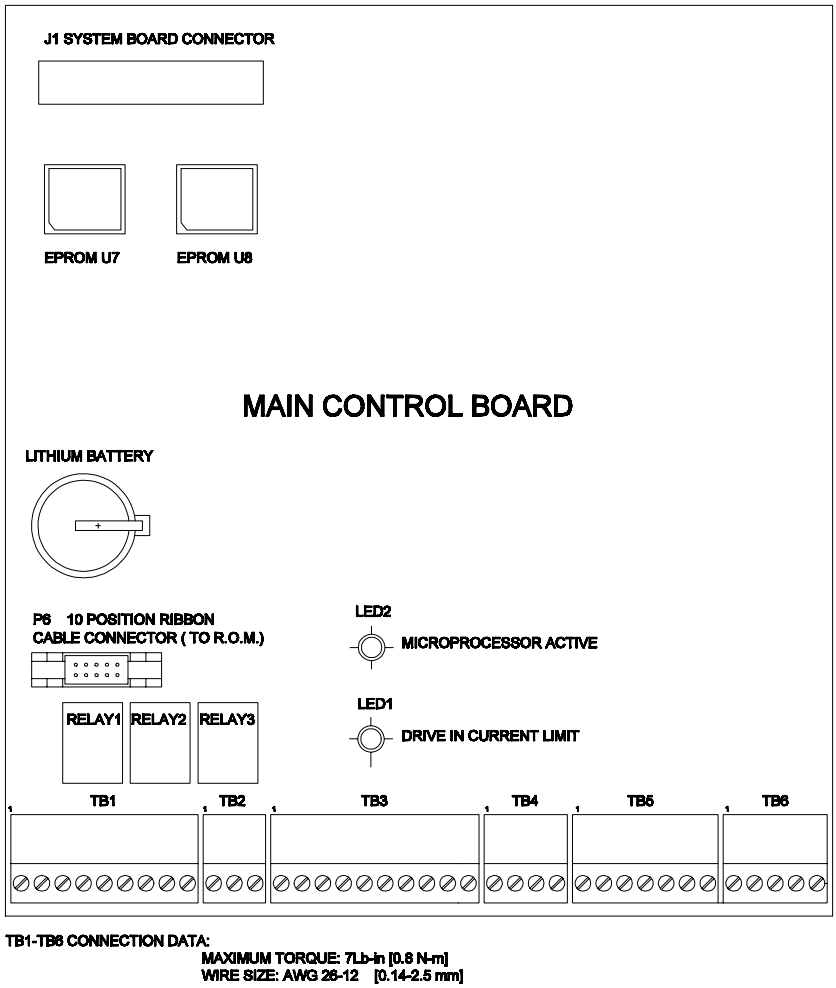
Table 2-4
Maximum Recommended Motor Cable Lengths

Type of Termination at Drive	Maximum Cable Length With General Purpose Motor Feet [Meters]	Maximum Cable Length With "Definite Purpose Inverter-Fed Motor"[1] Feet [meters]
None	100 [30]	400 [120]
3 % Reactor at Drive[2]	300 [90]	600[180]
dv/dt Filter at Drive[3]	1000 [300]	3000 [915]]
Carrier Suppression Filter[4]	10 Miles [16 Kilometers]	10 Miles [16 Kilometers]

[1] "Definite Purpose Inverter-Fed Motor" as defined in NEMA MG1- Part 31 section 31.40.4.2 "*Voltage Spikes".*
[2] Reactor designed for Inverter output installation.
[3] *dv/dt* Filters available from *US Drives.*
[4] Carrier Suppression Filters available from *US Drives*. A Step-up-Transformer and/or oversized motor cables must be used when long wire run is required.

Figure 2-4
Terminal Block Locations for Drive Control Board



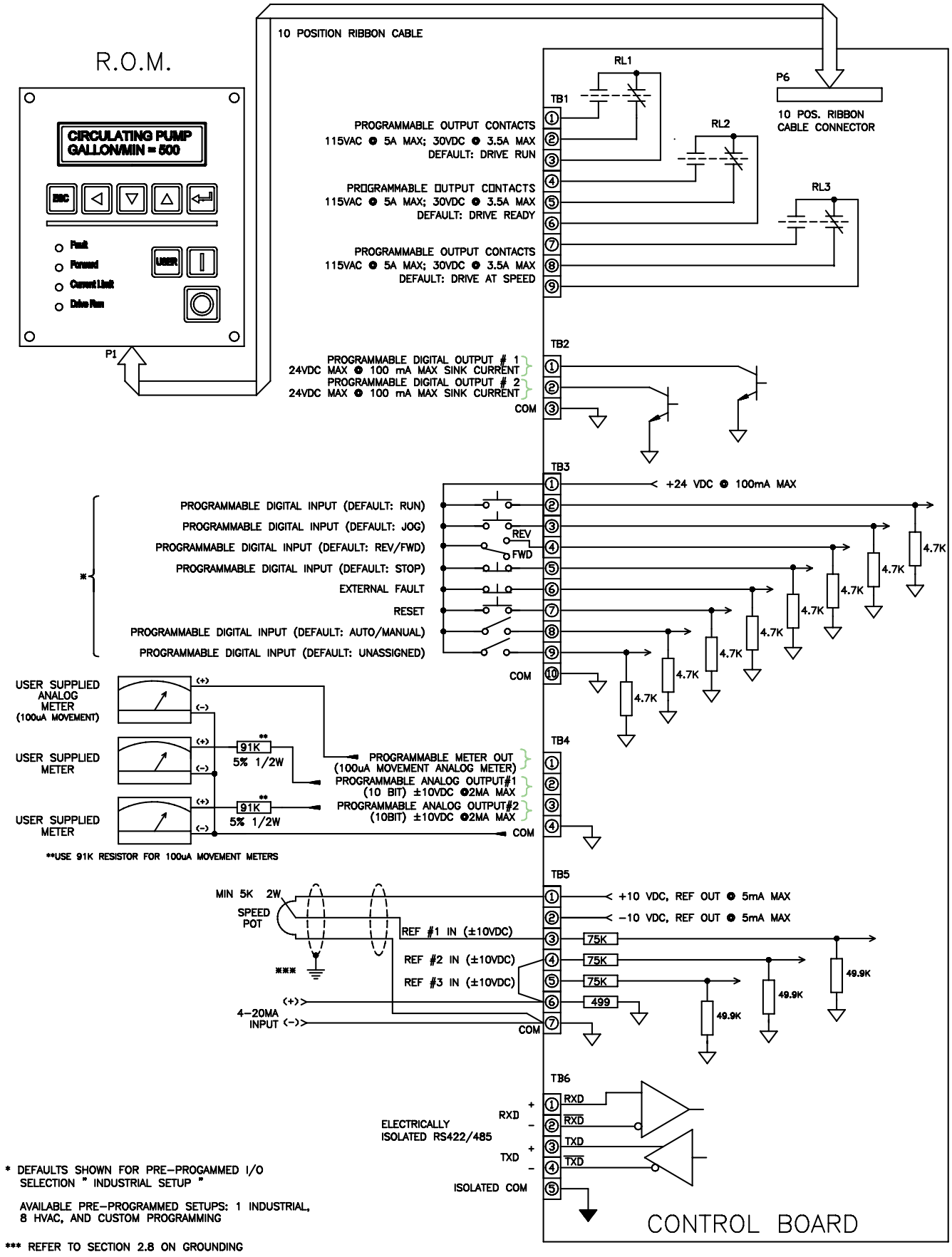


Figure 2-5
Control Logic and Signal

Before proceeding with any signal wiring, the following precautions for the signal conduit and wire must be followed:

2.10.1 Signal Conduit Requirements

- Use either rigid steel or flexible armored steel cable.
- The signal conduit must cross non-signal conduit at an angle of between 45° and 90°.
- Do not route the conduit through junction or terminal boxes that have non-signal wiring.

2.10.2 Signal Wire Requirements

- Size and install all wiring in conformance with the requirements of national and local industrial safety regulations (NEC, VDE 0160, BSI, etc.)
- Use shielded wire for reference and other signal wire connections.
- Route all signal wiring away from high current lines such as AC lines.
- Always run the signal wire in steel conduit. Never run the signal wire with non-signal wire.
- Route external wiring, rated at 600 volts or more, in separate steel conduit to eliminate electrical noise pickup.

CAUTION

User installed control and signal wiring must be routed inside the drive enclosure such that it is separated from any other wiring and uninsulated live parts. Failure to observe this precaution can result in equipment damage.

- For distances less than 150 feet, use a minimum of #22AWG wire. For distances more than 150 feet and less than 1000 feet, use a minimum of #16AWG wire.

2.10.3 2-Wire and 3-Wire Control

When deciding how to start and stop the drive, the user has the option of using two different control methods. The control industry refers to these two methods as “2-wire” and “3-wire” control “2-Wire” control is often referred to as “maintained contact” control and “3-wire” control is often referred to as “momentary contact” control. Figures 2-6a and 2-6b illustrate this terminology.

“**2-Wire” or “Maintained Contact” control gets its name** because the drive can be started and stopped with two(2) control wires sent to the drive (TB3-1 and TB3-2) and to keep the drive in run takes a “maintained” run contact.

“**3-Wire” or “Momentary Contact” control gets its name** because the drive can be started and stopped with three(3) control wires sent to the drive (TB3-1, TB3-2 and TB3-5) and to keep the drive in run takes a “momentary” activation of the run pushbutton.

Figure 2-6a.
“2-Wire” or “Maintained Contact” Control

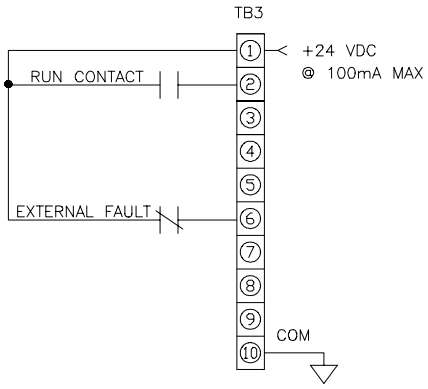
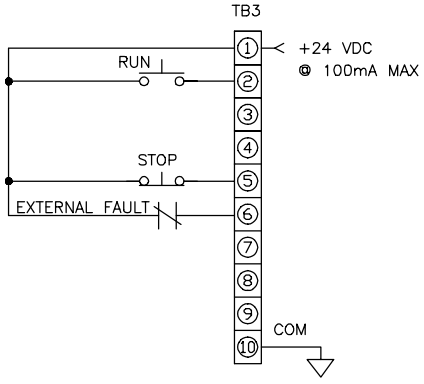


Figure 2-6b.
“3-Wire” or “Momentary Contact” Control



Note that the default setting of “INDUSTRIAL” for PREPROG I-O LIST(#264) parameter, uses “3-wire” or “momentary contact” control.

2.10.4 Wiring for Pre-Programmed I-O Setups

In order to help the user more easily setup the drive for a given application, the PHOENIX Drive contains nine(9) pre-programmed I-O setups; one(1) for general industrial use and eight(8) for the Heating, Ventilation, and Air Conditioning industry (HVAC). The user may select any one of these nine setups by simply programming the PREPROG I-O LIST(#264) parameter to the desired setup.

Note that the control logic wiring to TB3 shown in Figure 2-5 is with the PREPROG I-O LIST(#264) parameter set to "INDUSTRIAL".

Figures 2-7a through 2-7h that follow are wiring diagrams for the eight HVAC pre-programmed I-O setups.

NOTE

Remember that the ROM control I-O is "3-wire" in nature because it has separate Run and Stop keys. Therefore, whenever the drive is in a "2-wire" or "maintained contact" mode, the ROM Run/Stop keys are disabled.

NOTE

Anytime the user wants to change the default settings for parameters set by the Preprogrammed I-O Setups, by changing parameters in the CUSTOM I-O menu, the 'PREPROG I-O LIST(#264) parameter must be first changed to "IN CUSTOM I-O". See section 5.0, "DRIVE PROGRAMMING" for full details.

2.10.4.1 Hand-Off-Auto

Four of the pre-programmed setups involve a "Hand-Off-Auto" (HOA) selector switch with different combinations of "2-wire" and "3-wire" control for the "Hand" and "Auto" control devices.

HOA Selector Switch Enabling of Control Devices

With the selector switch in the "Hand" position, only the "Hand" controls are enabled. Additionally, for "3-wire" "Hand" setups, the ROM Run and Stop keys are also enabled.

Similarly, with the selector switch in the "Auto" position, only the "Auto" controls are enabled. Also when the HOA switch is in the "Off" position, the drive is stopped.

Note that the character strings at the end of the selection choices for the PREPROG I-O LIST(#264) parameter indicate which terminals are enabled in "Hand" mode and which TB3 terminals are enabled in the "Auto" mode. For example, "HOA#1 H25 A34" indicates that TB3 terminals 2 and 5 are enabled in "Hand" mode and TB3 terminals 3 and 4 are enabled in "Auto" mode.

NOTE

In all "3-wire" "Hand" setups, when the HOA selector switch is in the "Hand" position, the ROM Run/Stop keys are also enabled in addition to the "Hand" pushbuttons which are wired to TB3-2 and TB3-5. If these pushbuttons are not to be used and, instead, the ROM Run/Stop keys will be used for "Hand" control, TB3-5 ("Hand Stop") must be jumpered to 24 volts or parameter "TB-3 TERMINAL 5" (#259) must be set to "UNUSED" in the CUSTOM I-O menu. See section 5.0, "DRIVE PROGRAMMING" for full details.

HOA Selector Switch Control of Target References

With the HOA switch in the "Hand" position, the "KEYPAD FREQ REF" is used for the target reference With the HOA switch in the "Auto" position, "ANALOG REF#2" is used as the target reference.

NOTE

The FREQ REF SOURCE(#49) parameter must be set to "CONTACT INPUTS" for the target references to be switched properly.

2.10.4.2 Local/Remote Auto/Manual

Four of the setups involve both a "Local/Remote" switch and an "Auto/Manual" switch with different combinations of "2-wire" and "3-wire" control for the "Local" and "Remote" positions.

Local/Remote Switch Enabling of Control Devices

In the "Local" position only the "Local" controls are enabled. Additionally, for "3-wire" "Local" setups, the ROM Run and Stop keys are also enabled.

Similarly, in the "Remote" position, only the "Remote" controls are enabled.

Note that the character strings at the end of the selection choices for the PREPROG I-O LIST(#264) parameter indicate which terminals are enabled in "Local" mode and which TB3 terminals are enabled in the "Remote" mode. For example, "L/R A/M#1 L25R34" indicates that TB3 terminals 2 and 5 are enabled in "Local" mode and TB3 terminals 3 and 4 are enabled in "Remote" mode.

NOTE

In all “3-wire” “Local” setups, when the Local/Remote switch is in the “Local” position, the ROM Run/Stop keys are also enabled in addition to the “Local” pushbuttons which are wired to TB3-2 and TB3-5. If these pushbuttons are not to be used and, instead, the ROM Run/Stop keys will be used for “Local” control, TB3-5 (“Local Stop”) must be jumpered to 24 volts or parameter “TB-3 TERMINAL 5” (#259) must be set to “UNUSED” in the CUSTOM I-O menu. See section 5.0 for programming details.

Auto/Manual Switch Control of Target References

In the “Manual” position, the “KEYPAD FREQ REF” is used for the target reference while in the “AUTO” position “ANALOG REF#2” is used as the target reference.

NOTE

The FREQ REF SOURCE(#49) parameter must be set to “CONTACT INPUTS” for the target references to be switched properly.

Figure 2-7a.
HVAC HOA#1 H25 A34 Setup
3-Wire Hand / 3-Wire Auto Control

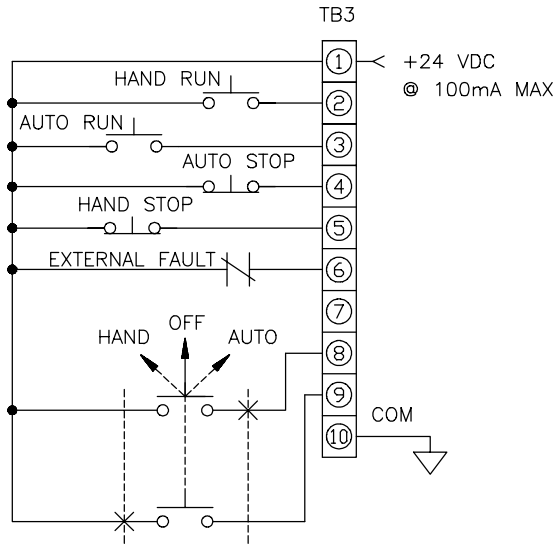


Figure 2-7b.
HVAC HOA#2 H25 A3
3-Wire Hand / 2-Wire Auto Control

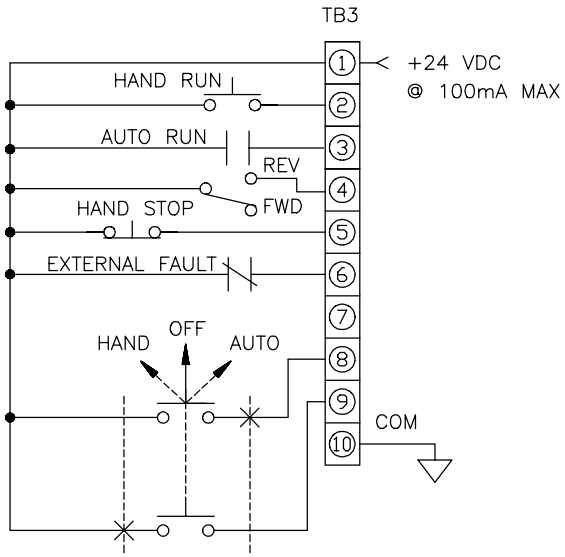


Figure 2-7c.
HVAC HOA#3 H2 A34 Setup
2-Wire Hand / 3-Wire Auto Control

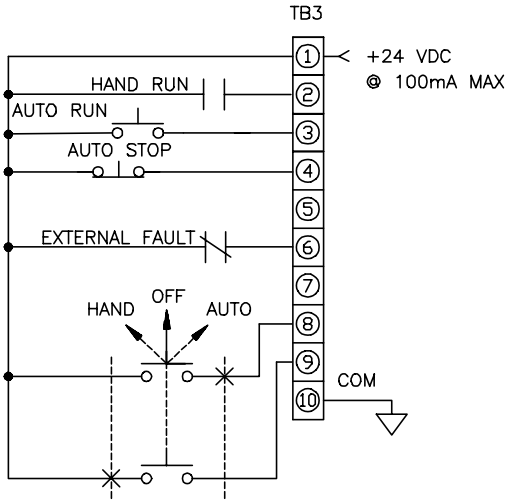


Figure 2-7d.
HVAC HOA#4 H2 A3
2-Wire Hand / 2-Wire Auto Control

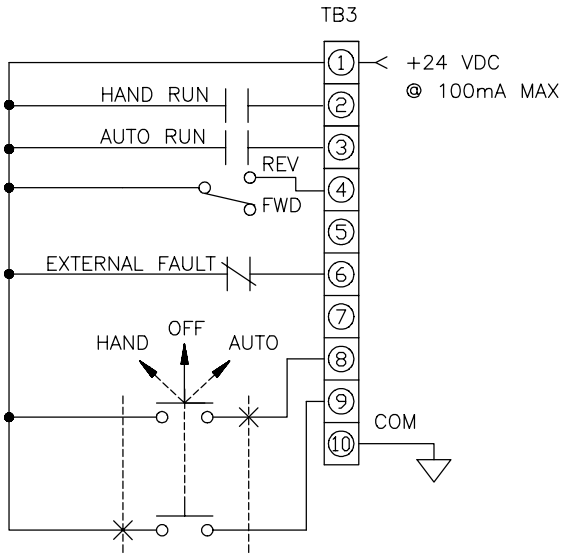


Figure 2-7e.
HVAC L/R A/M#1 L25R34
3-Wire Local / 3-Wire Remote Control

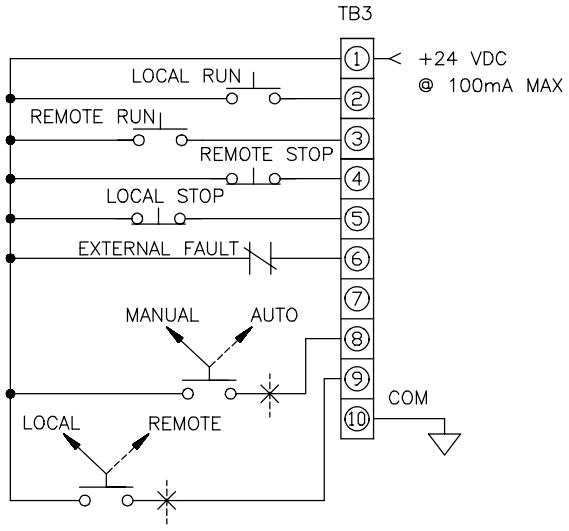


Figure 2-7g.
HVAC L/R A/M#3 L2 R34
2-Wire Local / 3-Wire Remote Control

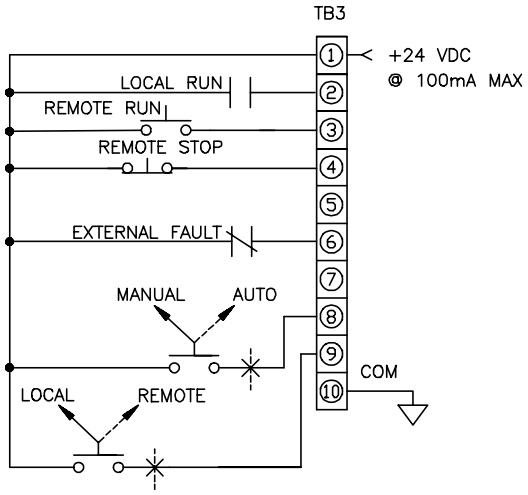


Figure 2-7f.
HVAC L/R A/M#2 L25 R3
3-Wire Local / 2-Wire Remote Control

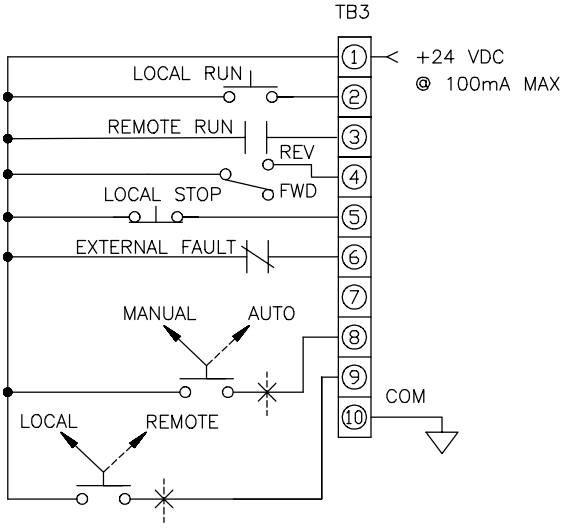
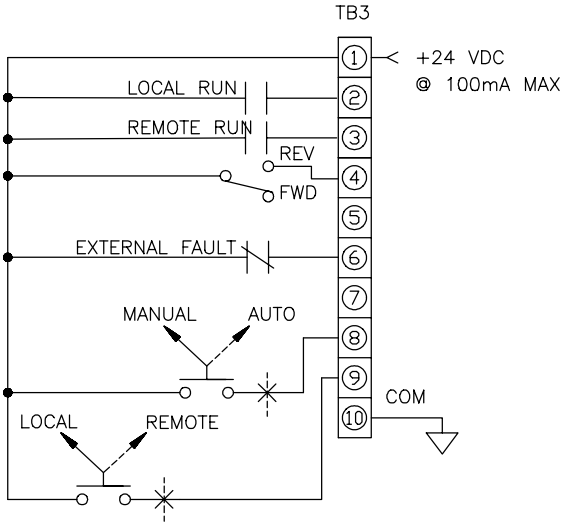


Figure 2-7h.
HVAC L/R A/M#4 L2 R3
2-Wire Local / 2-Wire Remote Control



END INSTALLATION AND WIRING SECTION

3.0 REAL-TIME OPERATOR MODULE

3.1 ROM DESCRIPTION

This section gives a brief description of the various controls and indicators on the Real-time Operator Module (ROM). The material presented here must be understood before the user proceeds to the "Quick Setup" section.

The ROM, in its standard configuration, is mounted to the enclosure door. For applications where the drive is mounted in another enclosure (e.g. NEMA 12), the ROM can be remotely mounted as far as forty feet from the control board.

The ROM can be viewed as having two sections; a Display Panel and a Control Panel. The Display Panel provides access to program and to view the various Drive parameters. The Control Panel allows various drive functions to be controlled such as starting and stopping as well as displaying the drive status.

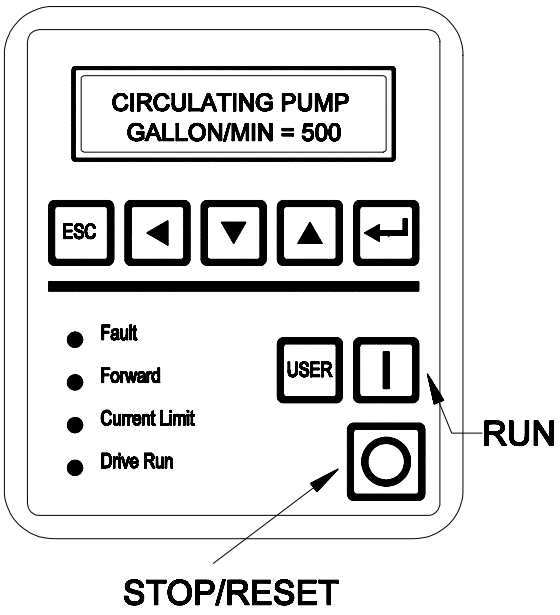


Figure 3-1
ROM Front Panel

3.2 DISPLAY PANEL KEY DESCRIPTIONS:

ESCape
When pressed, the ESCape key will cause the next level up menu line to be displayed when navigating the menu tree or will abort the editing of a given parameter (restoring the original value if the parameter is R/W) if in the edit mode. Repeated pressing of the ESCape key will cause the display to return to the top of the menu tree, showing "Top of List" on line 1 of the display along with top level menu lines shown on line 2 of the display.

Enter
Pressing the enter key while on a menu item line will take the user to the next lower menu. If editing a parameter, pressing the enter key will cause the value displayed to be saved in battery-backed RAM. If in the MOP mode, the display will return to the "Powerup Display".

Up/Down Arrow Keys
These keys are used to move up and down the menu tree or to increment or decrement the value of a parameter. Also simultaneous activation of both the Up and Down Arrow keys puts the drive into the "Motor Operated Potentiometer" (MOP) mode . The MOP mode allows the KEYPAD FREQ REF (#52) to be increased or decreased by use of the Up and Down Arrow keys.

Left Arrow Key
Pressing the left arrow key when in edit mode moves the flashing cursor left to the next decade of the parameter to be increased or decreased by the up or down arrow keys respectively. When reaching the extreme left travel, further pressing of the left arrow key "wraps" to extreme right decade position.

3.3 CONTROL PANEL KEY AND LED DESCRIPTIONS:

Run
The Run key will start the drive if no other Stop commands are present and the "serial run cntl" parameter is enabled. The "serial run cntl" parameter is enabled for the default "Industrial" pre-programmed setup as well as for "3-wire" HOA "Hand" mode and "3-wire" L/R A/M "Local" mode. Refer to sections 2.10.4.1
and 2.10.4.2 for ROM operation with pre-programmed setups.

Stop/Reset
If the drive is running, pressing the Stop/Reset key will cause the drive to stop if the "serial stop cntl" parameter is enabled. The "serial stop cntl" parameter is enabled for the default "Industrial" pre-programmed setup as well as for "3-wire" HOA "Hand" mode and "3-wire" L/R A/M "Local" mode. Refer to sections 2.10.4.1
and 2.10.4.2 for ROM operation with pre-programmed setups.

If the drive has stopped due to a fault, pressing the Stop/Reset key will clear the fault and reset the drive.

User

The User key can take on a number drive functions such as Jog and Fwd/Rev. It is programmable by the user.

Fault LED

The Fault LED becomes lit upon generation any fault and remains lit until the drive is reset either by way of the Stop/Reset key or a terminal block reset button. Simultaneous with the illumination of the Fault LED the appropriate Fault message is put out on the display.

NOTE

Pressing any Display Panel key will clear the fault message allowing normal use of the display. However, until the drive is reset, the fault remains uncleared and the Fault LED will remain lit.

Forward LED

The Forward LED becomes lit upon command for the drive to run in the forward direction. This may be achieved by way of the programmable User key or from a terminal block input. When this LED is not lit, the drive is being commanded to run in the reverse direction.

Current Limit LED

This LED is lit whenever the drive is in current limit.

Drive Run

This LED indicates when the drive is running.

4.0 START-UP AND QUICK SETUP

The "Factory Default" settings for the drive have been purposely setup to make the "Start-Up and Quick Setup" as simple as possible. Even for advanced users, going through this procedure is a quick and simple way to verify proper drive operation and it provides a good starting platform for more advanced setups.

This Start-Up and Quick Setup procedure covers only the most commonly adjusted parameters, all of which appear in the "QUICK SETUP" menu.

WARNING

THE FOLLOWING PROCEDURES SHOULD ONLY BE PERFORMED AFTER A COMPLETE REVIEW OF THE INSTALLATION SECTION OF THIS MANUAL. THIS SECTION CONTAINS WARNINGS, INITIAL CHECKS, WIRING INSTRUCTIONS AND OTHER INFORMATION CRITICAL TO THE SUCCESSFUL STARTUP OF THE DRIVE. PAY PARTICULAR ATTENTION TO THE "WARNING" AND "CAUTION" NOTES.

Power must be applied to the drive to perform the following procedure. Some of the voltages present are at the incoming line potential. To avoid electric shock hazard or damage to equipment, only qualified service personnel should perform the following procedure. Thoroughly read and understand the procedure before beginning. If an event does not occur while performing this procedure, **Do Not Proceed. Remove Power** by opening the branch circuit disconnect device and correct the malfunction before continuing.

NOTE

Power must be applied to the drive when viewing or changing Phoenix parameters. Previous programming may affect the drive status when power is applied. If the state of the parameters is in question, load "FACTORY DEFAULTS" as detailed in section 5.0, "Drive Programming" before proceeding.

Remote start circuits may be connected to TB3 of the control board. Confirm that all circuits are in a de-energized state before applying power. User supplied voltages may exist at TB3, even when power is not applied to the drive.

Refer to section 6.0, "Maintenance & Troubleshooting" for fault message information

The following procedure describes starting and stopping the drive using the ROM Run and Stop keys. The drive frequency reference can be controlled either by using the ROM "Motor Operated Potentiometer" (MOP) mode or an analog reference.

4.1 START-UP PROCEDURE FOR RUNNING DRIVE WITH MOP OR SPEED POT:

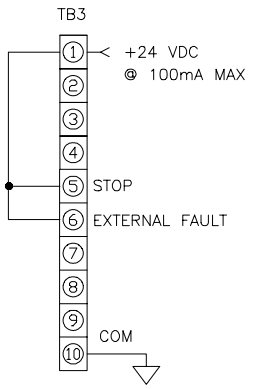
4.1.1 Wiring Checks - Motor Disconnected:

1. Verify that AC line power at the disconnect device is within the rated value of the drive. If a control interface option is installed, verify that the control power to this board matches the board rating.

2. Remove and lock-out all incoming power to the drive including incoming AC power to terminals L1, L2 and L3 plus any separate control power for remote interface devices. Open the drive door and disconnect the motor leads from terminals U, V and W.

3. Verify that the "Stop" and "External Fault" interlocks are installed. If not, connect jumpers between TB3-1, TB3-5 and TB3-5, TB3-6 as shown in Figure 3-1 below. If a Speed Pot is desired for frequency reference control instead of the MOP, wire it to TB5-1, TB5-2 and TB5-3. Reference the "Recommended Control Signal Wiring" diagram, Figure 2-5.

Figure 3-1
Control Wiring for ROM MOP Operation



4. Check for earth ground faults with an ohmmeter. A very high resistance of over 1 megohm should be measured from earth ground to all terminals. If there is a low reading, investigate before proceeding. If all readings are high, then power can be applied.

5. Apply AC power and control voltages to the drive.

4.1.2 Drive Programming:

1. On power-up, the LCD Display should light and show the default Powerup Display. Press the ESCape key until you see "Top Of List" on the ROM display Press the Up/Down Arrow keys until you see the "QUICK SETUP" menu line. Press the Enter key to get into this menu. You are now ready to edit the following parameters if necessary.

2. Use the UP/Down Arrow key to view each parameter listed below and observe its value. If you like what you see, go on to the next parameter. If you want to change the value of a parameter, press the Enter key and using the Left and Up/Down Arrow keys to get the value you want. Save the value to battery-backed Ram by hitting the Enter key, then proceed to the next parameter. The following parameters are found under the "QUICK SETUP" menu when in level 2 security:

   RATED LINE VOLTS (#61)
   MOTOR HORSEPOWER (#65)
   MOTOR VOLTAGE (#66)
   BASE MOTOR FREQ (#67)
   MOTOR CURRENT (#68)
   MOTOR CURR LIMIT (#111)
   FREQ REF SOURCE (#49)
   ACCEL RATE (#50)
   DECEL RATE (#51)
   UPPER FREQ LIMIT (#234)
   MIN OUTPUT FREQ (#53)

3. Make sure that the "PREPROG I-O LIST" parameter (# 264) under the "PRE-PROGRAMD I-O" menu is still set to the default setting of "INDUSTRIAL".

4. Check the "MAN REF SOURCE" parameter (#276) under the "CUSTOM I-O" menu and be sure it is still set to "KEYPAD FREQ REF" for MOP operation. If a Speed Pot is desired, set parameter #276 to "ANALOG REF #1" and change the "PREPROG I-O LIST" parameter (# 264) from "INDUSTRIAL" to "IN CUSTOM I-O".

4.1.3 Remove Power

Remove and lock-out the input and control power to the drive. When the ROM Display is no longer illuminated, open the drive door.

WARNING

TO AVOID A HAZARD OF ELECTRIC SHOCK, AFTER THE INPUT AND CONTROL POWER IS REMOVED FROM THE DRIVE AND THE ROM DISPLAY IS NO LONGER LIT, WAIT FIVE (5) MINUTES FOR BUS CAPACITORS TO FULLY DISCHARGE.

4.1.4 Reconnect Motor:

WARNING

In the following steps, rotation of the motor in an undesired direction can occur. To guard against possible equipment damage, it is recommended that the motor be disconnected from the load before proceeding.

1. Reconnect motor leads and close drive door.

4.1.5 Check for Correct Motor Rotation:

1. Reapply power to the drive

2. Verify that the drive target frequency is at zero Hz.

   If using a Speed Pot adjust it full counter-clockwise.

   For MOP frequency reference control, press the Up Arrow and Down Arrow Control Panel keys simultaneously. This displays the "KEYPAD FREQ REF" parameter in edit mode. Simply then use the Display Panel Left Arrow key to select the desired decade and the Down Arrow key to decrease the parameter value to zero. When finished adjusting speed, pressing the Enter key exits the MOP mode and returns to the Power-up Display.

3. Using the Forward LED on the ROM Display Panel verify that the forward direction is selected. (LED should be illuminated).

4. Start the drive using the ROM Run key. Slowly increase the drive speed with either the Speed Pot or by the MOP until the motor begins to turn. Note the direction of motor rotation, then stop the drive using the ROM Stop key. If the direction of rotation is correct, proceed on to section 4.1.6, "Check for Proper Operation".

If the direction of motor rotation is incorrect, remove and lock-out input and control power to the drive. When the ROM is no longer illuminated, wait for five (5) minutes for the bus capacitors to fully discharge. Open drive door and interchange any two of the three motor leads, U, V, or W. Close drive door and repeat steps 2 through 5 to verify correct rotation.

4.1.6 Check for Proper Operation:

1. Start the drive and slowly increase the frequency reference. Check for proper motor operation throughout the speed range.

2. With the drive running at 20 Hz or greater, press the ROM Stop key and verify that the correct stopping mode has been programmed.

3. This completes the "Startup and Quick Setup" procedure. Depending on your application, further parameter programming may be required. Refer to the Programming section of this manual for more information.

   If you like what you see now, save your setup to serial eeprom. Do this by pressing the ESCape key until "Top of List" is observed and the use the UP/Down Arrow keys until "SAVE PARAMETERS" is displayed. Press the Enter key and you will then see the parameter, SAVE TO EEPROM? (#201). Press the Enter key again and use the Up Arrow key to change "NO" to "YES". Press the Enter key. After successful writing of all the parameters to serial eeprom the message, "DATABASE LOAD SUCCESSFUL!" will be put out on the display. Press the ESCape key repeatedly to get to "Top of List".

   That's all there is to it! Remember, use the Run and Stop Display Panel keys to control the drive. **For MOP frequency reference control, press the Up Arrow and Down Arrow Control Panel keys simultaneously.** This displays the "KEYPAD FREQ REF" parameter in edit mode. Simply then use the Display Panel Left Arrow key to select the desired decade for a fine or coarse MOP increment and the UP / Down Arrow keys to increase or decrease the drive speed. When finished adjusting speed, pressing the Enter key exits the MOP mode and returns to the Power-Up Display . Note that once the MOP increment is selected using the Left Arrow key, it need not be set again - the control remembers the position. Anytime the drive speed needs to be further adjusted, just repeat the simultaneous UP / Down Arrow key entries to get back into the MOP mode.

END START-UP AND QUICK SETUP

5.0 DRIVE PROGRAMMING

This section gives complete details on programming the PHOENIX Drive. It gives information on the parameter menu trees and complete details on all user programmable parameters. Most users will never need to know the level of detail expressed in this section.

It is assumed that the user has already performed the following sections prior to this point:

1. Section 2.0, "INSTALLATION AND WIRING"
2. Section 3.0, "REAL-TIME OPERATOR MODULE"
3. Section 4.0, "START-UP AND QUICK SETUP"

The simplest way to setup your PHOENIX Drive for any application, is to scroll through the major menu tree categories from the "Top of List" using the ROM. The complete menu tree is shown in Table 5-1. The menu item names and parameters have been carefully chosen so that everything involving the drive programming feels very intuitive and "works like you think it should work". A quick study of the parameter tree and actual use of the ROM several times you probably will never have to refer to this section again except for fine details on a given parameter.

5.1 POWER-UP DISPLAY

When AC power is applied to the drive, if there are no faults present, the user definable Power-Up Display will appear on the ROM LCD display. The user can program lines 1 and 2 of the Power-Up Display using the "PWRUP 1 DISPLAY" (#196) and "PWRUP 2 DISPLAY" (#197) parameters. There are a number pre-formatted signals to chose from or users can create their own using the Power-Up Display in conjunction with the PROGRAM DISPLAY menu. The PROGRAM DISPLAY menu deals with parameters 212 through 219.

5.2 ENTERING SECURITY CODES

Each access level of the drive menu tree can have its own associated security code. The higher the access level, the more complex the parameter usage and higher the skill level that is required by the user.

The security code for a given level must be entered through the ROM display panel before menu levels and parameters of that level and lower can be viewed on the display. By providing a separate security code for each access level, different levels of security can be provided to prevent unauthorized access and possible tampering with various parameters.

The factory default for the access code is 0 for level 2, which is the highest access level. Since the software defaults to code 0 on every power-up, level 2 will always be available without re-entering the Security Code.

Access level 0 is the least sensitive level. The only parameters visible are in menu's:

METERING
SECURITY CODE

Access level 1 Refer to Table 5-1 to see the level 0 and level 1 parameters you will be able to access.

LEVEL 1 CODE
XXXX

Access level 2 is the highest level allowing access to all level 0, level 1 and level 2 menu's and parameters. Refer to Table 5-1 to see the level 0, level 1 and level 2 parameters you will be able to access.

LEVEL 2 CODE
XXXX

If you wish to change the Security Codes to those of your own, proceed to step 1. If not, press the ROM ESC key to return to "Top of List".

1. **To Enter Custom Security Codes** for access levels 1 and 2 Proceed as follows:

    A. Using the ROM Up and Down Arrow keys, scroll up or down until LEVEL 1 CODE or LEVEL 2 CODE appears on the top line of the display, depending on which code you wish to change.

    B. Press the ROM Enter key and enter your custom code. Then press the Enter key again.

    C. If you are entering a new Security Code for an access level that you are presently at, you must be careful. As soon as you enter the new Security code, record it immediately. As soon as the ROM ESC key is pressed or a fault or power loss occurs, the software defaults to the level 0 Security Code. To regain access to level 1 or level 2 parameters, you must enter your new custom code.

NOTE

If desired, you can program a custom Security Code for given level to zero. Since the software defaults to the level 0 Security Code on power-up, that access level will always be available without re-entering the Security Code.

D. Press the ROM ESC key as many times as necessary to return to "Top of List".

5.3 ADVANCED DRIVE PROGRAMMING

For more advanced applications involving drive features such as custom V/Hz curves, Auto Restart or programming the drive input contacts, a number of interdependent parameters are usually involved. The following sections are provided to give the user greater detail than that provided in Table 5-2.

5.3.1 Frequency Reference Definitions

For the digital and analog references found under the "DIGITAL REFS" and "ANALOG REFS" menu's, there are several terms that must be understood.

Reference Direction Control

Every analog and digital reference (except the preset frequencies) has a direction parameter associated with it. An example of such a parameter is JOG FREQ REF DIR(#266). The programming choices for this direction parameter is:

- **REVERSE LOCKOUT** - This means that only forward or positive reference values are allowed.
- **FORWARD LOCKOUT** - This means that only reverse or negative reference values are allowed.
- **NO LOCKOUT** - Both forward (positive) and reverse (negative) reference values are allowed. This may also be referred to as "bipolar".
- **FWD/REV SWITCH** - The reference direction or polarity is controlled by the contact input forward/reverse.

Note that all the drive references are limited by the UPPER FREQ LIMIT(#234) and MIN OUTPUT FREQ(#53) with the following exception: when the reference direction is set to "NO LOCKOUT", only the UPPER FREQ LIMIT(#234) parameter applies. This is because discontinuities around zero for bipolar references would exist if the MIN OUTPUT FREQ(#53) was applied.

Reference Scaling

In addition to direction, the analog and external frequency references have scaling parameters for incoming values that correspond to minimum and maximum drive output frequency. Below two examples are listed:

Bipolar -10 volt to +10 volt Speed Pot

Program:
REF1: V AT MIN F (#91) = 0.0 volts
REF1: V AT MAX F (#92) =11.0 volts
REF1: DIRECTION (#90) = NO LOCKOUT
MIN OUTPUT FREQ (#53) = 0.0

Unipolar Speed Pot with 10% Minimum and 100 % Maximum Values and Fwd/Rev Switch

Program:
REF1: V AT MIN F (#91) = 0.0 volts
REF1: V AT MAX F (#92) =11.0 volts
REF1: DIRECTION (#90) = FWD/REV SWITCH
UPPER FREQ LIMIT (#234) = 60.0 HZ
MIN OUTPUT FREQ (#53) = 6.0 HZ

4-20MA Input Signals

A special case of interest is for 4-20ma analog input signals. Referring to Figure 2-5, note that a 4-20ma signal is connected between TB5-6 (IN_4_20MA) and TB5-7 (COM). There is also a jumper connected between TB5-6 AND TB5-4 (AREF#2). A 500 ohm dropping resistor converts the current signal to a voltage signal that ranges from 2 to 10 volts. For this case, REF2: V AT MIN F(#94) would be programmed to 2.0 volts and REF2: V AT MAX F(#95) would be programmed to 11.0 volts.

V/Hz Curves

The V-HZ PROGRAMMING menu consists of three sub-menu's:

VIEW V-HZ CURVE
CUSTOM VHZ CURVE
CURVE SELECTION

The **"VIEW V-HZ CURVE"** menu allows the user to **view** the six(6) **read only** parameters that define the three(3) curve points of the selected V/Hz curve as set by the VHZ CURVE LIST(#81) parameter. The six(6) **read only** parameters are #69 through #74.

The **"CUSTOM VHZ CURVE"** menu allows the user to program his own custom V/Hz curve by programming these three(3) curve points using the six(6) **read/write** parameters, #75 through #80. See Figure 5-1 for definition of these parameters.

The **"CURVE SELECTION"** menu has the single parameter, VHZ CURVE LIST(#81) which allows selection of one of the nine(9) pre-programmed curves or selection of the user programmable custom curve. Refer to Figures 5-2a. through 5-2i for various constant torque and variable torque applications. Note that Pre-programmed Curve 1 (Figure 5-2a.) is the default curve.

The degree to which the V/Hz curves can be altered depends on the access level the drive is at. In access level 1, the user can only view the active V/Hz curve. In access level 2, the user may select one of nine(9) pre-programmed curves or create his own "Custom Curve".

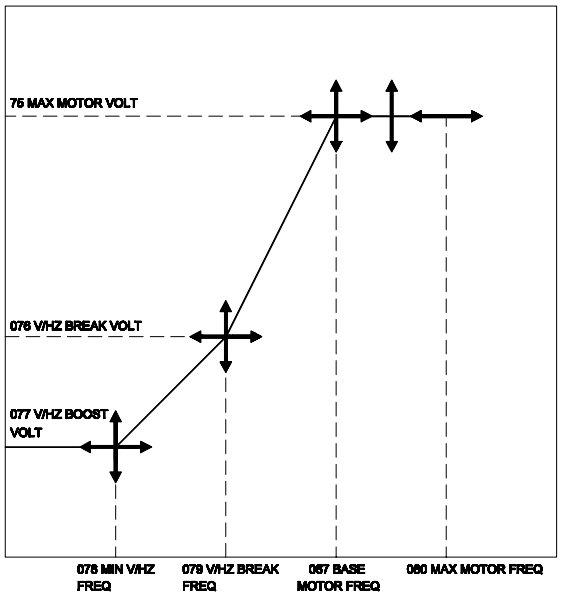


Figure 5-1
CUSTOM VHZ CURVE
Parameter Definition

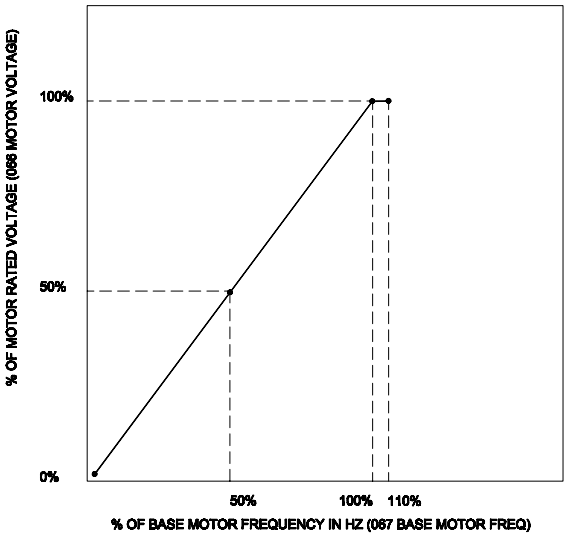


Figure 5-2a.
Pre-Programmed Curve 1
Typical Constant Torque Application
Max Output Frequency = 1.1x Motor Rated Frequency

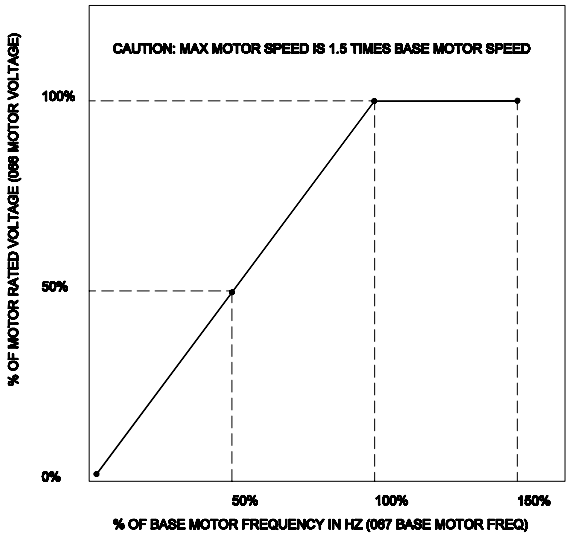


Figure 5-2b.
Pre-Programmed Curve 2
(Typical Constant Torque Application)
Max Output Frequency = 1.5 x Motor Rated Frequency

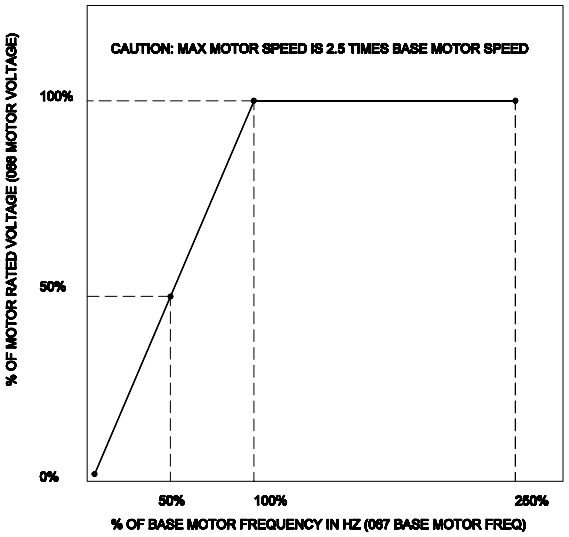


Figure 5-2d.
Pre-Programmed Curve 4
(Typical Constant Torque Application)
Max Output Frequency = 2.5 x Motor Rated Frequency

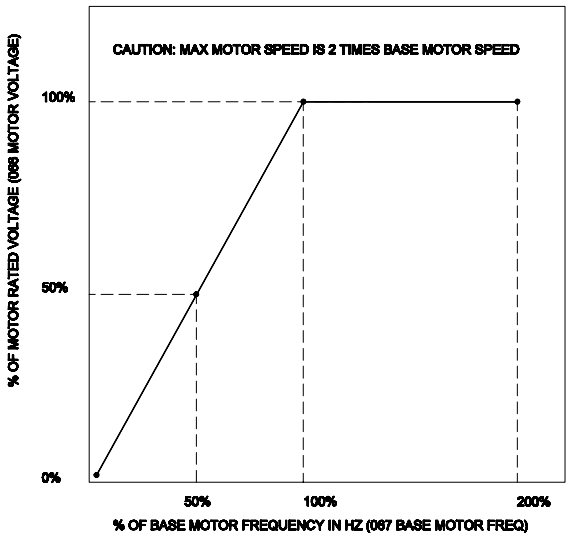


Figure 5-2c.
Pre-Programmed Curve 3
(Typical Constant Torque Application)
Max Output Frequency = 2.0 x Motor Rated Frequency

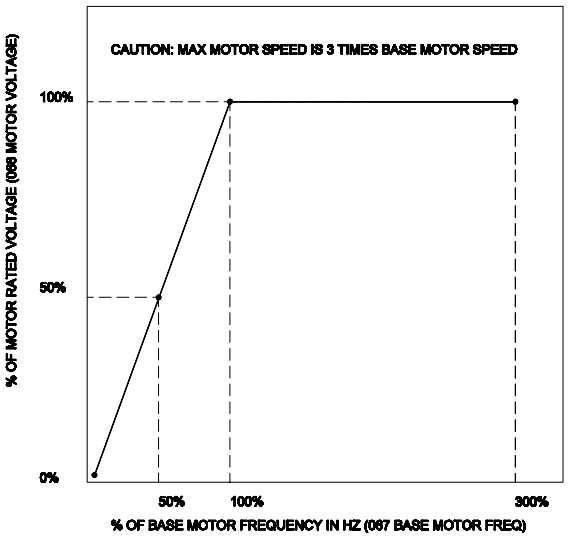


Figure 5-2e.
Pre-Programmed Curve 5
(Typical Constant Torque Application)
Max Output Frequency = 3.0 x Motor Rated Frequency

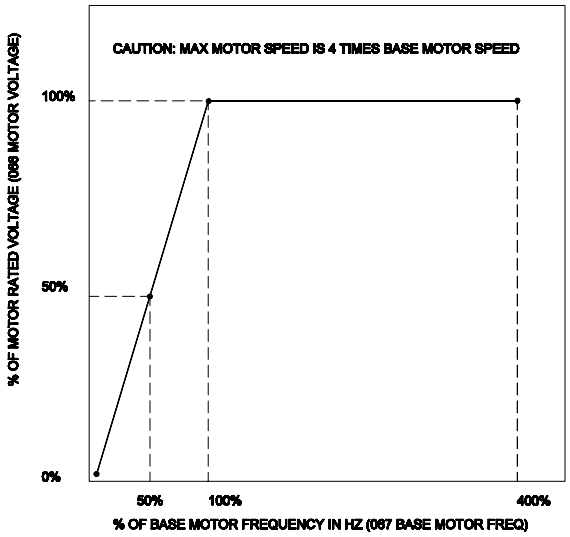


Figure 5-2f.
Pre-Programmed Curve 6
Typical Constant Torque Application
Max Output Frequency = 4.0 x Motor Rated Frequency

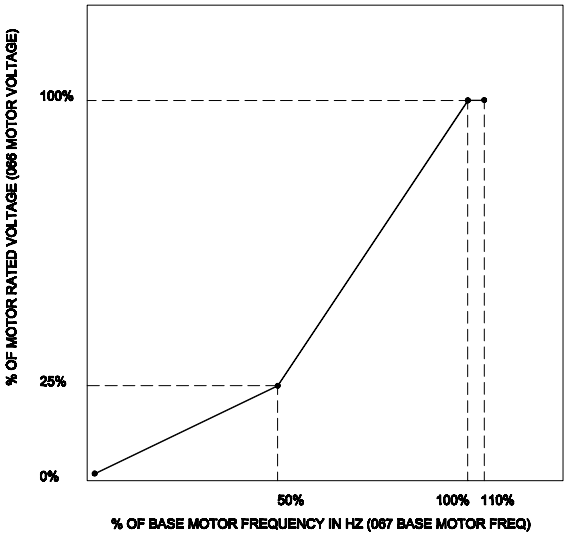


Figure 5-2h.
Pre-Programmed Curve 8
Variable Torque Fan or Pump Application
(25% rated voltage at 50% base frequency)

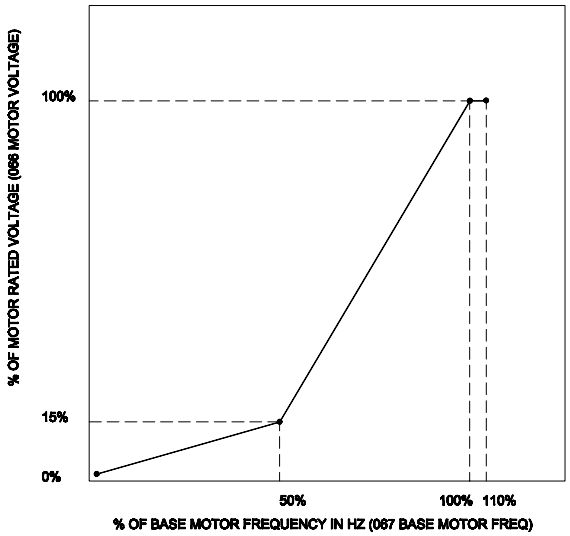


Figure 5-2g.
Pre-Programmed Curve 7
Variable Torque Fan or Pump Application
(15% rated voltage at 50% base frequency)

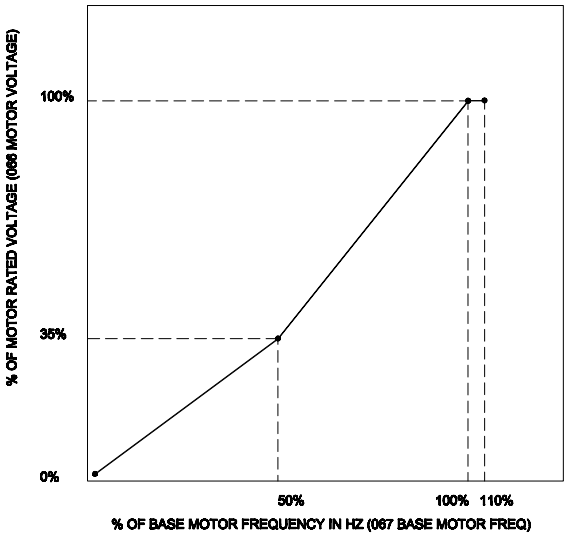


Figure 5-2i.
Pre-Programmed Curve 9
Variable Torque Fan or Pump Application
(35% rated voltage at 50% base frequency)

5.3.3 PWM Carrier Programming

The **PWM CARRIER PROG** menu allows the user to program his own custom variable PWM carrier curve. The curve is defined by three(3) points using the six(6) parameters #105 through #110. See Figure 5-3 for definition of these parameters. For most applications, the "Factory Defaults" supplied settings are the satisfactory. For special applications, consult the factory. Higher than necessary carrier frequencies cause more noise emissions and higher switching losses in the drive output power transistors.

This menu is only available to users with level 2 access.

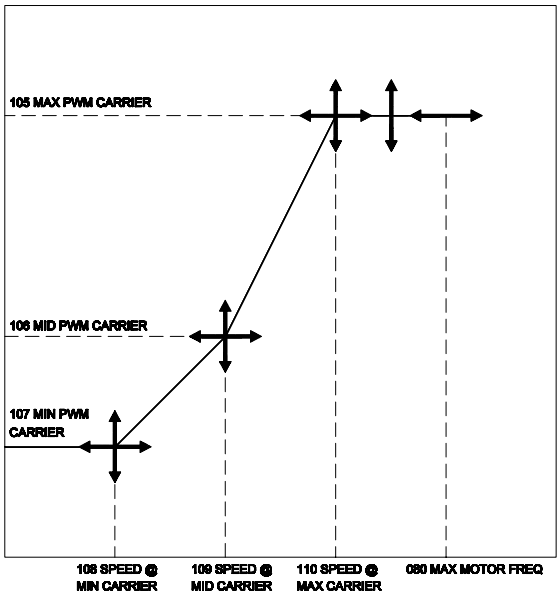


Figure 5-3
PWM CARRIER CURVE
Parameter Definition

5.3.4 Flycatcher (Catch a Spinning Motor)

The "Flycatcher" (catch a spinning motor) option is enabled by setting the FLYCATCH ON/OFF?(#151) parameter to "ON".

This option is most useful for high inertia loads, where a loss of AC power while the drive is running results in the motor coasting for a long period of time. It is also useful for applications where the load can "overhaul" (spin) the motor before the drive is started.

When starting a motor with the Flycatcher option off, the initial speed reference is zero and it ramps up to the speed target reference, under full dynamic control, as set by the drive accel rate. When starting this way at zero motor speed, normal motor speed control can be expected. However, if the drive is started with the motor still spinning, the initial speed target of the drive will "jerk" the motor speed to zero and then ramp it up to the target speed reference. This condition is also known as "plugging" the motor. This action may be damaging to the system's mechanical linkages.

With the Flycatcher option active, the drive starts at the last known speed target (or maximum motor speed when starting first time after loading defaults) and at zero stator current. While the drive ramps down the drive frequency "looking" for the rotor frequency, it regulates the stator current from the initial level of zero to rated motor current.

When the drive determines that the present output electrical frequency of the drive equals the rotor speed of the motor, it switches the drive from flycatcher mode to run mode.

5.3.5 Auto Restart

The AUTO RESTART menu contains the following parameters:

- **AUTO RST ON/OFF (#150):** Use this parameter to enable or disable the Auto Restart feature.

- **AUTO RST AFTER? (#189):** Use this parameter to define the conditions under which the Auto Restart feature will be engaged. The selection choices are:

  NEVER: Disables Auto Restart function.

  All FAULTS: Drive restarts after any VFD fault.

  VFD FAULTS ONLY: Drive restart after Internal VFD faults only (not after AC power-fail).

  AC PWR LOSS ONLY: Drive restart only after AC power loss.

- **ATTEMPT WINDOW (#190):** Use to set the amount of time after which the drive will stop trying to restart during a fault condition. If a fault condition lasts longer than the selected window value, the Auto Restart feature will be disabled and an "AUTORESTART FLT" fault will occur.

- **ATTEMPT INTERVAL(#191):** Use to set the time interval between Auto Restart attempts. Note that this interval must be smaller than the "ATTEMPT WINDOW (#190)", or the drive will never attempt to restart. If the drive is still attempting to restart after the end of the "ATTEMPT WINDOW (#190)", an "AUTORESTART FLT" fault will occur.

- **AUTOSTARTS / DAY(#192):** Sets the number of successful restarts to be allowed in 24 hour period.

5.3.6 Motor Overload

The Motor Overload protection provided by the PHOENIX drive is a fully programmable speed sensitive algorithm that complies with N.E.C. Article 430.

The MOTOR OVERLOAD menu consists of three(3) parameters:

IxT OVRLOAD TIME(#119)
IxT BREAK FREQ(#269)
IxT ZER FRQ THLD(#270)

By proper programming of these parameters, class 10, class 20 or class 30 thermal protection for either general purpose self-cooled (TEFC) motors or Blower-Cooled (TENV) motors can be obtained.

See Figure 5-4a. for graphical definition of the IxT BREAK FREQuency(#269) and IxT ZERo FREQuency THreshoLD(#270) parameters. These two parameters define the continuous operation zone of the motor.

The IxT OVeRLOAD TIME(#119) parameter determines how long the motor can run outside the continuous operation zone before it will thermally trip. By setting this parameter for 120, 180, or 300 seconds respectively, class 10, class 20, or class 30 overload protection is achieved. Refer to Figure 5-4b. for thermal overload trip times for these different classes of protection. Note that Figure 5-4b. show thermal trip times for a blower-Cooled (TENV) motor.

General purpose (TEFC) motors cannot run at high torque levels while at low speed continuously. This is because the cooling for the motor is supplied by a fan that is driven by the motor shaft. As the speed of the motor decreases, the flow of air supplied by the fan decreases and the less cooling there is. For this type of motor, the proper motor thermal overload protection curve can be matched to the motor thermal time constant by setting the IxT ZERO FRQ THLD(#270) parameter to 60% and the IxT BREAK FREQ(#269) parameter to 100%. This means at zero speed the motor can safely draw 60% rated motor current indefinitely without overheating. At base speed, the motor can safely draw its full load rated current due to full cooling capability. Refer to Figure 5-4c. for class 10 thermal trip curves for this type of motor.

For Blower-Cooled (TENV) motors, running at high torque levels at low speed can be tolerated. This is because the cooling for the motor is supplied by a separately powered blower that provides the same volume of cooling air, regardless of the motor speed. For this type of motor, the proper motor thermal overload protection curve can be matched to the motor thermal time constant by setting the IxT ZERO FRQ THLD(#270) parameter to 100% and the IxT BREAK FREQ(#269) parameter to 100%. This means at zero speed, the motor can safely draw 100% rated motor current indefinitely without overheating. At base speed, the motor can safely draw its full load rated current due to full cooling capability. Refer to Figure 5-4d. for class 10 thermal trip curves for this type of motor.

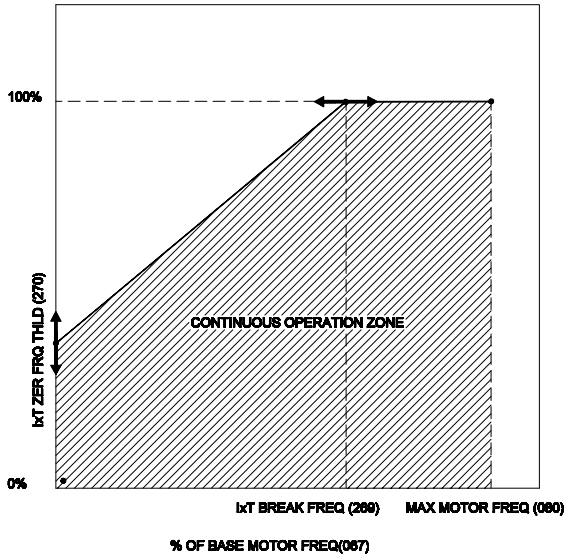


Figure 5-4a.
Motor Thermal Continuous Operation Zone

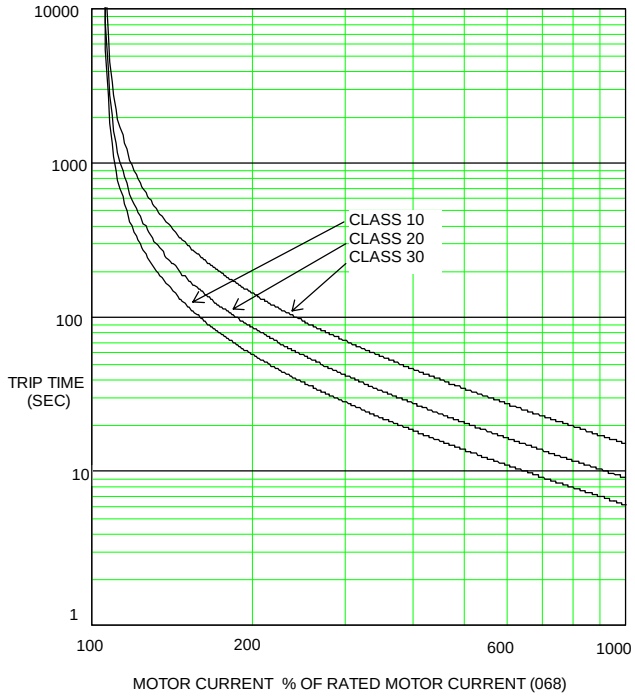


Figure 5-4b.
Thermal Trip Curves for Various Classes for Blower-Cooled (TENV) Motor

Conditions:
IxT OVRLOAD TIME (#119) = 120 SEC (CLASS 10)
IxT OVRLOAD TIME (#119) = 180 SEC (CLASS 20)
IxT OVRLOAD TIME (#119) = 300 SEC (CLASS 30)

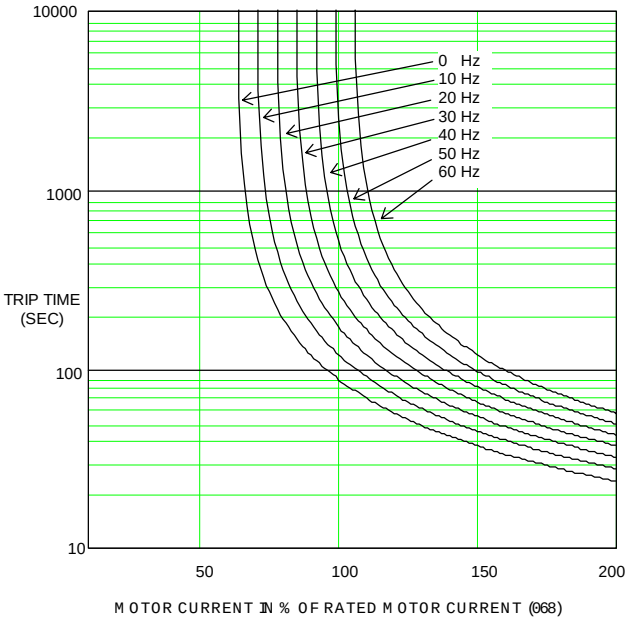


Figure 5-4c.
Motor Thermal Trip Curves for General Purpose (TEFC) Motor

Conditions:
IxT ZER FRQ THLD (#270) = 60%
IxT OVRLOAD TIME (#119) = 120 SEC (CLASS 10)
IxT BREAK FREQ (#269) = 60Hz

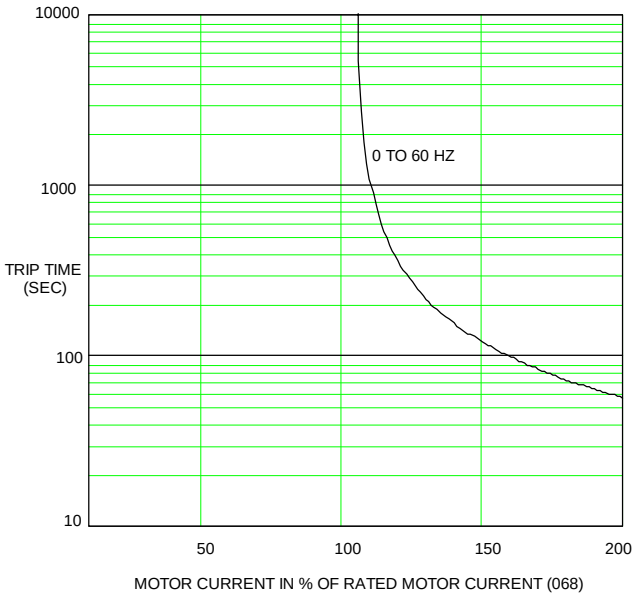


Figure 5-4d.
Motor Thermal Trip Curve for Blower-Cooled (TENV) Motor

Conditions:
IxT ZER FRQ THLD (#270) = 100%
IxT OVRLOAD TIME (#119) = 120 SEC (CLASS 10)
IxT BREAK FREQ (#269) = 60Hz

5.3.7 Preset Speeds

The user can program up to 8 preset speeds using from one(1) to three(3) input contacts. These contacts must be selected by programming available CUSTOM I-O parameters in the range of #256 through #261. The preset speed values are set by use of parameters #181 through #188.

- Use 1 input contact (BIT0) for 2 preset speeds:

  PRESET FREQ#1(#181)
  PRESET FREQ#2(#182)

- Use 2 input contacts (BIT0, BIT1) for 4 preset speeds:

  PRESET FREQ#1(#181)
  PRESET FREQ#2(#182)
  PRESET FREQ#3(#183)
  PRESET FREQ#4(#184)

- Use 3 input contacts (BIT0, BIT1 & BIT 2) for 8 preset speeds:

  PRESET FREQ#1(#181)
  PRESET FREQ#2(#182)
  PRESET FREQ#3(#183)
  PRESET FREQ#4(#184)
  PRESET FREQ#5(#185)
  PRESET FREQ#6(#186)
  PRESET FREQ#7(#187)
  PRESET FREQ#8(#188)

Preset Speed Selection

PRESET FREQ BIT2	PRESET FREQ BIT1	PRESET FREQ BIT0	Drive Speed
0	0	0	PRESET FREQ #1
0	0	1	PRESET FREQ #2
0	1	0	PRESET FREQ #3
0	1	1	PRESET FREQ #4
1	0	0	PRESET FREQ #5
1	0	1	PRESET FREQ #6
1	1	0	PRESET FREQ #7
1	1	1	PRESET FREQ #8

The FREQ REF SOURCE(#49) parameter must also be set to “INPUT CONTACTS” for the presets to be selected. Refer to Table 5-3, “Parameter Definitions” for complete details.

NOTE

You need to go to the PREPROG I-O LIST(#264) parameter and change the selection to “IN CUSTOM I-O” for the software to accept your CUSTOM I-O changes.

5.3.8 MOP Function

The MOP (motor operated potentiometer) function is available using two(2) different methods. The first method uses the Real-time Operator Module (ROM) to increase or decrease the KEYPAD FREQ REF(#52) by way of the Up/Down Arrow keys. Refer to section 4.1 for wiring and programming details.

The second method uses increase/decrease pushbuttons connected to TB3 and assignable to any of the available programmable input contacts found under the CUSTOM I-O menu. The MOP Functions as reference “increase” and “decrease” for digital references only. The FREQ REF SOURCE(#49) parameter must be set to either “KEYPAD FREQ”, JOG FREQ REF, or “SERIAL COM REF. The “MOP INC” and “MOP DEC” pushbuttons must not be pressed at the same time or no action will occur.

The target reference is increased/decreased at the rate of 1 Hz/second of pushbutton activation. The MOP functions whether the drive is in "Run" or "Stop" mode. Remember that the MOP will not operate unless The FREQ REF SOURCE(#49) parameter is set to either "KEYPAD FREQ", JOG FREQ REF, or "SERIAL COM REF.

5.3.9 Critical Speed Rejection

The CRITICAL FRQ REJ menu contains the following parameters:

FREQ REJECT #1 (#175)
FRQ REJECT BW #1 (#176)
FREQ REJECT #2 (#177)
FRQ REJECT BW #2 (#178)
FREQ REJECT #3 (#179)
FRQ REJECT BW #3 (#180)

The three(3) "reject" parameters select frequencies to be "skipped over" or rejected by the drive. This means the drive will slew through the "reject" frequencies but will not settle or "lock" onto them. In conjunction with each "reject" frequency there is corresponding "frequency reject bandwidth (BW)" parameter. The "reject" frequencies are centered in the middle of the corresponding "frequency reject bandwidth (BW)" parameter.

5.3.10 Input Contacts

The input contacts are wired to connector TB3 of the drive main control board. Two of the eight inputs are "hard-wired" for "EXTERNAL FAULT" (TB3-6) and "RESET" (TB3-7). Refer "Control Logic and Signal Wiring", Figure 2-5. These two(2) "hard-wired" inputs are checked at interrupt level and are the most secure form of stop that can be used. The remaining terminals of TB3 are fully programmable by the user.

5.3.10.1 Pre-Programmed Setups

In order to help the user more easily setup the drive for a given application, the PHOENIX Drive contains nine(9) pre-programmed I-O setups; one(1) for general industrial use and eight(8) for the Heating, Ventilation, and Air Conditioning industry (HVAC). The user may select any one of these nine setups by simply programming the PREPROG I-O LIST(#264) parameter to the desired setup.

The selection choices for the PREPROG I-O LIST(#264) parameter are:

IN CUSTOM I-O
INDUSTRIAL
HOA#1 H25 A34
HOA#2 H25 A3
HOA#3 H2 A34
HOA#4 H2 A3
L/R A/M#1 L25R34
L/R A/M#2 L25 R3
L/R A/M#3 L2 R34
L/R A/M#4 L2 R3

The wiring information for the above listed pre-programmed setups can be found in Figure 2-5 for the "INDUSTRIAL" setup and Figures 2-7a. through 2-7h. for the HVAC setups. For Full details on the operation of the HVAC pre-programmed setups, refer to the following sections:

2.10.3 "2-Wire and 3-Wire Control"
2.10.4 "Wiring for Pre-Programmed I-O Setups
2.10.4.1 "Hand-Off-Auto"
2.10.4.2 "Local/Remote Auto/Manual

5.3.10.2 Custom I-O

For some applications, you will find that the pre-programmed setups are close to what you need, but you need something a little different from the defaults. This is where the CUSTOM I-O menu comes in. The CUSTOM I-O menu contains the following parameters:

TB-3 TERMINAL 2 (#256)
TB-3 TERMINAL 3 (#257)
TB-3 TERMINAL 4 (#258)
TB-3 TERMINAL 5 (#259)
TB-3 TERMINAL 8 (#260)
TB-3 TERMINAL 9 (#261)
AUTO REF SOURCE (#275)
MAN REF SOURCE (#276)
HOA AUTO REF SRC (#277)
HOA HAND REF SRC (#278)
REF SEL #0 SRC (#279)
REF SEL #1 SRC (#280)
REF SEL #2 SRC (#281)
REF SEL #3 SRC (#282)

Parameters #256 through #261 program the individual TB3 terminals. Refer to those parameters in Table 5-3, "Parameter Definitions" for all the selection choices.

When programming the terminals, your pin programming choice may appear to be rejected (choice reverts to “none” when the ROM Enter key is pressed). If this happens you are attempting to select a conflicting function. For example, two Fwd/Rev switches are not allowed because they could “disagree”. Similarly, HOA pins and Auto/Manual pins conflict because they both switch target references.

Parameters #275 through #282 program the target reference sources for the pre-programmed I-O setups. Refer to those parameters in Table 5-3, “Parameter Definitions” for all the selection choices.

NOTE

You need to go to the PREPROG I-O LIST(#264) parameter and change the selection to “IN CUSTOM I-O” for the software to accept your CUSTOM I-O changes.

NOTE

The FREQ REF SOURCE(#49) parameter must be set to “CONTACT INPUTS” for the target references to be switched properly.

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Table 5-1
Parameter Menu Tree Showing Parameter Numbers and Access Levels

Top of List		Access Level
METERING		**0**
000	POWERUP DISPLAY	0
001	TARGET FREQUENCY	0
002	OUTPUT FREQUENCY	0
274	AC LINE VOLTAGE	0
003	OUTPUT VOLTAGE	0
004	DC BUS VOLTAGE	0
005	DC BUS CURRENT	0
006	MOTOR CURRENT	0
007	PWM CARRIER FREQ	0
008	INPUT POWER	0
230	POWER METER	0
232	RUNNING KWH COST	0
047	SOFTWARE REV NO.	0
009	FAULT MESSAGE	0
010	CLOCK TIME/DATE	0
011	PROG DISPLAY 1	0
012	PROG DISPLAY 2	0
013	DRIVE NAME	0
048	DRIVE MODEL NO.	0
200	DRIVE STATUS	0
QUICK SETUP		**1**
061	RATED LINE VOLTS	1
065	MOTOR HORSEPOWER	1
066	MOTOR VOLTAGE	1
067	BASE MOTOR FREQ	1
068	MOTOR CURRENT	1
111	MOTOR CURR LIMIT	1
049	FREQ REF SOURCE	1
050	ACCEL RATE	1
051	DECEL RATE	1
234	UPPER FREQ LIMIT	1
053	MIN OUTPUT FREQ	1
FREQ REF MENU		**1**
DIGITAL REFS		**1**
052	KEYPAD FREQ REF	1
087	KEYPAD REF DIR	1
055	JOG FREQ REF	1
266	JOG FREQ REF DIR	1
056	SERIAL COM REF	1
088	SERIAL REF DIR	1
221	EXT FREQ @ MIN F	1
237	EXT FREQ @ MAX F	1
220	EXT FREQ DIR	1
238	EXT FREQ UPDATE	1
181	PRESET FREQ #1	1
182	PRESET FREQ #2	1

	183	PRESET FREQ #3	1
	184	PRESET FREQ #4	1
	185	PRESET FREQ #5	1
	186	PRESET FREQ #6	1
	187	PRESET FREQ #7	1
	188	PRESET FREQ #8	1
ANALOG REFS			**1**
	090	REF1: DIRECTION	1
	091	REF1: V AT MIN F	1
	092	REF1: V AT MAX F	1
	135	REF1:FLTR BK FRQ	1
	093	REF2: DIRECTION	1
	094	REF2: V AT MIN F	1
	095	REF2: V AT MAX F	1
	239	REF2:FLTR BK FRQ	1
	096	REF3: DIRECTION	1
	097	REF3: V AT MIN F	1
	098	REF3: V AT MAX F	1
	240	REF3:FLTR BK FRQ	1
DRIVE SIZE-MODEL			**2**
058	DRIVE SIZE		2
059	DRIVE MODEL		2
V-HZ PROGRAMMING			**1**
VIEW V-HZ CURVE			
	069	MAX MOTOR VOLT	1
	070	V/HZ BREAK VOLT	1
	071	V/HZ BOOST VOLT	1
	072	MIN V/HZ FREQ	1
	073	V/HZ BREAK FREQ	1
	074	MAX MOTOR FREQ	1
CUSTOM VHZ CURVE			**2**
	075	MAX MOTOR VOLT	2
	076	V/HZ BREAK VOLT	2
	077	V/HZ BOOST VOLT	2
	078	MIN V/HZ FREQ	2
	079	V/HZ BREAK FREQ	2
	080	MAX MOTOR FREQ	2
CURVE SELECTION			**2**
	081	VHZ CURVE LIST	2
DIGITAL I-O			**2**
INPUT CONTACTS			**2**
PRE-PROGRAMD I-O			**2**
	264	PREPROG I-O LIST	2
CUSTOM I-O			**2**
	256	TB-3 TERMINAL 2	2
	257	TB-3 TERMINAL 3	2
	258	TB-3 TERMINAL 4	2

	259	TB-3 TERMINAL 5	2
	260	TB-3 TERMINAL 8	2
	261	TB-3 TERMINAL 9	2
	275	AUTO REF SOURCE	2
	276	MAN REF SOURCE	2
	277	HOA AUTO REF SRC	2
	278	HOA HAND REF SRC	2
	279	REF SEL #0 SRC	2
	280	REF SEL #1 SRC	2
	281	REF SEL #2 SRC	2
	282	REF SEL #3 SRC	2
OUTPUT CONTACTS			**1**
	085	OUTPUT RELAY 1	1
	086	OUTPUT RELAY 2	1
	271	OUTPUT RELAY 3	1
	272	DIGITAL OUTPUT 1	1
	273	DIGITAL OUTPUT 2	1
SERIAL COM SETUP			**2**
	210	SELECT BAUD RATE	2
	211	DATA FORMAT	2
	198	DRIVE ID NUMBER	1
SERIAL RUN CNTRL			**2**
	202	SERIAL RUN CNTL	2
	204	SERIAL JOG CNTL	2
	205	SERIAL FWD-REV	2
	206	SERIAL AUTO-MAN	2
	265	SERIAL STOP CNTL	2
ANALOG OUTPUTS			**1**
	099	D/A OUT 1 SELECT	1
	100	DA1 V @ 100% OUT	1
	101	D/A OUT 2 SELECT	1
	102	DA2 V @ 100% OUT	1
	103	METER OUT SELECT	1
	104	METER @ 100% OUT	1
PWM CARRIER PROG			**2**
	105	MAX PWM CARRIER	2
	106	MID PWM CARRIER	2
	107	MIN PWM CARRIER	2
	108	SPEED @ MIN CARR	2
	109	SPEED @ MID CARR	2
	110	SPEED @ MAX CARR	2
DRIVE OPTIONS			**1**
MOTOR OVERLOAD			**1**
	119	IxT OVRLOAD TIME	1
	269	IxT BREAK FREQ	1
	270	IxT ZER FRQ THLD	1
FLYCATCHER SETUP			**1**
	151	FLYCATCH ON/OFF?	1
AUTO BOOST			**1**

160	AUTO BOOST VOLT	1
162	AUTO BOOST DELAY	2
132	AUTO BOOST RANGE	2
IR COMPENSATION		**1**
167	IRCOMP % MOTOR V	1
MOTOR SLIP COMP		**1**
170	SLIP COMP % BASE	1
BRAKING SETUP		**1**
149	BRAKING MODE	1
283	BRAKING RESPONSE	1
171	DC BRAKING TIME	1
172	DC BRAKE CURRENT	1
143	DCBRK START FREQ	1
CRITICAL FRQ REJ		**1**
175	FREQ REJECT #1	1
176	FRQ REJECT BW #1	1
177	FREQ REJECT #2	1
178	FRQ REJECT BW #2	1
179	FREQ REJECT #3	1
180	FRQ REJECT BW #3	1
AUTO RESTART		**2**
150	AUTO RST ON/OFF?	2
189	AUTO RST AFTER ?	2
190	ATTEMPT WINDOW	2
191	ATTEMPT INTERVAL	2
192	AUTOSTARTS / DAY	2
PWR METER SETUP		**2**
231	RESET PWRMETER ?	0
233	COST PER KWH	0
PID SETUP		**2**
255	PID CNRL ON/OFF?	2
241	PID SETPT SOURCE	2
243	SET PT SLEW RATE	2
242	PID FDBK SOURCE	2
253	PID CONTROL MODE	2
254	PID OUTPUT MODE	2
244	PID PROP GAIN	2
245	INTEG TIME CONST	2
246	INTEG HI LIMIT	2
247	INTEG LO LIMIT	2
248	DE-INTEG RATE	2
249	DIFF FLTR BK FRQ	2
250	DIFFERNTIAL GAIN	2
251	PID OUT HI LIMIT	2
252	PID OUT LO LIMIT	2
SECURITY CODES		**0**
046	SECURITY CODE	0
193	LEVEL 1 CODE	1
194	LEVEL 2 CODE	2

FAULT RECORDER		**1**
FAULT HISTORY		**1**
026	LAST FAULT	1
027	RECORDED FAULTS	1
028	TIME-DATE STAMP	1
SIGNAL HISTORY		**1**
029	HISTORY SIGNAL 1	1
030	HISTORY SIGNAL 2	1
031	HISTORY SIGNAL 3	1
032	HISTORY SIGNAL 4	1
033	HISTORY SIGNAL 5	1
034	HISTORY SIGNAL 6	1
035	HISTORY SIGNAL 7	1
036	HISTORY SIGNAL 8	1
RECORDER SETUP		**1**
018	HISTORY SELECT 1	1
019	HISTORY SELECT 2	1
020	HISTORY SELECT 3	1
021	HISTORY SELECT 4	1
022	HISTORY SELECT 5	1
023	HISTORY SELECT 6	1
024	HISTORY SELECT 7	1
025	HISTORY SELECT 8	1
USER DEFINABLES		**1**
TIME-DATE-NAME		**1**
015	SET CLOCK TIME	1
016	SET DATE	1
199	EDIT DRIVE NAME	1
POWER-UP DISPLAY		**1**
196	PWRUP 1 DISPLAY	1
197	PWRUP 2 DISPLAY	1
PROGRAM DISPLAY		**1**
212	DISPLAY 1 SIGNAL	1
213	DISPLAY 1 SCALE	1
214	DISPLAY 1 TEXT	1
215	DISPLAY 1 FORMAT	1
216	DISPLAY 2 SIGNAL	1
217	DISPLAY 2 SCALE	1
218	DISPLAY 2 TEXT	1
219	DISPLAY 2 FORMAT	1
RETRIEVE PARAMS		**2**
208	FACTORY/EEPROM ?	2
SAVE PARAMETERS		**2**
201	SAVE TO EEPROM ?	2
ELAPSD TIME DISP		**1**
042	AC POWER ON TIME	1
043	TOTAL RUN TIME	1

MAINTENANCE		**1**
044	COUNTDOWN TIMER1	1
045	COUNTDOWN TIMER2	1

Table 5-2a.
Parameter List in Alphabetical Order

Description	Parameter Number
AC LINE VOLTAGE	274
AC POWER ON TIME	42
ACCEL RATE	50
ATTEMPT INTERVAL	191
ATTEMPT WINDOW	190
AUTO BOOST DELAY	162
AUTO BOOST RANGE	132
AUTO BOOST VOLT	160
AUTO REF SOURCE	275
AUTO RST AFTER ?	189
AUTO RST ON/OFF?	150
AUTOSTARTS / DAY	192
BASE MOTOR FREQ	67
BRAKING MODE	149
BRAKING RESPONSE	283
CLOCK TIME/DATE	10
COST PER KWH	233
COUNTDOWN TIMER1	44
COUNTDOWN TIMER2	45
D/A OUT 1 SELECT	99
D/A OUT 2 SELECT	101
DA1 V @ 100% OUT	100
DA2 V @ 100% OUT	102
DATA FORMAT	211
DC BRAKE CURRENT	172
DC BRAKING TIME	171
DCBRK START FREQ	143
DC BUS CURRENT	5
DC BUS VOLTAGE	4
DE-INTEG RATE	248
DECEL RATE	51
DIFF FLTR BK FRQ	249
DIFFERNTIAL GAIN	250
DIGITAL OUTPUT 1	272
DIGITAL OUTPUT 2	273
DISPLAY 1 FORMAT	215
DISPLAY 1 SCALE	213
DISPLAY 1 SIGNAL	212
DISPLAY 1 TEXT	214
DISPLAY 2 FORMAT	219
DISPLAY 2 SCALE	217
DISPLAY 2 SIGNAL	216
DISPLAY 2 TEXT	218
DRIVE ID NUMBER	198
DRIVE MODEL	59
DRIVE MODEL NO.	48
DRIVE NAME	13
DRIVE SIZE	58
DRIVE STATUS	200
EDIT DRIVE NAME	199
EXT FREQ @ MAX F	237
EXT FREQ @ MIN F	221

Description	Parameter Number
EXT FREQ DIR	220
EXT FREQ UPDATE	238
FACTORY/EEPROM ?	208
FAULT MESSAGE	9
FLYCATCH ON/OFF?	151
FREQ REF SOURCE	49
FREQ REJECT #1	175
FREQ REJECT #2	177
FREQ REJECT #3	179
FRQ REJECT BW #1	176
FRQ REJECT BW #2	178
FRQ REJECT BW #3	180
HISTORY SELECT 1	18
HISTORY SELECT 2	19
HISTORY SELECT 3	20
HISTORY SELECT 4	21
HISTORY SELECT 5	22
HISTORY SELECT 6	23
HISTORY SELECT 7	24
HISTORY SELECT 8	25
HISTORY SIGNAL 1	29
HISTORY SIGNAL 2	30
HISTORY SIGNAL 3	31
HISTORY SIGNAL 4	32
HISTORY SIGNAL 5	33
HISTORY SIGNAL 6	34
HISTORY SIGNAL 7	35
HISTORY SIGNAL 8	36
HOA AUTO REF SRC	277
HOA HAND REF SRC	278
INPUT POWER	8
INTEG HI LIMIT	246
INTEG LO LIMIT	247
INTEG TIME CONST	245
IRCOMP % MOTOR V	167
IxT BREAK FREQ	269
IxT OVRLOAD TIME	119
IxT ZER FRQ THLD	270
JOG FREQ REF	55
JOG FREQ REF DIR	266
KEYPAD FREQ REF	52
KEYPAD REF DIR	87
LAST FAULT	26
LEVEL 1 CODE	193
LEVEL 2 CODE	194
MAN REF SOURCE	276
MAX MOTOR FREQ	80
MAX MOTOR FREQ	74
MAX MOTOR VOLT	75
MAX MOTOR VOLT	69
MAX PWM CARRIER	105
METER OUT SELECT	103

Description	Parameter Number
METER @ 100% OUT	104
MID PWM CARRIER	106
MIN OUTPUT FREQ	53
MIN PWM CARRIER	107
MIN V/HZ FREQ	72
MIN V/HZ FREQ	78
MOTOR CURR LIMIT	111
MOTOR CURRENT	6
MOTOR CURRENT	68
MOTOR HORSEPOWER	65
MOTOR VOLTAGE	66
OUTPUT FREQUENCY	2
OUTPUT RELAY 1	85
OUTPUT RELAY 2	86
OUTPUT RELAY 3	271
OUTPUT VOLTAGE	3
PID CNRL ON/OFF?	255
PID CONTROL MODE	253
PID FDBK SOURCE	242
PID OUT HI LIMIT	251
PID OUT LO LIMIT	252
PID OUTPUT MODE	254
PID PROP GAIN	244
PID SETPT SOURCE	241
POWER METER	230
POWERUP DISPLAY	0
PREPROG I-O LIST	264
PRESET FREQ #1	181
PRESET FREQ #2	182
PRESET FREQ #3	183
PRESET FREQ #4	184
PRESET FREQ #5	185
PRESET FREQ #6	186
PRESET FREQ #7	187
PRESET FREQ #8	188
PROG DISPLAY 1	11
PROG DISPLAY 2	12
PWM CARRIER FREQ	7
PWRUP 1 DISPLAY	196
PWRUP 2 DISPLAY	197
RATED LINE VOLTS	61
RECORDED FAULTS	27
REF SEL #0 SRC	279
REF SEL #1 SRC	280
REF SEL #2 SRC	281
REF SEL #3 SRC	282
REF1: DIRECTION	90
REF1: V AT MAX F	92
REF1: V AT MIN F	91
REF1:FLTR BK FRQ	135
REF2: DIRECTION	93
REF2: V AT MAX F	95
REF2: V AT MIN F	94
REF2:FLTR BK FRQ	239
REF3: DIRECTION	96
REF3: V AT MAX F	98
REF3: V AT MIN F	97
REF3:FLTR BK FRQ	240

Description	Parameter Number
RESET PWRMETER ?	231
RUNNING KWH COST	232
SAVE TO EEPROM ?	201
SECURITY CODE	46
SELECT BAUD RATE	210
SERIAL AUTO-MAN	206
SERIAL COM REF	56
SERIAL FWD-REV	205
SERIAL JOG CNTL	204
SERIAL REF DIR	88
SERIAL RUN CNTL	202
SERIAL STOP CNTL	265
SET CLOCK TIME	15
SET DATE	16
SET PT SLEW RATE	243
SLIP COMP % BASE	170
SOFTWARE REV NO.	47
SPEED @ MAX CARR	110
SPEED @ MID CARR	109
SPEED @ MIN CARR	108
TARGET FREQUENCY	1
TB-3 TERMINAL 2	256
TB-3 TERMINAL 3	257
TB-3 TERMINAL 4	258
TB-3 TERMINAL 5	259
TB-3 TERMINAL 8	260
TB-3 TERMINAL 9	261
TIME-DATE STAMP	28
TOTAL RUN TIME	43
UPPER FREQ LIMIT	234
V/HZ BOOST VOLT	71
V/HZ BOOST VOLT	77
V/HZ BREAK FREQ	73
V/HZ BREAK FREQ	79
V/HZ BREAK VOLT	70
V/HZ BREAK VOLT	76
VHZ CURVE LIST	81

Table 5-2b.
Parameter List in Numerical Order

Parameter Number	Description
0	POWERUP DISPLAY
1	TARGET FREQUENCY
2	OUTPUT FREQUENCY
3	OUTPUT VOLTAGE
4	DC BUS VOLTAGE
5	DC BUS CURRENT
6	MOTOR CURRENT
7	PWM CARRIER FREQ
8	INPUT POWER
9	FAULT MESSAGE
10	CLOCK TIME/DATE
11	PROG DISPLAY 1
12	PROG DISPLAY 2
13	DRIVE NAME
15	SET CLOCK TIME
16	SET DATE
18	HISTORY SELECT 1
19	HISTORY SELECT 2
20	HISTORY SELECT 3
21	HISTORY SELECT 4
22	HISTORY SELECT 5
23	HISTORY SELECT 6
24	HISTORY SELECT 7
25	HISTORY SELECT 8
26	LAST FAULT
27	RECORDED FAULTS
28	TIME-DATE STAMP
29	HISTORY SIGNAL 1
30	HISTORY SIGNAL 2
31	HISTORY SIGNAL 3
32	HISTORY SIGNAL 4
33	HISTORY SIGNAL 5
34	HISTORY SIGNAL 6
35	HISTORY SIGNAL 7
36	HISTORY SIGNAL 8
42	AC POWER ON TIME
43	TOTAL RUN TIME
44	COUNTDOWN TIMER1
45	COUNTDOWN TIMER2
46	SECURITY CODE
47	SOFTWARE REV NO.
48	DRIVE MODEL NO.
49	FREQ REF SOURCE
50	ACCEL RATE
51	DECEL RATE
52	KEYPAD FREQ REF
53	MIN OUTPUT FREQ
55	JOG FREQ REF
56	SERIAL COM REF
58	DRIVE SIZE
59	DRIVE MODEL
61	RATED LINE VOLTS

Parameter Number	Description
65	MOTOR HORSEPOWER
66	MOTOR VOLTAGE
67	BASE MOTOR FREQ
68	MOTOR CURRENT
69	MAX MOTOR VOLT
70	V/HZ BREAK VOLT
71	V/HZ BOOST VOLT
72	MIN V/HZ FREQ
73	V/HZ BREAK FREQ
74	MAX MOTOR FREQ
75	MAX MOTOR VOLT
76	V/HZ BREAK VOLT
77	V/HZ BOOST VOLT
78	MIN V/HZ FREQ
79	V/HZ BREAK FREQ
80	MAX MOTOR FREQ
81	VHZ CURVE LIST
85	OUTPUT RELAY 1
86	OUTPUT RELAY 2
87	KEYPAD REF DIR
88	SERIAL REF DIR
90	REF1: DIRECTION
91	REF1: V AT MIN F
92	REF1: V AT MAX F
93	REF2: DIRECTION
94	REF2: V AT MIN F
95	REF2: V AT MAX F
96	REF3: DIRECTION
97	REF3: V AT MIN F
98	REF3: V AT MAX F
99	D/A OUT 1 SELECT
100	DA1 V @ 100% OUT
101	D/A OUT 2 SELECT
102	DA2 V @ 100% OUT
103	METER OUT SELECT
104	METER @ 100% OUT
105	MAX PWM CARRIER
106	MID PWM CARRIER
107	MIN PWM CARRIER
108	SPEED @ MIN CARR
109	SPEED @ MID CARR
110	SPEED @ MAX CARR
111	MOTOR CURR LIMIT
119	IxT OVRLOAD TIME
132	AUTO BOOST RANGE
135	REF1:FLTR BK FRQ
143	DCBRK START FREQ
149	BRAKING MODE
150	AUTO RST ON/OFF?
151	FLYCATCH ON/OFF?
160	AUTO BOOST VOLT

Parameter Number	Description
167	IRCOMP % MOTOR V
170	SLIP COMP % BASE
171	DC BRAKING TIME
172	DC BRAKE CURRENT
175	FREQ REJECT #1
176	FRQ REJECT BW #1
177	FREQ REJECT #2
178	FRQ REJECT BW #2
179	FREQ REJECT #3
180	FRQ REJECT BW #3
181	PRESET FREQ #1
182	PRESET FREQ #2
183	PRESET FREQ #3
184	PRESET FREQ #4
185	PRESET FREQ #5
186	PRESET FREQ #6
187	PRESET FREQ #7
188	PRESET FREQ #8
189	AUTO RST AFTER ?
190	ATTEMPT WINDOW
191	ATTEMPT INTERVAL
192	AUTOSTARTS / DAY
193	LEVEL 1 CODE
194	LEVEL 2 CODE
196	PWRUP 1 DISPLAY
197	PWRUP 2 DISPLAY
198	DRIVE ID NUMBER
199	EDIT DRIVE NAME
200	DRIVE STATUS
201	SAVE TO EEPROM ?
202	SERIAL RUN CNTL
204	SERIAL JOG CNTL
205	SERIAL FWD-REV
206	SERIAL AUTO-MAN
208	FACTORY/EEPROM ?
210	SELECT BAUD RATE
211	DATA FORMAT
212	DISPLAY 1 SIGNAL
213	DISPLAY 1 SCALE
214	DISPLAY 1 TEXT
215	DISPLAY 1 FORMAT
216	DISPLAY 2 SIGNAL
217	DISPLAY 2 SCALE
218	DISPLAY 2 TEXT
219	DISPLAY 2 FORMAT
220	EXT FREQ DIR
221	EXT FREQ @ MIN F
230	POWER METER
231	RESET PWRMETER ?

Parameter Number	Description
232	RUNNING KWH COST
233	COST PER KWH
234	UPPER FREQ LIMIT
237	EXT FREQ @ MAX F
238	EXT FREQ UPDATE
239	REF2:FLTR BK FRQ
240	REF3:FLTR BK FRQ
241	PID SETPT SOURCE
242	PID FDBK SOURCE
243	SET PT SLEW RATE
244	PID PROP GAIN
245	INTEG TIME CONST
246	INTEG HI LIMIT
247	INTEG LO LIMIT
248	DE-INTEG RATE
249	DIFF FLTR BK FRQ
250	DIFFERNTIAL GAIN
251	PID OUT HI LIMIT
252	PID OUT LO LIMIT
253	PID CONTROL MODE
254	PID OUTPUT MODE
255	PID CNRL ON/OFF?
256	TB-3 TERMINAL 2
257	TB-3 TERMINAL 3
258	TB-3 TERMINAL 4
259	TB-3 TERMINAL 5
260	TB-3 TERMINAL 8
261	TB-3 TERMINAL 9
264	PREPROG I-O LIST
265	SERIAL STOP CNTL
266	JOG FREQ REF DIR
269	IxT BREAK FREQ
270	IxT ZER FRQ THLD
271	OUTPUT RELAY 3
272	DIGITAL OUTPUT 1
273	DIGITAL OUTPUT 2
274	AC LINE VOLTAGE
275	AUTO REF SOURCE
276	MAN REF SOURCE
277	HOA AUTO REF SRC
278	HOA HAND REF SRC
279	REF SEL #0 SRC
280	REF SEL #1 SRC
281	REF SEL #2 SRC
282	REF SEL #3 SRC
283	BRAKING RESPONSE

Table 5-3
Parameter Definitions
(Listed in Parameter Numerical Order)

Parameters Description		
000 **POWER DISPLAY** Parameter Path: **METERING** This is a two-line power-up display	Parameter Type: Access Priority:	Read Only 0
001 **TARGET FREQUENCY** Parameter Path: **METERING** This parameter displays the active drive reference frequency	Access Rights: Display Units: Access Priority: Limits:	Read Only Hz 0 -500.0 to 500.0
002 **OUTPUT FREQUENCY** Parameter Path: **METERING** This parameter displays the drive output frequency	Access Rights: Display Units: Access Priority: Limits:	Read Only Hz 0 0 to 1000.0
003 **OUTPUT VOLTAGE** Parameter Path: **METERING** This parameter displays the drive output voltage	Access Rights: Display Units: Access Priority: Limits:	Read Only Volts 0 0.0 to 800.0
004 **DC BUS VOLTAGE** Parameter Path: **METERING** This parameter displays the drive DC Bus voltage	Access Rights: Display Units: Access Priority: Limits:	Read Only Volts 0 0.0 to 999.9
005 **DC BUS CURRENT** Parameter Path: **METERING** This parameter displays the drive DC Bus current (average value)	Access Rights: Display Units: Access Priority: Limits:	Read Only Amps 0 0.0 to 1000
006 **MOTOR CURRENT** Parameter Path: **METERING** This parameter displays the drive motor current	Access Rights: Display Units: Access Priority: Limits:	Read Only Amps 0 0.0 to 1000
007 **PWM CARRIER FREQ** Parameter Path: **METERING** This parameter displays the drive PWM carrier motor	Access Rights: Display Units: Access Priority: Limits:	Read Only Hz 0 0.0 to 10000.0
008 **PWM INPUT POWER** Parameter Path: **METERING** This parameter displays the drive input power	Access Rights: Display Units: Access Priority: Limits:	Read Only Kw 0 0.0 to 10000.0
009 **FAULT MESSAGE** Parameter Path: **METERING** This parameter displays the drive fault	Access Rights: Access Priority: Display Strings:	Read Only 0 DRIVE READY GROUND FAULT DSP WATCHDOG CONTROL PWR FAIL BUS OVERVOLTAGE GATE DRIVE FAULT INST I MOT FLT AUTORESTART FLT EXTERNAL STOP OVERTEMP DSP FAULT DEFAULTS LOADED

		AC POWER LOSS SET TYPE/MODEL DSP/196 COMM FLT UNDER VOLTAGE NUISANCE FAULT PRECHRGE TIMEOUT ILLEGAL INTRPT LINE OVERVOLTAGE LOW BATTERY MOTOR OVERLOAD PRECHRG AUX FAIL DSP RST SYNC FLT EXCESSIVE BOOST DRIVE OVERLOAD
010 **CLOCK TIME/DATE** Parameter Path: **METERING** This parameter displays the time and date	Access Rights: Display Units: Access Priority:	Read Only HH:MM MM/DD/YY 0
011, 012 **PROG DISPLAY 1** **PROG DISPLAY 2** Parameter Path: **METERING** These parameters display the user definable display signals. From menu USER DEFINABLES→PROGRAM DISPLAY→DISPLAY 1 SIGNAL, DISPLAY 1 SIGNAL	Access Rights: Access Priority: Default: PROG DISPLAY 1 PROG DISPLAY 2	Read Only 0 FREQ = Output Frequency (Hz) CURR= Motor Current
013 **DRIVE NAME** Parameter Path: **METERING** This parameter displays the user definable display signal. From menu USER DEFINABLES→ TIME-DATE-NAME→EDIT DRIVE NAME	Access Rights: Access Priority: Default:	Read Only 0 USDRIVES PHOENIX
015 **SET CLOCK TIME** Parameter Path: **USER DEFINABLES→TIME-DATE-NAME→SET CLOCK TIME** Sets correct time for drive real-time clock	Access Rights: Access Priority: Display Units:	Read and Write 1 HH:MM:SS
016 **SET DATE** Parameter Path: **USER DEFINABLES→TIME-DATE-NAME→SET DATE** Sets correct date for drive real-time clock	Access Rights: Access Priority: Display Units:	Read and Write 1 MM:DD:YY
018 TO 025 **HISTORY SELECT 1 TO HISTORY SELECT 1** Parameter Path: **FAULT RECORDER→RECORDER SETUP→HISTORY SELECT 1TO 8** Select signal to chart record	Access Rights: Access Priority: Default:Signal 1 Signal 2 Signal 3 Signal 4 Signal 5 Signal 6 Signal 7 Signal 8 Signal Selection:	Read and Write 1 TARGET FREQUENCY OUTPUT_FREQUENCY AC LINE VOLTAGE OUTPUT VOLTAGE DC BUS VOLTAGE DC BUS CURRENT MOTOR CURRENT POWER (KW) TARGET FREQUENCY OUTPUT_FREQUENCY AC LINE VOLTAGE OUTPUT VOLTAGE DC BUS VOLTAGE DC BUS CURRENT MOTOR CURRENT POWER (KW) PWM CARRIER FREQ
026 **LAST FAULT** Parameter Path: **FAULT RECORDER→FAULT HISTORY→LAST FAULT** This parameter displays drive last fault	Access Rights: Access Priority:	Read Only 0

027
RECORDED FAULTS

Parameter Path: **FAULT RECORDER→FAULT HISTORY→RECORDED FAULTS**
This parameter displays log of last 12 recorded time-stamped faults; 1= most recent

Access Rights: Read and Write
Access Priority: 0

028
TIME-DATE STAMP

Parameter Path: **FAULT RECORDER→FAULT HISTORY→TIME-DATE STAMP**
This parameter displays time and date of the most recent fault

Access Rights: Read Only
Access Priority: 0

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029 to 036
HISTORY SIGNAL 1 to HISTORY SIGNAL 8

Parameter Path: **FAULT RECORDER→SIGNAL HISTORY→HISTORY SIGNAL 1 TO 8**
Display time stamped 120 samples (at 34 msec interval) of recorded signal

Access Rights: Read Only
Access Priority: 0

042
AC POWER ON TIME

Parameter Path: **ELAPSD TIME DISP→AC POWER ON TIME**
Displays elapsed time that the drive has had power applied

Access Rights: Read Only
Display Units: Hours
Access Priority: 0
Limits: 0.0 to 999999.0

043
TOTAL RUN TIME

Parameter Path: **ELAPSD TIME DISP→TOTAL RUN TIME**
Displays elapsed time that the drive has run

Access Rights: Read Only
Display Units: Hours
Access Priority: 0
Limits: 0.0 to 999999.0

044
AC PWR COUNTDOWN

Parameter Path: **MAINTENANCE→COUNTDOWN TIMER1**
Sets number of hours of countdown timer (number of hours AC power has been applied).
At the end of the elapsed period, message AC PWR COUNTDOWN will be displayed. Also one of the output relays can be programmed to be energized.

Access Rights: Read and Write
Display Units: Hours
Access Priority: 1
Default: 99999.0
Limits: 0.0 to 99999.0

045
VFD RUN COUNTDWN

Parameter Path: **MAINTENANCE→COUNTDOWN TIMER2**
Sets number of hours of countdown timer (number of hours Drive has run).
At the end of the elapsed period, message VFD RUN COUNTDWN will be displayed.
Also one of the output relays can be programmed to be energized.

Access Rights: Read and Write
Display Units: Hours
Access Priority: 1
Default: 99999.0
Limits: 0.0 to 99999.0

046
SECURITY CODE

Parameter Path: **SECURITY CODES→SECURITY CODE**
Code entered by user to gain the desired drive parameter access priority

Access Rights: Read and Write
Access Priority: 0
Default: 0
Limits: 0.0 to 9999.0

047
SOFTWARE REV NO.

Parameter Path: **METERING→SOFTWARE REV NO.**
This parameter displays the drive software revision number.

Access Rights: Read Only
Access Priority: 0
Default: 3.006

048
DRIVE MODEL NO.

Parameter Path: **METERING→DRIVE MODEL NO.**
This parameter displays the drive model number

Access Rights: Read Only
Access Priority: 0

049
FREQ REF SOURCE

Parameter Path: **QUICK SETUP→FREQ REF SOURCE**
User may select the speed reference source.
Factory default is INPUT CONTACTS per pre-programmed I/O INDUSTRIAL setup. In "INDUSTRIAL" setup the input contact that selects the reference is AUTO/MANUAL terminal 8 @ TB3.
INDUSTRIAL setup MANUAL: speed reference is KEYPAD FREQ REF (from the R.O.M keypad)
INDUSTRIAL setup AUTO: speed reference is: ANALOG REF # 2 .
From factory, terminal 8 @ TB3 is not wired, therefore drive is in manual mode and the speed

Access Rights: Read and Write
Access Priority: 1
Default: INPUT CONTACTS

Selection:
ANALOG REF # 1
ANALOG REF # 2
ANALOG REF # 3
KEYPAD FREQ REF
SERIAL COM REF
EXT FREQ REF
JOG FREQ REF

reference is from the R.O.M. keypad) INPUT CONTACTS

050
ACCEL RATE

Parameter Path: **QUICK SETUP→ACCEL RATE**
Sets the time to accelerate from zero to base motor frequency

Access Rights:	Read and Write
Access Priority:	1
Default:	20.0 for size 1 drives 30.0 for size 2 drives 40.0 for size 3 drives 50.0 for size 4 drives
Limits:	0.1 to 3600.0

051
DECEL RATE

Parameter Path: **QUICK SETUP→ DECEL RATE**
Sets the time to decelerate from base motor frequency to zero frequency

Access Rights:	Read and Write
Access Priority:	1
Display Units:	Sec
Default:	20.0 for size 1 drives 30.0 for size 2 drives 40.0 for size 3 drives 50.0 for size 4 drives
Limits:	0.1 to 3600.0

052
KEYPAD FREQ REF

Parameter Path: **FREQ REF MENU→DIGITAL REFS→KEYPAD FREQ REF**
Sets the value of the keypad frequency reference.

Access Rights:	Read and Write
Access Priority:	1
Display Units:	Hz
Default:	0
Limits:	Min = MIN OUTPUT FREQ (053) Max= UPPER FREQ LIMIT (234)

053
MIN OUTPUT FREQ

Parameter Path: **QUICK SETUP→MIN OUTPUT FREQ**
Sets lowest frequency the drive will supply to motor

Access Rights:	Read and Write
Access Priority:	1
Display Units:	Hz
Default:	0
Limits:	Min = 0 Max= UPPER FREQ LIMIT-1Hz (234)

055
JOG FREQ REF

Parameter Path: **FREQ REF MENU→DIGITAL REFS→JOG FREQ REF**
Sets value of jog frequency reference.

Access Rights:	Read and Write
Access Priority:	2
Display Units:	Hz
Default:	0.0
Limits:	Min = MIN OUTPUT FREQ (053) Max= UPPER FREQ LIMIT (234)

058
DRIVE SIZE

Parameter Path: **DRIVE SIZE-MODEL→DRIVE SIZE**
This parameter sets drive size. Use to program a new or replacement control board. When DRIVE SIZE is programmed, DRIVE MODEL has to be programmed to correspond to the drive nameplate

Access Rights:	Read and Write
Access Priority:	2
Selection:	1, 2, 3, 4, 5, 6

059
DRIVE MODEL

Parameter Path: **DRIVE SIZE-MODEL→DRIVE MODEL**
This parameter sets drive model size. Use to program a new or replacement control board. DRIVE MODEL has to correspond to the drive nameplate.

Access Rights:	Read and Write
Access Priority:	2

061
RATED LINE VOLTS

Parameter Path: **QUICK SETUP→RATED LINE VOLTS**
This parameter sets drive model size. Use to program a new or replacement control board. DRIVE MODEL has to correspond to the drive nameplate.

Access Rights:	Read and Write
Access Priority:	1
Display Units:	Vac
Default:	240 V for 0200-xxxx drives 480 V for 0400-xxxx drives 575 V for 0500-xxxx drives
Limits:	200 to 250 for 0200-xxxx drives 380 to 500 for 0400-xxxx drives 500 to 600 for 0500-xxxx drives

065
MOTOR HORSEPOWER

Parameter Path: **QUICK SETUP→MOTOR HORSEPOWER**
Sets the rated motor horsepower.

Access Rights:	Read and Write
Access Priority:	0
Display Units:	Hp
Default:	constant Hp value
Limits:	1 to VT rated drive Hp

066
MOTOR VOLTAGE

Parameter Path: **QUICK SETUP→MOTOR VOLTAGE**
Sets the rated motor voltage

Access Rights:	Read and Write
Access Priority:	0
Display Units:	Vac
Default:	RATED LINE VOLTS (#061)
Limits:	MIN: 0.05*RATED LINE VOLTS MAX: RATED LINE VOLTS

067
BASE MOTOR FREQ

Parameter Path: **QUICK SETUP→BASE MOTOR FREQ**
Sets the rated (base) motor frequency

Access Rights:	Read and Write
Access Priority:	0
Display Units:	Hz
Default:	60.0
Limits:	MIN: 30.0 MAX: MAX MOTOR FREQ (74) in Hz

068
MOTOR CURRENT

Parameter Path: **QUICK SETUP→MOTOR CURRENT**
Sets the motor current at rated HP

Access Rights:	Read and Write
Access Priority:	0
Display Units:	Amps
Default:	CT rated output drive current
Limits:	MIN: 0.10*CT rated output drive current MAX: VT rated output drive current

069
MAX MOTOR VOLT

Parameter Path: **V-HZ PROGRAMMING→VIEW V-HZ CURVE→MAX MOTOR VOLT**
This parameter displays the maximum V/Hz output voltage. This is useful to view the active V/Hz curve.

Access Rights:	Read Only
Access Priority:	1
Display Units:	% of rated motor voltage

070
V/HZ BREAK VOLT

Parameter Path: **V-HZ PROGRAMMING→VIEW V-HZ CURVE→V/HZ BREAK VOLT**
This parameter displays the voltage level at the break point of the V/Hz curve. This is useful to view the active V/Hz curve.

Access Rights:	Read Only
Access Priority:	1
Display Units:	% of rated motor voltage

071
V/HZ BOOST VOLT

Parameter Path: **V-HZ PROGRAMMING→VIEW V-HZ CURVE→V/HZ BOOST VOLT**
This parameter displays the minimum voltage level of the V/Hz curve. This is useful to view the active V/Hz curve.

Access Rights:	Read Only
Access Priority:	1
Display Units:	% of rated motor voltage

072
MIN V/HZ FREQ

Parameter Path: **V-HZ PROGRAMMING→VIEW V-HZ CURVE→MIN V/HZ FREQ**
This parameter displays the minimum frequency of the V/Hz curve. This is useful to view the active V/Hz curve.

Access Rights:	Read Only
Access Priority:	1
Display Units:	% of base motor frequency

073
V/HZ BREAK FREQ

Parameter Path: **V-HZ PROGRAMMING→VIEW V-HZ CURVE→V/HZ BREAK FREQ**
This parameter displays the frequency at the break point of the V/Hz curve. This is useful to view the active V/Hz curve.

Access Rights:	Read Only
Access Priority:	1
Display Units:	% of base motor frequency

074
MAX MOTOR FREQ

Parameter Path: **V-HZ PROGRAMMING→VIEW V-HZ CURVE→MAX MOTOR FREQ**
This parameter displays the maximum V/Hz output frequency. This is useful to view the active V/Hz curve.

Access Rights:	Read Only
Access Priority:	1
Display Units:	% of base motor frequency

075
MAX MOTOR VOLT

Parameter Path: **V-HZ PROGRAMMING→CUSTOM VHZ CURVE→MAX MOTOR VOLT**
This parameter sets the maximum V/Hz output voltage. This is useful to customize the drive V/Hz curve.

Access Rights:	Read and Write
Access Priority:	2
Display Units:	% of rated motor voltage

076
V/HZ BREAK VOLT

Parameter Path: **V-HZ PROGRAMMING→CUSTOM VHZ CURVE→V/HZ BREAK VOLT**
This parameter sets the voltage level at the break point of the V/Hz curve. This is useful to customize the drive V/Hz curve.

Access Rights:	Read and Write
Access Priority:	2
Display Units:	% of rated motor voltage

077
V/HZ BOOST VOLT

Parameter Path: **V-HZ PROGRAMMING→CUSTOM VHZ CURVE→V/HZ BOOST VOLT**
This parameter sets the minimum voltage level of the V/Hz curve. This is useful to customize the drive V/Hz curve.

Access Rights: Read and Write
Access Priority: 2
Display Units: % of rated motor voltage

078
MIN V/HZ FREQ

Parameter Path: **V-HZ PROGRAMMING→CUSTOM VHZ CURVE→MIN V/HZ FREQ**
This parameter sets the minimum frequency of the V/Hz curve. This is useful to customize the drive V/Hz curve.

Access Rights: Read and Write
Access Priority: 2
Display Units: % of rated motor frequency

079
V/HZ BREAK FREQ

Parameter Path: **V-HZ PROGRAMMING→CUSTOM VHZ CURVE→V/HZ BREAK FREQ**
This parameter sets the frequency at the break point of the V/Hz curve. This is useful to customize the drive V/Hz curve.

Access Rights: Read and Write
Access Priority: 2
Display Units: % of rated motor frequency

080
MAX MOTOR FREQ

Parameter Path: **V-HZ PROGRAMMING→CUSTOM VHZ CURVE→MAX MOTOR FREQ**
This parameter sets the maximum frequency of the V/Hz custom curve. This is useful to customize the drive V/Hz curve.

Access Rights: Read and Write
Access Priority: 2
Display Units: % of rated motor frequency
Limits: 600Hz Consult factory

081
VHZ CURVE LIST

Parameter Path: **V-HZ PROGRAMMING→CURVE SELECTION→VHZ CURVE LIST**
Selects any one of the pre-programmed V/Hz curves or a custom curve.

Access Rights: Read and Write
Access Priority: 2
Default: PREPROGRAMMED 1

Selection:
PREPROGRAMMED 1
PREPROGRAMMED 2
PREPROGRAMMED 3
PREPROGRAMMED 4
PREPROGRAMMED 5
PREPROGRAMMED 6
PREPROGRAMMED 7
PREPROGRAMMED 8
PREPROGRAMMED 9
CUSTOM CURVE

085, 086, 271
OUTPUT RELAY 1
OUTPUT RELAY 2
OUTPUT RELAY 3

Parameter Path: **DIGITAL I-O→OUTPUT CONTACTS→OUTPUT RELAY 1 to 3**
Selects function associated with relay 1, 2, or 3 at TB1

Access Rights: Read and Write
Access Priority: 1
Default RELAY1: DRIVE RUNNING
RELAY2: DRIVE READY
RELAY3: DRIVE AT SPEED

Selection:
LOCAL/REMOTE
CURRENT LIMIT
FORWARD/REVERSE
JOG
AT ZERO SPEED
AT SET SPEED
AUTO/MANUAL
HOA - HAND
HOA - AUTO
DRIVE RUNNING
UNASSIGNED
MAINT TIMER AT 0
DRIVE READY
GROUND FAULT
CONTROL PWR FAIL
BUS OVERVOLTAGE
GATE DRIVE FAULT
INST I MOT FLT
AUTORESTART FLT
EXTERNAL STOP
OVERTEMP
DEFAULTS LOADED
AC POWER LOSS
SET TYPE/MODEL
UNDER VOLTAGE

		PRECHRGE TIMEOUT LINE OVERVOLTAGE LOW BATTERY MOTOR OVERLOAD PRECHRG AUX FAIL EXCESSIVE BOOST

087
KEYPAD REF DIR

Parameter Path: **FREQ REF MENU+DIGITAL REFS+KEYPAD REF DIR**
Select output direction reference mode.
Note: When "Fwd/Rev Switch" is selected for keypad direction**, you must disable any Fwd/Rev terminal at TB3 for the keypad fwd/Rev switch to work..**

Access Rights:	Read and Write
Access Priority:	1
Default:	REVERSE LOCKOUT
Selection:	FORWARD LOCKOUT FWD/REV SWITCH NO LOCKOUT

090, 093, 096
REF1,2,3 DIRECTION

Parameter Path: **FREQ REF MENU→ANALOG REFS→REF1: DIRECTION**
Parameter Path: **FREQ REF MENU→ANALOG REFS→REF2: DIRECTION**
Parameter Path: **FREQ REF MENU→ANALOG REFS→REF3: DIRECTION**
Select output direction reference mode.

ANALOG REF1 is TB5 TERM 3
ANALOG REF1 is TB5 TERM 4
ANALOG REF1 is TB5 TERM 5

Access Rights:	Read and Write
Access Priority:	1
Default:	REVERSE LOCKOUT
Selection:	FORWARD LOCKOUT FWD/REV SWITCH NO LOCKOUT

091, 094, 097
V AT MIN F (for speed reference 1, 2, 3)

Parameter Path: **FREQ REF MENU→ANALOG REFS→REF1: V AT MIN F**
Parameter Path: **FREQ REF MENU→ANALOG REFS→REF2: V AT MIN F**
Parameter Path: **FREQ REF MENU→ANALOG REFS→REF3: V AT MIN F**
Sets reference voltage level corresponding to minimum drive frequency

Access Rights:	Read and Write
Access Priority:	1
Display Units:	Volts
Default:	0
Limits:	-1500.0 to 1500.0

092, 095, 098 (for speed reference 1, 2, 3)
V AT MAX F
Parameter Path: **FREQ REF MENU→ANALOG REFS→REF1: V AT MAX F**
Parameter Path: **FREQ REF MENU→ANALOG REFS→REF2: V AT MAX F**
Parameter Path: **FREQ REF MENU→ANALOG REFS→REF3: V AT MAX F**
Sets reference voltage level corresponding to maximum drive frequency

Access Rights:	Read and Write
Access Priority:	1
Display Units:	Volts
Default:	11
Limits:	-1500.0 to 1500.0

099, 101
D/A OUT 1 SELECT
D/A OUT 2 SELECT

Parameter Path: **ANALOG OUTPUTS→D/A OUT 1 SELECT**
Parameter Path: **ANALOG OUTPUTS→D/A OUT 2 SELECT**
Select the analog output variable

Access Rights:	Read and Write
Access Priority:	1
Default D/A OUT 1:	OUTPUT VOLTAGE
D/A OUT 2:	MOTOR CURRENT
Selection:	TARGET_FREQUENCY OUTPUT_FREQUENCY AC LINE VOLTAGE OUTPUT VOLTAGE DC BUS VOLTAGE DC BUS CURRENT MOTOR CURRENT POWER (KW) F_CARRIER

100, 102
DA1 V @ 100% OUT
DA2 V @ 100% OUT

Parameter Path: **ANALOG OUTPUTS→DA1 V @ 100% OUT**
Parameter Path: **ANALOG OUTPUTS→DA2 V @ 100% OUT**
Set D/A output voltage at 100% of the chosen variable

Access Rights:	Read and Write
Access Priority:	1
Display Units:	Volts
Default D/A OUT 1:	9.2
D/A OUT 2:	9.2
Limits:	-100000.0 to 100000.0

103
METER OUT SELECT

Parameter Path: **ANALOG OUTPUTS→METER OUT SELECT**
Select the meter output variable

Access Rights:	Read and Write
Access Priority:	1
Default:	OUTPUT_FREQUENCY
Selection:	TARGET_FREQUENCY OUTPUT_FREQUENCY

		AC LINE VOLTAGE OUTPUT VOLTAGE DC BUS VOLTAGE DC BUS CURRENT MOTOR CURRENT POWER (KW) F_CARRIER

104
METER @ 100% OUT

Parameter Path: **ANALOG OUTPUTS→ METER @ 100% OUT**
Sets meter output gain at 100% of the chosen variable.
This output is used for analog meters with 100 µAmps movement

Access Rights:	Read and Write
Access Priority:	1
Default:	1.0
Limits:	0.01 to 10000

105
MAX PWM CARRIER

Parameter Path: **PWM CARRIER PROG→MAX PWM CARRIER**
Sets PWM carrier frequency corresponding to drive speed SPEED @ MAX CARR (110)

Access Rights:	Read and Write
Access Priority:	2
Display Units:	Hz
Default:	Size 1= 3000 Hz Size 2= 1800 Hz Size 3= 1200 Hz
Limits:	MIN: MIN PWM CARRIER (107) MAX: Size 1: 6000 Hz, Size 2: 3000 Hz, Size 3: 1200 Hz

106
MID PWM CARRIER

Parameter Path: **PWM CARRIER PROG→MID PWM CARRIER**
Sets PWM carrier frequency at the break point curve corresponding to the drive speed SPEED @ MID CARR (109)

Access Rights:	Read and Write
Access Priority:	2
Display Units:	Hz
Default:	1500 Hz
Limits:	MIN: MIN PWM CARRIER (107) MAX: MAX PWM CARRIER (105)

107
MIN PWM CARRIER

Parameter Path: **PWM CARRIER PROG→MIN PWM CARRIER**
Sets PWM minimum carrier frequency corresponding to the drive speed SPEED @ MIN CARR (108)

Access Rights:	Read and Write
Access Priority:	2
Display Units:	Hz
Default:	1000 Hz
Limits:	MIN: 100 MAX: MAX PWM CARRIER (105)

108
SPEED @ MIN CARR

Parameter Path: **PWM CARRIER PROG→SPEED @ MIN CARR**
Sets drive speed corresponding to the minimum PWM carrier frequency MIN PWM CARRIER (107)

Access Rights:	Read and Write
Access Priority:	2
Display Units:	Hz
Default:	10
Limits:	MIN: 0.1 MAX: SPEED @ MAX CARR-1 (110)

109
SPEED @ MID CARR

Parameter **Path: PWM CARRIER PROG→SPEED @ MID CARR**
Sets drive speed corresponding to the MID PWM CARRIER (106)

Access Rights:	Read and Write
Access Priority:	2
Display Units:	Hz
Default:	30
Limits:	MIN: SPEED @ MIN CARR +1 (108) MAX: SPEED @ MAX CARR-1 (110)

110
SPEED @ MAX CARR

Parameter **Path: PWM CARRIER PROG→SPEED @ MAX CARR**
Sets drive speed corresponding to the MAX PWM CARRIER (105)

Access Rights:	Read and Write
Access Priority:	2
Display Units:	Hz
Default:	60
Limits:	MIN: SPEED @ MIN CARR +1 (108) MAX: 600

111
MOTOR CURR LIMIT

Parameter Path: **QUICK SETUP→MOTOR CURR LIMIT**
Sets maximum drive output current allowed before current limit occurs

Access Rights:	Read and Write
Access Priority:	1
Display Units:	% of MOTOR CURRENT(068)
Default:	150 %
Limits:	MIN: 50 % MAX: $\frac{120 * VT.Rated.Drive.Current}{Motor.Current(068)}$

119

Access Rights:	Read and Write

IxT OVRLOAD TIME

Parameter Path: **DRIVE OPTIONS→MOTOR OVERLOAD→IxT OVRLOAD TIME**
This parameter sets the motor overload time at 150 % of MOTOR CURRENT (068)
Use this parameter to select different overload class tripping characteristics

Set IxT OVRLOAD TIME to 120 for CLASS 10 Tripping Characteristics
Set IxT OVRLOAD TIME to 180 for CLASS 20 Tripping Characteristics
Set IxT OVRLOAD TIME to 300 for CLASS 30 Tripping Characteristics

Access Priority:	1
Display Units:	Sec
Default:	120
Limits:	5 to 300

132
AUTO BOOST RANGE

Parameter Path: **DRIVE OPTIONS→AUTO BOOST→AUTO BOOST RANGE**
Sets the frequency range where the auto-bosst is active. Above this output frequency, the IR compensation function is active

Access Rights:	Read and Write
Access Priority:	2
Display Units:	Hz
Default:	20
Limits:	0.0 to 60.0

135, 239, 240
REF1:FLTR BK FRQ
REF2:FLTR BK FRQ
REF3:FLTR BK FRQ

Parameter Path: **FREQ REF MENU→ANALOG REFS→REF1:FLTR BK FRQ**
Sets the cut-off frequency of the analog reference filter.
Each analog reference has its own digital filter.
Analog reference 1,2,3 are filtered using a first order digital filter.

Access Rights:	Read and Write
Access Priority:	1
Display Units:	Hz
Default:	12
Limits:	0.0 to 100.0

143
DCBRK START FREQ

Parameter Path: **DRIVE OPTIONS→BRAKING SETUP→ DCBRK START FREQ**
Sets the DC Braking start frequency

Access Rights:	Read and Write
Access Priority:	1
Display Units:	Hz
Default:	0
Limits:	0 to 10Hz

149
BRAKING MODE

Parameter Path: **DRIVE OPTIONS→BRAKING SETUP→BRAKING MODE**
Selects the motor braking mode

Access Rights:	Read and Write
Access Priority:	1
Default:	COAST TO STOP
Selection	COAST TO STOP RAMP TO STOP DC BRAKING RAMP + DC BRAKE

150
AUTO RST ON/OFF?

Parameter Path: **DRIVE OPTIONS→AUTO RESTART→AUTO RST ON/OFF?**
Enable or disable drive auto-restart feature.

Access Rights:	Read and Write
Access Priority:	2
Default:	OFF
Selection	OFF ON

151
FLYCATCH ON/OFF?

Parameter Path: **DRIVE OPTIONS→FLYCATCHER SETUP→FLYCATCH ON/OFF?**
Enable or disable drive flycatcher (catch a spinning motor) feature.

Access Rights:	Read and Write
Access Priority:	1
Default:	OFF
Selection	OFF ON

160
AUTO BOOST VOLT

Parameter Path: **DRIVE OPTIONS→AUTO BOOST→AUTO BOOST VOLT**
Specify additional output boost voltage at 100 % rated motor current

Access Rights:	Read and Write
Access Priority:	1
Display Units:	% of MOTOR VOLTAGE (066)
Default:	1
Limits:	0.0 to 10.0

162
AUTO BOOST DELAY

Parameter Path: **DRIVE OPTIONS→AUTO BOOST→AUTO BOOST DELAY**
Sets time delay from drive start command to application of auto-boost voltage

Access Rights:	Read and Write
Access Priority:	2
Display Units:	Sec
Default:	3
Limits:	0.0 to 30.0

167
IRCOMP % MOTOR V

Parameter Path: **DRIVE OPTIONS→IR COMPENSATION→IRCOMP % MOTOR V**
Specify additional IxR drop voltage.
IxR: could voltage drop due to motor cables

Access Rights:	Read and Write
Access Priority:	1
Display Units:	% of MOTOR VOLTAGE (066)
Default:	0
Limits:	0.0 to 10.0

170
DC BRAKE CURRENT

Parameter Path: **BRAKING SETUP→DC BRAKE CURRENT**
Specify additional output frequency at 100% rated motor current

Access Rights:	Read and Write
Access Priority:	1
Display Units:	% of MOTOR CURRENT (068)
Default:	0
Limits:	0.0 to 10.0

171
SLIP COMP % BASE

Parameter Path: **DRIVE OPTIONS→MOTOR SLIP COMP→SLIP COMP % BASE**
Specify duration of DC braking current application

Access Rights:	Read and Write
Access Priority:	1
Display Units:	Sec
Default:	5.0
Limits:	0.0 to 60.0

172
DC BRAKING TIME

Parameter Path: **DRIVE OPTIONS→BRAKING SETUP→DC BRAKING TIME**
Specify DC braking current level

Access Rights:	Read and Write
Access Priority:	1
Display Units:	% of MOTOR CURRENT (068)
Default:	150.0
Limits:	0.0 to 100.0

175, 177, & 179
FREQ REJECT #1
FREQ REJECT #2
FREQ REJECT #3

Parameter Path: **DRIVE OPTIONS→CRITICAL FRQ REJ→FREQ REJECT #1, #2, & #3**
Specify output frequencies to reject

Access Rights:	Read and Write
Access Priority:	1
Display Units:	Hz
Default:	0.0
Limits:	Min = 0 Max= UPPER FREQ LIMIT (234)

176, 178, & 180
FRQ REJECT BW #1
FRQ REJECT BW #2
FRQ REJECT BW #3

Parameter Path: **DRIVE OPTIONS→CRITICAL FRQ REJ→FRQ REJECT BW #1, 2, & 3**
Set the bandwidths centered about the speed reject frequencies

Access Rights:	Read and Write
Access Priority:	1
Display Units:	Hz
Default:	0.0
Limits:	0.0 to 20.0

181 TO 188
PRESET FREQ #1 TO # 8

Parameter Path: **FREQ REF MENU→DIGITAL REFS→PRESET FREQ #1 TO # 8**
Select values of preset drive output frequencies.
Preset speed references are activated by programming up to three TB3 input contacts to PRESET FREQ BIT 0,1, 2 IN Menu: DIGITAL I-O→INPUT CONTACTS→CUSTOM I-O→TB-3 TERMINALX (Parameter 256 to 261)

Also Program: parameter PREPROG I-O LIST (264) to: IN CUSTOM I-O
parameter FREQ REF SOURCE (049) to: INPUT CONTACT

PRESET FREQ BIT2	**PRESET FREQ BIT1**	**PRESET FREQ BIT0**	**Drive Speed**
0	0	0	PRESET FREQ #1
0	0	1	PRESET FREQ #2
0	1	0	PRESET FREQ #3
0	1	1	PRESET FREQ #4
1	0	0	PRESET FREQ #5
1	0	1	PRESET FREQ #6
1	1	0	PRESET FREQ #7
1	1	1	PRESET FREQ #8

Access Rights:	Read and Write
Access Priority:	1
Display Units:	Hz
Default:	0.0
Limits:	MIN: - UPPER FREQ LIMIT (234) MAX: + UPPER FREQ LIMIT (234)

189
AUTO RST AFTER ?

Parameter Path: **DRIVE OPTIONS→AUTO RESTART→AUTO RST AFTER ?**
Selects conditions under which auto restart feature will be engaged.

Access Rights:	Read and Write
Access Priority:	2
Default:	ALL FAULTS
Selection:	NEVER ALL FAULTS VFD FAULTS ONLY AC PWR LOSS ONLY

190
ATTEMPT WINDOW

Parameter Path: **DRIVE OPTIONS→ AUTO RESTART→ATTEMPT WINDOW**
Selects the amount of time after which the drive will stop trying to restart during a fault condition. If a fault condition lasts longer than the selected window value, the auto-restart feature will be disabled and an "AUTORESTART FLT" fault will occur.

Access Rights:	Read and Write
Access Priority:	2
Default:	FOREVER
Selection:	1 Minute 5 Minutes 10 Minutes 20 Minutes 30 Minutes

191
ATTEMPT INTERVAL

Parameter Path: **DRIVE OPTIONS→AUTO RESTART→ATTEMPT INTERVAL**
Sets the time interval between auto restart attempts.
This interval must be smaller than the ATTEMPT WINDOW (190), or the drive will never attempt to restart.
If the drive is still attempting to restart after the end of the ATTEMPT WINDOW (190), an "AUTORESTART FLT" fault will occur.

Access Rights:	Read and Write
Access Priority:	2
Display Units	Sec
Default:	5
Limits:	1.0 to 3600.0

192
AUTOSTARTS / DAY

Parameter Path: **DRIVE OPTIONS→AUTO RESTART→AUTOSTARTS / DAY**
Sets the number of successful restarts to be allowed in 24 hour period.

Access Rights:	Read and Write
Access Priority:	2
Default:	10
Limits:	0 to 10

193
LEVEL 1 CODE

Parameter Path: **SECURITY CODES→LEVEL 1 CODE**
Code entered by user to gain the desired drive parameter access level.

Access Rights:	Read and Write
Access Priority:	1
Default:	0
Limits:	0 to 9999

194
LEVEL 2 CODE

Parameter Path: **SECURITY CODES→LEVEL 2 CODE**
Code entered by user to gain the desired drive parameter access level.

Access Rights:	Read and Write
Access Priority:	2
Default:	0
Limits:	0 to 9999

196, 197
PWRUP 1 DISPLAY
PWRUP 2 DISPLAY

Parameter Path:**USER DEFINABLES→POWER-UP DISPLAY→PWRUP 1 DISPLAY**
USER DEFINABLES→POWER-UP DISPLAY→PWRUP 2 DISPLAY
Select power-up/reset display information for line 1 of 2-line LCD display.
A user can chose the information to display at power-up or reset of the drive.

Using "PROG DISPLAY 1,2" from the selection list, a user can display his or her own custom display message programmed in "USER DEFINABLES→PROGRAM DISPLAY" menu (parameters: 212 to 219)

PROG DISPLAY 1: is for LCD line 1 display
PROG DISPLAY 2: is for LCD line 2 display

Access Rights:	Read and Write
Access Priority:	1
Default: for PARM196	TRG F
Default: for PARM197	OUT F
Selection:	TRG F
	OUT F
	AC LINE V
	OUT V
	BUS V
	BUS I
	MOT I
	CARR F
	POWER
	KWH MTR
	KWH COST
	REVISION
	FAULT CODE
	CLOCK TIME/DATE
	PROG DISPLAY 1
	PROG DISPLAY 2
	DRIVE NAME
	DRIVE MODEL NO

198
DRIVE ID NUMBER

Parameter Path: **DIGITAL I-O→SERIAL COM SETUP→DRIVE ID NUMBER**
Sets An ID number to the drive. This is useful when more than one drive is communicating to a host using the serial port @ TB6

Access Rights:	Read and Write
Access Priority:	1
Default:	1
Limits:	1 to 99

199
EDIT DRIVE NAME

Parameter Path: **USER DEFINABLES→TIME-DATE-NAME→EDIT DRIVE NAME**
Used to assign a 16 character name. This can viewed in the METERING menu.
It can also be displayed at power-up on line 1 or 2 of LCD when selected by parameter 196 or 197 (PWRUP 1 DISPLAY or PWRUP 2 DISPLAY) in menu
USER DEFINABLES→POWER-UP DISPLAY→PWRUP X DISPLAY

Access Rights:	Read and Write
Access Priority:	1
Default:	USDRIVES PHOENIX
Limits:	1 to 99

200
DRIVE STATUS
Parameter Path: **METERING→DRIVE STATUS**
This parameter displays the drive operating state.

Access Rights:	Read Only
Access Priority:	0
Display Strings:	INIT STATE (0)
	STOP RUN (1)

		DRIVE READY (2) RUN NORMAL (3) RUN MANUAL (4) NOT USED (5) JOG NORMAL (6) JOG MANUAL (7) NOT USED (8) AUTO RESTART (9) FAULT (10) STOP JOG (11) NOT USED (12) DC BRAKING (13) INITIAL RUN (14) INITIAL JOG (15)
201 **SAVE TO EEPROM ?** Parameter Path: **SAVE PARAMETERS→SAVE TO EEPROM ?** Save all current parameter values to EEPROM	Access Rights: Access Priority: Selection:	Read and Write 2 No YES
202 **SERIAL RUN CNTL** Parameter Path: **DIGITAL I-O→SERIAL DRIVE CTL→ SERIAL RUN CNTL** Enable/ disable RUN command control via serial port	Access Rights: Access Priority: Default: Selection:	Read and Write 2 ENABLED DISABLED ENABLED
204 **SERIAL JOG CNTL** Parameter Path: **DIGITAL I-O→ SERIAL DRIVE CTL → SERIAL JOG CNTL** Enable/ disable JOG command control via keypad or serial port.	Access Rights: Access Priority: Default: Selection:	Read and Write 2 ENABLED DISABLED ENABLED
205 **SERIAL FWD-REV** Parameter Path: **DIGITAL I-O→ SERIAL DRIVE CTL → SERIAL FWD-REV** Enable/ disable FORWARD/REVERSE command control via keypad or serial port.	Access Rights: Access Priority: Default: Selection:	Read and Write 2 ENABLED DISABLED ENABLED
206 **SERIAL AUTO-MAN** Parameter Path: **DIGITAL I-O→ SERIAL DRIVE CTL → SERIAL AUTO-MAN** Enable/ disable AUTO/MANUAL command control via keypad or serial port.	Access Rights: Access Priority: Default: Selection:	Read and Write 2 ENABLED DISABLED ENABLED
208 **FACTORY/EEPROM ?** Parameter Path: **RETRIEVE PARAMS→FACTORY/EEPROM ?** Load default parameters from either the factory setup or the EEPROM. Drive must be reset when message “DEFAULT LOADED” appears.	Access Rights: Access Priority: Selection:	Read and Write 2 NO FACTORY DEFAULTS SERIAL EEPROM
210 **SELECT BAUD RATE** Parameter Path: **DIGITAL I-O→SERIAL COM SETUP→SELECT BAUD RATE** Specify the baud rate for serial communications at TB6	Access Rights: Access Priority: Default: Selection:	Read and Write 2 9600 19.2 K 9600 4800 2400 1200 300
211 **SELECT BAUD RATE** Parameter Path: **DIGITAL I-O→SERIAL COM SETUP→DATA FORMAT** Specify the baud rate for serial communications at TB6	Access Rights: Access Priority: Default: Selection:	Read and Write 2 8 DATA, NO PARITY 8 DATA, NO PARITY 7 DATA, EVEN PARITY

212, 216
DISPLAY 1 SIGNAL
DISPLAY 2 SIGNAL

Parameter Path:**USER DEFINABLES→PROGRAM DISPLAY→DISPLAY 1 SIGNAL**
USER DEFINABLES→PROGRAM DISPLAY→DISPLAY 2 SIGNAL
DISPLAY 1 SIGNAL is used to customize user programmable display PROG DISPLAY1 (011) in METERING menu.
DISPLAY 2 SIGNAL is used to customize user programmable display PROG DISPLAY2 (012) in METERING menu.

A user can select a signal and customize the display of the signal for given application using parameters:
DISPLAY 1 SCALE (213)
DISPLAY 2 SCALE (217)
DISPLAY 1 TEXT (214)
DISPLAY 2 TEXT (218)
DISPLAY 1 FORMAT (215)
DISPLAY 2 FORMAT (219)

Access Rights: Read and Write
Access Priority: 1
Default:
DISPLAY 1 SIGNAL OUTPUT FREQUENCY
DISPLAY 2 SIGNAL MOTOR CURRENT

Selection:
TARGET_FREQUENCY
OUTPUT_FREQUENCY
AC LINE VOLTAGE
OUTPUT VOLTAGE
DC BUS VOLTAGE
DC BUS CURRENT
MOTOR CURRENT
POWER (KW)
PWM CARRIER FREQ

213, 217
DISPLAY 1 SCALE
DISPLAY 2 SCALE

Parameter Path: **USER DEFINABLES→PROGRAM DISPLAY→DISPLAY 1 SCALE**
USER DEFINABLES→PROGRAM DISPLAY→DISPLAY 2 SCALE
Scale displayed value for DISPLAY 1 SIGNAL(212)
Scale displayed value for DISPLAY 2 SIGNAL(216)
Display value = (% of base value of selected signal) * (Display Scale)

Access Rights: Read and Write
Access Priority: 1
Default:
DISPLAY 1 SCALE 1.0
DISPLAY 2 SCALE 1.0

Limits: 10000.0 to 10000.0

214, 218
DISPLAY 1 TEXT
DISPLAY 2 TEXT

Parameter Path: **USER DEFINABLES→PROGRAM DISPLAY→DISPLAY 1 TEXT**
USER DEFINABLES→PROGRAM DISPLAY→DISPLAY 2 TEXT
Select 16 character user defined label for DISPLAY 1 SIGNAL(212)
Select 16 character user defined label for DISPLAY 1 SIGNAL(216)

Access Rights: Read and Write
Access Priority: 1
Default:
DISPLAY 1 TEXT FREQ
DISPLAY 2 TEXT CURR

Limits: 10000.0 to 10000.0

215, 219
DISPLAY 1 FORMAT
DISPLAY 1 FORMAT

Parameter Path: **USER DEFINABLES→PROGRAM DISPLAY→DISPLAY 1 FORMAT**
USER DEFINABLES→PROGRAM DISPLAY→DISPLAY 2 FORMAT
Select the number of integer and fractional digits displayed (INTEGER**.**FRACTION) for DISPLAY 1 SIGNAL(212) & DISPLAY 1 SIGNAL(216)

Access Rights: Read and Write
Access Priority: 1
Default:
DISPLAY 1 FORMAT 3.1
DISPLAY 2 FORMAT 3.1

Limits: 0.0 to 9.9

220
EXT FREQ DIR

Parameter Path: **FREQ REF MENU→DIGITAL REFS→EXT FREQ DIR**
Selects output direction mode.

EXT FREQ REF Consult factory for use of this reference.

Access Rights: Read and Write
Access Priority: 1
Default: REVERSE LOCKOUT

Selection: REVERSE LOCKOUT
FORWARD LOCKOUT
FWD/REV SWITCH
NO LOCKOUT

221
EXT FREQ @ MIN F

Parameter Path: **FREQ REF MENU→DIGITAL REFS→EXT FREQ @ MIN F**
Sets reference external frequency level corresponding to minimum drive speed

Access Rights: Read and Write
Access Priority: 1
Display Units Khz
Default: 0
Limits: -2000.0 to 2000.0

230
EXT FREQ @ MIN F

Parameter Path: **METERING→POWER METER**
Sets reference external frequency level corresponding to minimum drive speed

Access Rights: Read and Write
Access Priority: 1
Display Units Khz
Default: 0
Limits: -2000.0 to 2000.0

230
POWER METER

Parameter Path: **METERING→POWER METER**

Access Rights: Read Only
Access Priority: 0
Display Units Kwh

This parameter displays the input Kilowatt-hours of the drive. Consult factory for Kilowatt metering kit.

231
RESET PWRMETER ?

Parameter Path: **DRIVE OPTIONS→PWR METER SETUP→RESET PWRMETER ?**
This parameter resets Kwh meter to 0
Consult factory for Kilowatt metering kit.

Access Rights: Read and Write
Access Priority: 2

Selection: No
YES

232
RUNNING KWH COST

Parameter Path: **METERING→RUNNING KWH COST**
This parameter displays running total Kwh cost.
Consult factory for Kilowatt metering kit.

Access Rights: Read only
Access Priority: 0

233
COST PER KWH

Parameter Path: **PWR METER SETUP→COST PER KWH**
Enter cost of local electricity power
Consult factory for Kilowatt metering kit.

Access Rights: Read and Write
Access Priority: 2
Display Units: $ per Kwh
Default: 0.00
Limits: 0.00 to 99.00

234
UPPER FREQ LIMIT

Parameter Path: **QUICK SETUP→UPPER FREQ LIMIT**
Sets highest frequency drive will supply to motor

Access Rights: Read and Write
Access Priority: 1
Display Units: Hz
Default: 60.0 Hz
Limits: MIN: **MIN OUTPUT FREQ (053)**
MAX: MAX MOTOR FREQ (074)

237
EXT FREQ @ MAX F

Parameter Path: **FREQ REF MENU→DIGITAL REFS→EXT FREQ @ MAX F**
Sets external reference frequency level corresponding to maximum drive output frequency.
Consult factory for use of EXT FREQ REF reference.

Access Rights: Read and Write
Access Priority: 1
Display Units: Khz
Default: 100.0 Khz
Limits: -2000.0 to 2000.0

238
EXT FREQ UPDATE

Parameter Path: **FREQ REF MENU→DIGITAL REFS→EXT FREQ UPDATE**
Sets rate at which the external reference frequency measurement is updated.
The microcontroller on the control board has an internal counter to measure the external reference frequency. The larger is the update rate, the better is the resolution (more counts)
Consult factory for use of EXT FREQ REF reference.

Access Rights: Read and Write
Access Priority: 1
Display Units: Khz
Default: .986 sec
Limits: 0.034 to 99.999

239
REF2:FLTR BK FRQ

See parameter **REF1:FLTR BK FRQ (135)** for description

240
REF3:FLTR BK FRQ

See parameter **REF1:FLTR BK FRQ (135)** for description

241
PID SETPT SOURCE

Parameter Path: **DRIVE OPTIONS→PID SETUP→PID SETPT SOURCE**
Selects the desired reference to be used for the PID setpoint

Access Rights: Read and Write
Access Priority: 2
Default: ANALOG REF 2

Selection
ANALOG REF 1
ANALOG REF 2
ANALOG REF 3
SELECTED FRQ REF
KEYPAD FREQ REF
SERIAL COM REF
EXT FREQ REF

242
PID FDBK SOURCE

Parameter Path: **DRIVE OPTIONS→PID SETUP→PID FDBK SOURCE**
Selects the desired reference to be used for the PID feedback

Access Rights: Read and Write
Access Priority: 2
Default: ANALOG REF 3

Selection
ANALOG REF 1
ANALOG REF 2

		ANALOG REF 3 SELECTED FRQ REF KEYPAD FREQ REF SERIAL COM REF EXT FREQ REF
243 **SET PT SLEW RATE** Parameter Path: **DRIVE OPTIONS→PID SETUP→SET PT SLEW RATE** Sets the PID slew-rate. The PID setpoint is delayed with an accel/decel circuit before it is summed with the PID feedback	Access Rights: Access Priority: Display Units: Default: Limits:	Read and Write 2 Sec 1.0 0.0 to 9999999.0
244 **PID PROP GAIN** Parameter Path: **DRIVE OPTIONS→PID SETUP→PID PROP GAIN** Sets the PID proportional gain Kp in %. The output of the proportional gain is Kp*(PID setpoint - PID feedback)	Access Rights: Access Priority: Display Units: Default: Limits:	Read and Write 2 % 10.0 % 0.0 to 2000.0
245 **INTEG TIME CONST** Parameter Path: **DRIVE OPTIONS→PID SETUP→INTEG TIME CONST** Sets the PID integral time constant "T" in seconds. PID Integrator gain is Ki= 1/T	Access Rights: Access Priority: Display Units: Default: Limits:	Read and Write 2 Sec 10.0 0.0 to 3600.0
246 **INTEG HI LIMIT** Parameter Path: **DRIVE OPTIONS→PID SETUP→INTEG HI LIMIT** Sets a limit for the PID integral output.	Access Rights: Access Priority: Display Units: Default: Limits:	Read and Write 2 % of BASE MOTOR FREQ (067) 100.0 -2000.0 to 2000.0
247 **INTEG LO LIMIT** Parameter Path: **DRIVE OPTIONS→PID SETUP→INTEG LO LIMIT** Sets a limit for the PID integral output.	Access Rights: Access Priority: Display Units: Default: Limits:	Read and Write 2 % of BASE MOTOR FREQ (067) -100.0 -2000.0 to 2000.0
248 **DE-INTEG RATE** Parameter Path: **DRIVE OPTIONS→PID SETUP→ DE-INTEG RATE** Sets the de-integrate rate after an integrator reset command	Access Rights: Access Priority: Display Units: Default: Limits:	Read and Write 2 %/Sec -10.0 0.0 to 2000.0
249 **DIFF FLTR BK FRQ** Parameter Path: **DRIVE OPTIONS→PID SETUP→ DIFF FLTR BK FRQ** Sets the PID differentiator pre-filter cutoff frequency in Hz. The PID error [PID setpoint - PID feedback] is prefiltered before it is fed to the differentiator block. The filter is used because a differentiator circuit is sensitive to noise.	Access Rights: Access Priority: Display Units: Default: Limits:	Read and Write 2 Hz 1.0 0.0 to 100.0
250 **DIFFERNTIAL GAIN** Parameter Path: **DRIVE OPTIONS→PID SETUP→DIFFERNTIAL GAIN** Sets the PID differentiator gain in seconds. The PID error block function is $Kd*\frac{d(e)}{dt}$, where e= [PID setpoint - PID feedback]	Access Rights: Access Priority: Display Units: Default: Limits:	Read and Write 2 Sec 0.0 0.0 to 2000.0
251 **PID OUT HI LIMIT** Parameter Path: **DRIVE OPTIONS→PID SETUP→PID OUT HI LIMIT** Sets a limit for the PID output.	Access Rights: Access Priority: Display Units: Default: Limits:	Read and Write 2 % 100 -2000.0 to 2000.0
252 **PID OUT LO LIMIT** Parameter Path: **DRIVE OPTIONS→PID SETUP→PID OUT LO LIMIT**	Access Rights: Access Priority: Display Units: Default:	Read and Write 2 % -100

Sets a limit for the PID output.

Limits: -2000.0 to 2000.0

253
PID CONTROL MODE

Access Rights: Read and Write
Access Priority: 2
Default: 2

Parameter Path: **DRIVE OPTIONS→PID SETUP→PID CONTROL MODE**
Sets the PID control mode.

Selection: 0, 1, 2, 3, 4, 5

Control mode 0: The PID loop is enabled whenever the drive is in RUN or JOG and the PID feature is turn ON (parameter PID CNRL ON/OFF?(255) = ON)

Control mode 1: The PID loop is enabled whenever the drive is in RUN (not JOG) and the PID feature is turn ON (parameter PID CNRL ON/OFF?(255) = ON)

Control mode 2: The PID loop is enabled whenever the drive is in RUN and AUTO and the PID feature is turn ON (parameter PID CNRL ON/OFF?(255) = ON)

Control mode 3: The PID loop is enabled whenever the drive is in RUN and the PID ENABLE INPUT TERMINAL* AT TB3 is at 24V and the PID feature is turn ON (parameter PID CNRL ON/OFF?(255) = ON).

Control mode 4 &5: The PID loop is enabled whenever the drive is in RUN and HOA AUTO and the PID feature is turn ON (parameter PID CNRL ON/OFF?(255) = ON).

*See menu "INPUT CONTACTS"→CUSTOM I-O" to define one of the programmable TB3 terminals as "PID ENABLE".

254
PID OUTPUT MODE

Access Rights: Read and Write
Access Priority: 2
Default: DIRECT

Parameter Path: **DRIVE OPTIONS→PID SETUP→PID OUTPUT MODE**

Selection: DIRECT
TRIM

Sets the PID output mode.
The PID control loop output can modify the drive output frequency in two modes:

- DIRECT mode: the PID output directly feeds the drive speed reference input.
- TRIM mode: the PID output is summed with the normal drive speed reference.

255
PID CNRL ON/OFF?

Access Rights: Read and Write
Access Priority: 2
Default: OFF

Parameter Path: **DRIVE OPTIONS→PID SETUP→PID CNRL ON/OFF?**
Enable/disable the PID feature.

Selection: OFF
ON

256 TO 261
TB-3 TERMINAL 2, 3, 4, 5, 8, & 9

Access Rights: Read and Write**
Access Priority: 2

Parameter Path: **DIGITAL I-O→INPUT CONTACTS→CUSTOM I-O→TB-3 TERMINAL X**

Default:
TERMINAL 2 RUN MOM
TERMINAL 3 JOG
TERMINAL 4 REV / FWD
TERMINAL 5 STOP
TERMINAL 8 AUTO/MAN BIT # 0
TERMINAL 9 UNUSED

****Note that you need to go to the PREPROG I-O LIST to change the selection to " IN CUSTOM I-O" for the software to accept the changes.**

Used to program TB3 terminals.
Each input contact at TB3 can be programmed to address a particular application. ****Note that you need to go to the PREPROG I-O LIST to change the selection to " IN CUSTOM I-O" for the software to accept the changes.**
The FREQ REF SOURCE(#49) parameter must be set to "CONTACT INPUTS" for the target references to be switched properly.

Description of Selection:

UNUSED:	Use this selection for unused input contact terminal.
STOP:	Use for momentary STOP command (3-wire system).
RUN MOM:	Use for momentary RUN command (3-wire system).
RUN MAIN:	Use for momentary RUN command (2-wire system).
JOG:	Use for JOG command.
MOP INC:	Motor Operated Potentiometer (MOP), increase speed.
MOP DEC:	Motor Operated Potentiometer (MOP), decrease speed.
PID ENABLE:	This enables PID. See Parameter PID CONTROL MODE 253
REV / FWD:	Use for FORWARD/REVERSE command.
REF SELECT BIT1:	Use to control the source of the drive speed reference.
REF SELECT BIT0:	To change the switchable references refer to parameters:

Selection:
UNUSED
STOP
RUN MOM
RUN MAIN
JOG
MOP INC
MOP DEC
PID ENABLE
REV / FWD
REF SELECT BIT1
REF SELECT BIT0
PRESET FREQ BIT2
PRESET FREQ BIT1
PRESET FREQ BIT0
HOA BIT # 1

REF SEL #0 SRC (279)
REF SEL #1 SRC (280)
REF SEL #2 SRC (281)
REF SEL #3 SRC (282)

BIT1	BIT0	
0	0	ref. defined by parm: REF SEL #0 SRC (279)
0	1	ref. defined by parm: REF SEL #1 SRC (280)
1	0	ref. defined by parm: REF SEL #2 SRC (281)
1	1	ref. defined by parm: REF SEL #3 SRC (282)

The following is the default list:

BIT1	BIT0	
0	0	Analog reference #1
0	1	Analog reference #2
1	0	Keypad reference
1	1	Serial Reference (serial port TB6)

HOA BIT # 0
REM/LOCAL BIT #1
REM/LOCAL BIT #0
AUTO/MAN BIT # 0
RUN REV MAINTAIN
RUN FWD MAINTAIN
JOG FWD
JOG REV

PRESET FREQ BIT2:
PRESET FREQ BIT1:
PRESET FREQ BIT0:

Use to control drive preset speed.
See parameter PRESET FREQ #1 TO # 8 (181 to 188).

BIT2	BIT1	BIT0	DRIVE SPEED
0	0	0	PRESET FREQ#1
0	0	1	PRESET FREQ#2
0	1	0	PRESET FREQ#3
0	1	1	PRESET FREQ#4
1	0	0	PRESET FREQ#5
1	0	1	PRESET FREQ#6
1	1	0	PRESET FREQ#7
1	1	1	PRESET FREQ#8

HOA BIT # 1:
HOA BIT # 0:

Use HOA BIT #0 and HOA BIT#1 to operate An HAND-OFF-AUTO function.
See parameters HOA AUTO REF SRC(277) & HOA HAND REF(278) to select the HAND & AUTO references

HOA BIT1	HOA BIT0	FUNCTION
0	0	DRIVE STOP
0	1	HAND
1	0	AUTO
1	1	do not use

REM/LOCAL BIT #0:

Use to operate LOCAL/REMOTE function.

REM/LOCAL BIT#0	FUNCTION
0	LOCAL
1	REMOTE

AUTO/MAN BIT # 0:

Use to operate AUTO/MANUAL function.

Default MANUAL reference: Keypad Freq Ref
Default AUTO reference: ANALOG REF #2
See parameters AUTO REF SOURCE(275) & MAN REF SOURCE(276) to select the MANUAL & AUTO references

AUTO/MAN BIT#0	FUNCTION
0	MANUAL
1	AUTO

RUN REV MAINTAIN:
RUN FWD MAINTAIN:
JOG FWD:
JOG REV:

Use for RUN reverse command.
Use for RUN forward command.
Use for JOG reverse command.
Use for JOG forward command.

264
PREPROG I-O LIST

Access Rights: Read and Write
Access Priority: 2
Display Units: Hz
Default: INDUSTRIAL

Selection:
IN CUSTOM I-O
INDUSTRIAL
HOA#1 H25 A34
HOA#2 H25 A3
HOA#3 H2 A34
HOA#4 H2 A3
L/R A/M#1 L25R34
L/R A/M#2 L25 R3
L/R A/M#3 L2 R34
L/R A/M#4 L2 R3

Parameter Path: DIGITAL I-O→INPUT CONTACTS→PRE-PROGRAMD I-O→PREPROG I-O LIST
Select a pre-programmed setup.
There are six user programmable terminals at TB3: (Terminal 2, 3,4, 5, 8 & 9)
They can either be programmed individually or a preprogrammed setup can be selected.
There are 9 popular setups available.

IN CUSTOM I-O: **Use this setup to activate the six programmable terminals at TB3.**

You can use one of the pre-programmed setups as the starting point and then go to the CUSTOM I-O menu to change any terminals at TB3.
Note that you need to go to PREPROG I-O LIST to change the selection to "IN CUSTOM I-O" to activate the changes.
The FREQ REF SOURCE(#49) parameter must be set to "CONTACT INPUTS" for the target references to be switched properly.

INDUSTRIAL: This is a standard industrial setup
TB3 TERM 2 = RUN MOMENTARY
TB3 TERM 3 = JOG
TB3 TERM 4 = FWD/ REV
TB3 TERM 5 = STOP
TB3 TERM 8 = AUTO/MANUAL
0 = MANUAL (selects Keypad reference)
1 = AUTO (selects Analog reference # 2 at TB5 TERM 4)
TB3 TERM 9 = UNUSED

HOA#1 H25 A34: HVAC HOA configuration #1
TB3 TERM 2 = HAND RUN MOMENTARY
TB3 TERM 3 = AUTO RUN MOMENTARY
TB3 TERM 4 = AUTO STOP
TB3 TERM 5 = HAND STOP
TB3 TERM 8 = HOA BIT # 1
TB3 TERM 9 = HOA BIT # 0
00 = OFF (Drive off)
01 = HAND (selects Keypad reference)
10 = AUTO (selects analog Reference # 2 @ TB5 TERM 4)
11 = Do not use

HOA#2 H25 A3: HVAC HOA configuration #2
TB3 TERM 2 = HAND RUN MOMENTARY
TB3 TERM 3 = AUTO RUN MAINTAINED
TB3 TERM 4 = FWD/ REV
TB3 TERM 5 = HAND STOP
TB3 TERM 8 = HOA BIT # 1
TB3 TERM 9 = HOA BIT # 0
00 = OFF (Drive off)
01 = HAND (selects Keypad reference)
10 = AUTO (selects analog Reference # 2 @ TB5 TERM 4)
11 = Do not use

HOA#3 H2 A34: HVAC HOA configuration #3
TB3 TERM 2 = HAND RUN MAINTAINED
TB3 TERM 3 = AUTO RUN MOMENTARY
TB3 TERM 4 = AUTO STOP
TB3 TERM 5 = unused
TB3 TERM 8 = HOA BIT # 1
TB3 TERM 9 = HOA BIT # 0
00 = OFF (Drive off)
01 = HAND (selects Keypad reference)
10 = AUTO (selects analog Reference # 2 @ TB5 TERM 4)
11 = Do not use

HOA#4 H2 A3: HVAC HOA configuration #4
TB3 TERM 2 = HAND RUN MAINTAINED
TB3 TERM 3 = AUTO RUN MAINTAINED
TB3 TERM 4 = FWD/ REV
TB3 TERM 5 = unused
TB3 TERM 8 = HOA BIT # 1
TB3 TERM 9 = HOA BIT # 0
00 = OFF (Drive off)
01 = HAND (selects Keypad reference)
10 = AUTO (selects analog Reference # 2 @ TB5 TERM 4)

11 = Do not use

L/R A/M#1 L25R34: HVAC local/remote configuration #1
TB3 TERM 2 = LOCAL RUN MOMENTARY
TB3 TERM 3 = REMOTE RUN MOMENTARY
TB3 TERM 4 = REMOTE STOP
TB3 TERM 5 = LOCAL STOP
TB3 TERM 8 = AUTO/MANUAL
0 = MANUAL (selects Keypad reference)
1 = AUTO (selects Analog Reference #2 @ TB5 TERM 4)
TB3 TERM 9 = LOCAL/REMOTE
0 = LOCAL (selects local RUN: TB3 TERM 2)
1 = REMOTE (selects remote RUN: TB3 TERM 3)

L/R A/M#2 L25 R3: HVAC local/remote configuration #2
TB3 TERM 2 = LOCAL RUN MOMENTARY
TB3 TERM 3 = REMOTE RUN MAINTAINED
TB3 TERM 4 = FWD/ REV
TB3 TERM 5 = LOCAL STOP
TB3 TERM 8 = AUTO/MANUAL
0 = MANUAL (selects Keypad reference)
1 = AUTO (selects Analog Reference #2 @ TB5 TERM 4)
TB3 TERM 9 = LOCAL/REMOTE
0 = LOCAL (selects local RUN: TB3 TERM 2)
1 = REMOTE (selects remote RUN: TB3 TERM 3)

L/R A/M#3 L2 R34: HVAC local/remote configuration #3
TB3 TERM 2 = LOCAL RUN MAINTAINED
TB3 TERM 3 = REMOTE RUN MOMENTARY
TB3 TERM 4 = REMOTE STOP
TB3 TERM 5 = unused
TB3 TERM 8 = AUTO/MANUAL
0 = MANUAL (selects Keypad reference)
1 = AUTO (selects Analog Reference #2 @ TB5 TERM 4)
TB3 TERM 9 = LOCAL/REMOTE
0 = LOCAL (selects local RUN: TB3 TERM 2)
1 = REMOTE (selects remote RUN: TB3 TERM 3)

L/R A/M#4 L2 R3: HVAC local/remote configuration #4
TB3 TERM 2 = LOCAL RUN MAINTAINED
TB3 TERM 3 = REMOTE RUN MAINTAINED
TB3 TERM 4 = FWD/ REV
TB3 TERM 5 = unused
TB3 TERM 8 = AUTO/MANUAL
0 = MANUAL (selects Keypad reference)
1 = AUTO (selects Analog Reference #2 @ TB5 TERM 4)
TB3 TERM 9 = LOCAL/REMOTE
0 = LOCAL (selects local RUN: TB3 TERM 2)
1 = REMOTE (selects remote RUN: TB3 TERM 3)

265
SERIAL STOP CNTL

Parameter Path: **DIGITAL I-O→SERIAL RUN CNTRL→SERIAL STOP CNTL** Enable/ disable STOP command control via serial port.

Access Rights: Read and Write
Access Priority: 2
Default: ENABLED

Selection: DISABLED
ENABLED

266
JOG FREQ REF DIR

Parameter Path: **DIGITAL I-O→ FREQ REF MENU→DIGITAL REFS→JOG FREQ REF DIR**
Select output direction reference mode.

Access Rights: Read and Write
Access Priority: 1
Default: REVERSE LOCKOUT

Selection: REVERSE LOCKOUT
FORWARD LOCKOUT
FWD/REV SWITCH
NO LOCKOUT

269
IxT BREAK FREQ

Parameter Path: **DRIVE OPTIONS→MOTOR OVERLOAD→IxT BREAK FREQ**
Use to program the speed sensitive IxT curve.
When operating a motor at reduced speeds, the ability to dissipate heat is also reduced due to the slower cooling fan speed.
This parameter set the motor frequency break point below which motor derating is required

Access Rights: Read and Write
Access Priority: 1
Display Units: Hz
Default: 60

Limits: 1.0 to 60.0

270
IxT ZER FRQ THLD

Parameter Path:**DRIVE OPTIONS→MOTOR OVERLOAD→IxT ZER FRQ THLD**
Use to program the speed sensitive IxT curve.
When operating a motor at reduced speeds, the ability to dissipate heat is also reduced due to the slower cooling fan speed.
This parameter set the motor derating at low speeds. Sets the maximum continuous motor current at zero speed.

Access Rights: Read and Write
Access Priority: 1
Display Units: %
Default: 60

Limits: 40.0 to 100.0

271
OUTPUT RELAY 3

Parameter Path: **DIGITAL I-O→OUTPUT CONTACTS→OUTPUT RELAY 3**
See parameter (085) for description

Access Rights: Read and Write
Access Priority: 1

272, 273
DIGITAL OUTPUT 1
DIGITAL OUTPUT 2

Parameter Path: 272 **DIGITAL I-O→OUTPUT CONTACTS→DIGITAL OUTPUT 1 & 2**
Selects function associated with digital outputs (open collector) at TB2 TERM 1,2

Access Rights: Read and Write
Access Priority: 1
Default:
DIGITAL OUT1: UNASSIGNED
DIGITAL OUT2: UNASSIGNED

Selection:
LOCAL/REMOTE
CURRENT LIMIT
FORWARD/REVERSE
JOG
AT ZERO SPEED
AT SET SPEED
AUTO/MANUAL
HOA - HAND
HOA - AUTO
DRIVE RUNNING
UNASSIGNED
MAINT TIMER AT 0
DRIVE READY
GROUND FAULT
CONTROL PWR FAIL
BUS OVERVOLTAGE
GATE DRIVE FAULT
INST I MOT FLT
AUTORESTART FLT
EXTERNAL STOP
OVERTEMP
DEFAULTS LOADED
AC POWER LOSS
SET TYPE/MODEL
UNDER VOLTAGE
PRECHRGE TIMEOUT
LINE OVERVOLTAGE
LOW BATTERY
MOTOR OVERLOAD
PRECHRG AUX FAIL
EXCESSIVE BOOST

274
AC LINE VOLTAGE

Parameter Path: **METERING→AC LINE VOLTAGE**
This parameter displays the input AC line voltage.

Access Rights: Read Only
Display Units: Volts
Access Priority: 0
Limits: 0.0 to 999.0

275
AUTO REF SOURCE
****Note that you need to go to the PREPROG I-O LIST to change the selection to " IN CUSTOM I-O" for the software to accept the changes.**

Parameter Path: **DIGITAL I-O→INPUT CONTACTS→CUSTOM I-O→AUTO REF SOURCE**
Defines the AUTO reference speed source.
This is used to define the speed reference when one of the TB3 terminals is programmed for AUTO/MANUAL input. See parameters (256 TO 261)

Access Rights: Read and Write**
Access Priority: 2
Default: ANALOG REF #2

Selection:
NONE
ANALOG REF #1
ANALOG REF #2
ANALOG REF #3
KEYPAD FREQ REF
SERIAL COM REF
PRESET SPEED REF
EXT FREQ REF
JOG FREQ REF
DRIVE OFF

276
MAN REF SOURCE

Parameter Path: **DIGITAL I-O→INPUT CONTACTS→CUSTOM I-O→MAN REF SOURCE**
Defines the MANUAL reference speed source.
This is used to define the speed reference when one of the TB3 terminals is programmed for AUTO/MANUAL input. See parameters (256 TO 261)

****Note that you need to go to the PREPROG I-O LIST to change the selection to " IN CUSTOM I-O" for the software to accept the changes.**

Access Rights:	Read and Write**
Access Priority:	2
Default:	KEYPAD FREQ REF
Selection:	NONE
	ANALOG REF #1
	ANALOG REF #2
	ANALOG REF #3
	KEYPAD FREQ REF
	SERIAL COM REF
	PRESET SPEED REF
	EXT FREQ REF
	JOG FREQ REF
	DRIVE OFF

277
HOA AUTO REF SRC

Parameter Path: **DIGITAL I-O→INPUT CONTACTS→CUSTOM I-O→HOA AUTO REF SRC**
Defines the HOA AUTO reference speed source.
This is used to define the speed reference when two of the TB3 terminals are programmed for HOA function. See parameters (256 TO 261)

****Note that you need to go to the PREPROG I-O LIST to change the selection to " IN CUSTOM I-O" for the software to accept the changes.**

Access Rights:	Read and Write**
Access Priority:	2
Default:	NONE
Selection:	NONE
	ANALOG REF #1
	ANALOG REF #2
	ANALOG REF #3
	KEYPAD FREQ REF
	SERIAL COM REF
	PRESET SPEED REF
	EXT FREQ REF
	JOG FREQ REF
	DRIVE OFF

278
HOA HAND REF SRC

Parameter Path: **DIGITAL I-O→INPUT CONTACTS→CUSTOM I-O→HOA HAND REF SRC**
Defines the HOA HAND reference speed source.
This is used to define the speed reference when two of the TB3 terminals are programmed for HOA function. See parameters (256 TO 261)

****Note that you need to go to the PREPROG I-O LIST to change the selection to " IN CUSTOM I-O" for the software to accept the changes.**

Access Rights:	Read and Write**
Access Priority:	2
Default:	NONE
Selection:	NONE
	ANALOG REF #1
	ANALOG REF #2
	ANALOG REF #3
	KEYPAD FREQ REF
	SERIAL COM REF
	PRESET SPEED REF
	EXT FREQ REF
	JOG FREQ REF
	DRIVE OFF

279, 280, 281, 282
REF SEL #0 SRC
REF SEL #1 SRC
REF SEL #2 SRC
REF SEL #3 SRC

Parameter Path: **DIGITAL I-O→INPUT CONTACTS→CUSTOM I-O→ REF SEL #0, #1, #2, #3 SRC**
Defines the HOA HAND reference speed source.
This is used to define the speed reference when two of the TB3 terminals are programmed for HOA function. See parameters (256 TO 261)

****Note that you need to go to the PREPROG I-O LIST to change the selection to " IN CUSTOM I-O" for the software to accept the changes.**

Access Rights:	Read and Write**
Access Priority:	2
Default:	
REF SEL #0 SRC	ANALOG REF #1
REF SEL #1 SRC	ANALOG REF #2
REF SEL #2 SRC	KEYPAD FREQ REF
REF SEL #3 SRC	SERIAL COM REF
Selection:	NONE
	ANALOG REF #1
	ANALOG REF #2
	ANALOG REF #3
	KEYPAD FREQ REF
	SERIAL COM REF
	PRESET SPEED REF
	EXT FREQ REF
	JOG FREQ REF
	DRIVE OFF

283
BRAKING RESPONSE

Parameter Path: **DRIVES OPTIONS→BRAKING SETUP→BRAKING RESPONSE**
Set this parameter to a low value when US DRIVES AC-REGEN-MODULE or RESISTIVE-BRAKING-MODULE are used.

Access Rights:	Read and Write
Access Priority:	1
Display Units	Sec
Default:	5.0
Limits:	0.01 to 100.0

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APPENDIX

6-2 "2-WIRE" START/STOP SET-UP SHEET

1.0 WIRING:

- **Connect the "Run Contact"** per Figure 2-6a in PHOENIX USER MANUAL. If the user wishes to bring in external fault contacts that will shut the drive down, wire them in series and connect between TB3-6 and TB3-1 as shown in Figure 2-6b. Note that if there are no external fault contacts to be brought in, a jumper must be connected between TB3-6 and TB3-1 to permit the drive to run.

- **For a Uni-polar Speed Pot**, connect the Operator Speed pot to the Analog Ref #1 input on TB5-1, TB5-7 and TB5-3 as shown in Figure 2-5 of the PHOENIX USER MANUAL. Note that TB5-1 is +10 VDC, TB5-7 is COM and TB5-3 is the Pot wiper connection.

- **For a Bi-polar Speed Pot**, connect the Operator Speed pot to the Analog Ref #1 input on TB5-1, TB5-2 and TB5-3 as shown in Figure 2-5 of the PHOENIX USER MANUAL. Note that TB5-1 is +10 VDC, TB5-2 is -10 VDC and TB5-3 is the Pot wiper connection.

- **For a 4-20 ma Input Signal**, wire to TB5-6 and TB5-7 per Figure 2-5 of the PHOENIX USER MANUAL. Note that **terminals TB5-4 and TB5-6 must be jumpered together**. Also **connect a wire or selector switch between TB3-1 and TB3-8 to select the "Auto Reference"** (Analog Reference #2).

2.0 DRIVE PROGRAMMING:

The following parameters are the only parameters that must be programmed to achieve this particular drive setup:

(#264) DIGITAL I-O→INPUT CONTACTS→PRE-PROGRAMD I-O→PREPROG I-O LIST = IN CUSTOM I-O
(#256) DIGITAL I-O→INPUT CONTACTS→CUSTOM I-O→TB-3 TERMINAL 2 = RUN MAIN
(#259) DIGITAL I-O→INPUT CONTACTS→CUSTOM I-O→TB-3 TERMINAL 5 = UNUSED

2.1 For Uni-polar Speed Pot:

(#049) QUICK SETUP→FREQ REF SOURCE = ANALOG REF # 1

2.2 For Bi-polar Speed Pot:

(#049) QUICK SETUP→FREQ REF SOURCE = ANALOG REF # 1
(#090) FREQ REF MENU→ANALOG REFS→REF1: DIRECTION = NO LOCKOUT

2.3 For 4-20 ma Signal Input:

(#094) FREQ REF MENU→ANALOG REFS→REF2: V AT MIN F = 2.0 V

Remember to save your setup to serial eeprom as described in step 3 of section 4.1.6 in the PHOENIX USER MANUAL.

1.0 WIRING:

- **Connect “Start” and “Stop” pushbuttons** per Figure 2-6b in PHOENIX USER MANUAL. If the user wishes to bring in external fault contacts that will shut the drive down, wire them in series and connect between TB3-6 and TB3-1 as shown in Figure 2-6b. Note that if there are no external fault contacts to be brought in, a jumper must be connected between TB3-6 and TB3-1 to permit the drive to run.

- **For a Uni-polar Speed Pot**, connect the Operator Speed pot to the Analog Ref #1 input on TB5-1, TB5-7 and TB5-3 as shown in Figure 2-5 of the PHOENIX USER MANUAL. Note that TB5-1 is +10 VDC, TB5-7 is COM and TB5-3 is the Pot wiper connection.

- **For a Bi-polar Speed Pot**, connect the Operator Speed pot to the Analog Ref #1 input on TB5-1, TB5-2 and TB5-3 as shown in Figure 2-5 of the PHOENIX USER MANUAL. Note that TB5-1 is +10 VDC, TB5-2 is -10 VDC and TB5-3 is the Pot wiper connection.

- **For a 4-20 ma Input Signal**, wire to TB5-6 and TB5-7 per Figure 2-5 of the PHOENIX USER MANUAL. Note that **terminals TB5-4 and TB5-6 must be jumpered together**. Also **connect a wire or selector switch between TB3-1 and TB3-8 to select the “Auto Reference”** (Analog Reference #2).

2.0 DRIVE PROGRAMMING:

The following parameters are the only parameters that must be programmed to achieve this particular drive setup:

2.1 For Uni-polar Speed Pot:

(#049) QUICK SETUP→FREQ REF SOURCE = ANALOG REF # 1

2.2 For Bi-polar Speed Pot:

(#049) QUICK SETUP→FREQ REF SOURCE = ANALOG REF # 1
(#090) FREQ REF MENU→ANALOG REFS→REF1: DIRECTION = NO LOCKOUT

2.3 For 4-20 ma Signal Input:

(#094) FREQ REF MENU→ANALOG REFS→REF2: V AT MIN F = 2.0 V

Remember to save your setup to serial eeprom as described in step 3 of section 4.1.6 in the PHOENIX USER MANUAL.

6-4 STANDARD DRIVE WITH HOA SWITCH

NOTE: All Standard Drives with HOA switch have been pre-programmed at the factory per this setup sheet using a 0 to +10 volt input reference for "AUTO" mode (section 2.2). You do <u>not</u> have to re-program the drive unless your application is different from the STANDARD CONFIGURATION described in section 1.0 below or you have loaded "FACTORY DEFAULTS". If your application requires a 4-20 ma input for "AUTO" mode, proceed to step 2.4 below.

1.0 WIRING:

- **The control wiring diagram for US Drives standard AC Phoenix Drive with HOA switch** is shown per Figure 2-7b (HVAC HOA#2 H25 A3) in PHOENIX USER MANUAL (page 2-16) with the following exceptions:
    - The "Hand Run" contact between TB3 terminals 1 and 2 has been **<u>left open</u>**.
    - The "Hand Stop" contact between TB3 terminals 1 and 5 has been **<u>wired closed</u>**.
    - The "External Fault" contact has been **<u>wired closed</u>**.
- **Note that as shipped, the "External Fault" contact is wired closed.** If the customer wishes, he may replace this jumper with one or more additional normally closed contacts connected in series that when opened, will stop the Drive.
- **The "AUTO RUN" contact supplied by the Customer should be connected between TB3 terminal 1 and TB3 terminal 3 on the drive control board as shown per Figure 2-7b (HVAC HOA#2 H25 A3) in PHOENIX USER MANUAL (page 2-16).**
- In the standard configuration, when the "HAND-OFF-AUTO" switch is in the **"HAND" position**, the **VFD can be started and stopped by the ROM (Keypad) run and stop keys. The output frequency of VFD is controlled by use of the ROM MOP** ("**M**otor **O**perated **P**otentiometer") frequency control feature. See section 3.0 in the PHOENIX USER MANUAL for instruction on use of the MOP.
- In the standard configuration, when the "HAND-OFF-AUTO" switch is in the **"AUTO" position**, the **VFD can be started and stopped by the customer supplied "2-Wire" "AUTO RUN" contact.** When the "AUTO RUN" contact is closed, the VFD will run. When the "AUTO RUN" contact is opened, the VFD will stop. **The output frequency of VFD is controlled by use of Analog Reference #2.** This signal can either be a voltage input or a 4-20 ma input. See Figure 2-5 (Control Logic and Signal Wiring) in PHOENIX USER MANUAL for wiring details.

2.0 DRIVE PROGRAMMING:

The following parameters are the only parameters that must be programmed to achieve this particular drive setup after retrieving "FACTORY DEFAULT" parameters for the PHOENIX Drive:

2.1 Select HVAC Pre-Programmed I-O Setup :

PREPROG I-O LIST (#264) = HOA#2 H25 A3

2.2 For <u>0 to +10 Volt Input</u> in "AUTO" mode:

REF2: V AT MIN F (#094) = 0.0
REF2: V AT MAX F (#095) = 11.0

2.3 For <u>0 to (-)10 Volt Input</u> in "AUTO" mode:

REF2: V AT MIN F (#094) = 0.0
REF2: V AT MAX F (#095) = -11.0

2.4 For <u>4-20 ma input</u> in "AUTO" mode:

REF2: V AT MIN F (#094) = 2.0
REF2: V AT MAX F (#095) = 11.0

Note that for 4-20 ma input, TB5 terminals #4 and #6 must be jumpered together. See Fig. 2-5 in PHOENIX USER MANUAL for complete wiring details.

3.0 SAVE DRIVE SETUP

Remember to save your setup to serial eeprom as described in step 3 of section 4.1.6 in the PHOENIX USER MANUAL.

NOTE: All HVAC Drives have been pre-programmed at the factory per this setup sheet using a 0 to +10 volt input reference for "AUTO" mode (section 2.2). You do <u>not</u> have to re-program the drive unless your application is different from the STANDARD CONFIGURATION described in section 1.0 below or you have loaded "FACTORY DEFAULTS". If your application requires a 4-20 ma input for "AUTO" mode, proceed to step 2.4 below.

1.0 WIRING:

- **The wiring diagram for US Drives standard HVAC Phoenix Drive with Bypass** is shown on US Drives drawing 1000-0001. This drawing shows the internal wiring as well as customer connections.
- **Note that as shipped, the "Customer Interlock" is jumpered.** If the customer wishes, he may replace this jumper with one or more additional normally closed contacts connected in series that when opened, will stop the **<u>Motor,</u>** whether it is running in VFD or Bypass mode.
- **The "AUTO RUN" contact supplied by the Customer should be connected between TB3 terminal 1 and TB3 terminal 3 on the drive control board as shown on US DRIVES drawing 1000-0001.**
- In the standard configuration, when the "HAND-OFF-AUTO" switch is in the **"HAND" position** and the "VFD-OFF-BYP" switch is in the "VFD" position, the **VFD can be started and stopped by the ROM (Keypad) run and stop keys. The output frequency of VFD is controlled by use of the ROM MOP** ("**M**otor **O**perated **P**otentiometer")frequency control feature. See section 3.0 in the PHOENIX USER MANUAL for instruction on use of the MOP.
- In the standard configuration, when the "HAND-OFF-AUTO" switch is in the **"AUTO" position** and the "VFD-OFF-BYP" switch is in the "VFD" position, the **VFD can be started and stopped by the customer supplied "2-Wire" "AUTO RUN" contact.** When the "AUTO RUN" contact is closed, the VFD will run. When the "AUTO RUN" contact is opened, the VFD will stop. **The output frequency of VFD is controlled by use of Analog Reference #2.** This signal can either be a voltage input or a 4-20 ma input. See US Drives drawing 1000-0001 for wiring details.

2.0 DRIVE PROGRAMMING:

The following parameters are the only parameters that must be programmed to achieve this particular drive setup after retrieving "FACTORY DEFAULT" parameters for the PHOENIX Drive:

2.1 Select HVAC Pre-Programmed I-O Setup :

PREPROG I-O LIST (#264) = HOA#2 H25 A3

2.2 For <u>0 to +10 Volt Input</u> in "AUTO" mode:

REF2: V AT MIN F (#094) = 0.0
REF2: V AT MAX F (#095) = 11.0

2.3 For <u>0 to (-)10 Volt Input</u> in "AUTO" mode:

REF2: V AT MIN F (#094) = 0.0
REF2: V AT MAX F (#095) = -11.0

2.4 For <u>4-20 ma input</u> in "AUTO" mode:

REF2: V AT MIN F (#094) = 2.0
REF2: V AT MAX F (#095) = 11.0

Note that for 4-20 ma input, TB5 terminals #4 and #6 must be jumpered together. See Fig. 2-5 in PHOENIX USER MANUAL for complete wiring details.

3.0 SAVE DRIVE SETUP

Remember to save your setup to serial eeprom as described in step 3 of section 4.1.6 in the PHOENIX USER MANUAL.

4.0 CUSTOM APPLICATIONS:

If your particular application requires a different drive sequencing scheme or a different means of control of the frequency reference, you may need to select a different **Pre-Programmed I-O Setup** or use the **Custom I-O** menu. Refer to sections 5.3.10.1 and 5.3.10.2 in the PHOENIX USER MANUAL for more information.

5.0 HVAC MOUNTING INFORMATION:

Refer to the "PHOENIX HVAC Mounting Information" insert included with your PHOENIX Instruction manual.

6.0 INSTALLATION AND WIRING:

Refer to section 2.0 (INSTALLATION AND WIRING) section of the PHOENIX Instruction Manual. Please read and understand this section with its safety warnings before actual installation begins. All information in section 2.0 of the Phoenix Instruction Manual pertains except 2.4 (Mounting Dimensions - refer to 5.0 above) and 2.5.4 (Input Fusing - Self-contained Semiconductor fuses in HVAC package).

7.0 DRIVE START-UP

WARNING
TO AVOID A HAZARD OF ELECTRIC SHOCK, AFTER THE INPUT AND CONTROL POWER IS REMOVED FROM THE DRIVE AND THE ROM DISPLAY IS NO LONGER LIT, WAIT FIVE (5) MINUTES FOR BUS CAPACITORS TO FULLY DISCHARGE BEFORE OPENING THE DRIVE TO MAKE WIRING CHANGES.

Refer to section 4.0 (START-UP AND QUICK SETUP) section of the PHOENIX Instruction Manual. Please read and understand this section with its safety warnings before start-up begins. Follow the instructions in this section of the PHOENIX Instruction Manual with the following exceptions:

- In section 4.1.1 (Wiring Checks - Motor Disconnected) refer to section 1.0 (WIRING) of this setup sheet for the HVAC control wiring description.
- In section 4.1.2 (Drive Programming) only perform steps 1 and 2. Skip steps 3 through 5 which deal with programming the drive - the drive has been pre-programmed for the HVAC model. For any custom programming requirements, refer to section 2.0 (DRIVE PROGRAMMING) in this setup sheet.
- Please note Electric Shock warning in section 4.1.3 and Motor Rotation Warning in section 4.1.4.
- In section 4.1.5 (Check for Correct Motor Rotation) you must check for the proper motor rotation in **both VFD and BYPASS Mode.**

WARNING
In the following steps, rotation of the motor in an undesired direction can occur. To guard against possible equipment damage, it is recommended that the motor be disconnected from the load before proceeding.

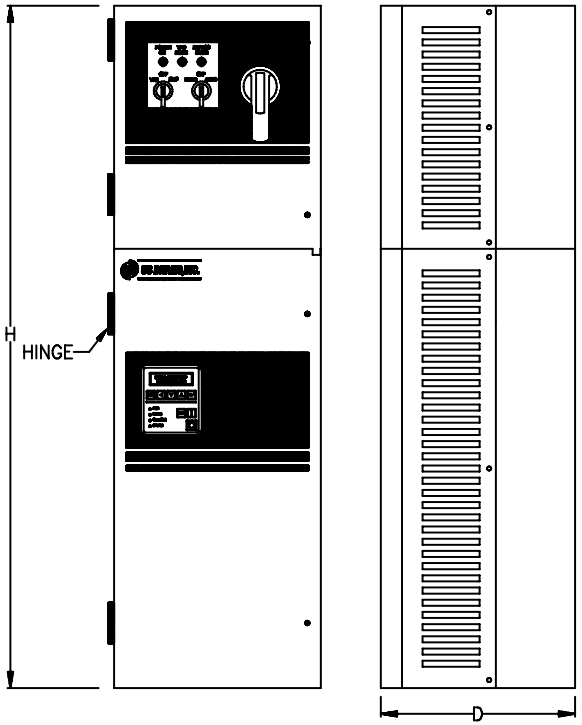
VFD MOTOR ROTATION CHECK:

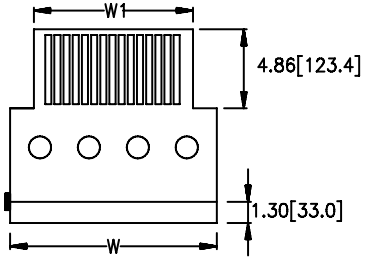
Sections 4.1.5 and 4.1.6 should first be performed with the "VFD-OFF-BYP" switch is in the **"VFD" position** and the "HAND-OFF-AUTO" switch in the **"HAND" position**. Follow all instructions using the MOP frequency control. If motor rotation is incorrect, as stated in section 4.1.5 interchange any two of the three **customer** "OUTPUT TO MOTOR" leads, U, V, or W. **Under no circumstances should the internal drive wiring be interchanged**. This completes the check for motor rotation in VFD mode.

BYPASS MOTOR ROTATION CHECK:

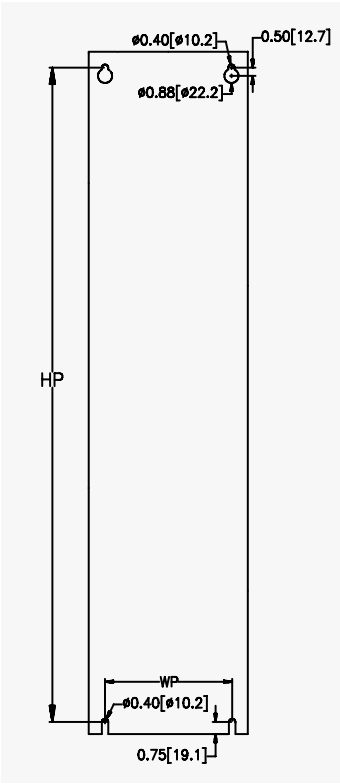
After stopping the VFD by pressing the ROM stop key, place the "HAND-OFF-AUTO" switch in the **"OFF" position**. Start the motor in BYPASS mode by placing the "VFD-OFF-BYP" switch in the **"BYP" position**. If the motor direction is incorrect, remove and lock-out input and control power to the drive. When the ROM is no longer illuminated, wait for five (5) minutes for the bus capacitors to fully discharge. Open the drive door and interchange any two of the three **customer** AC LINE INPUT leads, L1, L2, or L3. **Under no circumstances should the internal drive wiring be interchanged**. This completes the check for motor rotation in BYPASS mode.

NEMA TYPE 1 (IP20) DIMENSIONS: SIZE1 & SIZE2



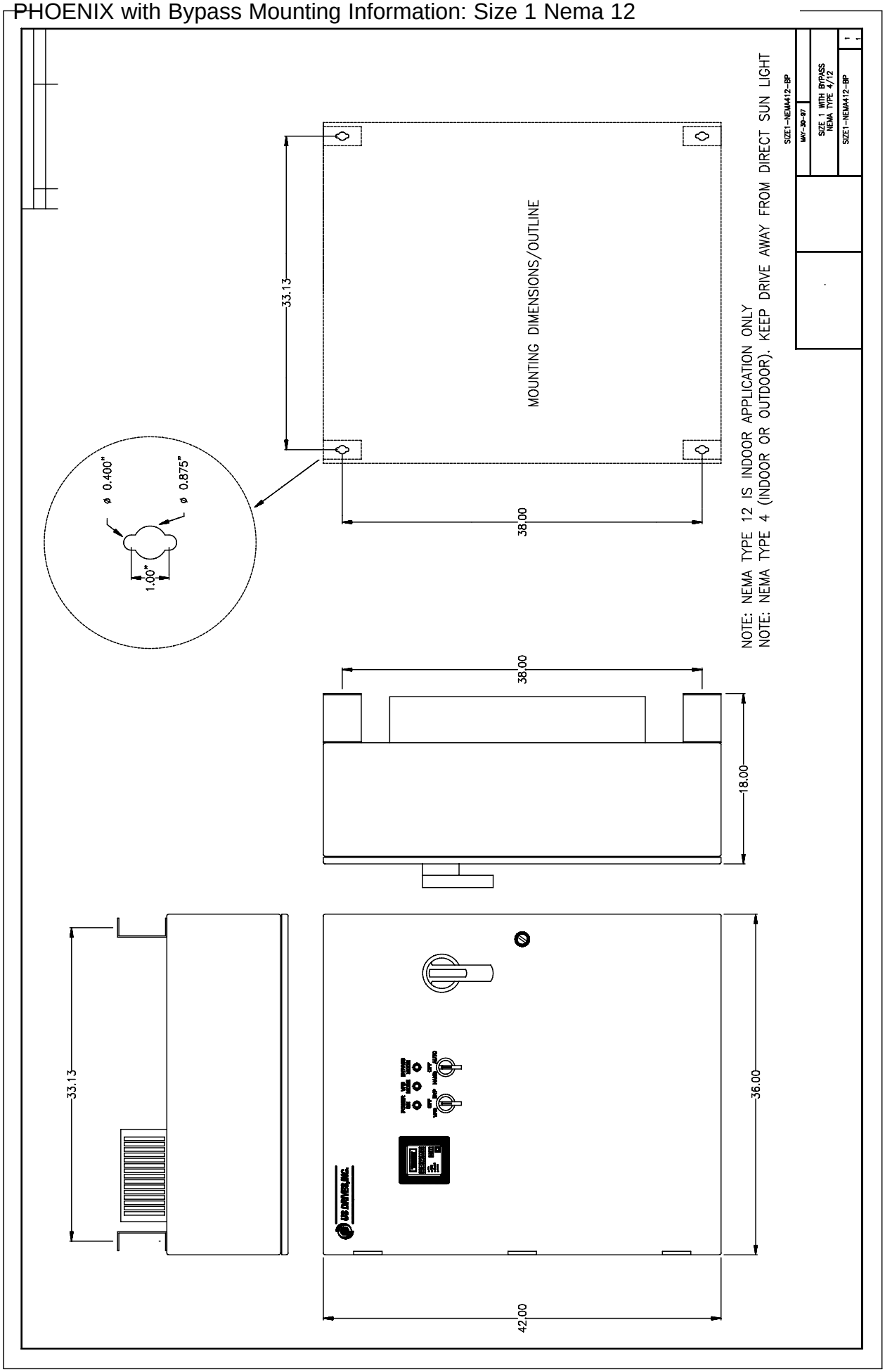


PANEL MOUNTING

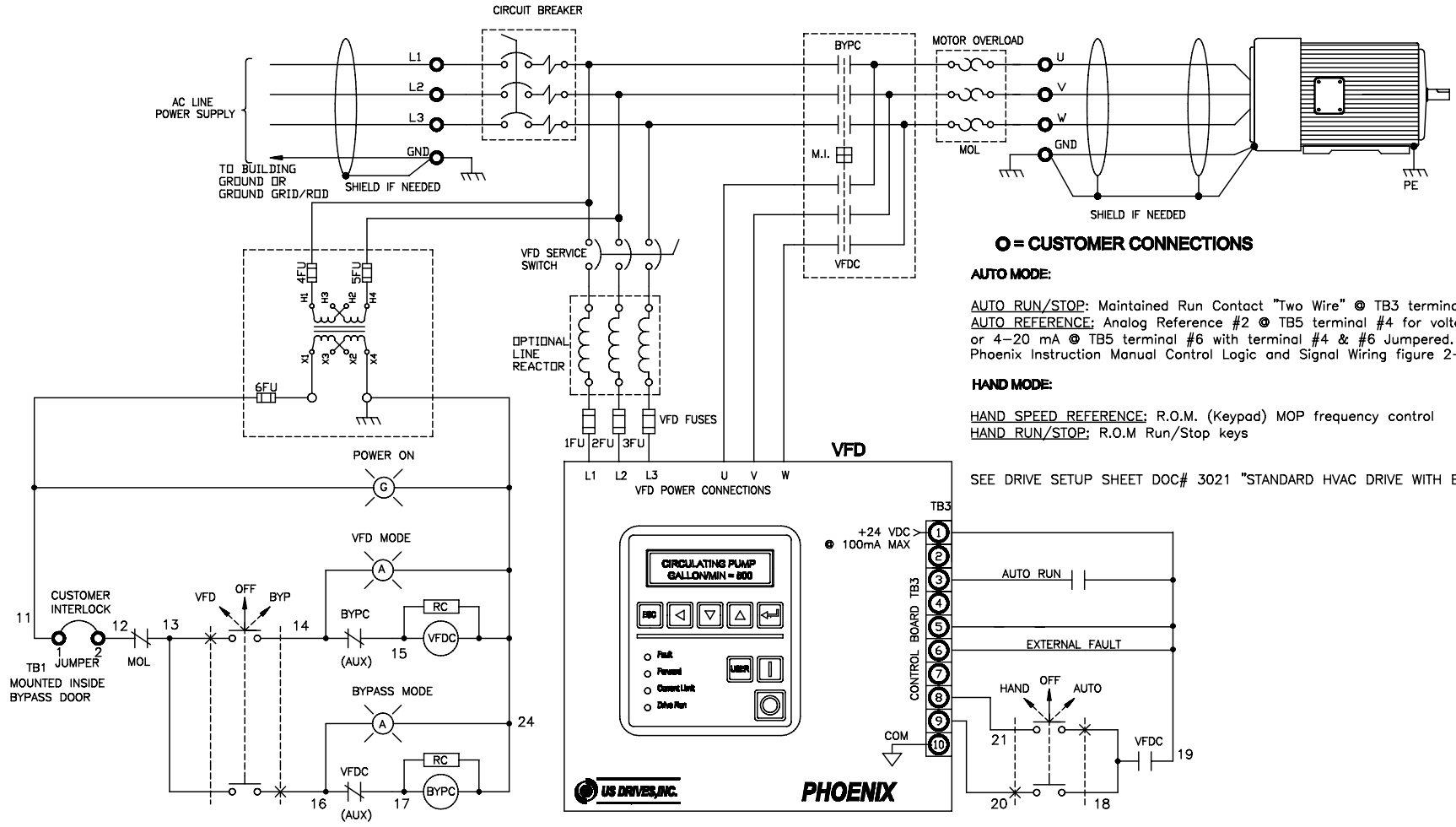


* Note: Top and bottom endplates are removable to gain access to mounting holes and to punch holes for conduits.

Frame Designation	H Inches [mm]	W Inches [mm]	D Inches [mm]	HP Inches [mm]	WP Inches [mm]	Knockouts	Weights Lbs [Kgs]
SIZE 1	42.00 [1066.8]	12.67 [321.8]	11.91 [302.5]	40.21 [1021.3]	7.75 [196.9]	Four 1.359" [34.5] DIA. Knockouts For 1" [25.4] Trade Size Conduits	110 [50]
SIZE 2	65.00 [1651.0]	20.11 [510.8]	13.52 [343.4]	62.60 [1590.0]	11.74 [298.2]	Three 3" [76.2] DIA. Knockouts For 2.5" [63.5] Trade Size Conduits & Three 1.359" [34.5] DIA. Knockouts For 1" [25.4] Trade Size Conduits	250 [113]


MOUNTING DIMENSIONS/OUTLINE
33.13
38.00
ø 0.400"
ø 0.875"
1.00"
NOTE: NEMA TYPE 12 IS INDOOR APPLICATION ONLY
NOTE: NEMA TYPE 4 (INDOOR OR OUTDOOR). KEEP DRIVE AWAY FROM DIRECT SUN LIGHT
38.00
18.00
33.13
36.00
42.00
SIZE1-NEMA412-BP
MAY-30-97
SIZE 1 WITH BYPASS
NEMA TYPE 4/12
SIZE1-NEMA412-BP

REVISION		
REV.	DESCRIPTION	CHG. BY & DATE



O = CUSTOMER CONNECTIONS

AUTO MODE:

AUTO RUN/STOP: Maintained Run Contact "Two Wire" @ TB3 terminal #3
AUTO REFERENCE: Analog Reference #2 @ TB5 terminal #4 for voltage input, or 4–20 mA @ TB5 terminal #6 with terminal #4 & #6 Jumpered. See Phoenix Instruction Manual Control Logic and Signal Wiring figure 2–5.

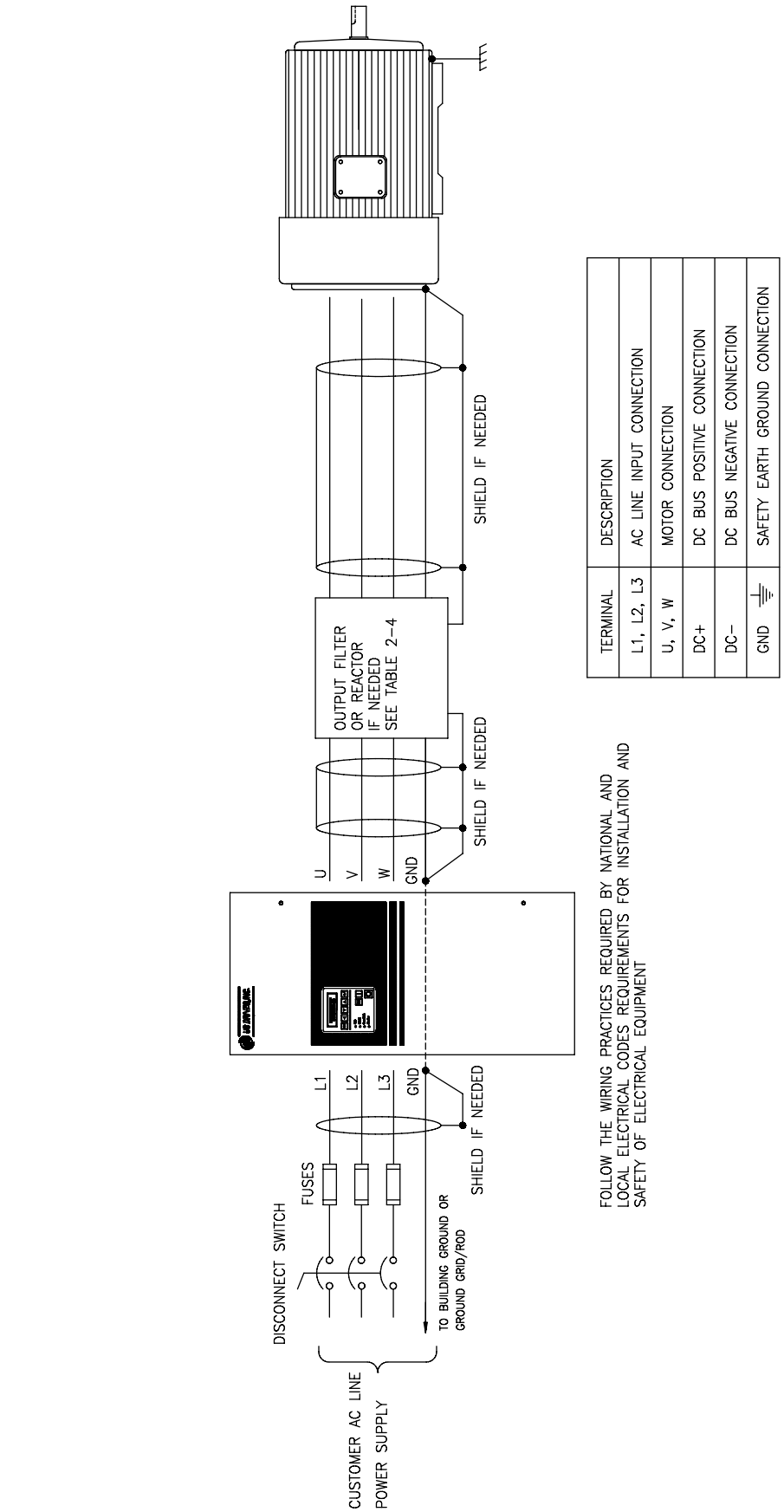
HAND MODE:

HAND SPEED REFERENCE: R.O.M. (Keypad) MOP frequency control
HAND RUN/STOP: R.O.M Run/Stop keys

SEE DRIVE SETUP SHEET DOC# 3021 "STANDARD HVAC DRIVE WITH BYPASS"

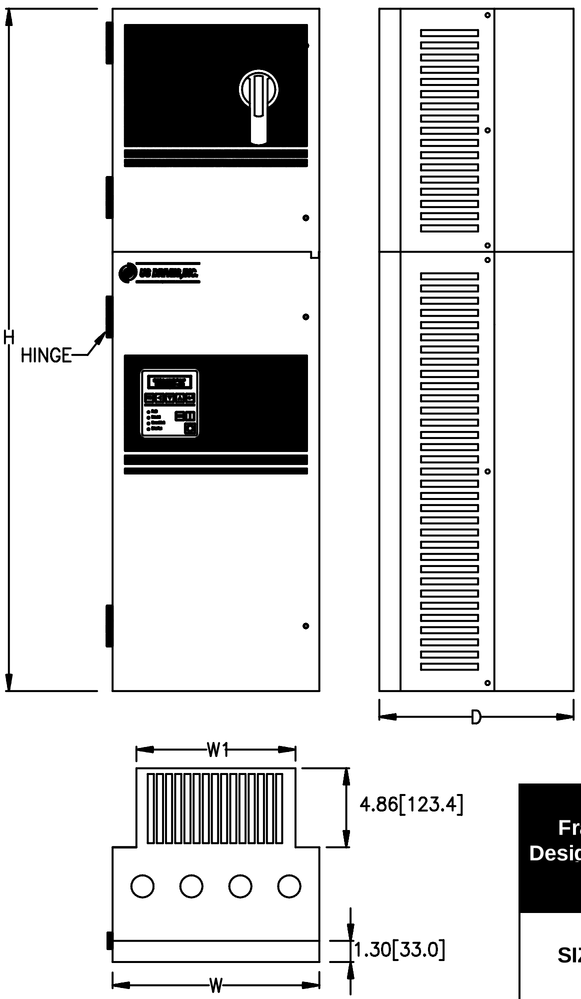
This is AutoCAD drawing # D1000-0001

US DRIVES, INC.	DIMENSIONS IN INCHES. TOL.±√___ FR ___ ±.XX___ ±.XXX___ ANGLES ± ___° HOLE DIA. ±.003	DR FEB-2-97	APPD
US DRIVES, INC. CLAIMS PROPRIETARY RIGHTS IN THE MATERIAL DISCLOSED HEREON. THIS DOCUMENT MAY NOT BE DISCLOSED TO OTHERS AND THE INFORMATION HEREIN BE USED WITHOUT WRITTEN PERMISSION FROM US DRIVES, INC.		TITLE	HVAC PHOENIX DRIVE BYPASS WIRING DIAGRAM
		1000-0001	SHT 1 OF 1

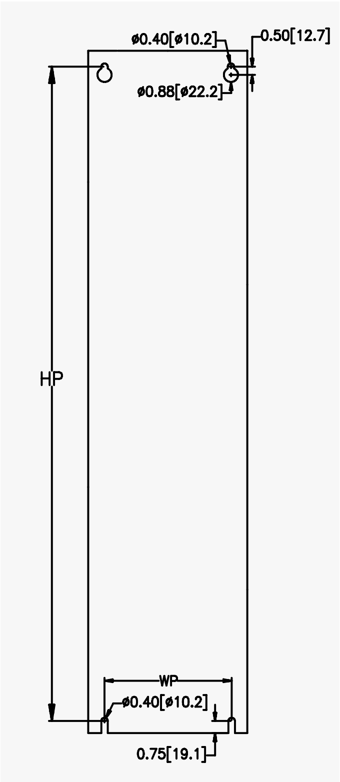


PHOENIX WITH DISCONNECT AND FUSES

NEMA TYPE 1 (IP20) DIMENSIONS: SIZE1 & SIZE2



PANEL MOUNTING

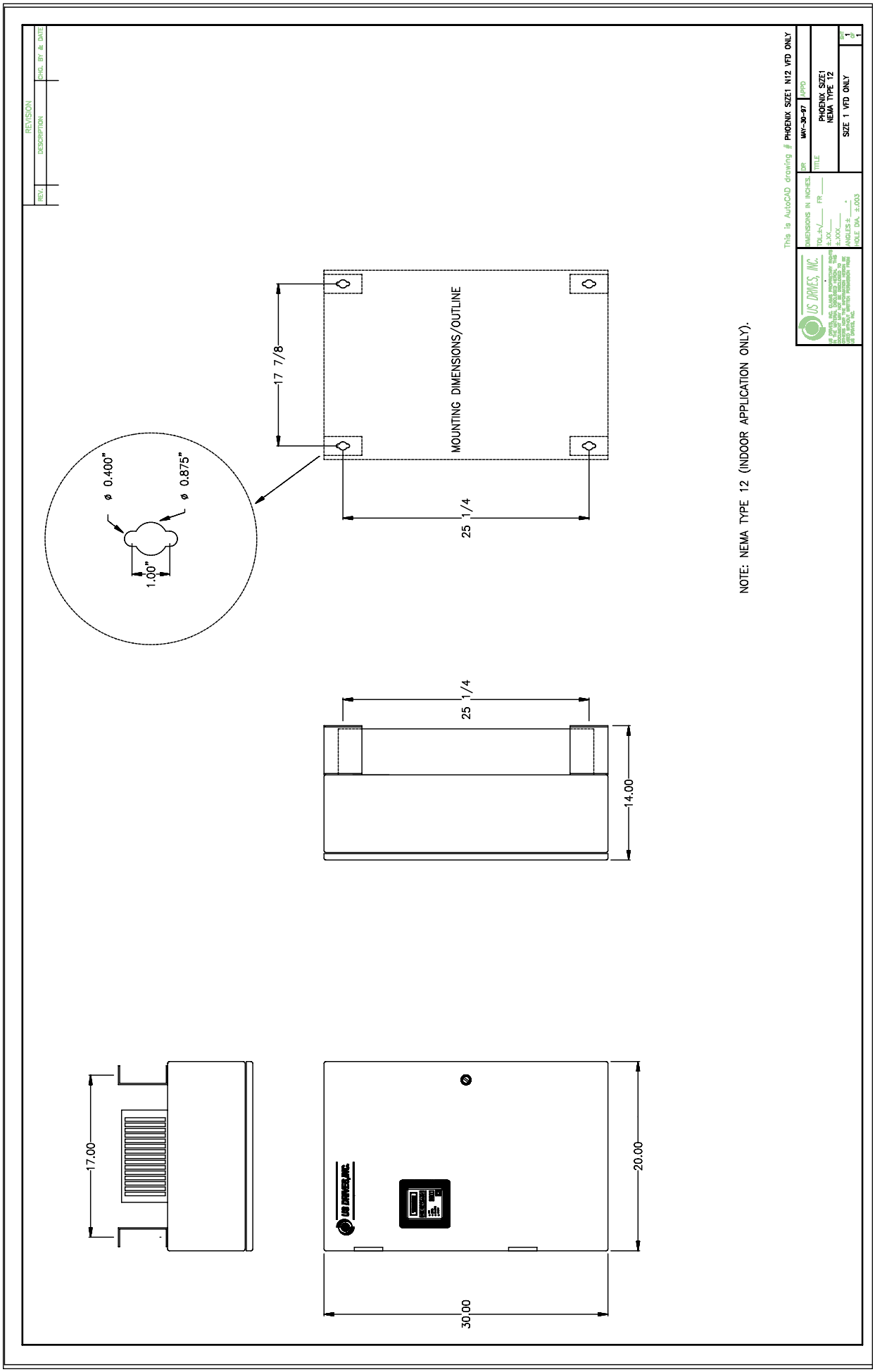


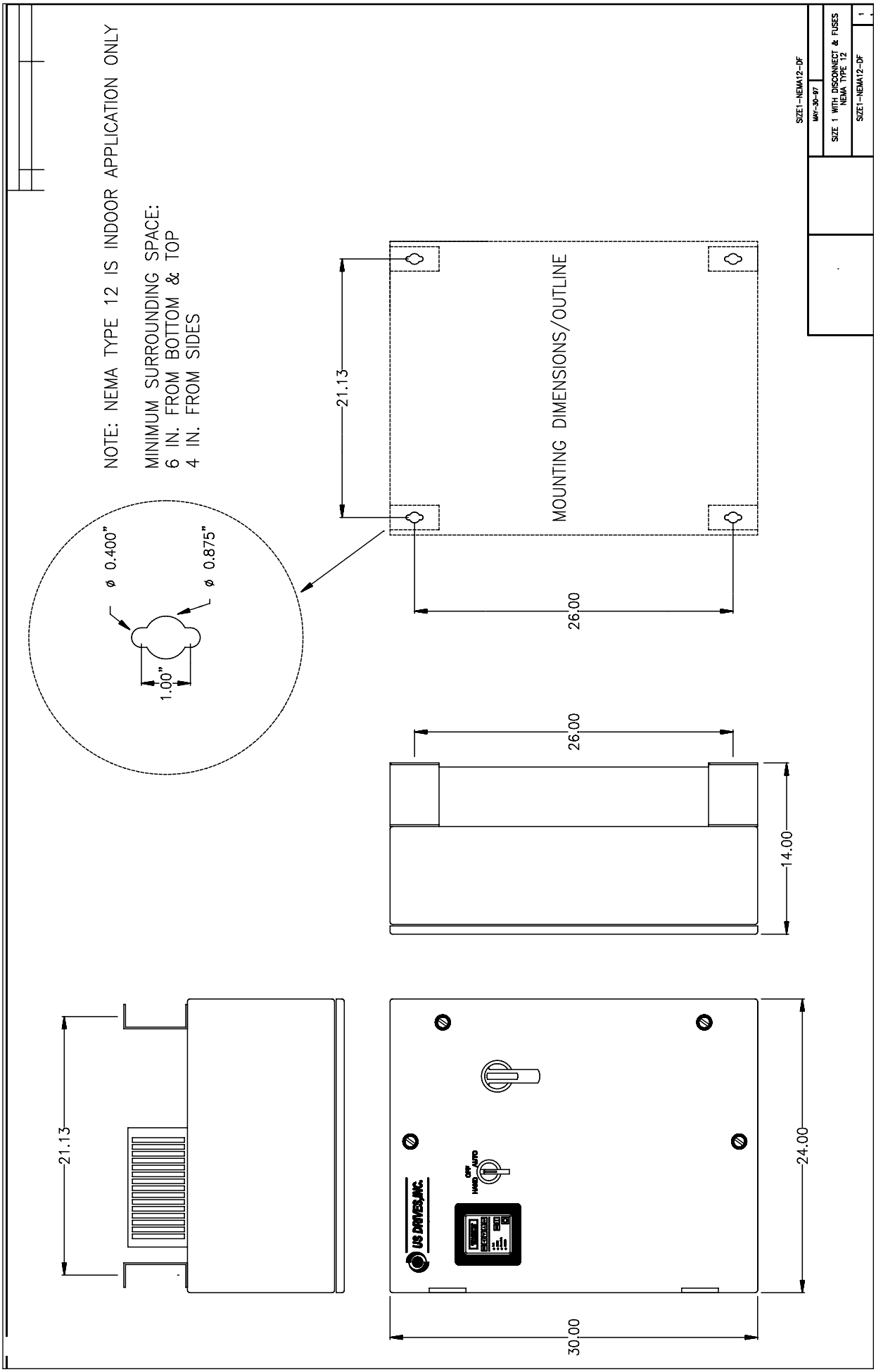
* Note: Top and bottom endplates are removable to gain access to mounting holes and to punch holes for conduits.

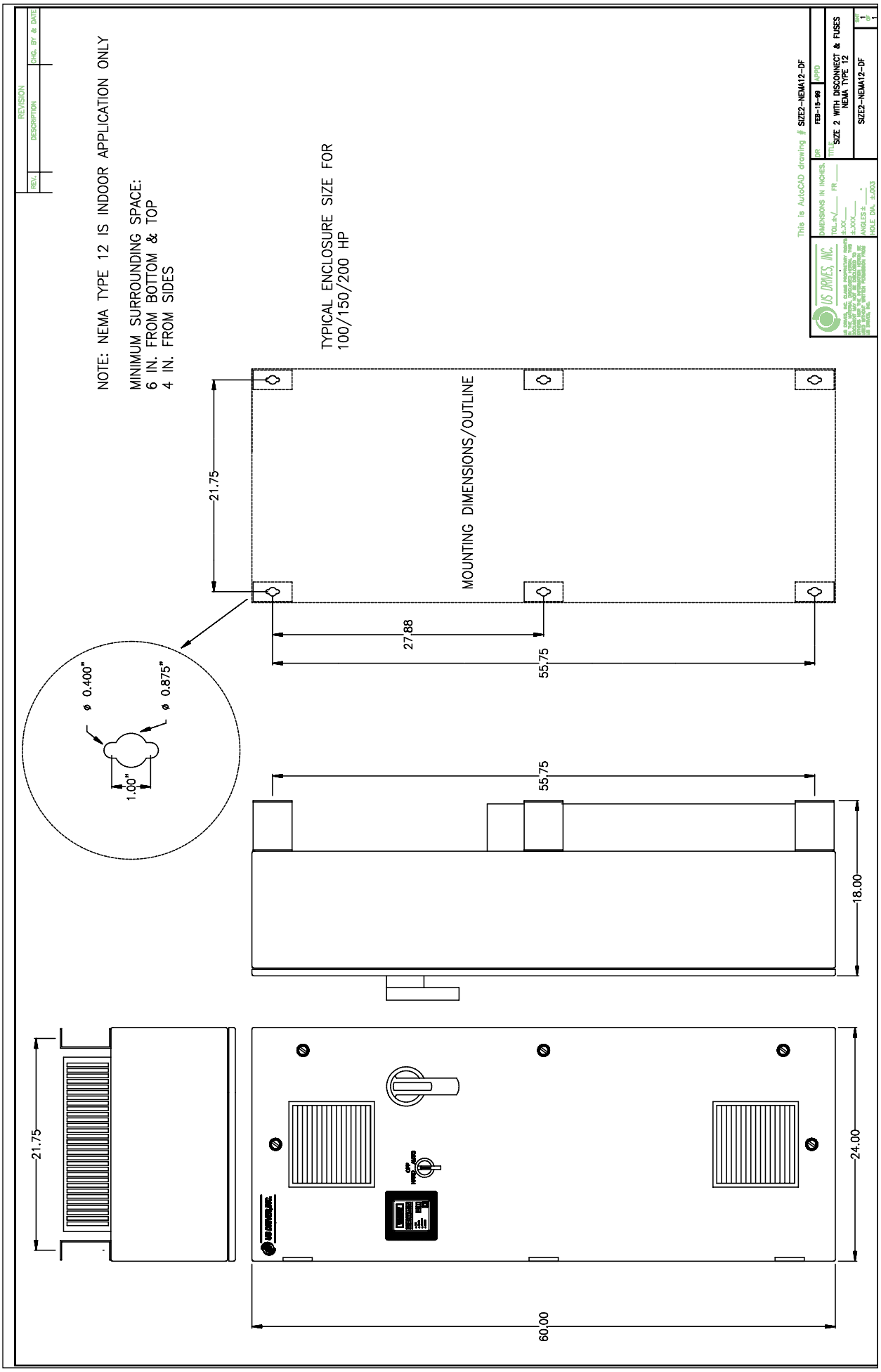
Frame Designation	H Inches [mm]	W Inches [mm]	D Inches [mm]	HP Inches [mm]	WP Inches [mm]	Knockouts	Weights Lbs [Kgs]
SIZE 1	42.00 [1066.8]	12.67 [321.8]	11.91 [302.5]	40.21 [1021.3]	7.75 [196.9]	Four 1.359" [34.5] DIA. Knockouts For 1" [25.4] Trade Size Conduits	110 [50]
SIZE 2	65.00 [1651.0]	20.11 [510.8]	13.52 [343.4]	62.60 [1590.0]	11.74 [298.2]	Three 3" [76.2] DIA. Knockouts For 2.5" [63.5] Trade Size Conduits & Three 1.359" [34.5] DIA. Knockouts For 1" [25.4] Trade Size Conduits	250 [113]

PHOENIX with Disconnect & Fuses: Mounting Information: Size 1 Through Size 2 Units

6-12 PHOENIX MOUNTING INFORMATION; Size 1 VFD only Nema 12




NOTE: NEMA TYPE 12 IS INDOOR APPLICATION ONLY
MINIMUM SURROUNDING SPACE:
6 IN. FROM BOTTOM & TOP
4 IN. FROM SIDES
MOUNTING DIMENSIONS/OUTLINE
21.13
26.00
ø 0.400"
ø 0.875"
1.00"
26.00
14.00
21.13
24.00
30.00
SIZE1-NEMA12-DF
MAY-30-97
SIZE 1 WITH DISCONNECT & FUSES
NEMA TYPE 12
SIZE1-NEMA12-DF


NOTE: NEMA TYPE 12 IS INDOOR APPLICATION ONLY
MINIMUM SURROUNDING SPACE:
6 IN. FROM BOTTOM & TOP
4 IN. FROM SIDES
TYPICAL ENCLOSURE SIZE FOR
100/150/200 HP
MOUNTING DIMENSIONS/OUTLINE
21.75
27.88
55.75
ø 0.400"
ø 0.875"
1.00"
55.75
18.00
21.75
24.00
60.00
SIZE 2 WITH DISCONNECT & FUSES
NEMA TYPE 12
SIZE2-NEMA12-DF
FEB-15-99

BOARD P/N: 3000-4040 & 3000-4040-120

INPUTS:

FOR INPUT VOLTAGE (DC) USE:	TB1: TERMINAL # 1 (+) , TERMINAL # 3 (-)	**Max input voltage: per table below**
FOR INPUT CURRENT USE:	TB1: TERMINAL # 2 (+) , TERMINAL # 3 (-)	**Max input current: 75mA**
SUPPLY VOLTAGE 24VDC:	TB2: TERMINAL # 1 (+) , TERMINAL # 2 (-)	**Max supply voltage 24Vdc**

OUTPUT:

OUTPUT VOLTAGE REFERENCE:	TB2: TERMINAL # 3	**0-10Vdc at 4 mA max**
OUTPUT CURRENT REFERENCE:	TB2: TERMINAL # 4	**4-20mA at 500Ω max**
COMMON, RETURN:	TB2: TERMINAL # 2	

SUPPLY VOLTAGE:

FOR BOARD P/N 3000-4040-120: TB3 TERMINAL#1 (HOT), TERMINAL#2 (NEUTRAL): 120VAC 50/60HZ 100MA MAX

FOR BOARD P/N 3000-4040: TB2 TERMINAL#1 (+), TERMINAL#2 (-): 24VDC 100MA MAX

JUMPER PROGRAMMING:

JP1 PROGRAMMING	
POSITION	MAX INPUT VOLTAGE
12V	12V
24V	24V
48V	48V
96V	96V
192V	192V

JP2 PROGRAMMING	
POSITION	INPUT
V-IN	VOLTAGE
I-IN	4-20 mA @ 250Ω

POTENTIOMETERS:

POT1 BIAS — Bias pot, used to set output to zero volts or 4mA at either zero volts input or 4mA current input.

- Voltage input: with input voltage set to zero volts, adjust POT1 BIAS for zero voltage at VOLT OUT.
- Voltage input: with input voltage set to zero volts, adjust POT1 BIAS for 4 mA at CURR OUT.

- Current input: current set to 4mA, adjust POT1 BIAS for zero voltage at VOLT OUT.
- Current input: current set to 4mA, adjust POT1 BIAS for 4 mA at CURR OUT.

POT2 GAIN — Gain Pot, used to set output to 10Vdc or 20mA at maximum input voltage or 20mA input current.

- Voltage input: with input voltage set to maximum volts, adjust POT2 GAIN for 10Vdc at VOLT OUT.
- Voltage input: with input voltage set to maximum volts, adjust POT2 GAIN for 20mA at CURR OUT.

- Current input: current set to 20mA, adjust POT2 GAIN for 10Vdc at VOLT OUT.
- Current input: current set to 20mA, adjust POT2 GAIN for 20 mA at CURR OUT.

6-16 3-15 PSI SIGNAL FOLLOWER PROGRAMMING

BOARD P/N: 3000-4045

INPUTS:

PSI signal input: pneumatic neoprene 1/8" ID hose to transducer nipple.

SUPPLY VOLTAGE 24VDC : TB1: TERMINAL # 1
SUPPLY COMMON: TB1: TERMINAL # 2

OUTPUT:

OUTPUT VOLTAGE REFERENCE: TB1: TERMINAL # 3
OUTPUT CURRENT REFERENCE: TB1: TERMINAL # 4

POTENTIOMETERS:

A) Calibration for output voltage reference 0-10V at "VOLT OUT"

1a. With air pressure of 3 PSI applied, adjust POT1 "BIAS" for zero volts at "VOLT OUT" at TB1 TERM#3.

2a. With air pressure of 15 PSI applied, adjust POT2 "GAIN" for 10 volts at "VOLT OUT" at TB1 TERM#3.

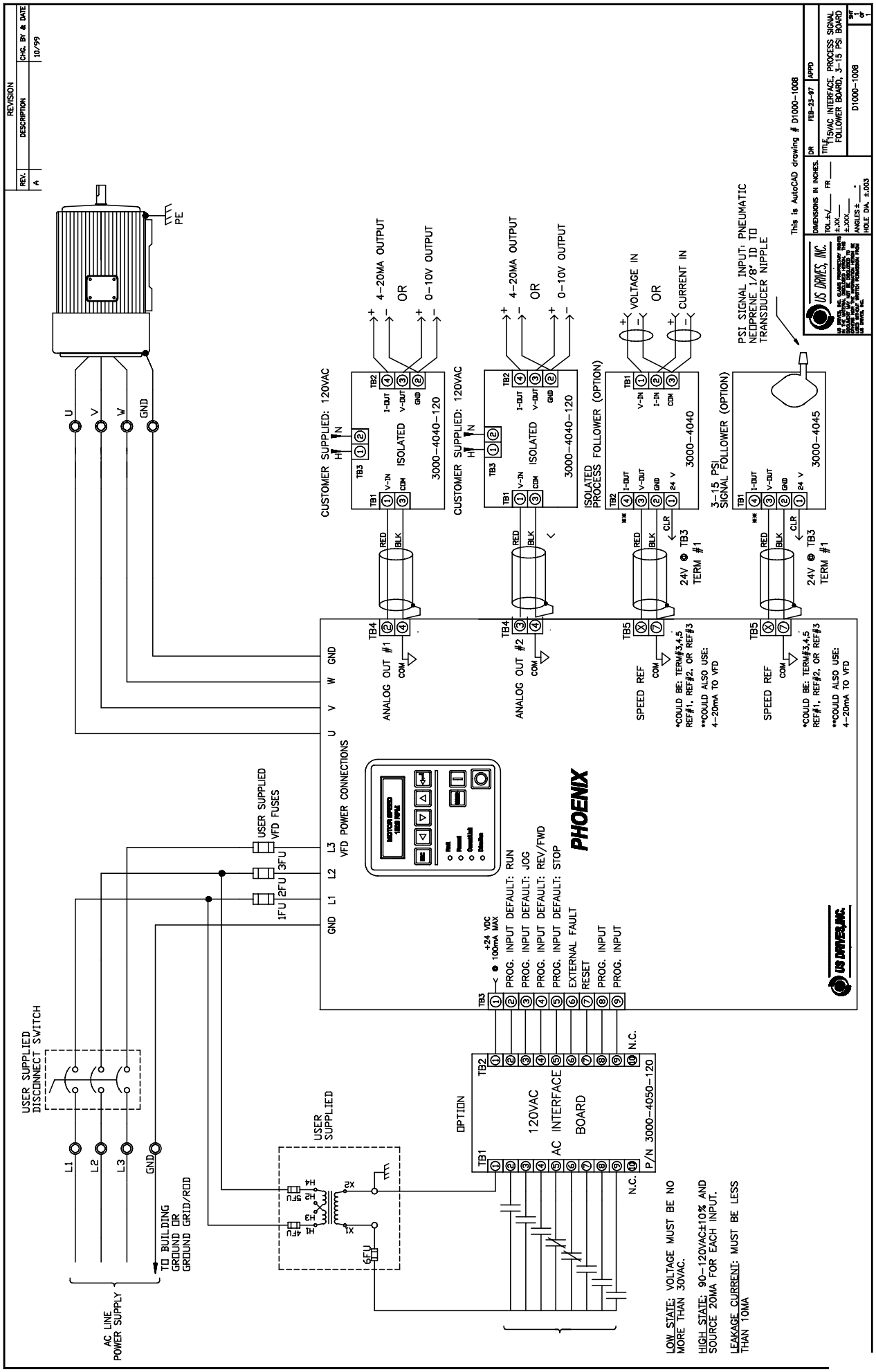
3a. Check bias and calibration by repeating step 1a and 2a.

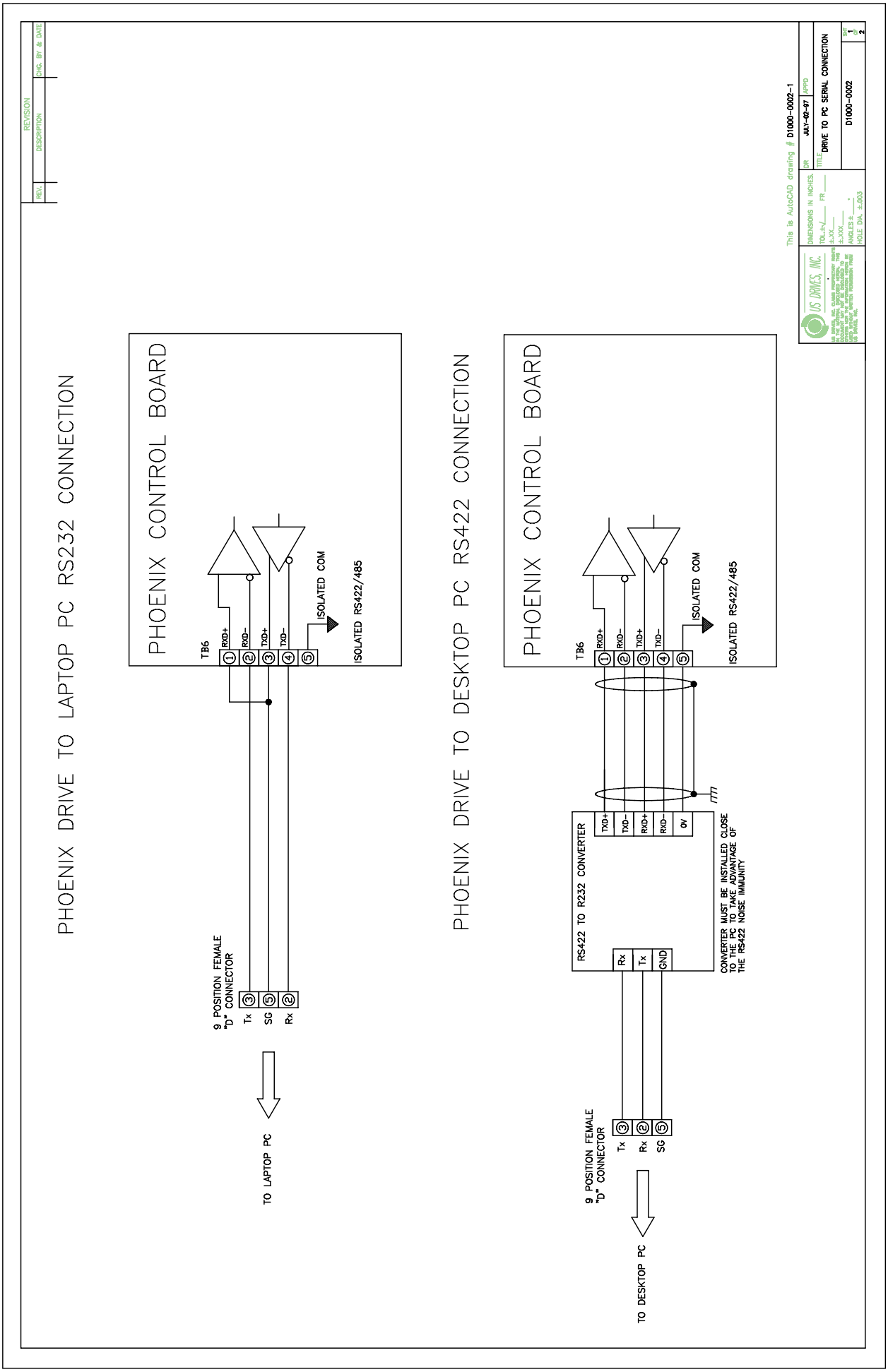
B) Calibration for output current reference 4-20mA at "CURR OUT"

1b. With air pressure of 3 PSI applied, adjust POT1 "BIAS" for 4mA at "CURR OUT" at TB1 TERM#4.

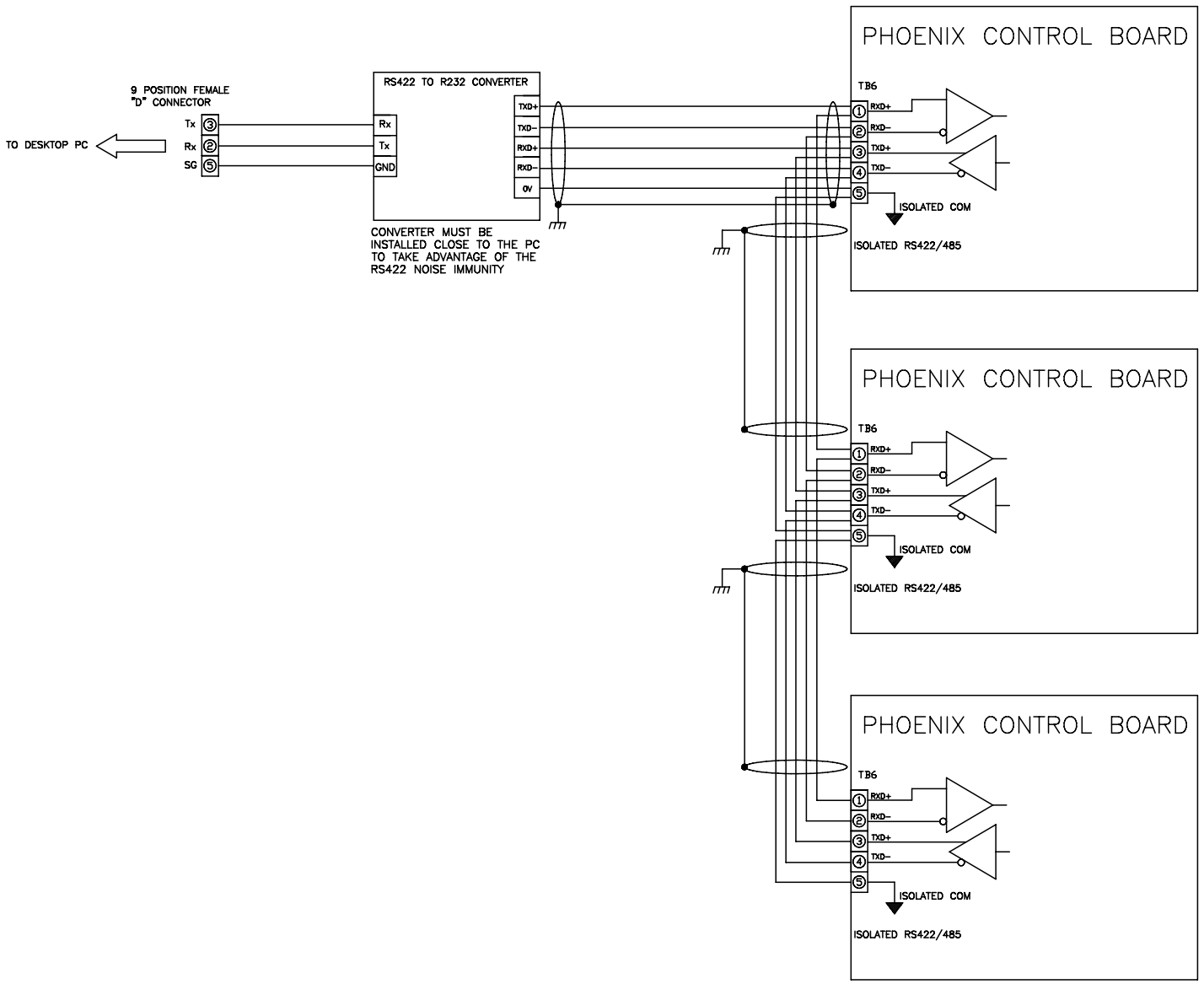
2b. With air pressure of 15 PSI applied, adjust POT2 "GAIN" for 20mA at "CURR OUT" at TB1 TERM#4.

3b. Check bias and calibration by repeating step 1b and 2b.


REVISION
REV. DESCRIPTION CHG. BY & DATE
A 10/99
This is AutoCAD drawing # D1000-1008
DIMENSIONS IN INCHES
TOL-+/- FR
.XX+/-
.XXX+/-
ANGLES+/-
HOLE DIA. ±.003
DR FEB-23-97 APPD
TITLE 115VAC INTERFACE, PROCESS SIGNAL FOLLOWER BOARD, 3-15 PSI BOARD
D1000-1008
SHT 1 OF 1
US DRIVES, INC.
PE
U V W GND
CUSTOMER SUPPLIED: 120VAC
ISOLATED
3000-4040-120
4-20MA OUTPUT
OR
0-10V OUTPUT
ISOLATED PROCESS FOLLOWER (OPTION)
3000-4040
VOLTAGE IN
CURRENT IN
3-15 PSI SIGNAL FOLLOWER (OPTION)
3000-4045
PSI SIGNAL INPUT: PNEUMATIC
NEOPRENE 1/8" ID TD
TRANSDUCER NIPPLE
ANALOG OUT #1
ANALOG OUT #2
SPEED REF
*COULD BE: TERM#3,4,5 REF#1, REF#2, OR REF#3
**COULD ALSO USE: 4-20mA TO VFD
24V @ TB3 TERM #1
RED
BLK
CLR
COM
GND L1 L2 L3 VFD POWER CONNECTIONS U V W GND
PHOENIX
+24 VDC @ 100mA MAX
PROG. INPUT DEFAULT: RUN
PROG. INPUT DEFAULT: JOG
PROG. INPUT DEFAULT: REV/FWD
PROG. INPUT DEFAULT: STOP
EXTERNAL FAULT RESET
PROG. INPUT
PROG. INPUT
N.C.
USER SUPPLIED VFD FUSES
1FU 2FU 3FU
USER SUPPLIED DISCONNECT SWITCH
L1 L2 L3 GND
AC LINE POWER SUPPLY
TO BUILDING GROUND OR GROUND GRID/ROD
USER SUPPLIED
6FU
OPTION
120VAC INTERFACE BOARD
AC
P/N 3000-4050-120
LOW STATE: VOLTAGE MUST BE NO MORE THAN 30VAC.
HIGH STATE: 90-120VAC±10% AND SOURCE 20MA FOR EACH INPUT.
LEAKAGE CURRENT: MUST BE LESS THAN 10MA


PHOENIX DRIVE TO LAPTOP PC RS232 CONNECTION
PHOENIX CONTROL BOARD
TB6
RXD+
RXD–
TXD+
TXD–
ISOLATED COM
ISOLATED RS422/485
9 POSITION FEMALE "D" CONNECTOR
Tx
SG
Rx
TO LAPTOP PC
PHOENIX DRIVE TO DESKTOP PC RS422 CONNECTION
PHOENIX CONTROL BOARD
TB6
RXD+
RXD–
TXD+
TXD–
ISOLATED COM
ISOLATED RS422/485
RS422 TO R232 CONVERTER
TXD+
TXD–
RXD+
RXD–
0V
Rx
Tx
GND
CONVERTER MUST BE INSTALLED CLOSE TO THE PC TO TAKE ADVANTAGE OF THE RS422 NOISE IMMUNITY
9 POSITION FEMALE "D" CONNECTOR
Tx
Rx
SG
TO DESKTOP PC
REVISION
REV.
DESCRIPTION
CHG. BY & DATE
This is AutoCAD drawing # D1000-0002-1
DR JULY-02-97 APPD
DIMENSIONS IN INCHES
TOL-+/-
.XX ±
.XXX ±
ANGLES ±
HOLE DIA. ±.003
US DRIVES, INC.
TITLE
DRIVE TO PC SERIAL CONNECTION
D1000-0002
SHT 1 2

PHOENIX DRIVE TO DESKTOP PC RS485 4-WIRE PARTY-LINE CONNECTION



REVISION		
REV.	DESCRIPTION	CHG. BY & DATE

This is AutoCAD drawing # D1000-0002-2

US DRIVES, INC.

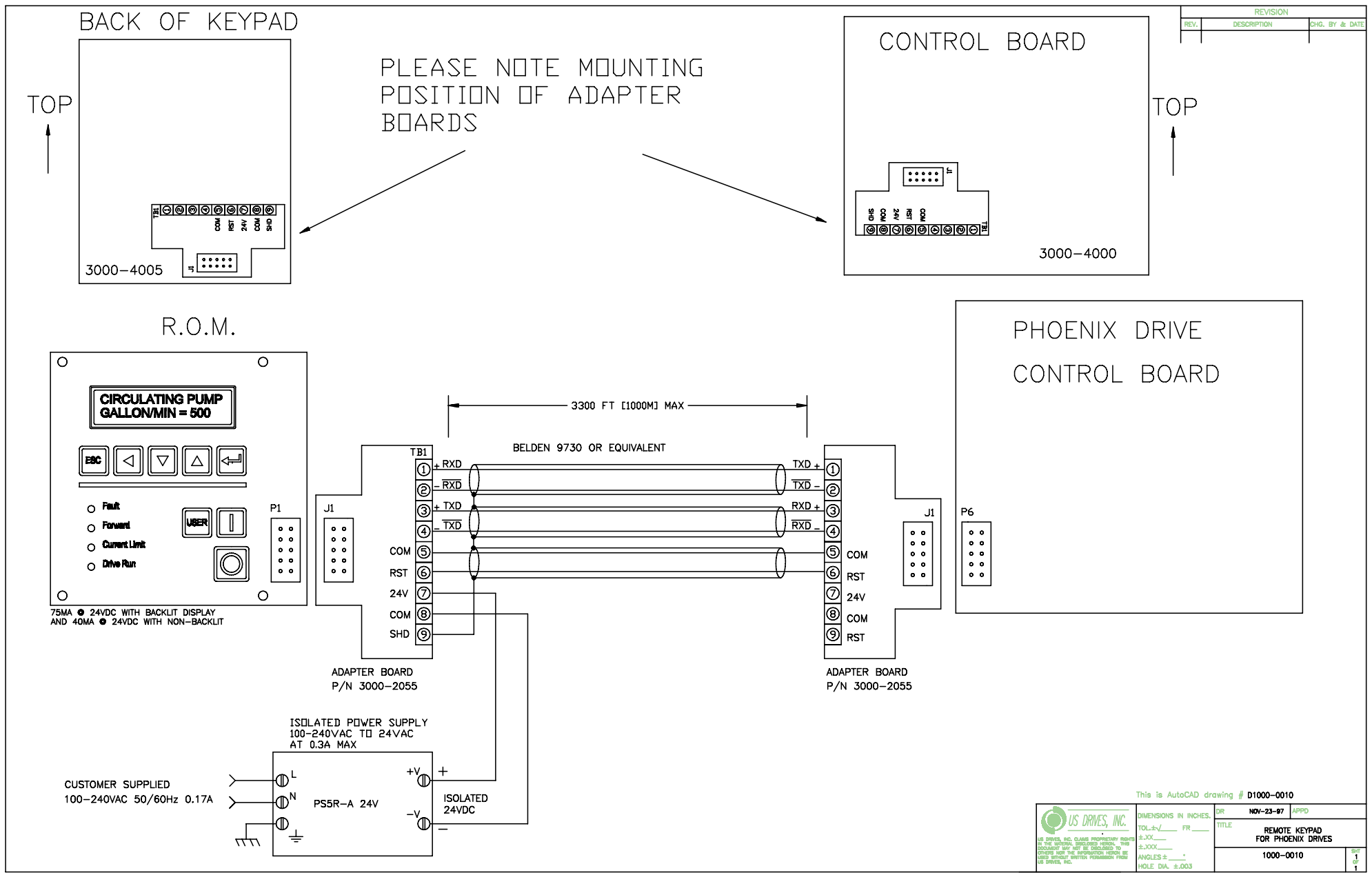
DIMENSIONS IN INCHES.
TOL.±√___ FR ___
±.XX___
±.XXX___
ANGLES ± ___°
HOLE DIA. ±.003

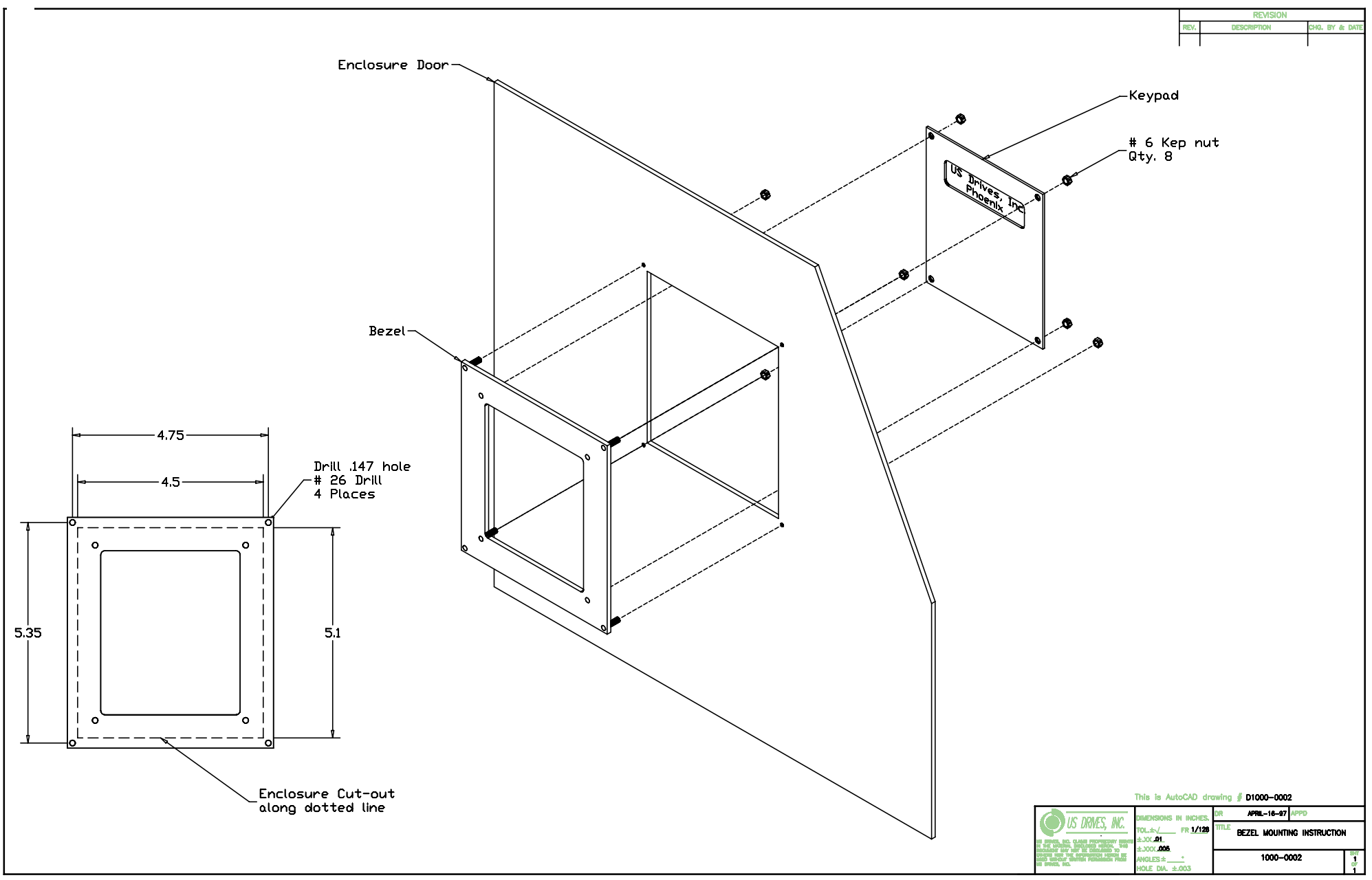
DR JULY-02-97 APPD

TITLE DRIVE TO PC SERIAL CONNECTION

D1000-0002

SHT 2 OF 2


BACK OF KEYPAD
TOP
3000-4005
PLEASE NOTE MOUNTING POSITION OF ADAPTER BOARDS
CONTROL BOARD
TOP
3000-4000
REVISION
REV.
DESCRIPTION
CHG. BY & DATE
R.O.M.
CIRCULATING PUMP
GALLON/MIN = 500
ESC
Fault
Forward
Current Limit
Drive Run
USER
P1
75MA @ 24VDC WITH BACKLIT DISPLAY
AND 40MA @ 24VDC WITH NON-BACKLIT
3300 FT [1000M] MAX
BELDEN 9730 OR EQUIVALENT
TB1
+ RXD
- RXD
+ TXD
- TXD
COM
RST
24V
COM
SHD
J1
ADAPTER BOARD
P/N 3000-2055
TXD +
TXD -
RXD +
RXD -
COM
RST
24V
COM
RST
J1
ADAPTER BOARD
P/N 3000-2055
PHOENIX DRIVE
CONTROL BOARD
P6
ISOLATED POWER SUPPLY
100-240VAC TO 24VAC
AT 0.3A MAX
CUSTOMER SUPPLIED
100-240VAC 50/60Hz 0.17A
L
N
PS5R-A 24V
+V
-V
+
-
ISOLATED
24VDC
This is AutoCAD drawing # D1000-0010
US DRIVES, INC.
DIMENSIONS IN INCHES
TOL. ±/____ FR ____
±.XX____
±.XXX____
ANGLES ± ____°
HOLE DIA. ±.003
DR NOV-23-97 APPD
TITLE
REMOTE KEYPAD
FOR PHOENIX DRIVES
1000-0010
SHT 1 OF 1



REVISION		
REV.	DESCRIPTION	CHG. BY & DATE

This is AutoCAD drawing # D1000-0002

US DRIVES, INC.

DIMENSIONS IN INCHES.
TOL.±/___ FR 1/128
±.XX .01
±.XXX .005
ANGLES ± ___°
HOLE DIA. ±.003

DR APRIL-16-97 APPD

TITLE BEZEL MOUNTING INSTRUCTION

1000-0002

SHT 1 OF 1

May 26, 2000

DRIVE FAULTS DESCRIPTION

DRIVE READY	NO DRIVE FAULTS ARE PRESENT
GROUND FAULT	GROUND FAULT DETECTED IN ONE OF THE MOTOR LEADS
DSP WATCHDOG	DIGITAL-SIGNAL-PROCESSOR (DSP) FAULT, THIS IS A CONTROL BOARD HARDWARE FAULT.
CONTROL PWR FAIL	CONTROL POWER SUPPLY DROPPED BELOW NORMAL
BUS OVERVOLTAGE	DC BUS VOLTAGE EXCEEDED MAXIMUM LEVEL
GATE DRIVE FAULT	IGBT DRIVER POWER SUPPLY LOSS, POWER BOARD HARDWARE FAULT
INST I MOT FLT	MAXIMUM PEAK CURRENT LEVEL HAS BEEN EXCEEDED.
AUTORESTART FLT	THE MAXIMUM OF AUTORESTARTS/DAY WAS EXCEEDED: AUTORESTART WAS DISABLED
EXTERNAL STOP	INPUT CONTACT OPENED AT TERMIMAL 5 @ TB3
OVERTEMP	HEATSINK OVER-TEMPERATURE: INADEQUATE COOLING
DSP FAULT	DIGITAL-SIGNAL-PROCESSOR (DSP) FAULT, THIS IS A CONTROL BOARD HARDWARE FAULT.
DEFAULTS LOADED	DEFAULT PARAMETERS HAVE BEEN LOADED EITHER FROM EEPROM OR FACTORY DEFAULT.
AC POWER LOSS	BUS UNDERVOLTAGE OR POWER SUPPLY LOSS DUE TO AC POWER LOSS
SET TYPE/MODEL	ILLEGAL DRIVE TYPE OR MODEL, MUST SET TYPE & MODEL AGAIN TO CLEAR FAULT.
DSP/196 COMM FLT	DSP & MICRO-CONTROLLER COMMUNICATIONS FAULT, THIS IS A CONTROL BOARD HARDWARE FAULT.
UNDER VOLTAGE	DC BUS VOLTAGE DROPPED BELOW THE MINIMUM LEVEL.
NUISANCE FAULT	FAULT DETECTED BUT NOT RECOGNIZED.
PRECHRGE TIMEOUT	DC BUS PRECHARGE CIRCUIT TIMED-OUT BECAUSE DC BUS VOLTAGE HAS NOT REACHED MINIMUM LEVEL
ILLEGAL INTRPT	MICRO-CONTROLLER INTERRUPT DETECTED BUT NOT RECOGNIZED.
LINE OVERVOLTAGE	AC LINE VOLTAGE EXCEEDED MAXIMUM LEVEL.
LOW BATTERY	LOW LITHIUM BATTERY ON CONTROL BOARD.
MOTOR OVERLOAD	MOTOR OVER-TEMPERATURE DETECTED BY DRIVE ELECTRONIC THERMAL PROTECTION CIRCUIT
PRECHRG AUX FAIL	PRECHARGE AUXILIARY SWITCH INDICATES THE CONTACTOR IS OPEN WHEN IT IS SUPPOSED TO BE CLOSED.
DSP RST SYNC FLT	DSP & MICRO-CONTROLLER COMMUNICATIONS FAULT, THIS IS A CONTROL BOARD HARDWARE FAULT.
EXCESSIVE BOOST	EXCESSIVE VOLTAGE BOOST SETTING, MUST LOWER AUTO-BOOST VOLTAGE SETTING.
DRIVE OVERLOAD	DRIVE OVER-LOAD DETECTED BY DRIVE ELECTRONIC THERMAL PROTECTION CIRCUIT

PHOENIX POWER CIRCUIT TEST TABLE

WARNING
TO AVOID A HAZARD OF ELECTRIC SHOCK, AFTER THE INPUT AND CONTROL POWER IS REMOVED FROM THE DRIVE AND THE ROM DISPLAY IS NO LONGER LIT, WAIT FIVE (5) MINUTES FOR BUS CAPACITORS TO FULLY DISCHARGE BEFORE OPENING THE DRIVE TO MAKE THIS TEST.

Visual Check:

Check all boards, wire harnesses and connectors for discoloration & damage.
Disconnect motor from drive at U, V, W before performing Ohmic check.

Ohmic Check :

+ Lead	– Lead	Meter setting	Reading	
L1	L2	20k ohms	OL	
L2	L3	20k ohms	OL	
L1	L3	20k ohms	OL	
U	V	200K ohms	10-30K Ω	
V	W	200K ohms	10-30K Ω	
W	U	200K ohms	10-30K Ω	
DC +	DC –	DIODE	Charge to OL	
DC –	DC +	DIODE	0.5V-0.8V	
L1, L2, L3	DC +	DIODE	0.5V-0.8V	
DC +	L1, L2, L3	DIODE	Charge to OL	
DC –	L1, L2, L3	DIODE	0.5V	
L1, L2, L3	DC –	DIODE	Charge to OL	
L1, L2, L3, DC+	GND	200k ohms	OL	
DC –, U, V, W	GND	200k ohms	OL	
DC–	U, V, W	DIODE	0.3V-0.5V	
U, V, W	DC+	DIODE	0.3V-0.5V	

FOR SIZE 2 DRIVES (75HP AND LARGER):

U, V, W	RIGHT SIDE OF BUS FUSE	DIODE	0.3V-0.5V	
LEFT SIDE OF BUS FUSE	RIGHT SIDE OF BUS FUSE	20K	0.002-0.005KΩ	

BUS FUSE LOCATED AT BOTTOM OF SIZE 2 DRIVE

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US DRIVES, INC.

OWNERS REGISTRATION CARD

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Cut Along Dotted Line

US Drives, Inc. offers free configuration software to all customers who fill out the owners registration form. Besides the free software, its a great way for us to keep you informed of product upgrades and new releases.

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Company Name:_____
Address:_____
_____
_____
Phone:_____
Fax: _____

Drive Part Number: _____
Drive Serial Number:_____
Application:_____
Comments:_____
_____
_____
_____
_____

Please Check One

☐ Register Me Only

☐ Register Me & Send Me Software

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2221 Niagara Falls Boulevard
P.O. Box 281
Niagara Falls, NY 14304-0281
Tel: (716)-731-1606 Fax: (716)-731-1524
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