FUJI ELECTRIC

AF-300E$™

1/2 - 350 Horsepower

Instructions

General Information – AF-300E$™ Instructions

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met during installation, operation, and maintenance. Should further information be desired or should particular problems arise that are not covered sufficiently for the purchaser's purpose, the matter should be referred to GE Fuji, Technical Service.

NOTE: The terms "inverter", "controller", and "drive" are sometimes used interchangably throughout the industry. We will use the term "Drive" in this document.

AF-300E$™ and X$D™ are trademarks of the General Electric Company.

Energy $aver® is a registered trademark of the General Electric Company.

NOTE: Always read the complete instructions prior to applying power or troubleshooting the equipment and follow all procedures step by step.

SHOCK HAZARD labels may be located on or inside the Drive to alert people that dangerous voltage may be present.

WARNING, CAUTION AND NOTES

The following format is used on the equipment or found in this manual. Read all labels and follow the directions on them whenever working on the equipment.

WARNING: Denotes operating procedures and practices that may result in personal injury or loss of life if not correctly followed.

CAUTION: Denotes operating procedures and practices that, if not strictly observed, may result in damage to, or destruction of the equipment.

NOTE: Notes call attention to information that is especially significant in understanding and operating the equipment.

WARNING, CAUTION AND NOTE PARAGRAPHS WITHIN THIS INSTRUCTION

The above paragraphs list some general safety reminders and safety recommendations to be followed when operating or installing this equipment. These safety precautions will be repeated throughout this instruction book where applicable.

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Section 1: Safety Precautions

WARNING - MECHANICAL MOTION HAZARD:

Drive systems cause mechanical motion. It is the responsibility of the user to insure that any such motion does not result in an unsafe condition. Factory provided interlocks and operating limits should not be bypassed or modified.

WARNING - ELECTRICAL SHOCK AND BURN HAZARD:

When using instruments such as oscilloscopes to work on live equipment, the oscilloscope's chassis should be grounded and a differential amplifier input should be used. Care should be used in the selection of probes and leads and in the adjustment of the oscilloscope so that accurate readings may be made. See instrument manufacturer's instruction book for proper operation and adjustments to the instrument.

WARNING - FIRE AND EXPLOSION HAZARD:

Fires or explosions might result from mounting drives in hazardous areas such as locations where flammable or combustible vapors or dusts are present. Drives should be installed away from hazardous areas, even if used with motors suitable for use in these locations.

WARNING - STRAIN HAZARD:

Improper lifting practices can cause serious or fatal injury. Lift only with adequate equipment and trained personnel.

WARNING - ELECTRICAL SHOCK HAZARD:

All motor bases and equipment enclosure housings should be grounded in accordance with the National Electric Code or equivalent.

WARNING - MOTOR OVERSPEED HAZARD:

With 400 Hz drive output possible, the drive will allow the motor to run up to 6 - 7 times its base speed. Never operate the motor above its top mechanical speed or a catastrophic failure may occur.

Any applications requiring operation above

120 Hz must be approved by the Company.

WARNING -

Before disassembling, disconnect and lock out power from the drive. Failure to disconnect power may result in death or serious injury. A bus charge light provides visual indication that bus voltage is present; verify the bus voltage level by measuring the voltage between power terminals P(+) and N(-) using an analog meter. Do not attempt to service the drive until the charge indicator has extinguished and the bus voltage has discharged to zero volts.

WARNING -

Replace all covers before applying power to the drive. Failure to do so may result in death or serious injury.

CAUTION:

Do not connect power supply voltage that exceeds the standard specification voltage fluctuation permissible. If excessive voltage is applied to the drive, damage to the internal components will result.

CAUTION:

Do not connect power supply to the output terminals (U, V, W). Connect power supply only to the power terminals (L1, L2, L3).

CAUTION:

Even though the main AF-300E$ power has been disconnected it may still receive electrical energy from more than one source. If external power is applied to the control terminals 30A, B & C and AX1 and AX2 as well as any option card control input terminal points (if installed in the drive), and if the independent power source is activated separately from the AF-300E$'s main input power, failure to to diconnect this external power source may result in death or serious injury. This external power must be removed prior to any work being performed on the drive.
WARNING: this equipment may receive electrical energy from more than one source. Additional disconnects are located outside this cabinet. Open all associated disconnects before servicing equipment. Refer to equipment diagrams.

CAUTION:

For RUN and STOP, use the FWD-CM (forward) and REV-CM (reverse) terminals. Do not use a contactor (ON/OFF) installed on the line side of the drive for RUN and STOP.

CAUTION:

Do not use a switch on the output side of the drive for ON/OFF operation.

CAUTION: Do not connect filter capacitors on the output side of the drive.

CAUTION:

Do not operate the drive without the ground wire connected. The motor chassis should be grounded to earth through a ground lead separate from all other equipment ground leads to prevent noise coupling.

The grounding connector shall be sized in accordance with the NEC or Canadian Electrical Code. The connection shall be made by a UL listed or CSA certified closed-loop terminal connector sized for the wire gauge involved. The connector is to be fixed using the crimp tool specified by the connector manufacturer.

CAUTION:

Do not perform a megger test between the drive terminals or on the control circuit terminals.

CAUTION:

The AF-300E$ drive develops an adjustable frequency via pulse width modulation, with the pulse rise time of 0.1 microseconds. While this does not present a problem on 200-230Vac applications, it may on 380-460Vac applications. When using the AF-300E$ drives on 380-460Vac, where the distance between the motor and the drive exceeds 60 feet, get the motor manufacturer's approval that his insulation system can withstand the voltage spikes (up to twice the dc bus voltage 2 x 621Vdc for a 460Vac power source) of the drive, in conjunction with the long motor cable lengths. If the insulation system does not meet this limit, utilize a filter to increase the Drive's pulse rise time to 1.0 microseconds.

CAUTION:

Because the ambient temperature greatly affects drive life and reliability, do not install the drive in any location that exceeds the allowable temperature. Leave the ventilation cover attached for temperatures of 40 degrees C or below, and remove the cover for temperatures of between 40 (104° F) and 50 (122° F) degrees C (30 Hp and lower). **If the cover needs to be removed, another type of enclosure may be required for safety purposes.**

CAUTION:

If the Drive's Fault Alarm is activated, consult the TROUBLESHOOTING section of this instruction book, and after correcting the problem, resume operation. Do not reset the alarm automatically by external sequence, etc.

CAUTION:

Be sure to remove the desicant dryer packet(s) when unpacking the drive. (If not removed these packets may become lodged in the fan or air passages and cause the drive to overheat.)

CAUTION:

AC induction motors require that they be sized based on the applications speed range and associated torque requirements for the motor-drive system. This is to avoid excessive motor heating. Observe motor manufacturers recommendations when operating any ac induction motor with the drive. Also observe motor manufacturer's recommended voltage/torque boost at lower operating frequencies.

CAUTION:

The available power source connected to the drive is not to exceed 500KVA. If the ac power source is greater than 500KVA and the driver's rating (Hp) is less than 10% of the power source's KVA; ac line reactors will have to be installed in L1, L2 & L3 power leads of the drive.

CAUTION:

The drive must be mounted on a wall that is constructed of heat resistant material. While the drive is operating, the temperature of the drive's cooling fins can rise to a temperature of 90°C (194°F.)

Section 2: Description, Component Identication and Specifications

The AF-300E$ drive is available in ratings of 0.5 to 30 Hp 200-230 VAC, 1 to 300 Hp (350Hp variable torque) 380-460 VAC. The AF-300E$ drive incorporates multiple control algorithms with either the traditional PWM Scalar power control or a selectable torque vector algorithm with a self tuning drive/motor function that is used in high performance operation. The AF-300E$ Drives are housed in a NEMA 1 type enclosure for either open or panel mounting and all Inverters are furnished with a detachable wiring lead-in plate to allow ease of accessing control and power wiring.

Drive operation and Function Code setting is performed from the "Keypad Panel" that also features a Digital Monitor, LCD Graphic Display and 8 dual function keys. The 8 dual function keys are used for drive programming and operation as well as selection of drive local/remote operation.

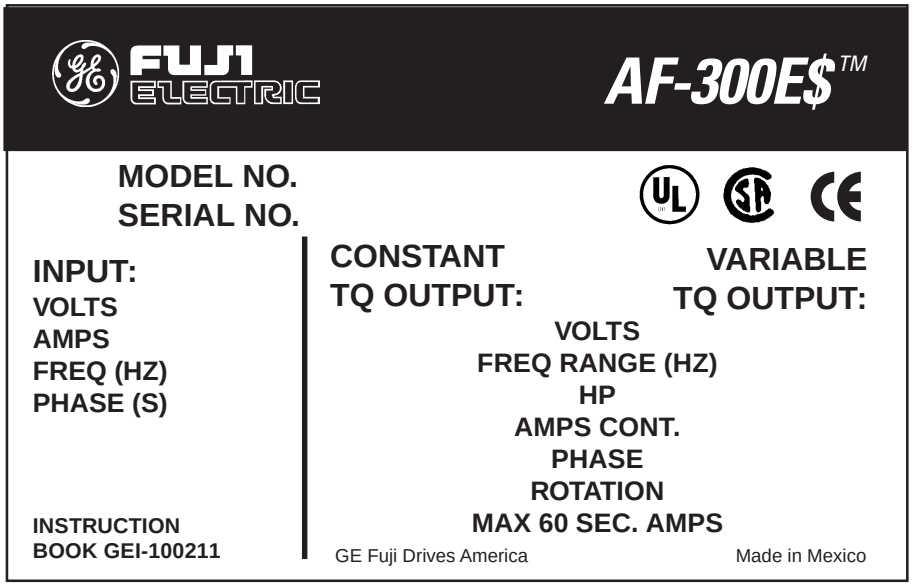
General data and specification for each drive are listed on the nameplate attached to the drive. Refer to TABLE 1 for complete AF-300E$ drive specification listing.

INSPECTION PROCEDURES UPON DELIVERY

Upon receipt of your drive, inspect the equipment for the following items:

1. Check the nameplate to insure that the specifications correspond to those ordered.
2. Inspect the unit for any damage that may have occurred during shipment.

   If shipping damage is found or the wrong Inverter is received, contact the distributor from which this equipment was purchased.



All models are UL Listed and CSA Approved*
(Nameplate shown larger than actual size.)

Figure 2-1. NAMEPLATE DATA IDENTIFICATION

* CE Mark for three-phase (3ø), 415 VAC, 1 to 30 Hp only.

Drive Keypad Functions and Layout

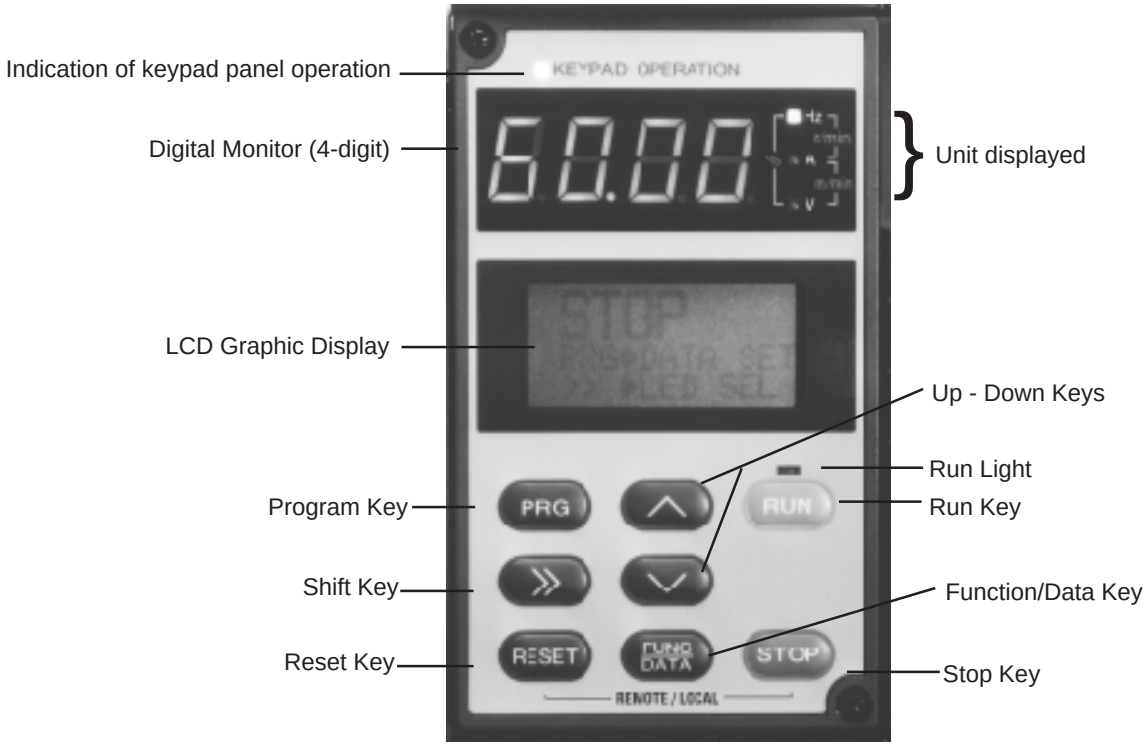


Figure 2-2. KEYPAD PANEL COMPONENT IDENTIFICATION

Attachment Screws -The Keypad Panel can be easily removed from the Drive unit by loosening the two attachment screws. With the optional extension cable, remote Keypad operation and display is possible.

LCD Graphic Display - LCD Display shows control status or Function Code settings.

PROGRAM (PRG) Key - Operation Mode or Program Mode selection key.

SHIFT (>>) Key - Changes the digital monitor display in the Operation Mode. Will also change the LCD graphic display in Program Mode and Trip Mode.

SET FUND/DATA Key - Displays data setting of selected Function Codes. Also, stores any changes in software.

RESET Key - After removal of the fault condition, faults can be reset and will return the Drive to the Operation Mode.

Remote/Local Operation - Remote/Local operation can be toggled by pressing the RESET and STOP keys simultaneously when the Drive is stopped.

RUN Key - This key is the RUN command in Keypad operation, run light will be illuminated at this time.

STOP Key - This key is used for stopping operation. If pressed when the Drive is running by external control, fault Er6 will be displayed and Drive will coast to a stop.

UP - DOWN Keys - These keys increase or decrease the frequency (or speed) of the Drive. When unit is in Program Setting Mode, they change the Function Code or Data Code values.

LCD Brightness - Function Code 79 permits adjustment for easy to read brightness of the graphic display.

Unit Display - The unit information is displayed by LEDs during RUN or STOP condition.

Digital Monitor - Displays Hz, Volts, R/Min, M/Min, or % as set by the operator using the SHIFT (>>) key or resetting Function Code 61.

Table 1: AF-300E$ – Standard Specifications

Environmental Conditions

Enclosures	NEMA 1 Standard
Installation Location	Suitable for indoor mounting only, less than 1000 meters (3300 feet) elevation, not in contact with corrosive gas, oil mist, dust, and out of direct sunlight.
Stored Temperature	-20° to +65°C (-4° to + 149°F)
Ambient Temperature	-10 to +50°C (+14 to +122°F) (remove ventilation covers if temperature is over +40°C [+104°F] up to 30 Hp; 40 Hp and above not required.)
Humidity	20% to 90% relative humidity (non-condensing).
Vibration	0.6G or less.
Cooling Method	1/2 to 1 Hp – Convection
	2 Hp and greater – Forced air

Output

Rated Output Voltage	3-Phase, 3-Wire Type, 80-240 VAC or 320-480 VAC (Can not exceed power supply voltage).
Frequency Range	0 - 400 Hertz (0.2 to 60 Hz start frequency; 0.2 to 120 Hz base frequency). Above 120 Hz, contact Company for approval of application.
Overload Current Rating	– 30 Hp and lower 150% for 1 minute duration (inverse time characteristic) 200% for 0.5 seconds – 40 Hp and greater 150% for 1 minute duration (inverse time characteristic) 180% for 0.5 seconds

Power Supply

Rated Input AC Voltage	– 200 to 230 VAC 50/60 Hz, 3 phase (1/2 to 30 Hp) – 380 to 400 VAC 50 Hz, 3 phase (1 to 300 Hp) CT – 380 to 480 VAC 60 Hz, 3 phase (1 to 300 Hp) CT – 460-480 VAC, 60 Hz, 3 phase, 40 Hp and above, variable torque applications only Voltage - +10%, -15%; Voltage Unbalance - Within 3%; Frequency - +/-5% Units are dual rated Constant Torque/Variable Torque. Drive looks for a similar Volts/Hz ratio).
Control System	Sinusoidal PWM Control (or with torque-vector control.)
Momentary Voltage Dip	When the input voltage dips below 165 VAC (230V System), 310 VAC (460V system) or 400 VAC (575V System), the Drive can operate for 15 ms with 85% full load applied.
Starting Torque	150% (when torque vector control is active.)
Carrier Frequency	– 2 to 15 KHz (1/2 to 30 Hp) 230 & 460 VAC – 2 to 10 KHz (40 to 75 Hp) – 2 to 6 KHz (100 Hp and greater)

Frequency Setting Resolution	– Analog: 1/3000 of max. frequency (0.02 Hz/60 Hz; 0.04 Hz/120 Hz) – Digital: 0.01 Hz (max. frequency up to 99.99 Hz); 0.1 Hz (max frequency of 100 Hz or more)
Accuracy (Stability)	– Analog setting: ± 0.2% of max. frequency (@ 25 ± 10°C) – Digital setting: ± 0.01% of max. frequency (@ -10 to + 50°C)
Voltage/Frequency Characteristics (V/F)	Voltage - 80-240 VAC, 320-480 VAC Frequency - 0.2 to 400 Hz
Torque Boost	– Auto: Automatic torque boost control by torque calculated value. – Manual: 0.0 to 20.0 code setting (includes the energy savings pattern, Function Code for variable torque load.)
Acceleration/Deceleration Characteristics	0.2 to 3600 seconds (independent acceleration/deceleration) 4 selectable linear and non-linear "S" curve characteristic.
Internal Functions: Operating Sound Selection	The quality of the sound produced by the motor can be changed to reduce irritating noise.
Frequency Meter Adjustment	Scale calibration of externally connected analog meter (6.5-10.5 VDC) or pulse frequency 6 to 100 times output frequency.
Data Protection	Data lock is possible to ensure that the data codes are not changed.
Pattern Operation	Seven independent stages (frequency up to 400 Hz, duration up to 6,000 seconds each. Configuration: Single cycle Repeat cycling Single cycle with continuous 7th speed
Momentary Power Loss Ride Thru	Five selections available. (Refer to Power Supply Specification.)
High/Low Limiter	Output frequency upper and lower range limit 0 to 400 Hz; 1 Hz step settings.
Bias	Magnitude of the zero offset can be set from 0 to 100% of maximum frequency (1 Hz steps.)
Gain	Output frequency gain corresponding to the reference signal can be set from 0 to 200% (0.1% steps.)
Programmable Jump Frequency	Three selectable frequencies can be set to avoid a mechanical resonant point. Width is adjustable from 0 to 30 Hz (1 Hz steps.)
Slip Compensation Control	Maintains motor at constant speed with load fluctuations. Adjustable from -9.9 Hz to +5.0 Hz.
Torque Limit Control	Output torque can be controlled within a range of 20% to 180% (1% steps.)
7 Step Preset Speed	7 programmable preset speeds selectable by 3 contact closures.
Momentary or Maintained Contact Operation	Selection between the maintained contact operation/stop command (2-wire operation) or the momentary contact (3-wire operation).
Terminal Function Change	Multi-Use terminals changed via Function Code settings. X1 to X5 inputs; Y1 to Y5 outputs.
Line to Drive Transition Logic	Motor transfer function from the AC line to Drive operation.
Sensorless Vector Control	– Improves torque characteristics throughout speed range. – Improves speed regulation.

Operation

Frequency Reference Signal	– Speed potentiometer/0 to +10 VDC – 4 to 20 mA – 0 to ±10 VDC (Standard on 40 Hp and greater) (Option on 1/2 to 30 Hp)
Input Signal (contact type)	Forward, reverse, self-holding selection (when operation is 3-wire), multi-step speed setting (7-step), multiple accel/decel time settings (4 settings), coast-to-stop, external alarm, and reset.
External Output Signals	One Dry Form "C" alarm output contact rated 250 VAC, 0.3 amp.one auxiliary run contact rated 250 VAC, 0.3 amp (available only on 40 Hp and above ratings.) 5 – Open collector outputs each rated 24 VDC, 50mA from external power. – Drive Run – Frequency equivalence signal – Overload early warning – Auto restart mode – Cycle completion pattern mode – Time-up signal during pattern mode – Undervoltage detection – Keypad operation – Torque limiting mode – Auto reset mode
Protective Functions:	– Stall prevention – Momentary power failure – Drive overheating – External faults – CPU malfunction – Motor overload (electronic thermal) – Undervoltage – Overcurrent – Overvoltage – Link error – Communication error – Ground fault
Frequency Meter Output Signal	Pulse frequency (6 to 100) times output frequency. Analog - 0 to +10 VDC (adjustment range of 6.5 to 10.3 VDC)
Keypad	Digital Display - 4 digit LED Graphic Display - LCD, with brightness control
Drive Operation	Output frequency, output current, output voltage, motor speed, line speed (m/min), machine speed (r/min), torque limit (driving), torque limit (braking), and motor torque. Set frequency is displayed when not in Run or Program Mode.
Drive Setting	Function Code and setting data displayed (see Operation Panel paragraph).

Drive Fault	– OC1 - Acceleration overcurrent – OC2 - Deceleration overcurrent – OC3 - Constant speed overcurrent – EF - Ground fault – LU (LV) - Undervoltage – OU1 - Overvoltage at accel – OU2 - Overvoltage at decel – OU3 - Overvoltage at constant speed – FUS - DC Bus fuse failed – OH1 - Drive overheat (Fins) – OH2 - External alarm – OH3 - Drive internal temperature – Er1 - EE Prom malfunction – Er2 - Communication error – Er3 - CPU malfunction – Er4 - Link error – Er5 - Option malfunction – Er6 - Drive error at start-up – Er7 - Missing motor connection
Drive Input/Output Display	– Forward – Reverse – Hld – Bx – X1 thru X5 – Y1 thru Y5 – Incoming reference voltages can be shown on LCD graphic display.
Charge Lamp (LED)	Lights when DC Link capacitor voltage is present.

AF-300E$ Model Numbering System Diagram

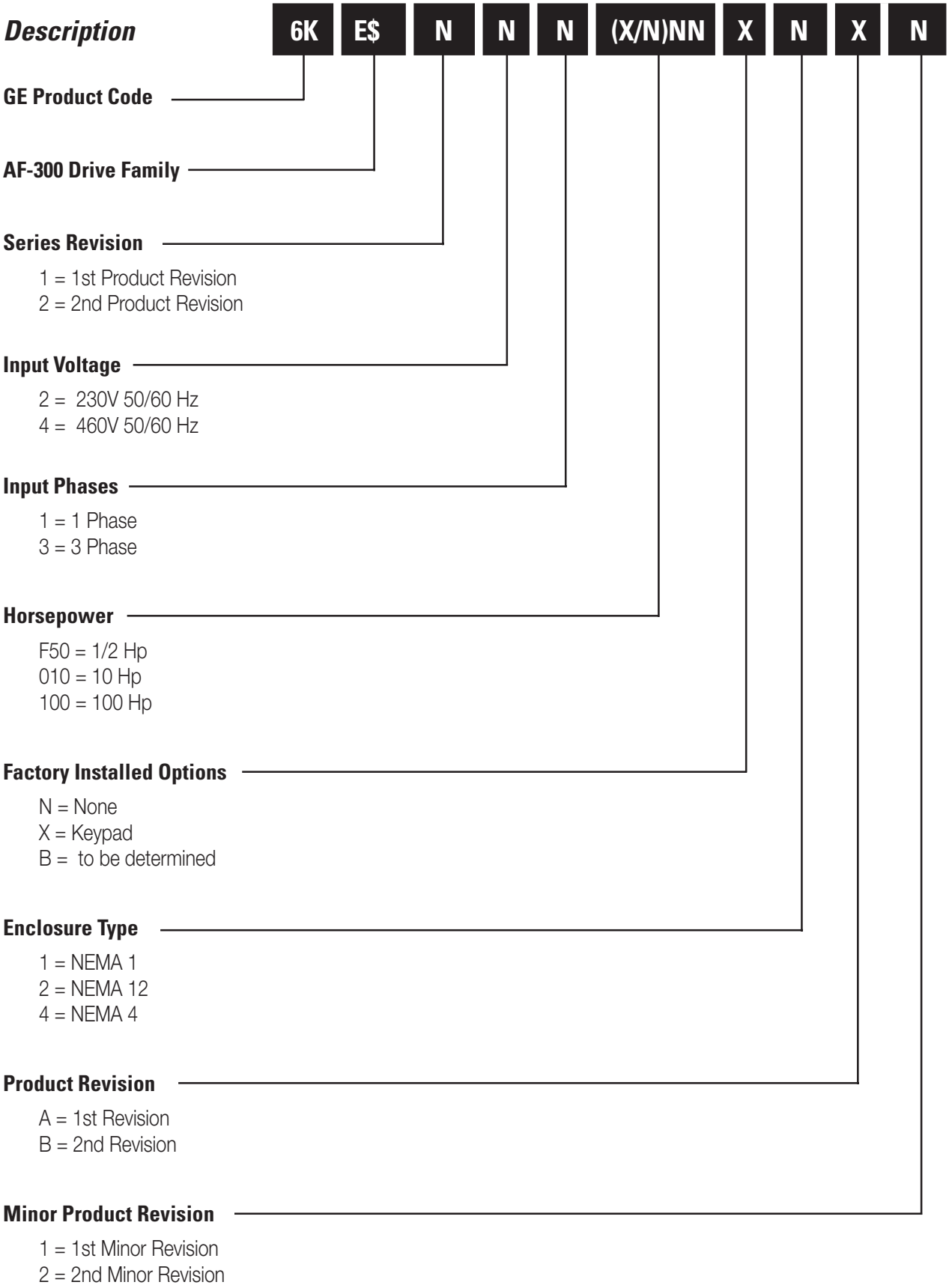


Table 2: AF-300E$ Drive Dimensions

Constant Torque Hp Rating 150% 1 min.*	Constant Torque Rated Output Amps	Variable Torque Hp Rating 115% 1 min.*	Variable Torque Rated Output Amps	AF-300E$ Model No.	Catalog No.	List Price GO-5E$	H x W x D inches	Weight (lbs.)
230 VAC, 3 phase, 50/60 Hz Input, NEMA 1 Enclosure								
0.5	3.0	N/A	N/A	6KE$223F50X1A1	D5501	810.	10.24 x 4.33 x 4.53	5.3
1	5.0	N/A	N/A	6KE$223001X1A1	D5502	860.	10.24 x 4.33 x 5.12	5.3
2	8.0	N/A	N/A	6KE$223002X1A1	D5503	920.	10.24 x 5.91 x 5.71	8.4
3	11.0	N/A	N/A	6KE$223003X1A1	D5504	990.	10.24 x 5.91 x 5.71	8.4
5	17.0	N/A	N/A	6KE$223005X1A1	D5505	1,220.	10.24 x 5.91 x 5.71	8.4
7.5	25.0	10	29.0	6KE$223007X1A1	D5506	1,520.	10.24 x 8.66 x 7.68	13
10	33.0	15	42.0	6KE$223010X1A1	D5507	1,850.	10.24 x 8.66 x 7.68	13
15	46.0	20	55.0	6KE$223015X1A1	D5508	2,475.	15.75 x 9.84 x 7.68	25
20	59.0	25	68.0	6KE$223020X1A1	D5509	3,120.	15.75 x 9.84 x 7.68	25
25	74.0	30	80.0	6KE$223025X1A1	D5510	3,705.	15.75 x 9.84 x 7.68	27
30	87.0	N/A	N/A	6KE$223030X1A1	D5511	4,300.	15.75 x 9.84 x 7.68	27
460 VAC, 3 phase, 50/60 Hz Input, NEMA 1 Enclosure								
1	2.5	N/A	N/A	6KE$243001X1A1	D5512	1,100.	10.24 x 5.91 x 5.71	8.4
2	3.7	N/A	N/A	6KE$243002X1A1	D5513	1,180.	10.24 x 5.91 x 5.71	8.4
3	5.5	N/A	N/A	6KE$243003X1A1	D5514	1,270.	10.24 x 5.91 x 5.71	8.4
5	9.0	N/A	N/A	6KE$243005X1A1	D5515	1,560.	10.24 x 5.91 x 5.71	8.4
7.5	13.0	10	16.5	6KE$243007X1A1	D5516	1,950.	10.24 x 8.66 x 7.68	14
10	18.0	15	23.0	6KE$243010X1A1	D5517	2,375.	10.24 x 8.66 x 7.68	14
15	24.0	20	30.0	6KE$243015X1A1	D5518	3,175.	15.75 x 9.84 x 7.68	25
20	30.0	25	37.0	6KE$243020X1A1	D5519	4,000.	15.75 x 9.84 x 7.68	25
25	39.0	30	44.0	6KE$243025X1A1	D5520	4,750.	15.75 x 9.84 x 7.68	27
30	45.0	N/A	N/A	6KE$243030X1A1	D5521	5,510.	15.75 x 9.84 x 7.68	27
30	45.0	40	52.0	6KE$243035X1A1	D5522	6,350.	33.5 x 13.4 x 9.65	89
40	60.0	50	66.0	6KE$243040X1A1	D5523	7,050.	33.5 x 13.4 x 9.65	89
50	75.0	60	77.0	6KE$243050X1A1	D5524	8,560.	33.5 x 14.8 x 9.65	100
60	91.0	75	96.0	6KE$243060X1A1	D5525	9,955.	39.4 x 14.8 x 9.65	111
75	112.0	100	124.0	6KE$243075X1A1	D5526	11,965.	39.4 x 14.8 x 9.65	122
100**	150.0	125	156.0	6KE$243100X1A1	D5527	14,915.	43.3 x 14.8 x 10.63	144
125**	176.0	150	180.0	6KE$243125X1A1	D5528	17,540.	47.3 x 20.9 x 12.4	221
150**	210.0	200	253.0	6KE$243150X1A1	D5529	19,830.	57.1 x 20.9 x 14.2	287
200**	304.0	250	304.0	6KE$243200X1A1	D5531	24,070.	57.1 x 20.9 x 14.2	298
250**	377.0	300	377.0	6KE$243250X1A1	D5532	28,135.	57.1 x 26.8 x 14.2	430
300**	415.0	350	415.0	6KE$243300X1A1	D5533	30,425.	57.1 x 26.8 x 14.2	430

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* Verify the full load rated current of the motor to which the drive will be applied.

** A DC Link Inductor is shipped as a separate item (Ratings equal to and greater than 100 Hp) and is to be connected to Drive Power Terminals P1 and P+. The DC Link Inductor is open core design. If single unit construction is required refer to the Panel Section of the manual.

Note: In variable torque applications, Function Code 86 (Motor Hp Capability) needs to be changed to Set Drive Hp vs. Load Hp. 40 Hp and above is 460-480 VAC input, variable torque applications only.

Table 3: CE Labeled AF-300E$ and Fuji Electric G9 Products

NEW PRODUCTS	Constant Torque Hp Rating	Variable Torque Hp Rating	Model No.	Catalog No.	List Price GO-5E$	Weight (lbs.)
AF-300E$ 415 VAC Three Phase						
	1	1	6KE$243001X1B1	D5625	1,135.	8.4
	2	2	6KE$243002X1B1	D5626	1,205.	8.4
	3	3	6KE$243003X1B1	D5627	1,295.	8.4
	5	5	6KE$243005X1B1	D5628	1,585.	8.4
NEMA 1	7.5	10	6KE$243007X1B1	D5629	1,975.	14
CE Labeled	10	15	6KE$243010X1B1	D5630	2,400.	14
UL/CSA	15	20	6KE$243025X1B1	D5631	3,200.	25
	20	25	6KE$243020X1B1	D5632	4,025.	25
	25	30	6KE$243025X1B1	D5633	4,775.	27
	30		6KE$243030X1B1	D5634	5,535.	27
AF-300E$ 415 VAC Three Phase						
	1	1	6KE$243001X4B1	D5635	1,320.	12
	2	2	6KE$243002X4B1	D5636	1,400.	12
NEMA 4	3	3	6KE$243003X4B1	D5637	1,490.	12
CE Labeled	5	5	6KE$243005X4B1	D5638	1,780.	12
UL/CSA	7.5	10	6KE$243007X4B1	D5639	2,240.	20.5
	10	15	6KE$243007X2B1	D5640	2,665.	20.5
	15	20	6KE$243007X2B1	D5641	3,575.	25
NEMA 12	20	25	6KE$243007X2B1	D5642	4,400.	25
CE Labeled	25	30	6KE$243007X2B1	D5643	5,150.	27
UL/CSA	30		6KE$243007X2B1	D5644	5,910.	277
Fuji Electric G9 415 VAC Open Chassis (IP00)						
	40		FRN30G9S-4EN	D5645	7,050.	79
	50		FRN37G9S-4EN	D5646	8,560.	82
	60		FRN45G9S-4EN	D5647	9,955.	97
	75		FRN55G9S-4EN	D5648	12,750.	112
CE Labeled	100		FRN75G9S-4EN	D5649	15,245.	134
	125		FRN90G9S-4EN	D5650	18,580.	194
	150		FRN110G9S-4EN	D5651	21,890.	194
	200		FRN160G9S-4EN	D5652	26,425.	2775
	250		FRN200G9S-4EN	D5653	31,080.	390
	300		FRN220G9S-4EN	D5654	36,400.	390

Compatible RFI Filters

	Model No.		Cat. No.	List Price	Weight
	EFL015G94	CE Filter 1 - 2 Hp	A3281	295.	4.4
	EFL040G94	CE Filter 3 - 5 Hp	A3282	750.	4.4
	EFL075G94	CE Filter 7.5 - 10 Hp	A3283	1,215.	5.9
CE Compliant	EFL150G94	CE Filter 15 - 20 Hp	A3284	1,990.	12
	EFL220G94	CE Filter 25 - 30 Hp	A3285	2,735.	12
	RS3120DF	CE Filter 40 - 50 Hp	A3286	3,440.	30
	RS3180DF	CE Filter 60 - 100 Hp	A3287	4,465.	49
	RS3280DF	CE Filter 125 - 200 Hp	A3288	5,815.	85
	RS3380DF	CE Filter 250 - 300 Hp	A3289	7,720.	93

4-001C

GE Fuji has expanded its product offering again, with a new line of CE labeled AF-300E$ drives. The drives are available in 415 VAC (380 VAC to 460 VAC UL, CSA only) ratings. Drives from 1 - 30 Hp also carry the UL and CSA approvals in addition to the CE Mark. Drives rated at 40 Hp and above carry the CE label exclusively. The units have the same variable torque and constant torque ratings as the existing line of AF-300E$ drives. In addition to the new CE labeled drives, GE Fuji offers a complete compatible line of RFI filters.

Table 4: AF-300E$ Drive Ratings Efficiency and Watts Loss

Catalog No.	Hp*		Output Current		Output Power		Constant Torque				Variable Torque	Internal DB
							Efficiency %		Watts Loss		Watts Loss	
	Const Trq	Var Trq	Const Trq	Var Trq	KVA	KW	2K Hz	15K Hz	2K Hz	15K Hz	15K Hz	
230 VAC - Three Phase												
6KE$223F50X1A1	0.5	0.5	3	3	1.2	0.4	90.0	87.5	40	50		44
6KE$223001X1A1	1	1	5	5	2	0.75	93.3	90.7	50	70		68
6KE$223002X1A1	2	2	8	8	3.1	1.5	94.7	92.7	80	110		75
6KE$223003X1A1	3	3	11	11	4.3	2.2	94.8	93.2	115	150		77
6KE$223005X1A1	5	5	17	17	6.7	3.7	95.4	93.8	170	230		93
6KE$223007X1A1	7.5	10*	25	29	9.9	5.5	96.0	94.4	220	310	415	138
6KE$223010X1A1	10	15*	33	42	13	7.5	96.0	94.5	300	415	685	188
6KE$223015X1A1	15	20*	46	55	18	11	95.4	93.8	510	685	720	
6KE$223020X1A1	20	25*	59	68	23	15	96.5	95.2	530	720	890	
6KE$223025X1A1	25	30*	74	80	29	18.5	96.3	95.2	690	890	1160	
6KE$223030X1A1	30		87		34	22	96.5	94.7	780	1160		
460 VAC - Three Phase												
6KE$243001X1A1, B1	1	1	2.5	2.5	2	0.75	93.3	88.0	50	90		68
6KE$243002X1A1, B1	2	2	3.7	3.7	2.9	1.5	95.7	92.7	65	110		75
6KE$243003X1A1, B1	3	3	5.5	5.5	4.4	2.2	96.1	93.2	85	150		77
6KE$243005X1A1, B1	5	5	9	9	7.2	3.7	97.0	93.8	110	230		93
6KE$243007X1A1, B1	7.5	10*	13	16.5	10	5.5	97.5	94.5	140	300	400	138
6KE$243010X1A1, B1	10	15*	18	23	14	7.5	97.3	94.7	200	400	525	188
6KE$243015X1A1, B1	15	20*	24	30	19	11	97.1	95.2	315	525	610	
6KE$243020X1A1, B1	20	25*	30	37	23	15	97.7	95.9	340	610	780	
6KE$243025X1A1, B1	25	30*	39	44	31	18.5	97.6	95.8	450	780	970	
6KE$243030X1A1, B1	30		45	45	35	22	97.7	95.6	510	970		
							2K Hz	10K Hz	2K Hz	10K Hz		
6KE$243035X1A1		40*	45	52	35	22	97.1	96.2	650	850		
6KE$243040X1A1	40	50*	60	66	47	30	97.2	96.3	850	1100	1050	
6KE$243050X1A1	50	60*	75	77	59	37	97.6	96.8	900	1200	1150	
6KE$243060X1A1	60	75*	91	96	72	45	97.8	97.1	1000	1300	1250	
6KE$243075X1A1	75	100*	112	124	89	55	98.0	97.2	1150	1550	1500	
							2K Hz	6K Hz	2K Hz	6K Hz		
6KE$243100X1A1	100	125*	150	156	119	75	98.0	97.9	1500	1600	1850	
6KE$243125X1A1	125	150*	176	180	140	90	98.1	97.9	1750	2000	2000	
6KE$243150X1A1	150	200*	210	253	202	132	98.2	97.9	2050	2350	2300	
6KE$243200X1A1	200	250*	304	304	242	160	98.1	97.8	2850	3250	3150	
6KE$243250X1A1	250	300*	377	377	300	200	98.1	97.9	3500	4000	3800	
6KE$243300X1A1	300	350*	415	415	330	220	98.3	98.0	3850	4450	4300	

4-002

* Verify the full load rated current of the motor to which the drive will be applied.

Note: In variable torque applications, Function Code 86 (Motor Hp Capability) needs to be changed to Set Drive Hp vs. Load Hp.

Section 3: Installation Guidelines

Installation Environment

Install the drive in an indoor location that meets the following requirements:

— The ambient temperature is between -10˚C and +50˚C (+14˚F to +122˚F). (Remove the ventilation cover when the temperature exceeds +40˚C [+104˚F].)

— The relative humidity is between 20% and 90%. Avoid any location subject to condensation, freezing, or where the drive would come in contact with water.

— Do not install in any location subject to direct sunlight, dust, corrosive gas, inflammable gas, or oil mist.

— The drive should be installed at an elevation below 1000 meters (3281 feet). Installation above 1000 meters (3300 feet) will need to be derated 1% per 333 feet.

Example:

5 Hp, 460 VAC, output current 9 amps. Application altitude 3900 feet.

$$\%\ \text{derate} = \left(\frac{3900 - 3300}{333} \right) \times 1\% = 1.8\%$$

$$(9\ \text{amps}) \times \left(\frac{100 - 1.8}{100} \right) = 8.84\ \text{amps derated output current.}$$

Motor derate may also be required, contact motor manufacturer.

— Vibration should be less than 0.6G.

Installation Mounting Clearance

CAUTION:

Because the ambient temperature greatly affects drive life and reliability, do not install the drive in any location that exceeds the allowable temperatures.

— Install at a sufficient distance from other equipment, walls, or wiring ducts as shown in Figure 3-1 (these clearances are required to allow the heat generated by the drive to escape).

— Install the drive perpendicular to the ground and with the lettering right side up. (If the drive is installed upside-down or horizontally, heat build-up will occur.)

CAUTION:

The mounting wall for the drive must be constructed of heat resistant material because during operation, the temperature of the Inverter's cooling fins rises to approximately 90 degrees C (194° F).

NOTE: When installing **two or more drives** in close proximity, allow sufficient space as shown in Figure 3-1 and install them in a horizontal row. If they must be installed in a vertical column, at least 19.7 inches (50cm) internal space must be provided between each one or a ventilation baffle should be provided to prevent the ambient temperature from rising.

— Mounting screws or bolts should be of appropriate size for weight of drive.

— See the appropriate view in Figure 3-2 for the location of mounting holes.

— After removing the knockouts in the wiring lead in plate, install the rubber bushings supplied to prevent cable damage and to minimize dust entry.

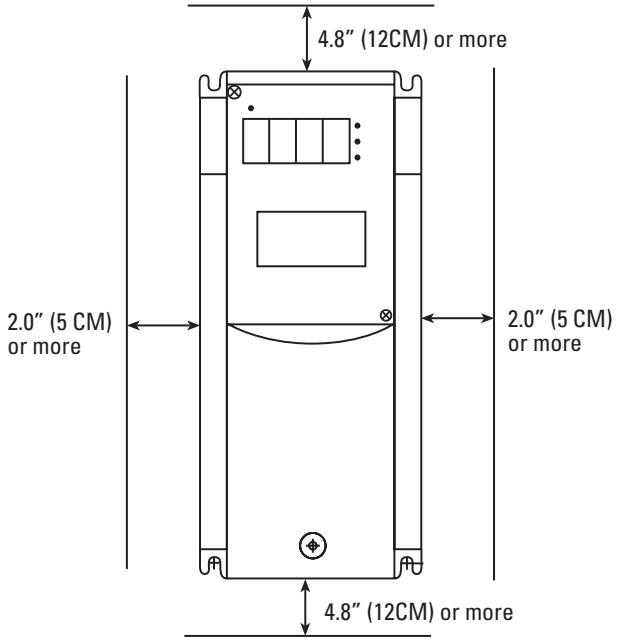
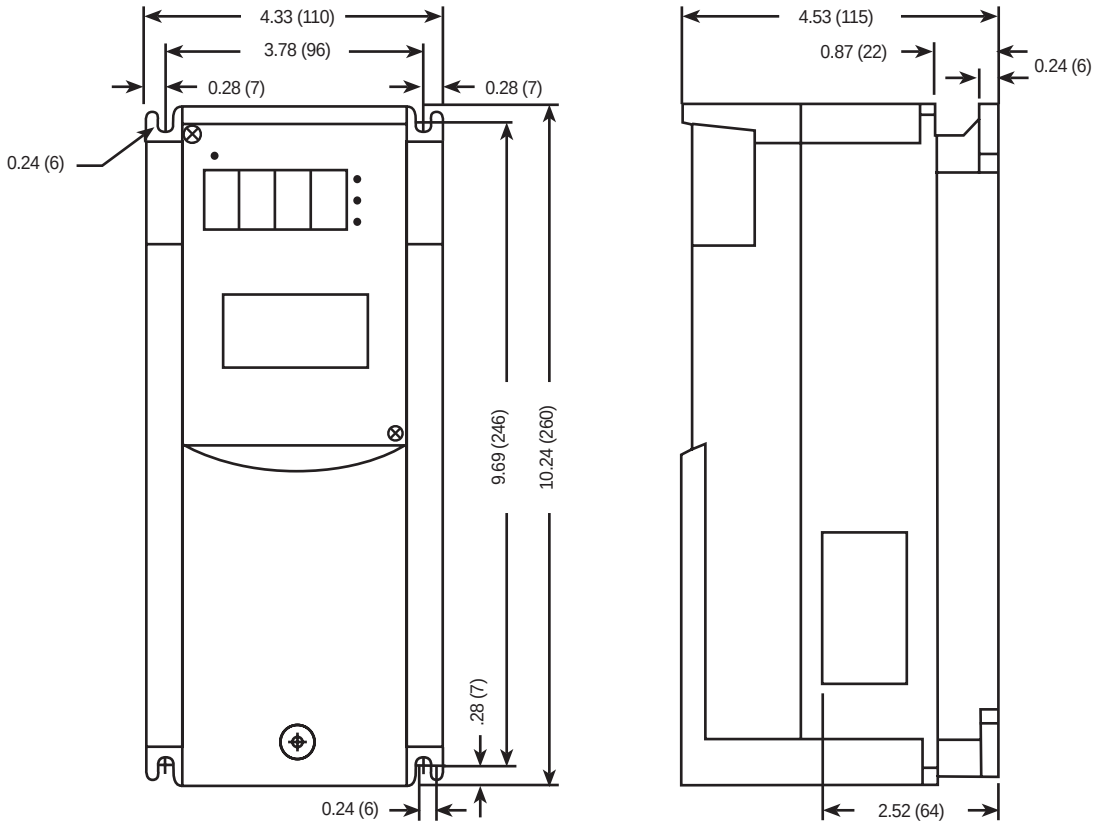
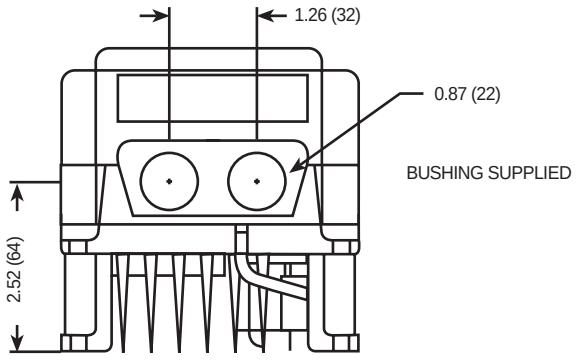


Figure 3-1. DRIVE MOUNTING CLEARANCE

Dimensions 0.5 Hp 230 VAC

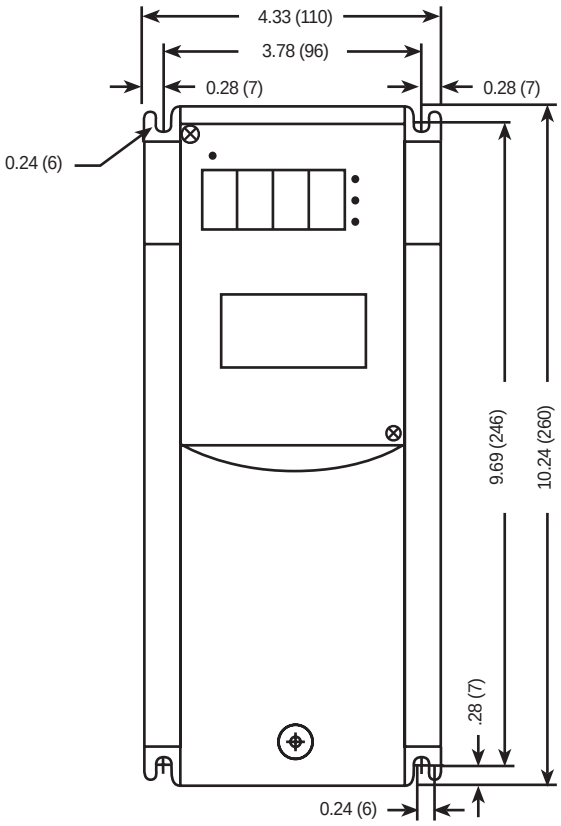
Dimensions in inches (mm)

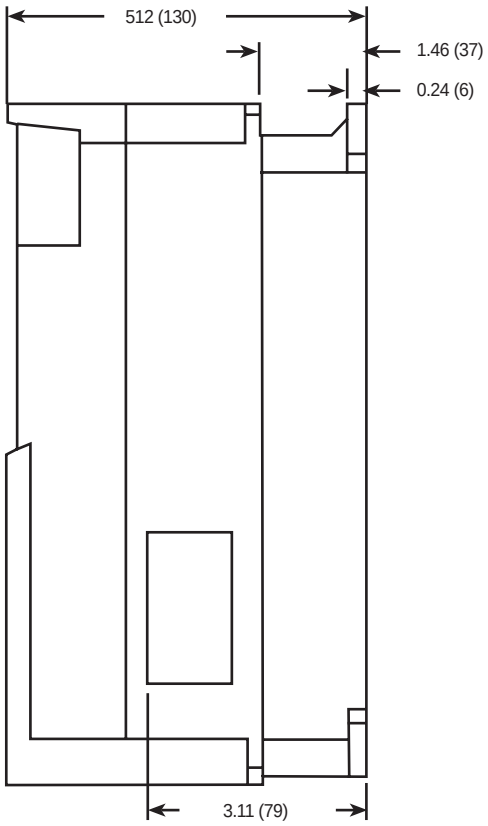


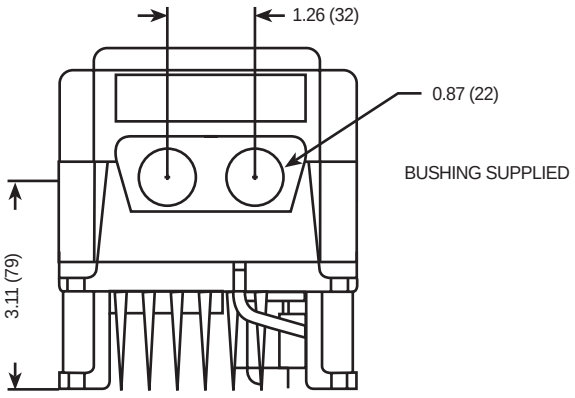


Dimensions 1 Hp 230 VAC

Dimensions in inches (mm)

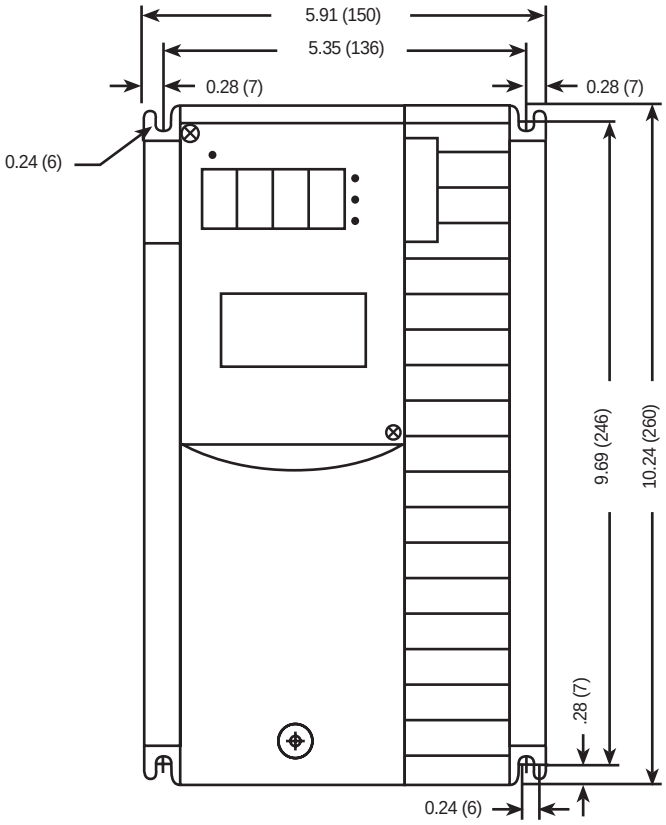


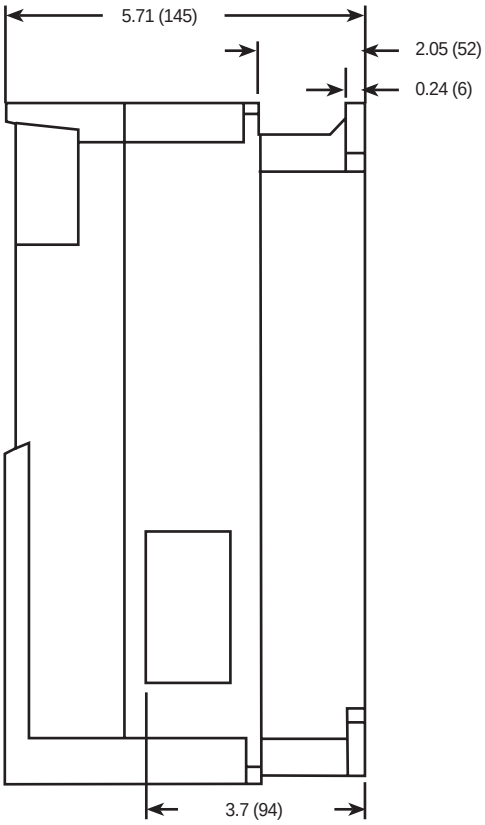


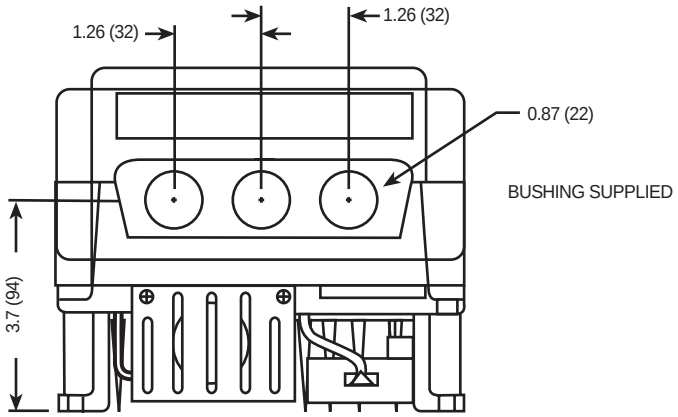


Dimensions 2, 3, 5 Hp 230 VAC and 1, 2, 3, 5 Hp 460 VAC

Dimensions in inches (mm)

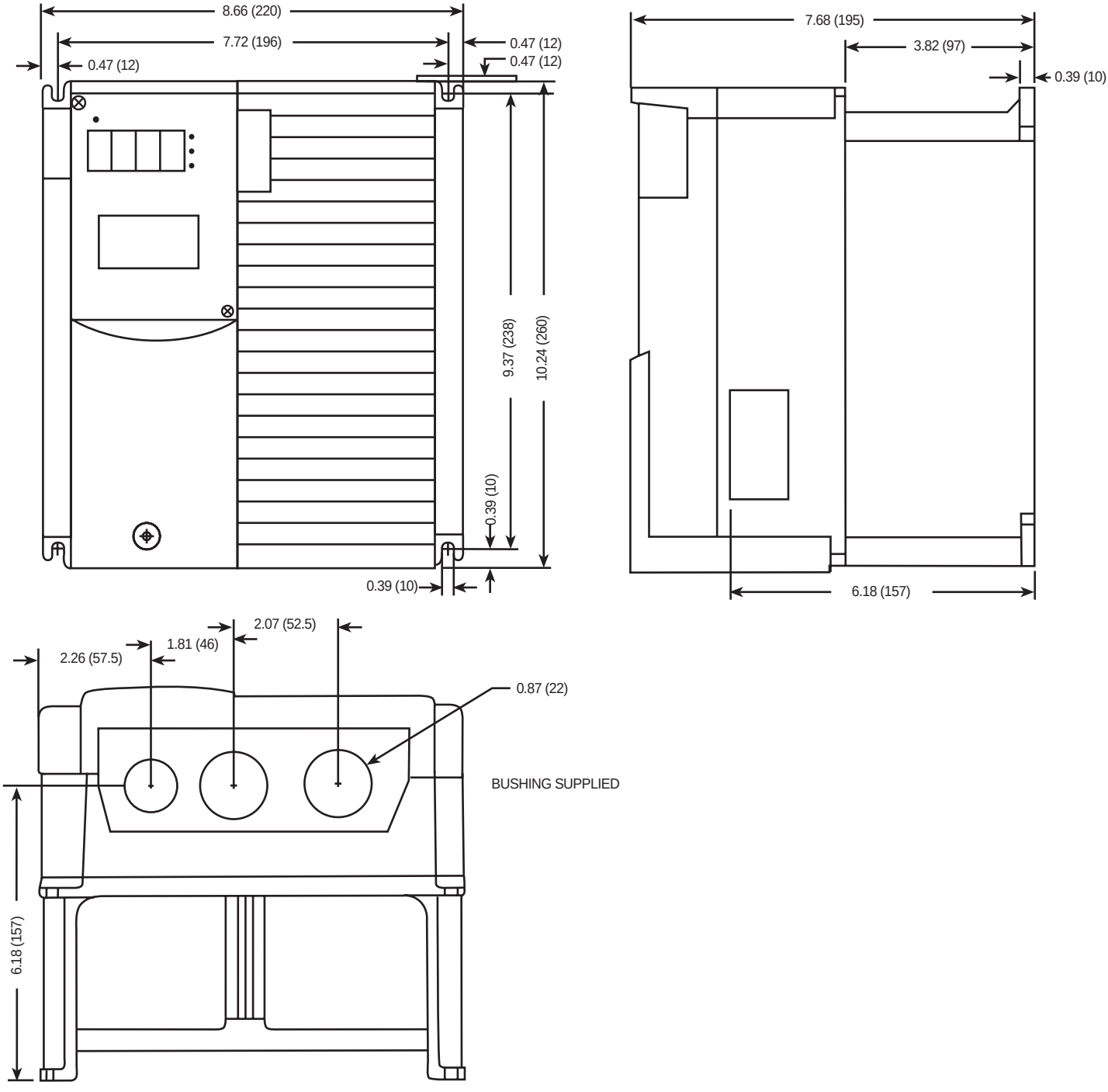






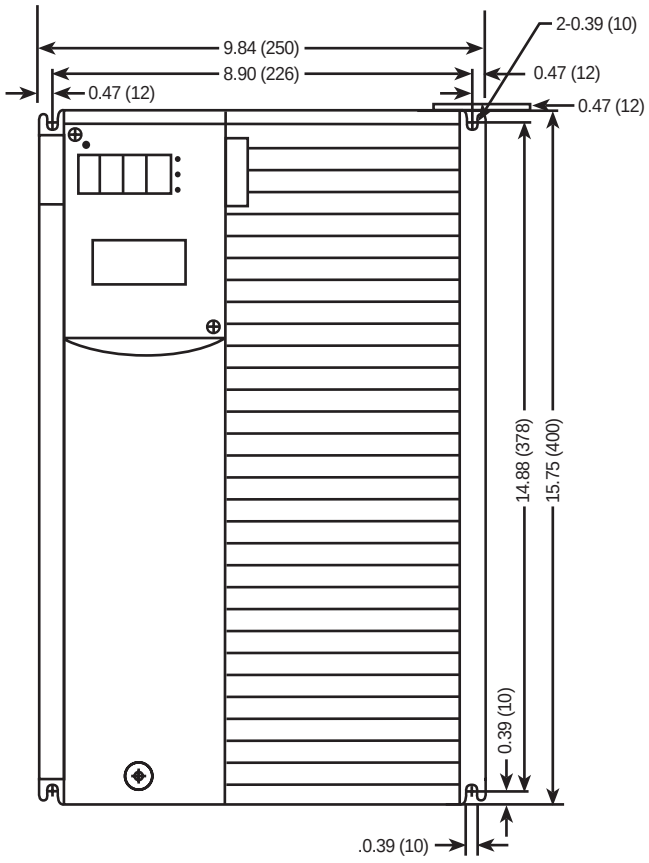
Dimensions 7.5 , 10 Hp 230 and 460 VAC

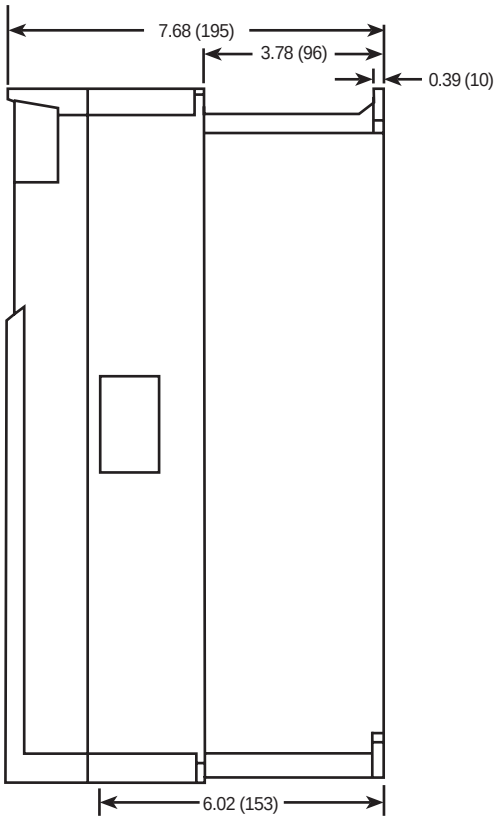
Dimensions in inches (mm)

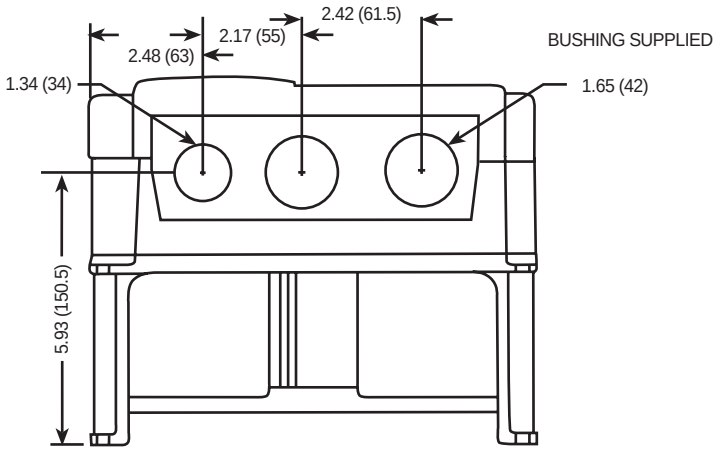


Dimensions 15, 20, 25, 30 Hp 230 and 460 VAC

Dimensions in inches (mm)



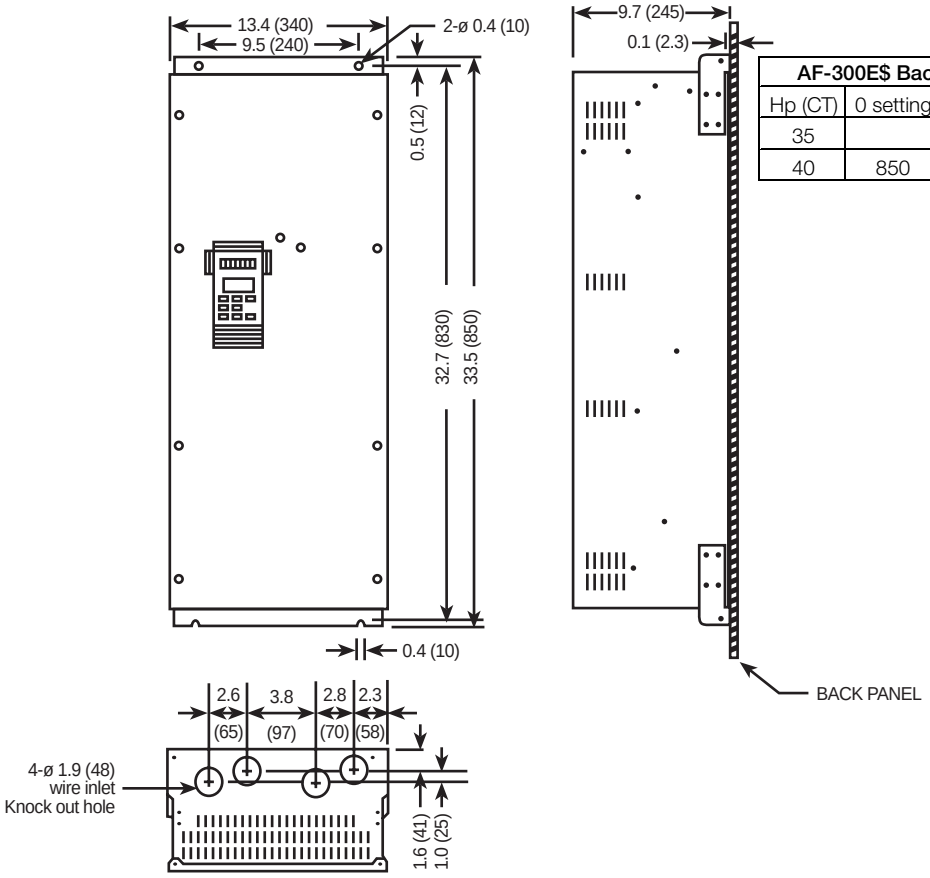




Dimensions 35 , 40 Hp 460 VAC

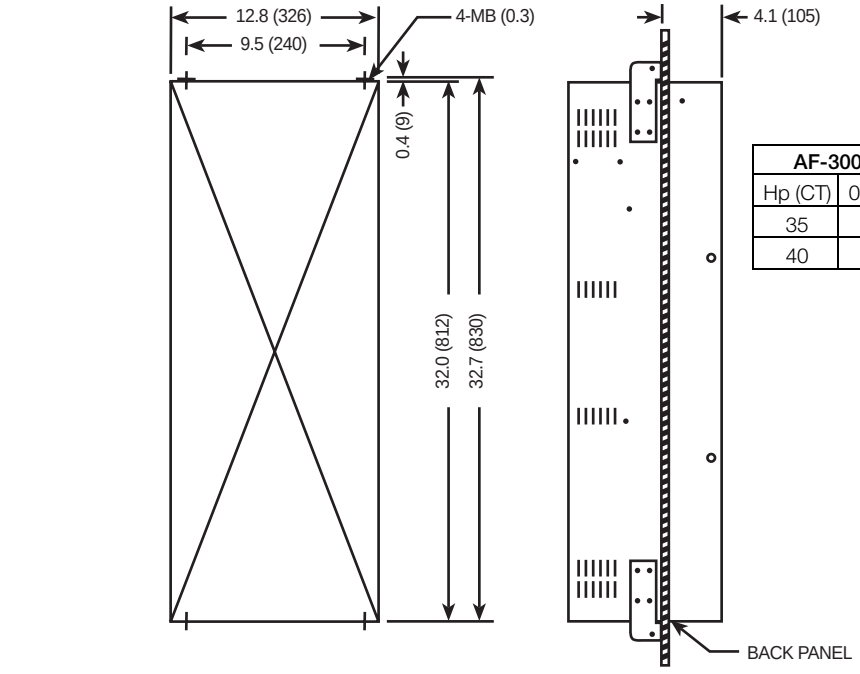
Dimensions in inches (mm)

BACK PANEL MOUNTING



AF-300E$ Back-Panel Mounting: Interior Watts Loss					
Hp (CT)	0 setting	10 setting	Hp (VT)	0 setting	10 setting
35			40	650	850
40	850	1100	50	900	1050

THROUGH PANEL MOUNTING

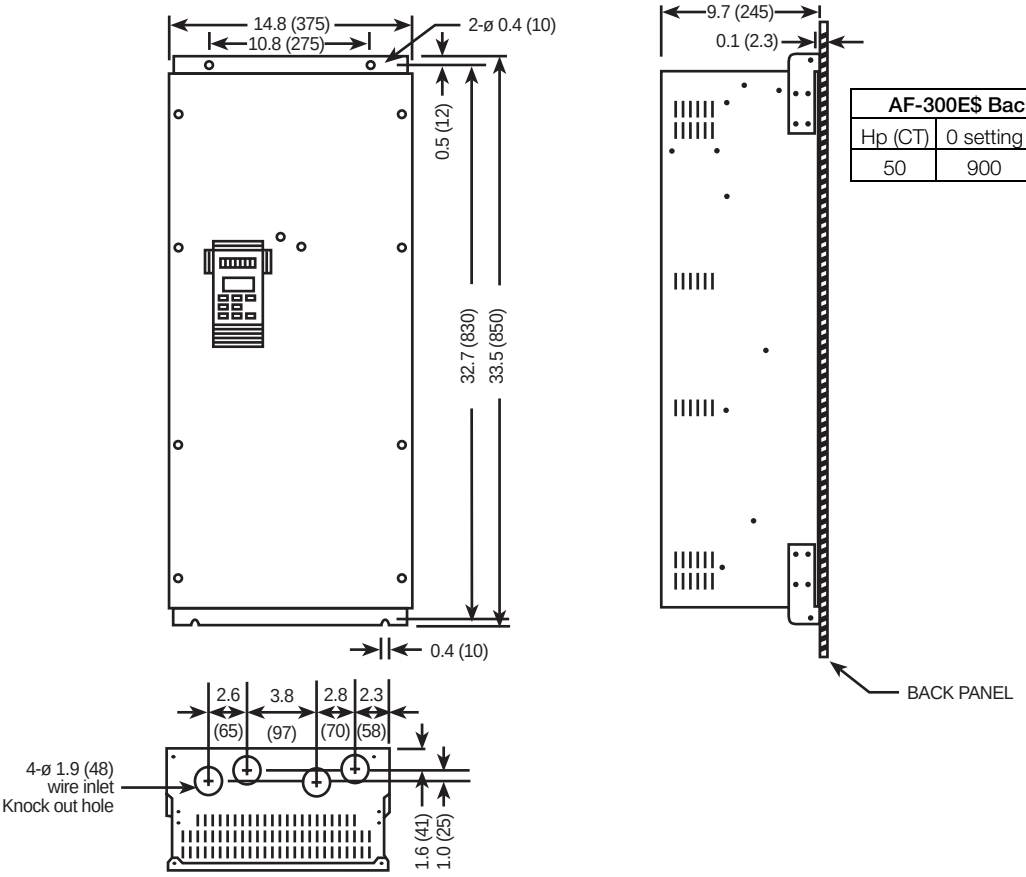


AF-300E$ Thru-Panel Mounting: Interior Watts Loss					
Hp (CT)	0 setting	10 setting	Hp (VT)	0 setting	10 setting
35			40	195	255
40	255	330	50	270	315

Dimensions 50 Hp 460 VAC

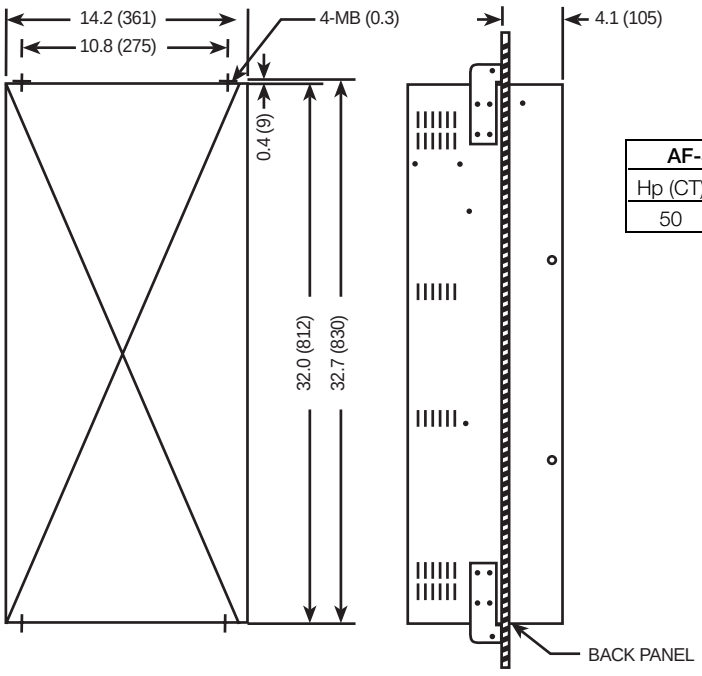
Dimensions in inches (mm)

BACK PANEL MOUNTING



AF-300E$ Back-Panel Mounting: Interior Watts Loss					
Hp (CT)	0 setting	10 setting	Hp (VT)	0 setting	10 setting
50	900	1200	60	950	1150

THROUGH PANEL MOUNTING

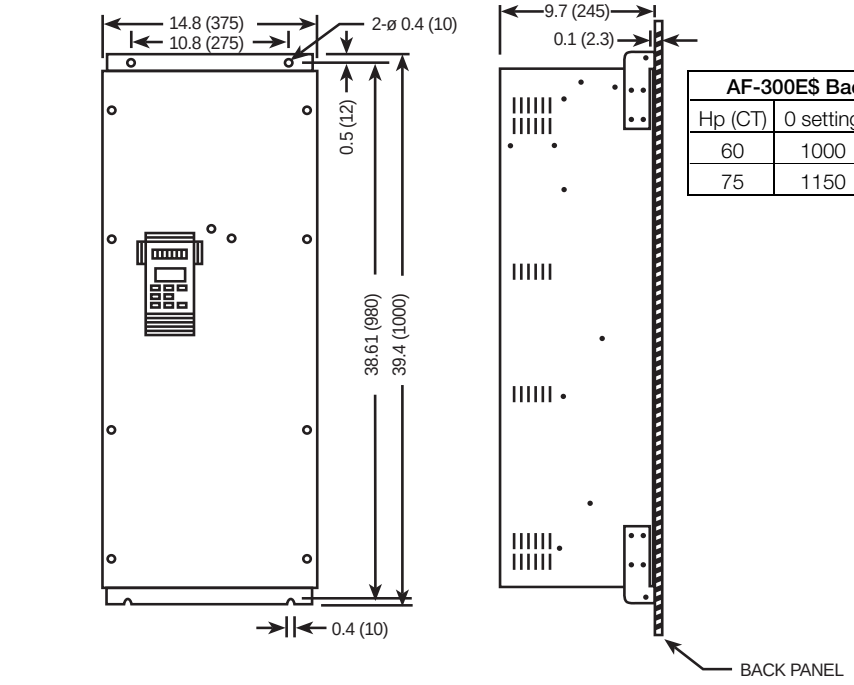


AF-300E$ Thru-Panel Mounting: Interior Watts Loss					
Hp (CT)	0 setting	10 setting	Hp (VT)	0 setting	10 setting
50	270	360	60	285	345

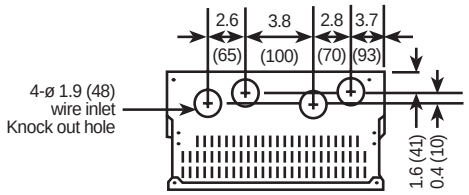
Dimensions 60, 75 Hp 460 VAC

Dimensions in inches (mm)

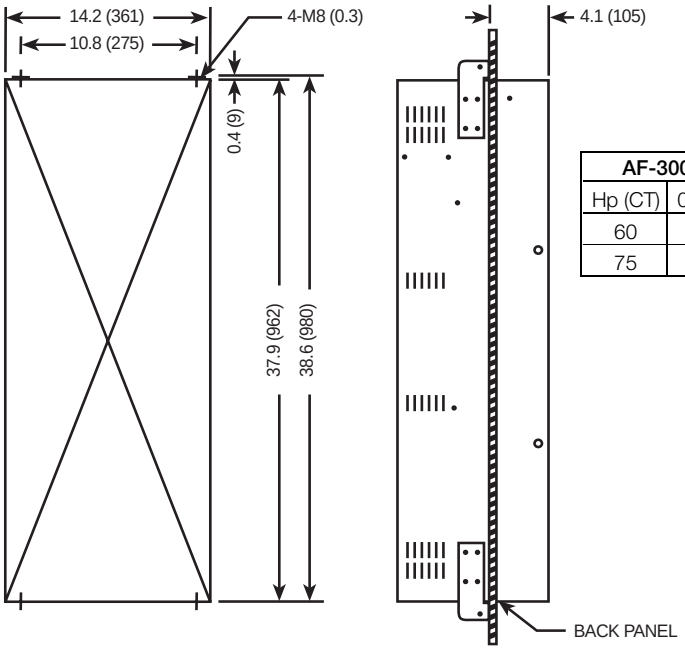
BACK PANEL MOUNTING



AF-300E$ Back-Panel Mounting: Interior Watts Loss					
Hp (CT)	0 setting	10 setting	Hp (VT)	0 setting	10 setting
60	1000	1300	75	1050	1250
75	1150	1550	100	1300	1500



THROUGH PANEL MOUNTING

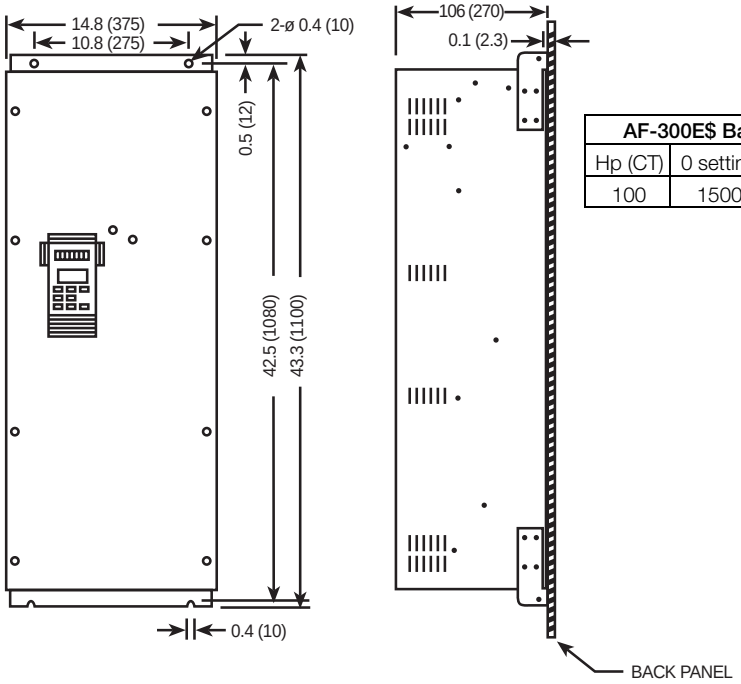


AF-300E$ Thru-Panel Mounting: Interior Watts Loss					
Hp (CT)	0 setting	10 setting	Hp (VT)	0 setting	10 setting
60	300	390	75	315	375
75	345	415	100	390	450

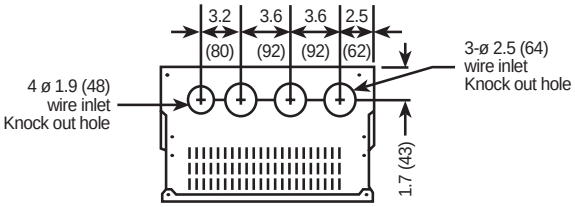
Dimensions 100 Hp 460 VAC

Dimensions in inches (mm)

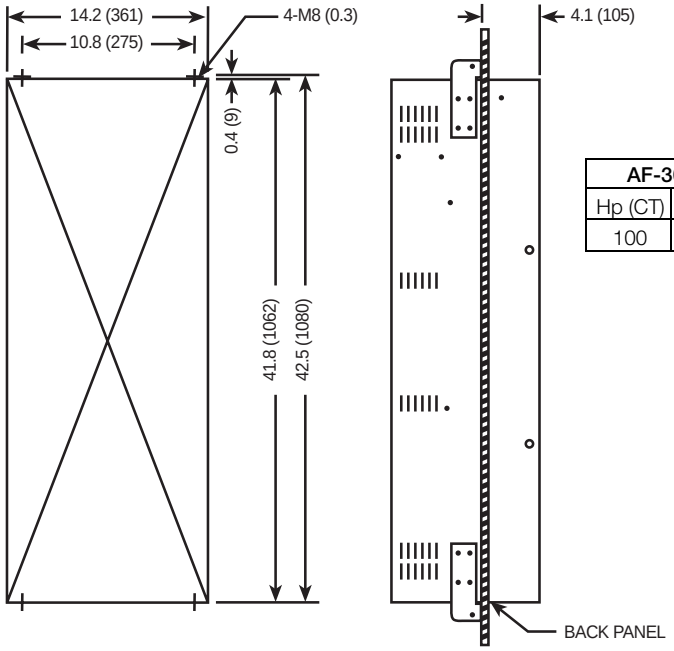
BACK PANEL MOUNTING



AF-300E$ Back-Panel Mounting: Interior Watts Loss					
Hp (CT)	0 setting	10 setting	Hp (VT)	0 setting	10 setting
100	1500	1600	125	1700	1850



THROUGH PANEL MOUNTING



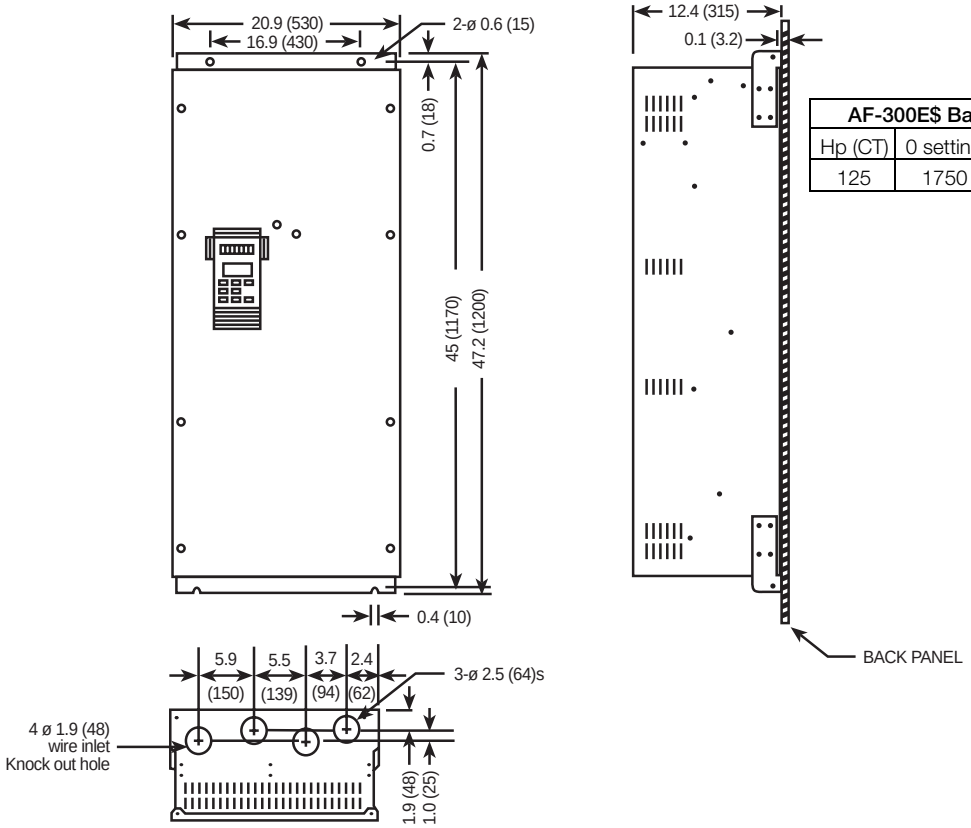
AF-300E$ Thru-Panel Mounting: Interior Watts Loss					
Hp (CT)	0 setting	10 setting	Hp (VT)	0 setting	10 setting
100	450	480	125	510	555

NOTE: Drive includes a separately mounted DC Link Reactor. See Page 4-10 for details

Dimensions 125 Hp 460 VAC

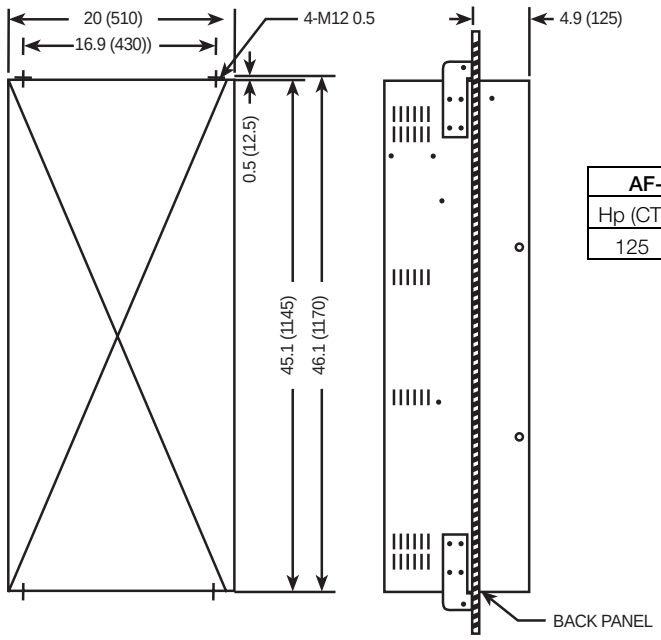
Dimensions in inches (mm)

BACK PANEL MOUNTING



AF-300E$ Back-Panel Mounting: Interior Watts Loss					
Hp (CT)	0 setting	10 setting	Hp (VT)	0 setting	10 setting
125	1750	2000	150	1800	2000

THROUGH PANEL MOUNTING



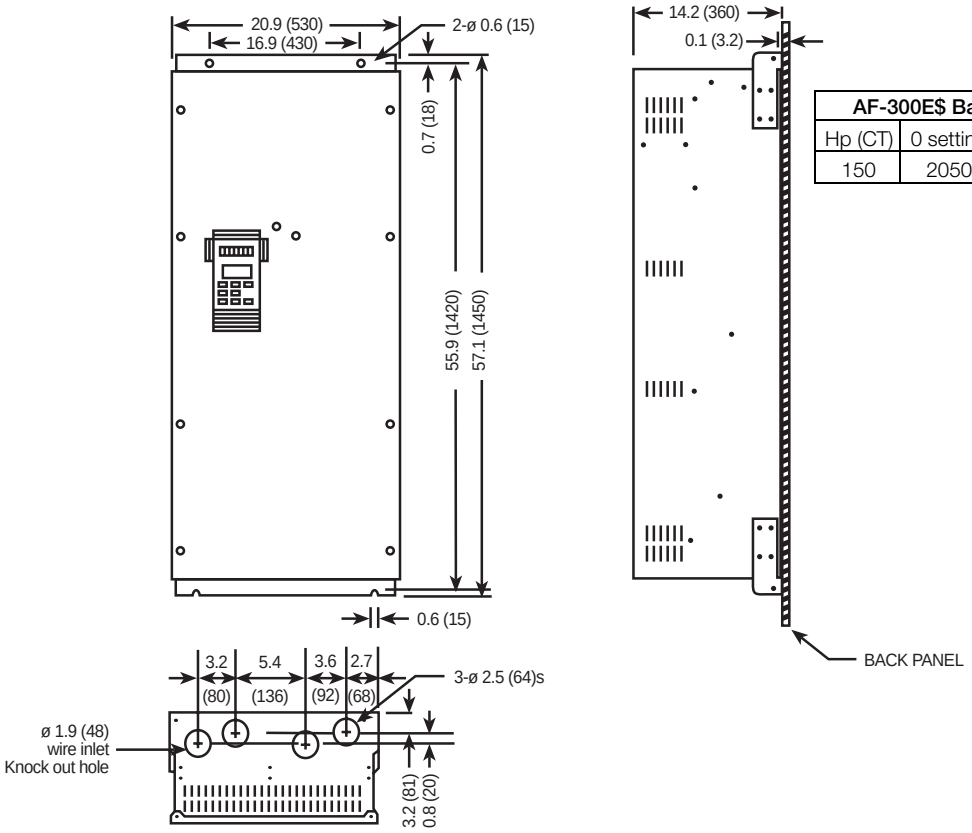
AF-300E$ Thru-Panel Mounting: Interior Watts Loss					
Hp (CT)	0 setting	10 setting	Hp (VT)	0 setting	10 setting
125	525	600	150	540	600

NOTE: Drive includes a separately mounted DC Link Reactor. See Page 4-10 for details

Dimensions 150 Hp 460 VAC

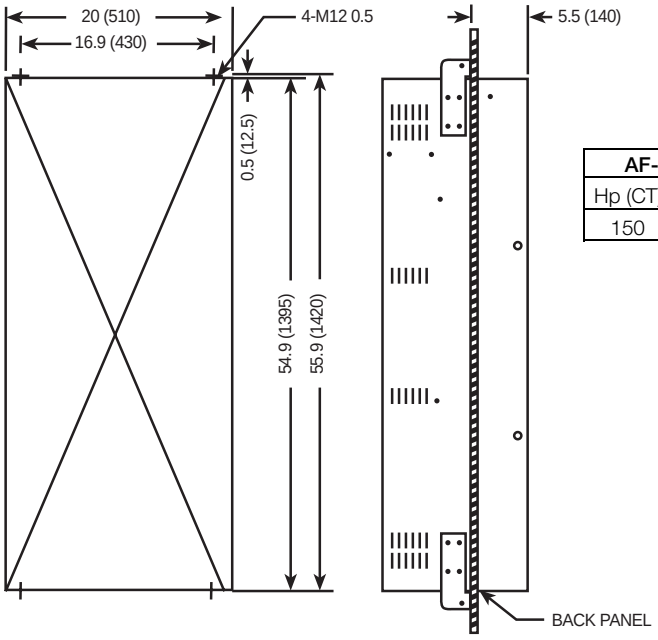
Dimensions in inches (mm)

BACK PANEL MOUNTING



AF-300E$ Back-Panel Mounting: Interior Watts Loss					
Hp (CT)	0 setting	10 setting	Hp (VT)	0 setting	10 setting
150	2050	2350	200	2050	2300

THROUGH PANEL MOUNTING



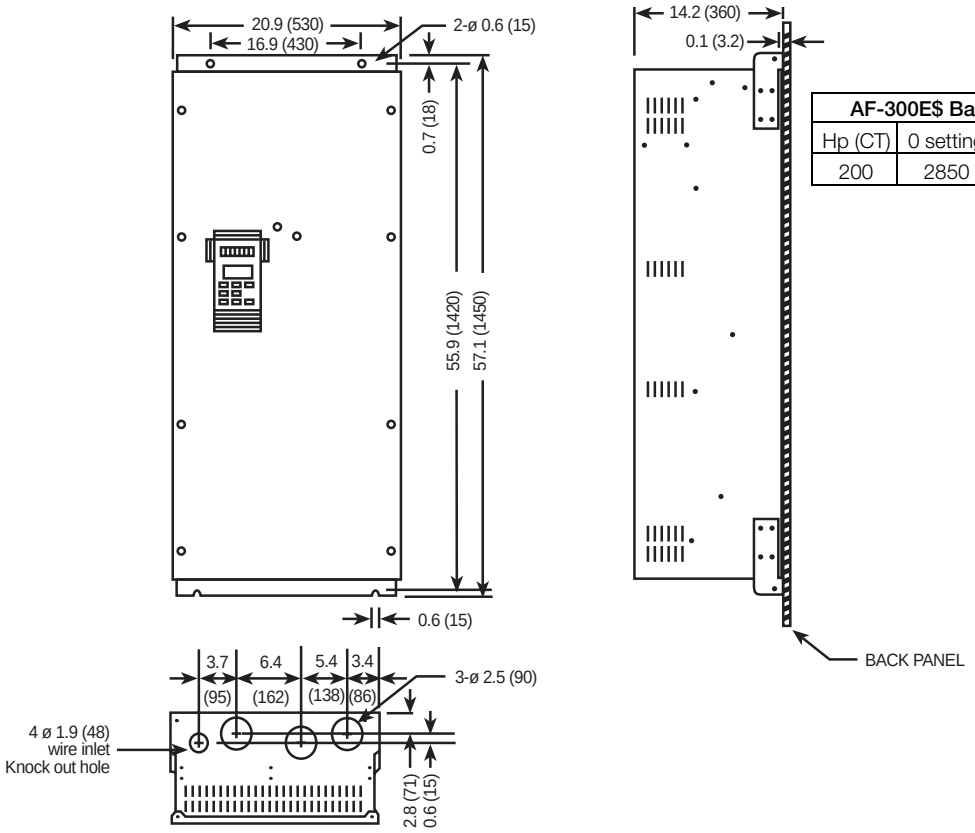
AF-300E$ Thru-Panel Mounting: Interior Watts Loss					
Hp (CT)	0 setting	10 setting	Hp (VT)	0 setting	10 setting
150	615	705	200	615	690

NOTE: Drive includes a separately mounted DC Link Reactor. See Page 4-10 for details

Dimensions 200 Hp 460 VAC

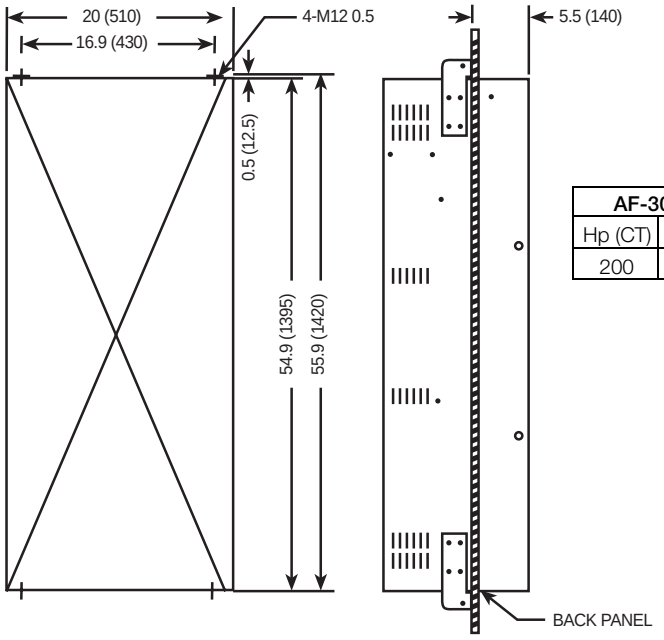
Dimensions in inches (mm)

BACK PANEL MOUNTING



AF-300E$ Back-Panel Mounting: Interior Watts Loss					
Hp (CT)	0 setting	10 setting	Hp (VT)	0 setting	10 setting
200	2850	3250	250	2800	3150

THROUGH PANEL MOUNTING



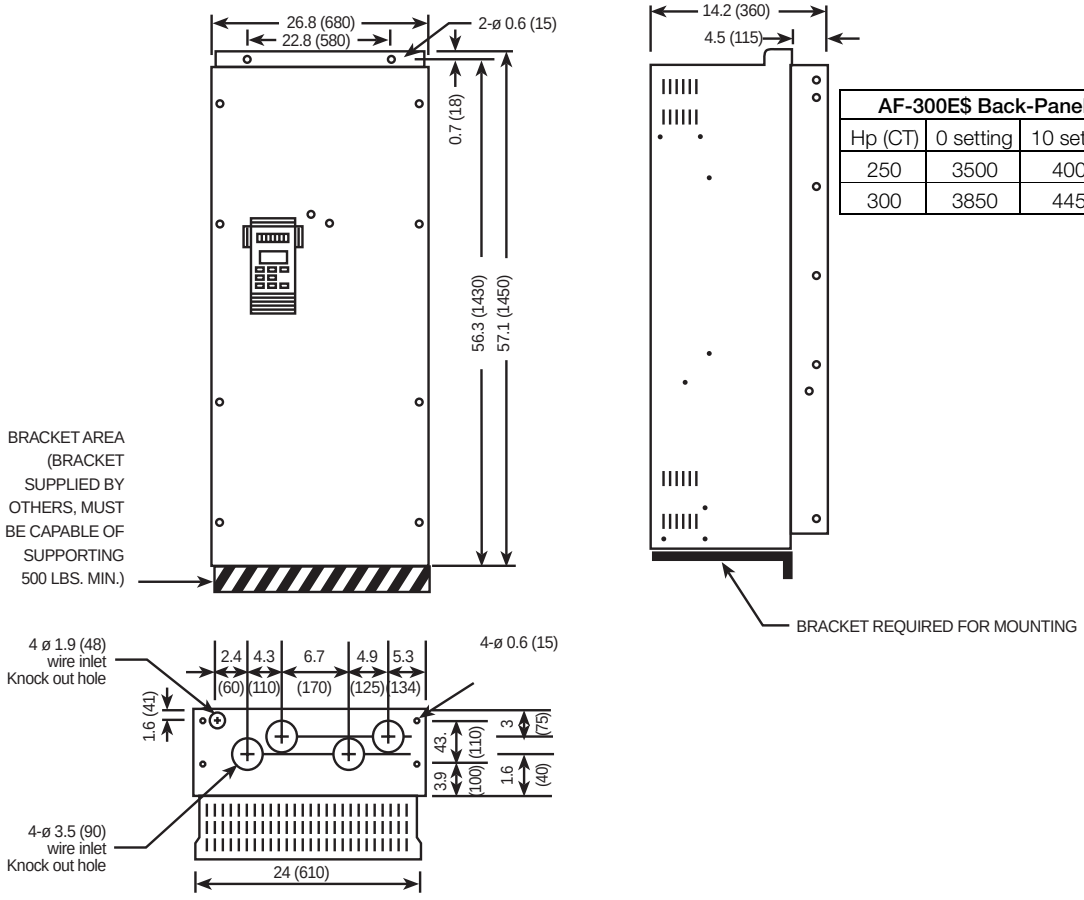
AF-300E$ Thru-Panel Mounting: Interior Watts Loss					
Hp (CT)	0 setting	10 setting	Hp (VT)	0 setting	10 setting
200	855	975	250	840	945

NOTE: Drive includes a separately mounted DC Link Reactor. See Page 4-10 for details

Dimensions 250, 300 Hp 460 VAC

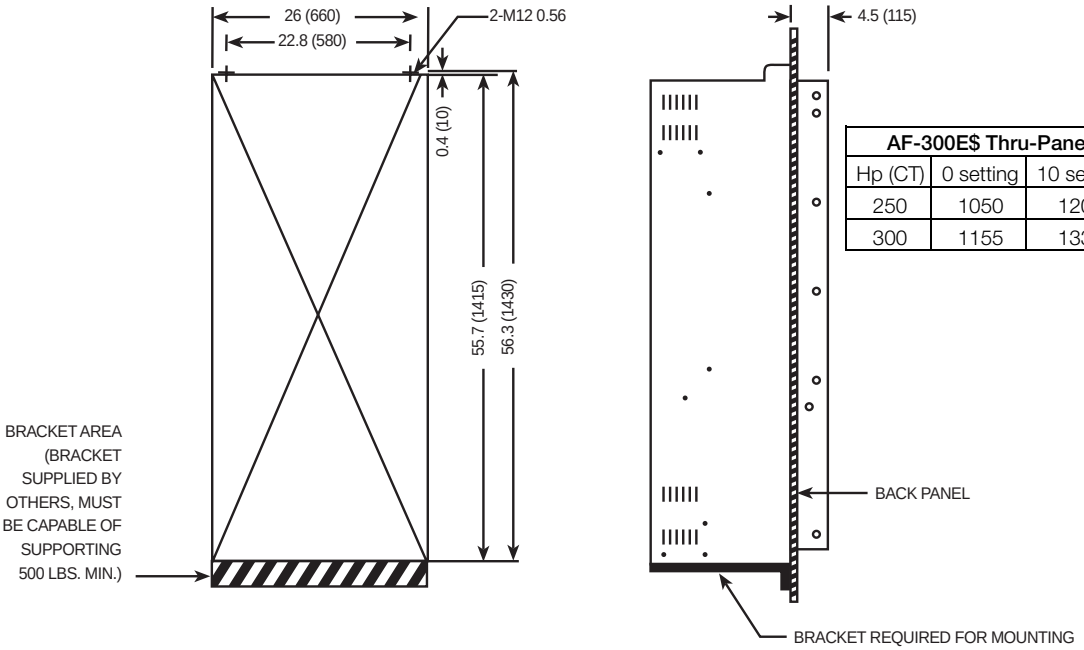
Dimensions in inches (mm)

BACK PANEL MOUNTING



AF-300E$ Back-Panel Mounting: Interior Watts Loss					
Hp (CT)	0 setting	10 setting	Hp (VT)	0 setting	10 setting
250	3500	4000	300	3450	3800
300	3850	4450	350	3900	4300

THROUGH PANEL MOUNTING

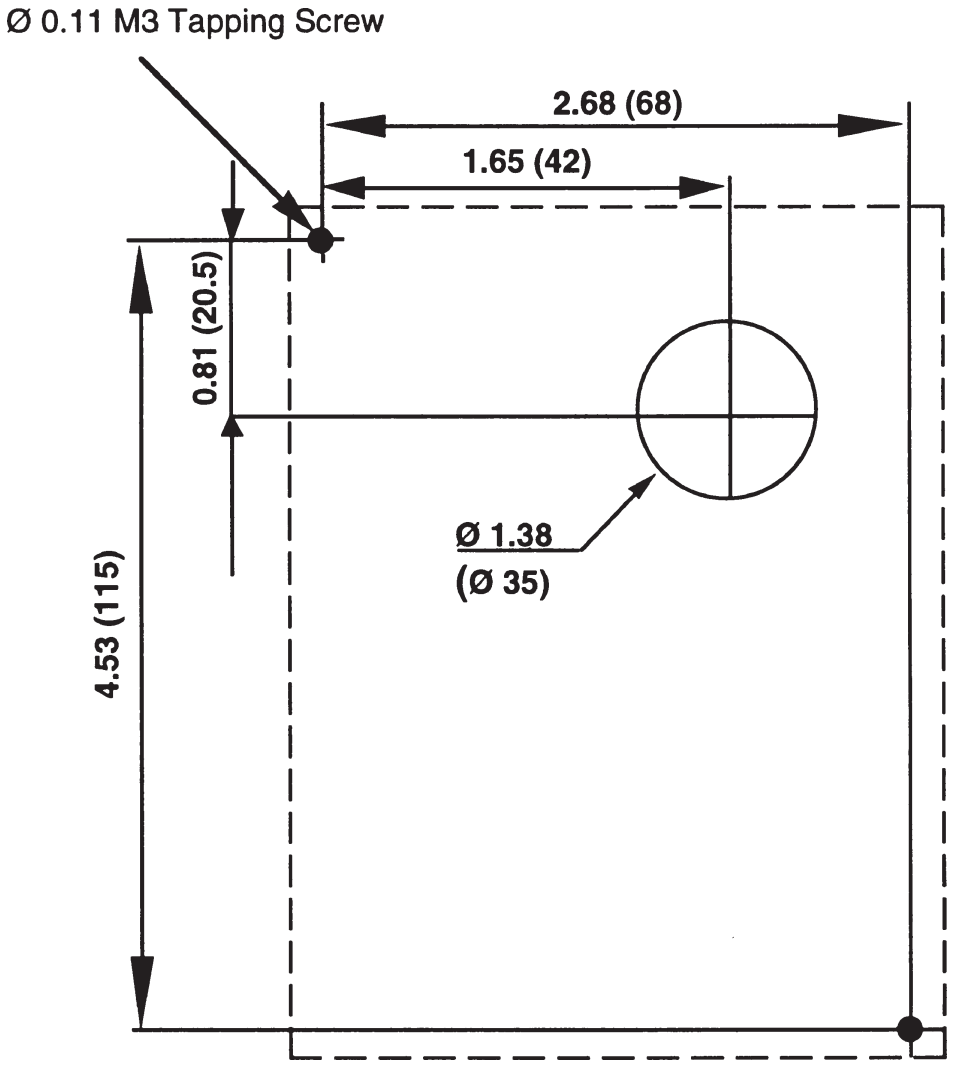


AF-300E$ Thru-Panel Mounting: Interior Watts Loss					
Hp (CT)	0 setting	10 setting	Hp (VT)	0 setting	10 setting
250	1050	1200	300	1035	1140
300	1155	1335	350	1170	1290

NOTE: Drive includes a separately mounted DC Link Reactor. See Page 4-10 for details

Keypad Mounting Hole (Panel Cutting)

Dimensions in inches (mm)



Notes:

Section 4: Wiring Procedures

WIRING PROCEDURES
REMOVE TERMINAL BLOCK COVER

Remove the terminal block cover as follows (see Figure 4-1):

1. Remove the screw(s) located at the bottom of the cover.
2. Press upward on bottom of cover and lift off.
3. See Figure 4-2 for the location of the Main Circuit Terminal Block and the Control Circuit Terminal Block.

WARNING:

Some printed circuit boards and drive components may contain hazardous voltage levels. If LED light CRG 1 on the Base Driver Board is illuminated, hazardous voltages are present in the drive circuit boards. Remove and lock out power before you disconnect or reconnect wires, and before you remove or replace fuses and circuit boards. Do not attempt to service the drive until the LED indicator has extinguished and the bus voltage has discharged to zero volts.

Figure 4-1. REMOVING THE FRONT COVER

CONTROL CIRCUIT WIRING

drive is wired at shipment for operation and frequency setting through the keypad panel (frequency is set at 60 Hz.)

– See Figure 4-3 & 4-4 for wiring connections.
– See TABLE 4 for description of all terminals.

Make wire connections as shown in Figure 4-4 through 4-6 for desired mode of external operation through control circuit terminals.

– See TABLE 4 for description of all terminals.

CAUTION:

The control circuit terminal wiring should be kept as far away as possible from the main power wiring to prevent operational error due to noise interference. Never install both types of wiring in the same duct or conduit. (A separation distance of 4 inches [10 centimeters] or more is recommended.) If the control circuit wiring must cross the main power wiring, it should cross at a right angle.

CAUTION:

Use shielded or twisted wire for the control circuit wiring (wiring should be as short as possible, i.e. 65 feet or less [20 meters].) Connect outer covering of the shielded wires to the drive ground terminal and leave the other end open, but taped.

CAUTION:

Install a supressor in parallel with any relays or solemoid type coils that may be close to the drive to prevent noise from causing drive misoperation.

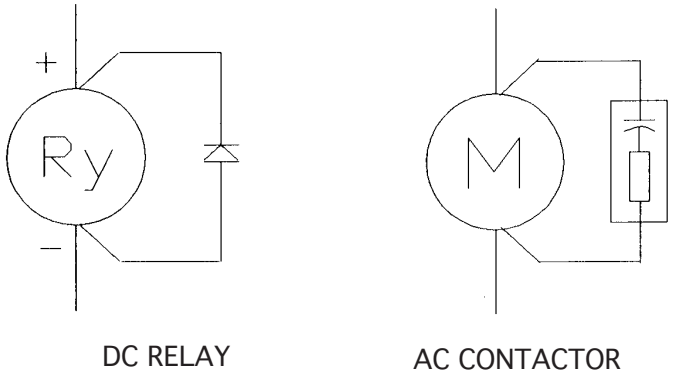


Figure 4-2.

MAIN CIRCUIT WIRING

CAUTION:

Be sure that the power supply is never connected to the U, V, W terminals or the N, P, DB terminals.

1. Connect the ground terminal as shown in the appropriate view of Figure 4-3 or 4-4. (Do not operate without the unit being grounded.)

   The ground wire must be as large and short as possible (see TABLE 5 for application wiring list.)

2. Connect the power supply wires to the L1, L2, and L3 terminals of the Main Circuit Terminal Block as shown in the appropriate view of Figure 4-3 or 4-4. (See TABLE 5 for description of all terminals and TABLE 4 for recommended wire sizes.)

3. Connect the 3-phase motor wires to the U, V, and W terminals of the Main Circuit Terminal Block as shown in the appropriate view of Figure 4-3 or 4-4. (See TABLE 5 for description of all terminals and TABLE 4 for recommended wire sizes.)

NOTE: Motor will rotate counterclockwise when viewed from the load side when connected normally. If the motor rotates in reverse direction, interchange any two of the U, V, or W terminal connections.

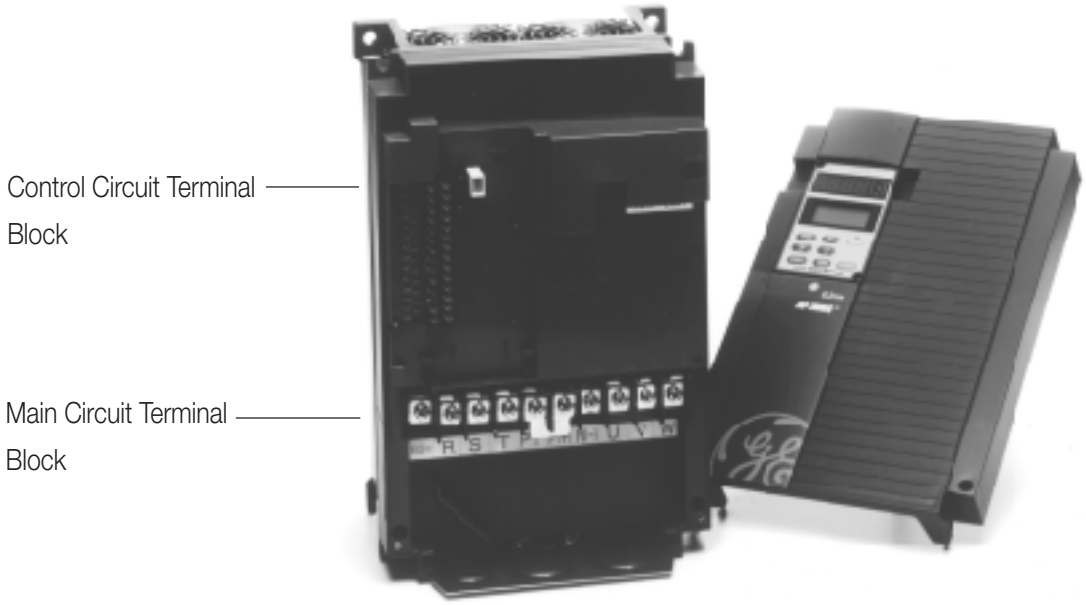


Figure 4-3. TERMINAL BLOCKS

Table 4: AF-300E$ Drive Cable Size Recommendations & Circuit Protection Rating

230V

HP		CURRENT		POWER			DB UNIT & DC LINK REACTOR			INCOMING POWER AC-LINE DEVICE[2]	
CONST TRQ	VAR TRQ	CONST TRQ	VAR TRQ	CABLE AWG	QTY	AMP TERMINAL #	CABLE AWG[1]	QTY	AMP TERMINAL #	FUSES	CIRCUIT BREAKER
0.5	0.5	3	3	16	1	–	14	1	–	6	15
1	1	5	5	16	1	–	14	1	–	10	15
2	2	8	8	14	1	–	14	1	–	15	15
3	3	11	11	14	1	–	14	1	–	20	20
5	5	17	17	10	1	–	10	1	–	30	30
7.5	10*	25	29	8	1	–	8	1	–	60	50
10	15*	33	42	6	1	–	6	1	–	80	60
15	20*	46	55	4	1	–	4	1	–	100	75
20	25*	59	68	2	1	–	2	1	–	125	100
25	30*	74	80	1	1	–	2	1	–	150	125
30		87		1	1	–	1/0	1	–	150	150

460V

HP		CURRENT		POWER			DB UNIT & DC LINK REACTOR			INCOMING POWER AC-LINE DEVICE[2]	
CONST TRQ	VAR TRQ	CONST TRQ	VAR TRQ	CABLE AWG	QTY	AMP TERMINAL #	CABLE AWG[1]	QTY	AMP TERMINAL #	FUSES	CIRCUIT BREAKER
1	1	2.5	2.5	16	1	–	14	1	–	6	5
2	2	3.7	3.7	16	1	–	14	1	–	10	10
3	3	5.5	5.5	16	1	–	14	1	–	15	15
5	5	9	9	14	1	–	14	1	–	15	15
7.5	10 *	13	16.5	10	1	–	14	1	–	30	30
10	15 *	18	23	10	1	–	14	1	–	40	30
15	20 *	24	30	8	1	–	14	1	–	50	40
20	25 *	30	37	6	1	–	14	1	–	60	50
25	30 *	39	44	6	1	–	14	1	–	80	60
30		45	45	4	1	–	12	1	–	80	75
	40 *	45	52	4	1	31812	12	1	321600	80	100
40	50 *	60	66	2	1	321600	12	1	321868	100	100
50	60 *	75	77	1/0	1	321868	10	1	31812	125	125
60	75 *	91	96	1/0	1	321868	8	1	321600	150	150
75	100 *	112	124	1/0	1	321868	6	1	321600	175	150
100	125 *	150	156	3/0	1	36927	6	1	321878	175	200
125	150 *	176	180	1/0	2	321868	6	1	321868	200	200
150	200 *	210	253	1/0	2	321868	4	1	36923	300	225
200	250 *	304	304	3/0	2	36929	4	2	171500-2	350	400
250	300 *	377	377	250	2	171500-2	4	2	171502-2	400	400
300	350 *	415	415	300	2	171500-2	4	2	171502-2	500	500

* In variable torque applications, Function Code 86 (Motor Hp Capacity) needs to be changed to Set Drive Hp vs. Load Hp.

40 Hp and above is 460-480 VAC input, VT applications only.

1 Device ratings such as system coordination, short-circuit rating and type must be carefully reviewed by the user.

2 Based on GE Fuji DB resistor designs. Other ratings require careful review.

3 Device ratings such as system coordination, short-circuit rating and type must be carefully reviewed by the user.

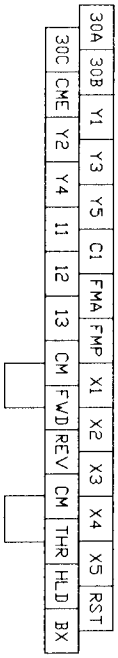
Note: Wire size from NEC table 310-16. Copper wire rated 60 Deg. C for 100 amps or less, 75 Deg. C for over 100 amps in 30 Deg. C ambient and 1.25 times Drive rated amps. These are minimum wire sizes; consult and conform to local and national codes.

CAUTION: The grounding connector shall be sized in accordance with the NEC or Canadian Electrical Code. The connection shall be made by a UL listed or CSA certified closed-loop terminal connector sized for the wire gauge involved. The connector is to be fixed using the crimp tool specified by the connector manufacturer.

Recommend GE Spectra RMS MAG-BREAK Circuit Breakers.

CAUTION: Quick-acting bussman JKS or equivalent J-class AC line fuses are required on 30 Hp or lower Drives. Check local electrical codes for 40 Hp and higher.

Control Terminal Board 1/2 - 30 Hp



CAUTION

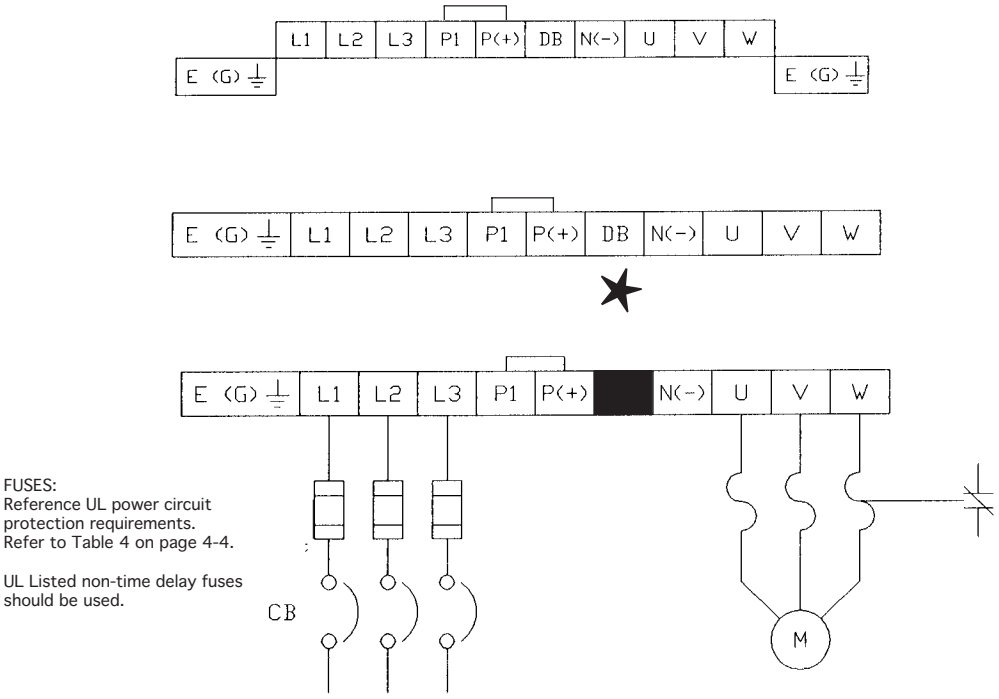
Remove Jumper from between terminals THR and CM when thermal interlocks are used.

NOTE

Wiring connections for operation with kaypad reference control.

CM-FWD and CM-THR terminals are jumpered together at the factory.

Power Terminal Board



FUSES:
Reference UL power circuit protection requirements.
Refer to Table 4 on page 4-4.

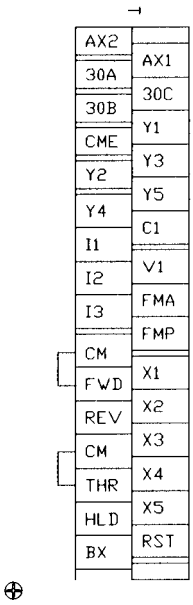
UL Listed non-time delay fuses should be used.

*** Refer to Dynamic Braking Table on Page 4-16.**

NOTE: P1 - P+ terminals are jumpered together at the factory.

Figure 4-4. 1/2 - 30 Hp TERMINAL BOARDS

Control Terminal Board 40 - 300 Hp



CAUTION

Remove Jumper from between terminals THR and CM when thermal interlocks are used.

CAUTION

Remove jumper from between terminals FWD and CM.

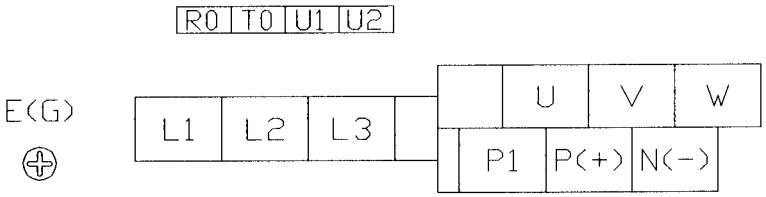
NOTE

Wiring connections for operation with kaypad reference control.

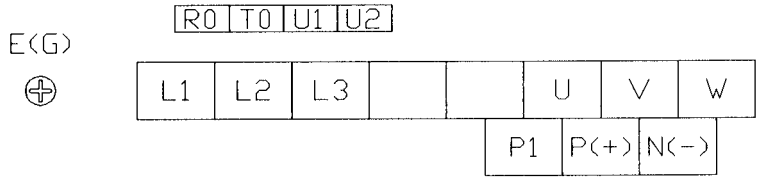
CM-FWD and CM-THR terminals are jumpered together at the factory.

Power Terminal Boards

40-75 Hp



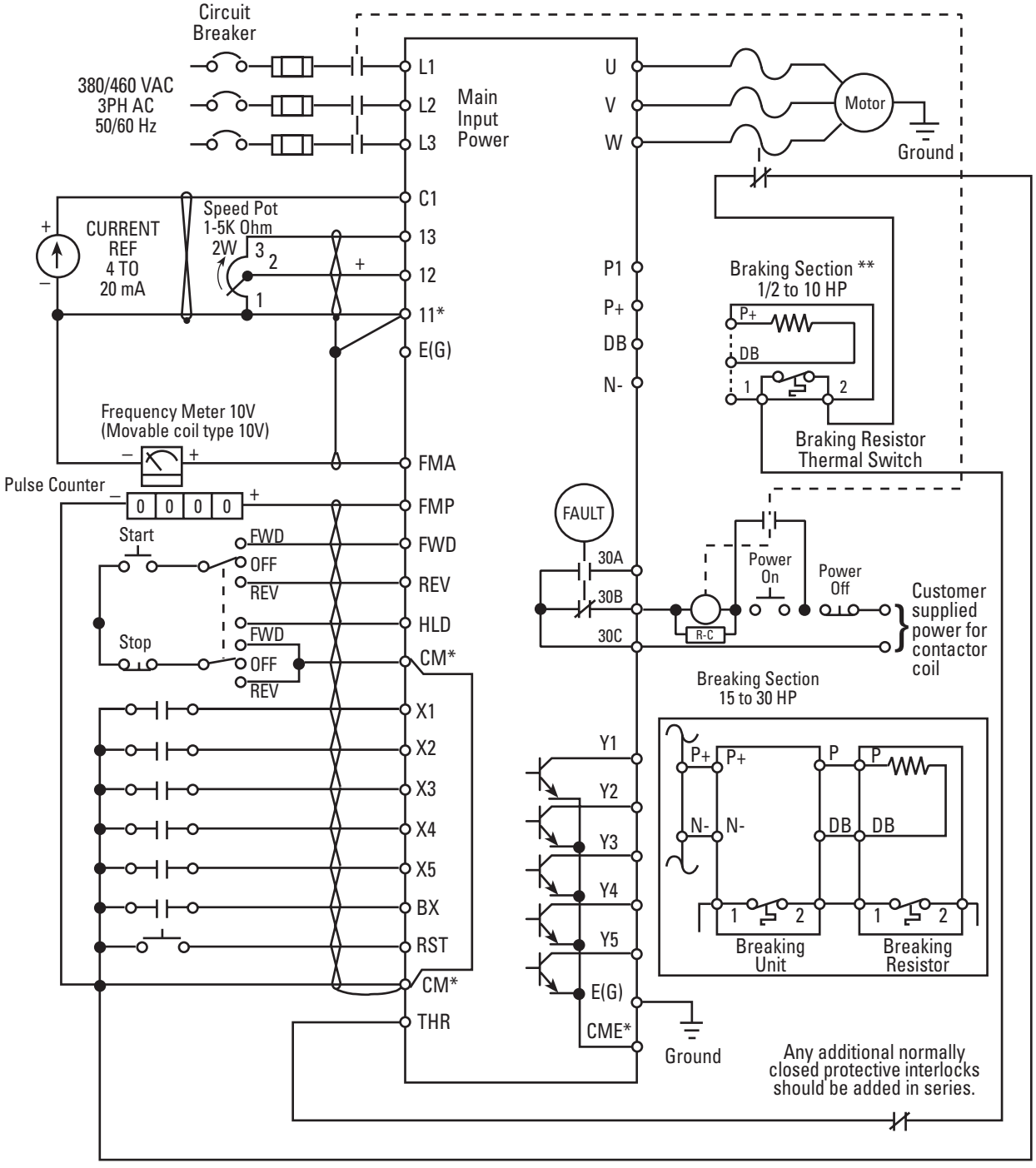
100 – 300 Hp



NOTE: A DC Link Reactor is also shipped for connection between terminals P1 - P+, 100 Hp and greater.

Figure 4-5. 40 - 300 Hp TERMINAL BOARDS

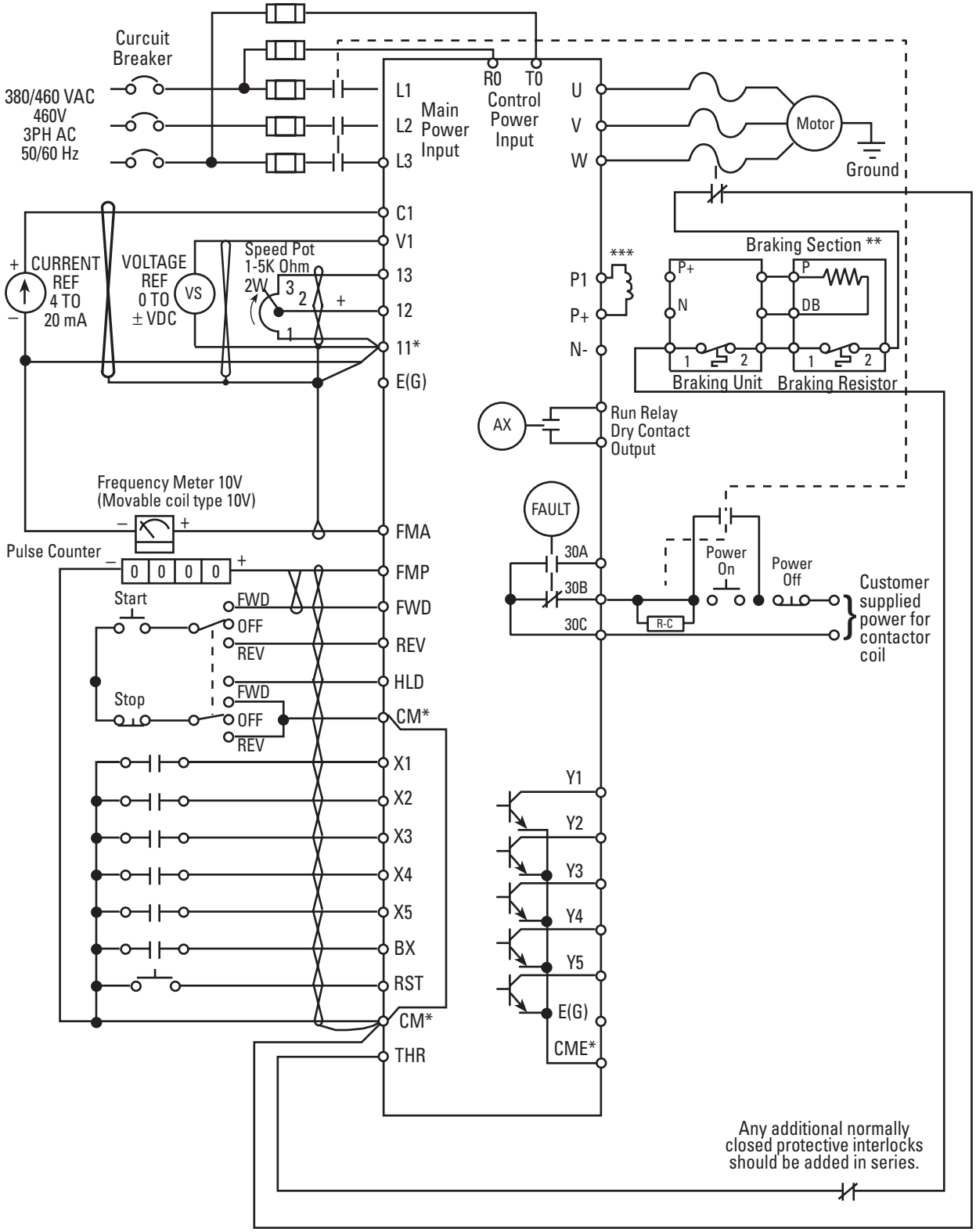
1/2 to 30 Hp AF-300E$ Drive Rating



*Terminal 11 should not be connected to either CM and/or CME.
** Refer to the Dynamic Braking Table on Page 4-13.

Figure 4-6. 1/2 - 30 Hp BASIC CONNECTION DIAGRAM

40 to 300 Hp AF-300E$ Drive Rating



*Terminal 11 should not be connected to either CM and/or CME.
** Refer to the Dynamic Braking Table on Page 4-13
*** DC Link Reactor furnished and mounted external on 100 Hp and higher.

Table 5: Terminal Identification/Function

Terminal Label	Terminal Name	Function
		POWER TERMINAL BOARD
L1, L2, L3	ac Supply Line Input Terminals	Connection for commercial power (200-230 VAC or 380-460 VAC); 3-phase; 50⁄60 Hz.
U, V, W	Drive Output Terminals	Connection for 3-phase induction motor.
P+, DB	External Braking Resistor Terminals	Connection for external braking resistor. (Only on 10 Hp or less.)
N-, P+	External Braking Unit Terminals	Connection for external braking resistor via external braking unit. (Only required on 15 Hp)
P+, P1	DC Reactor	Connection for a dc link reactor on unit rated 100 Hp and greater. These terminals are jumpered on units rated 75 Hp and less.
E (G)	Ground Terminal	Connection for ground. Note: Be sure to ground the chassis to prevent electrical shock & to reduce radio noise.
RO, TO	Control Power Auxiliary Input	Connection point for single-phase, 460 ac power for backing up the control circuit power when input starter is used (40 Hp and greater.)
U1, U2	Auxiliary Transformer Taps	Factory connection set at U1 for 400 - 460 VAC input. Reconnect to U2 for 380 VAC input. (40 Hp and greater)
		CONTROL TERMINAL BOARD
11	Frequency Setting Common Terminal	Common terminal for terminals 12, 13, C1 & V1, and FMA (Do not connect to CM terminal or electrical noise immunity may be lost.)
12	Frequency Setting Voltage Input	When 0 to +10 VDC (0 to 5V) is input, the maximum frequency is reached at +10 VDC (5V) and is proportional to output frequency down to 0 VDC. Input impedance is 22K ohm. Must be isolated source.
13	Frequency Setting Voltage Output Term.	Regulated +10 VDC power supply for frequency setting potentiometer, 10mA or less (13 to terminal 11.)
C1	Frequency Setting Current Input	When the input signal is +4 to +20mA dc, the maximum frequency is reached at 20mA and is proportional down to a minimum frequency setting at 4mA. Input impedance is 250 ohm. Must be isolated source.
V1	Voltage Input Auxiliary Terminal	Reaches maximum output frequency at +/- 10 VDC (the output freq. is proportional down to 0 VDC.) Input impedance is 22K ohms. Must be isolated source.
CM	Control Circuit Common Terminal	Common terminal for control input commands, and FMP pulse output signal. (Do not connect to terminal 11.)
FWD	Forward Command Input Terminal	Forward command via FWD-CM (closed). Reverse command via REV-CM (closed). When FWD-CM is closed and REV-CM is closed at the same time, the drive will decelerate to stop.
REV	Reverse Command Input Terminal	
BX	Motor Coast-To-Stop Input Terminal	Motor will coast-to-stop with BX-CM (closed). (For use when applying mechanical brake with drive in operation.) Note: If BX-CM is opened with FWD or REV closed, the drive will start operating.

Table 5: Terminal Identification/Function (continued)

Terminal Label	Terminal Name	Function
Control Terminal Board Cont'd		
HLD	3-wire Operation - Stop Command (Operation From Momentary Contacts)	When 3-wire operation is selected and HLD-CM is closed, the pulse signal input from FWD, REV terminals is held internally.
RST	Reset Signal Input	After removal of fault condition, Faults are reset when a momentary contact closure is made between the RST-CM terminals for more than 0.1 seconds. **NOTE:** *If there is an input to the FWD and/or REV terminals, the unit will not RESET.*
THR	External thermal trip command	With THR-CM (open), OH2 trip will occur and the motor will coast-to-stop. **NOTE:** *With no external thermal relay or external braking resistor thermostat, the THR-CM terminals must be closed or the drive will not operate. OH2 is a latched fault.*
FMA	Frequency Meter Connection Points Analog	Provides an output of 0 to +10 VDC (+10Vdc at max. frequency.) Available for connection of a voltmeter (with internal resistance of 10K ohms.) See Function Code 46 for monitoring selection. Meter connects between terminal FMA & 11. Two (2) voltmeters, each having an internal resistance of 10KΩ can be connected in parallel.
FMP Connection	Frequency Meter Points Pulse	Pulse frequency output equal to drive output frequency multiplied by the set value of Function Code 43. Meter connects between FMP and CM.
AX1 **AX2**	Run Relay Dry Contact Output	Contact is closed when the drive is running. (Contact rating resistive load: 250 VAC, 0.3 Amps.) (Only applicable to 40 Hp and greater)
30A **30B** **30C**	Fault Relay Output Terminals	During normal operation, the relay is not energized and contact is made between 30B and 30C. When a fault is detected, the relay is energized and contact is made between 30A and 30C. (Contact rating resistive load: 250 VAC, 0.3 Amps.)
X1-X5	Multi-step Input Function Selection	– Seven preset speed selection – Increment/Decrement function – DC Brake command – 2nd motor selection – Switching operation from ac line to Inverter – Data protection
Y1-Y5	Multi-step Output Function Selection	– Drive running – Frequency equivalence signal – Frequency level detection – Pattern timing signal – Overload early warning – Under voltage detection – Keypad operation – Auto restart – Auto reset

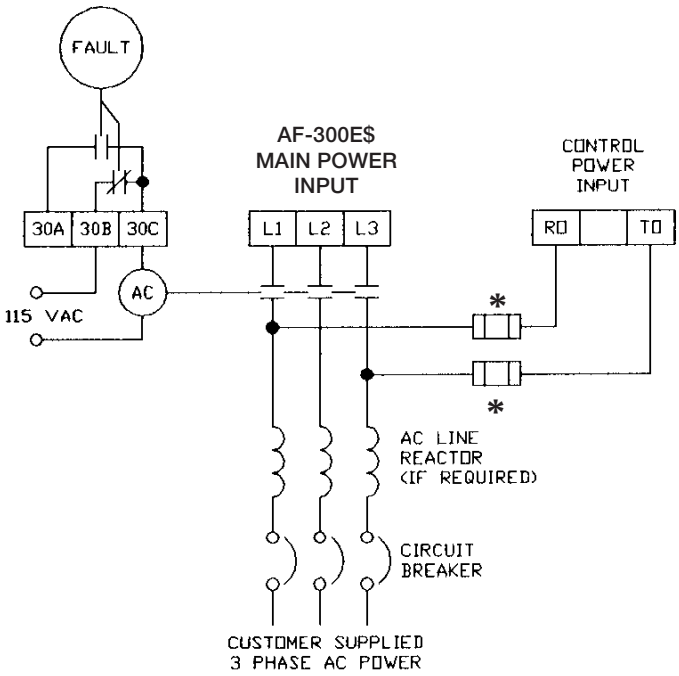
Auxiliary ControlPower Supply Connection

When using the circuit shown in Figure 4-8, it is necessary to connect terminals "RO" and "TO" to the line side of the MC Contactor.

CAUTION: Do not neglect to make these connections.

If not made, continuous cycling of the MC Contactor may occur that will stress (or fail) the charge resistor and DC link capacitors.

CAUTION: The RO and TO terminal control power cannot be separate or isolated from the main AC power.



* 40 - 300 Hp typical fuse 10 amp
(similar to Gould A60Q10-2)

Figure 4-8. AUXILIARY CONTROL POWER SUPPLY CONNECTION

DC Link Reactor Connection

A DC Reactor is required on all AF-300 drives rated 100 Hp and above. This reactor is included in the purchase of the drive and shipped with the drive. **This reactor must be installed or the warranty will be voided.**

1. Remove the jumper between the "P+" and "P1" terminals (if required.)
2. Connect DC Reactor between these terminals as shown in Figure 4-4 (see Table 4 for wire sizing.)

DC Link Reactor Dimensions

	Weight		Height		Width		Depth		Watts
HP	Lbs.	KG	Inches	MM	Inches	MM	Inches	MM	Loss
100	55	25	9.85	250	7.88	200	5.95	151	95
125	70.6	32	11.03	280	8.67	220	6.7	171	94
150	88	40	14.17	360	7.48	190	6.97	177	100
200	99	45	13.79	350	8.67	220	6.7	171	115
250	110	50	12.21	310	9.06	230	7.13	181	140
300	110	50	12.61	320	9.06	230	7.9	201	160

DETACH THE FACTORY INSTALLED JUMPER (IF REQUIRED)

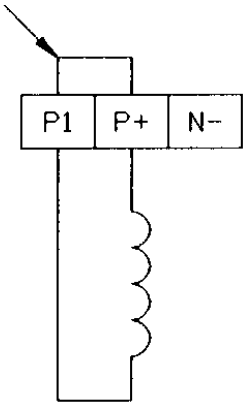
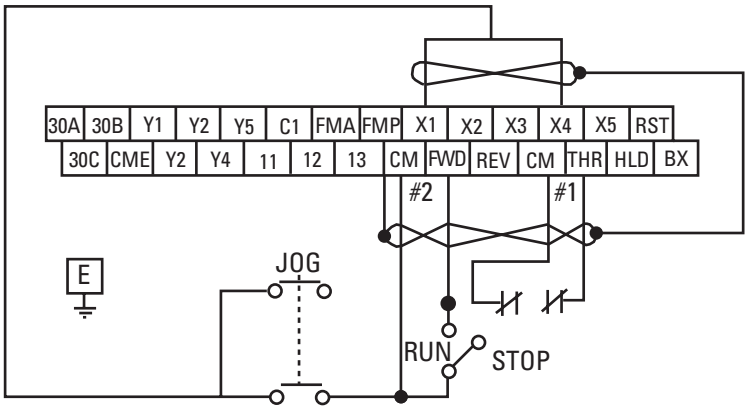


Figure 4-9. DC LINK REACTOR CONNECTION (100 Hp AND GREATER)

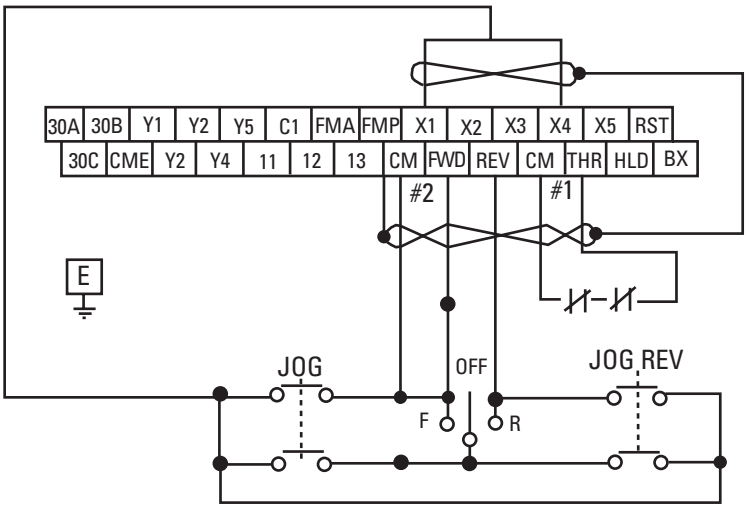
Remote Operation



01=1 (REMOTE)
33 JOG ACCEL TIME SETTING
34 JOG DECEL TIME SETTING
20 JOG SPEED (FREQUENCY) SETTING

NOTE:
CONTACT BETWEEN FWD AND CM MUST BE OPEN DURING POWER-UP OR "Er6" TRIP WILL OCCUR.

Figure 4-10A. REMOTE OPERATION WITH MAINTAINED contacts and JOG FUNCTION (NON-REVERSING)



01=1 (REMOTE)
33 JOG ACCEL TIME SETTING
34 JOG DECEL TIME SETTING
20 JOG SPEED (FREQUENCY) SETTING

NOTE:
CONTACT BETWEEN FWD AND CM MUST BE OPEN DURING POWER-UP OR "Er6" TRIP WILL OCCUR.

#1 CAUTION:
REMOVE JUMPER FROM BETWEEN TERMINALS THR AND CM WHEN THERMAL INTERLOCKS ARE USED.

#2 CAUTION:
REMOVE JUMPER FROM BETWEEN TERMINALS FWD AND CM.

Figure 4-10B. REMOTE OPERATION WITH MAINTAINED contacts and JOG FUNCTION with reversing capability

Automatic Restart Circuit Connection

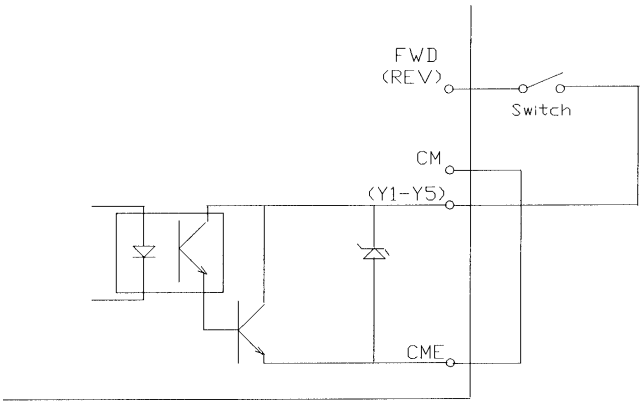


Figure 4-11. AUTOMATIC RESTART CIRCUIT CONNECTIONS

— Timer setting (T_M) is fixed in software at 5 seconds.

— Timer starts after an initializing time of 2 seconds maximum when power returns.

— Timer output is selectable from Y1 through Y5. This function is active when "A" is selected and programmed into Function Code 47.

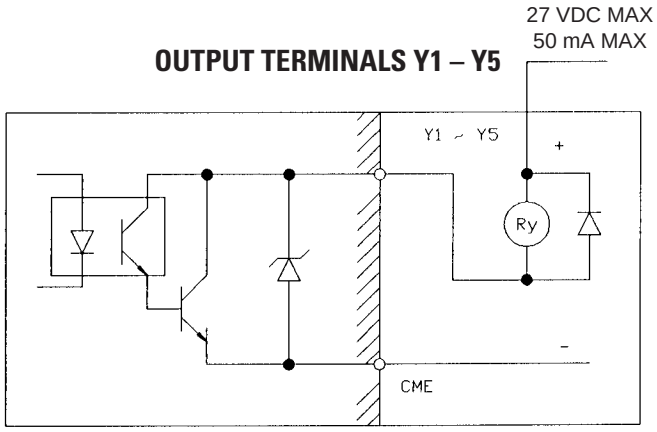
— Used to avoid Er6 after power failure, and re-application of main AC power.

WARNING:

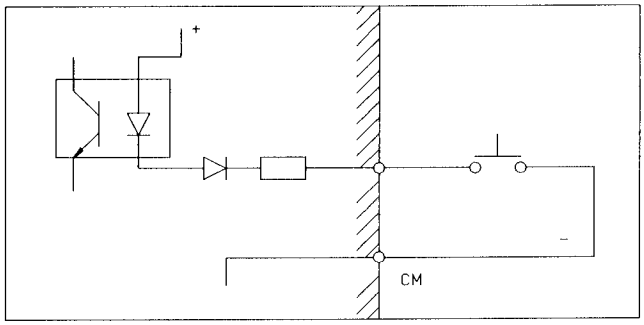
Personal safety must be considered when activating this function.

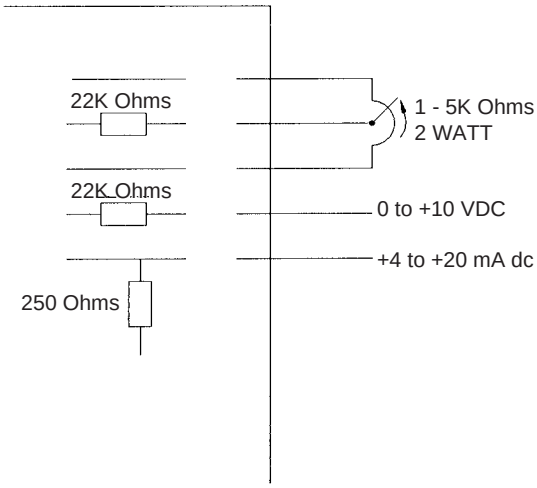
Drive Interface Details

OUTPUT TERMINALS Y1 – Y5



INPUT TERMINAL FWD, REV, X1-X5, HLD, BX, THR, RST





Dynamic Braking

Model No.	Braking Torque		CT Applications		VT Applications		Dynamic Braking Module	Qty Reqd	DB Resistor Model	Qty Reqd	Max KW	Total Ohms
	Built in Resistor	Optional Resistor	Duty Factor	Brake Time	Duty Factor	Brake Time						
230 VAC, 3 Phase, 60 Hz Input Power												
6KE$223F50X1A1	100%	150%	22	45 SEC	N/A	N/A	BUILT-IN	N/A	6KE$32DBR001	1	0.2	100.0
6KE$223001X1A1	100%	150%	18	45 SEC	N/A	N/A	BUILT-IN	N/A	6KE$32DBR001	1	0.2	100.0
6KE$223002X1A1	100%	150%	10	45 SEC	N/A	N/A	BUILT-IN	N/A	6KE$32DBR003	1	0.4	40.0
6KE$223003X1A1	100%	150%	7	30 SEC	N/A	N/A	BUILT-IN	N/A	6KE$32DBR003	1	0.4	40.0
6KE$223005X1A1	100%	150%	5	20 SEC	N/A	N/A	BUILT-IN	N/A	6KE$32DBR005	1	0.4	40.0
6KE$223007X1A1	100%	150%	5	20 SEC	3.5	15 SEC	BUILT-IN	N/A	6KE$32DBR007	1	0.8	20.0
6KE$223010X1A1	100%	150%	5	10 SEC	3.5	7 SEC	BUILT-IN	N/A	6KE$32DBR010	1	0.9	15.0
6KE$223015X1A1	20%	150%	5	10 SEC	3.5	7 SEC	6KE$32DBU025	1	6KE$32DBR015	1	1.4	12.0
6KE$223020X1A1	20%	150%	5	10 SEC	4	8 SEC	6KE$32DBU025	1	6KE$32DBR020	1	1.4	12.0
6KE$223025X1A1	20%	150%	5	10 SEC	4	8 SEC	6KE$32DBU025	1	6KE$32DBR025	1	1.8	10.0
6KE$223030X1A1	20%	150%	5	8 SEC			6KE$32DBU030	1	6KE$32DBR030	1	1.8	8.6
460 VAC, 3 Phase, 60 Hz Input Power												
6KE$243001X1A1, B1	100%	150%	10	45 SEC	N/A	N/A	BUILT-IN	N/A	6KE$34DBR001	1	0.2	160.0
6KE$243002X1A1, B1	100%	150%	10	45 SEC	N/A	N/A	BUILT-IN	N/A	6KE$34DBR003	1	0.4	160.0
6KE$243003X1A1, B1	100%	150%	7	30 SEC	N/A	N/A	BUILT-IN	N/A	6KE$34DBR003	1	0.4	160.0
6KE$243005X1A1, B1	100%	150%	5	20 SEC	N/A	N/A	BUILT-IN	N/A	6KE$34DBR005	1	0.4	160.0
6KE$243007X1A1, B1	100%	150%	5	20 SEC	3.5	15 SEC	BUILT-IN	N/A	6KE$34DBR007	1	0.8	80.0
6KE$243010X1A1, B1	100%	150%	5	10 SEC	3.5	7 SEC	BUILT-IN	N/A	6KE$34DBR010	1	0.9	60.0
6KE$243015X1A1, B1	20%	150%	5	10 SEC	3.5	7 SEC	6KE$34DBU030	1	6KE$34DBR015	1	1.4	48.0
6KE$243020X1A1, B1	20%	150%	5	10 SEC	4	8 SEC	6KE$34DBU030	1	6KE$34DBR020	1	1.4	48.0
6KE$243025X1A1, B1	20%	150%	5	10 SEC	4	8 SEC	6KE$34DBU030	1	6KE$34DBR025	1	1.8	40.0
6KE$243030X1A1, B1	20%	150%	5	8 SEC	N/A	N/A	6KE$34DBU030	1	6KE$34DBR030	1	1.8	34.4
6KE$243035X1A1	10%	100%	N/A	N/A	8	8 SEC	6KE$34DBU050	1	6KE$34DBR040	1	3.6	
6KE$243040X1A1	10%	100%	10	10 SEC	8	8 SEC	6KE$34DBU050	1	6KE$34DBR040	1	3.6	15.0
6KE$243050X1A1	10%	100%	10	10 SEC	8	8 SEC	6KE$34DBU050	1	6KE$34DBR050	1	4.8	12.0
6KE$243060X1A1	10%	100%	10	10 SEC	8	8 SEC	6KE$34DBU075	1	6KE$34DBR060	1	6	10.0
6KE$243075X1A1	10%	100%	10	10 SEC	7	7 SEC	6KE$34DBU075	1	6KE$34DBR075	1	7.2	7.5
6KE$243100X1A1	10%	100%	10	10 SEC	8	8 SEC	6KE$34DBU150	1	6KE$34DBR050	2	9.6	6.0
6KE$243125X1A1	10%	100%	10	10 SEC	8	8 SEC	6KE$34DBU150	1	6KE$34DBR060	2	12	5.0
6KE$243150X1A1	10%	100%	10	10 SEC	8	8 SEC	6KE$34DBU175	1	6KE$34DBR060	3	18	3.75
6KE$243200X1A1	10%	100%	10	10 SEC	N/A	N/A	6KE$34DBU150	2	6KE$34DBR050	4	19.2	3.0
6KE$243250X1A1	10%	100%	10	10 SEC	N/A	N/A	6KE$34DBU150	2	6KE$34DBR060	4	24	2.5
6KE$243300X1A1	10%	100%	10	10 SEC	N/A	N/A	6KE$34DBU150	2	6KE$34DBR075	4	28.8	1.88

4-008

Note: Duty Factor is the % of calculated total cycle time NOT to exceed the listed brake time for the total cycle.

Total Cycle Time = (Brake time / Duty Factor)* 100

Main Circuit Wiring for CE Mark

Connect the power supply of overvoltage category 2 to the main power input terminals L1, L2 and L3 via a circuit breaker and/or a leakage current breaker. There is no need to match the phase when connecting.
If the power supply is overvoltage category 3, place the devices to limit overvoltage below 2.5 kV as shown.

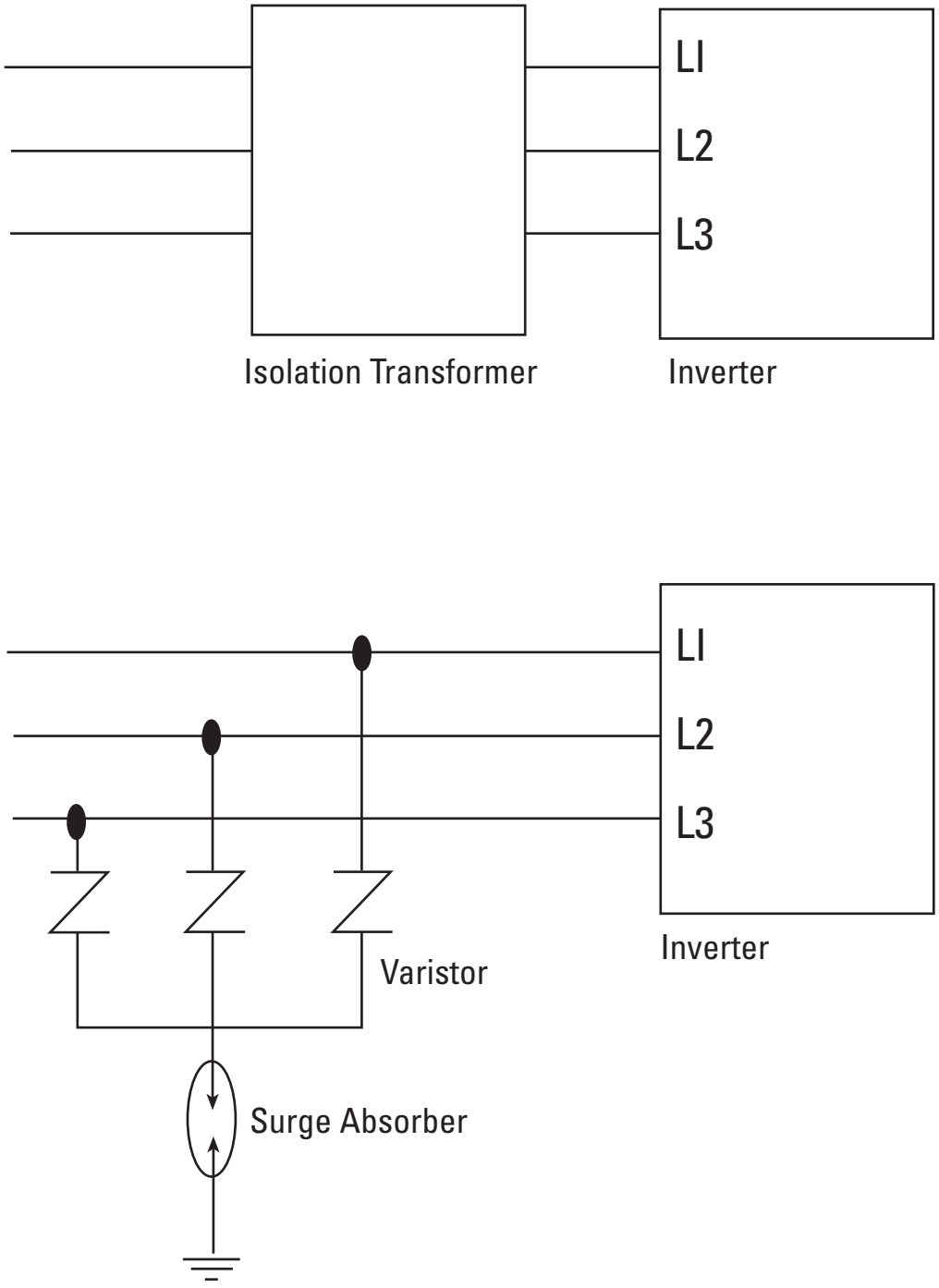


Figure 4-13. MAIN CIRCUIT WIRING FOR CE MARK

Section 5: Drive Operation

Drive Operation

Pre-operation Inspection

After mounting and wiring has been completed, check the drive for the following items before applying AC power:

— Check for wiring errors (especially main circuit wiring).

— Verify that there are no wiring chips, screws, etc. remaining in the drive.

— Check that all screw and terminal connections are tight.

— Verify that no exposed wire ends are touching other terminals.

Keypad Panel Identification

See TABLE 6 for Display and Keypad Operation description when in the Operation Mode, Program Mode or Trip Mode.

Function Code and Data Code Description/Selection

When AC power is applied to the drive, the operation panel display will be as shown in Figure 5-1 and will be flashing on and off. If the RUN key is pressed at this point, operation will be at 60 Hertz according to the Function Code set at the factory. (Use the STOP key to halt operation.)

-- A Flashing display indicates the set frequency when a run command is not present.

-- A Solid display indicates the actual output frequency when the drive is running.

If a test run is desired, press the DOWN key to change the flashing display of 60.00 Hz frequency setting to 5.00 Hz. Within 4 seconds, press the FUNC/DATA key to set the new setting into software. Conduct the test run and check for smooth rotation and correct direction of the motor.

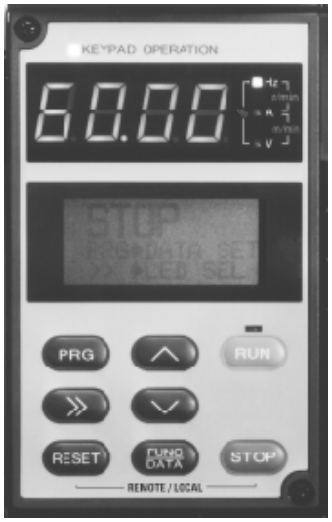
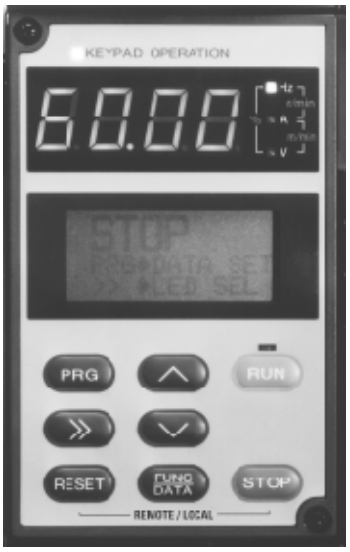


Figure 5-1. KEYPAD PANEL DISPLAY WHEN AC POWER IS APPLIED

Table 6: Keypad and Display Operation Programming

Keypad Panel



NOTE:
"Inv Running" on LCD display indicates Function Code cannot be changed until drive is stopped.

Mode Selection

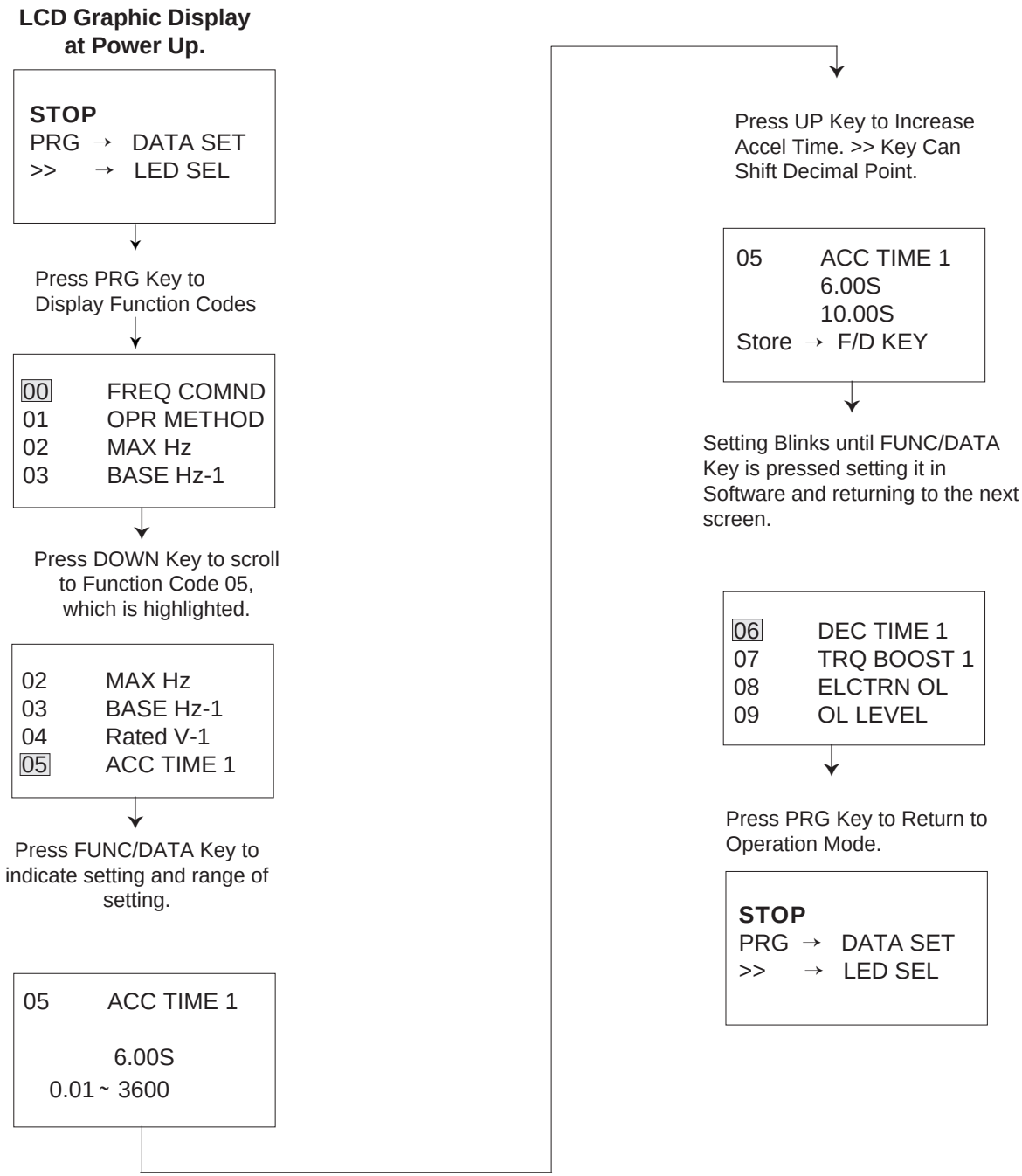
The Drive has three (3) modes:

(1) Operation Mode:	Full operation of Drive.
(2) Program Mode:	Drive Function Code settings.
(3) Trip Mode:	Drive system faults.

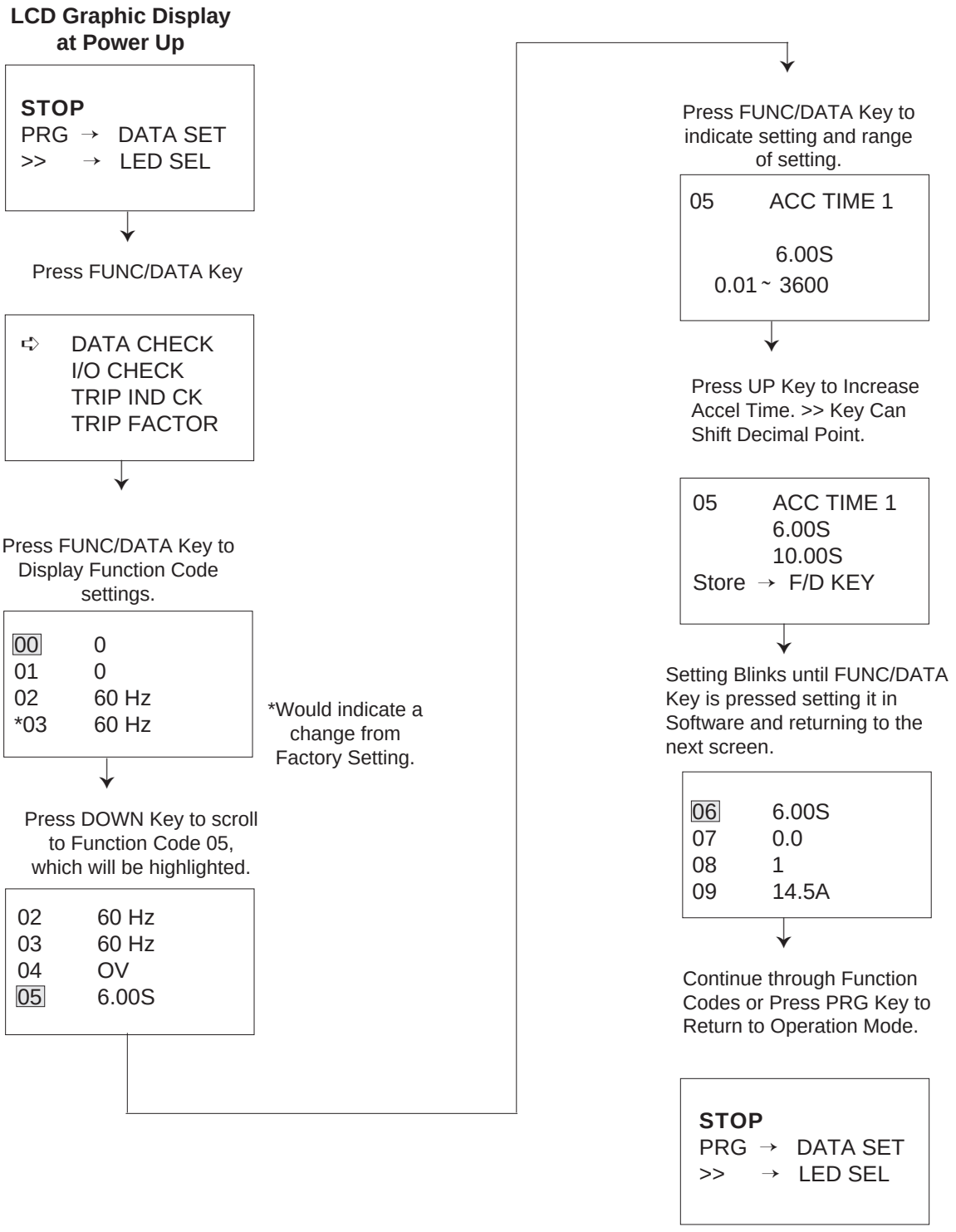
The following is an example of the key functions in the Programming Method:

(1) Push PRG:	set Program Mode
(2) Push UP/DOWN:	to move cursor to select a Function Code
(3) Push FUNC/DATA:	displays data setting of selected Function Code
(4) Push UP/DOWN:	changes setting. >> can shift decimal point
(5) Push FUNC/DATA:	to write the data into drive memory and return to the Program Mode
(6) Push PRG:	return to last display
(7) Push PRG:	return to Drive Operation Mode

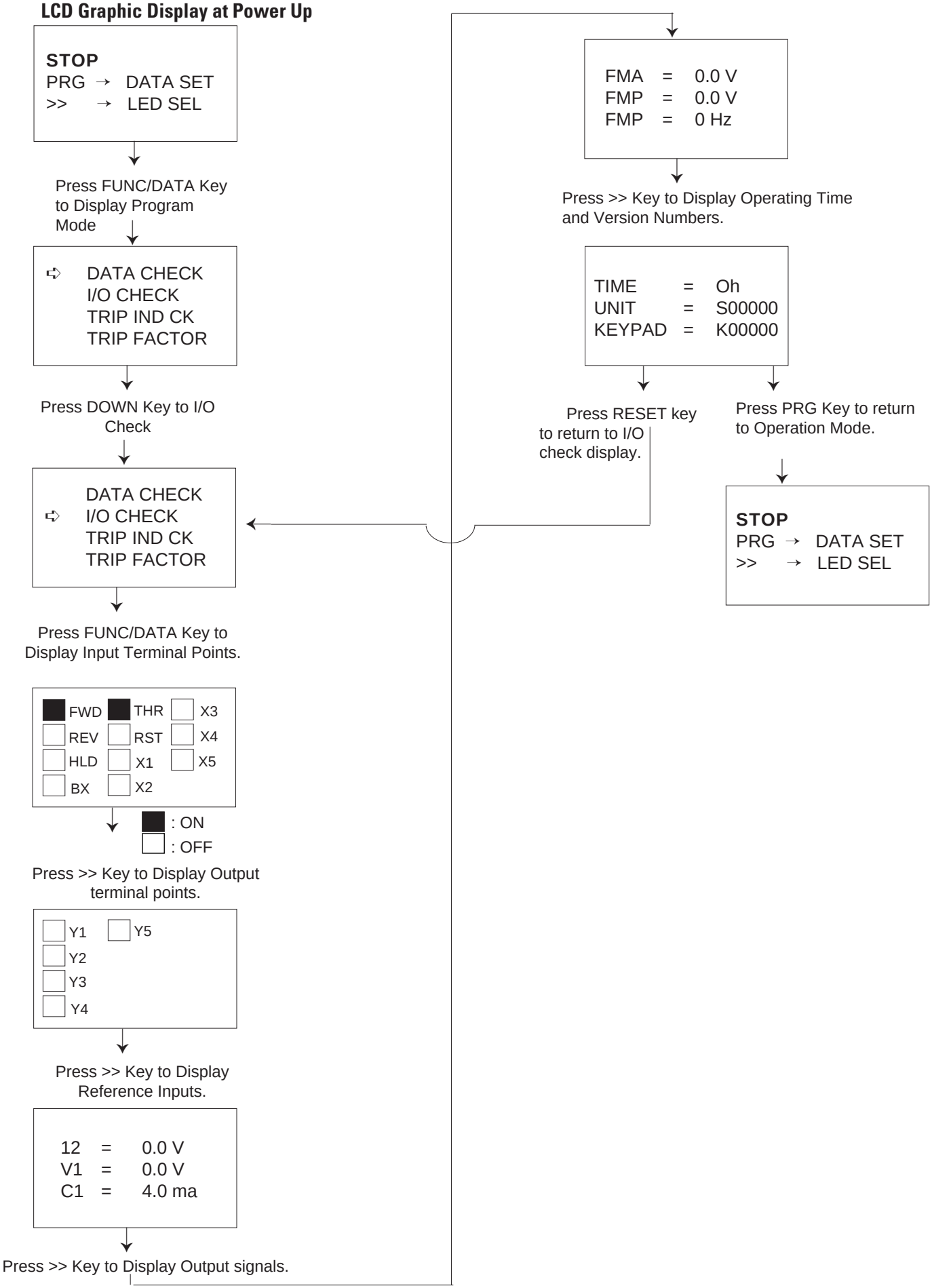
Program Mode Example of Changing a Function Code



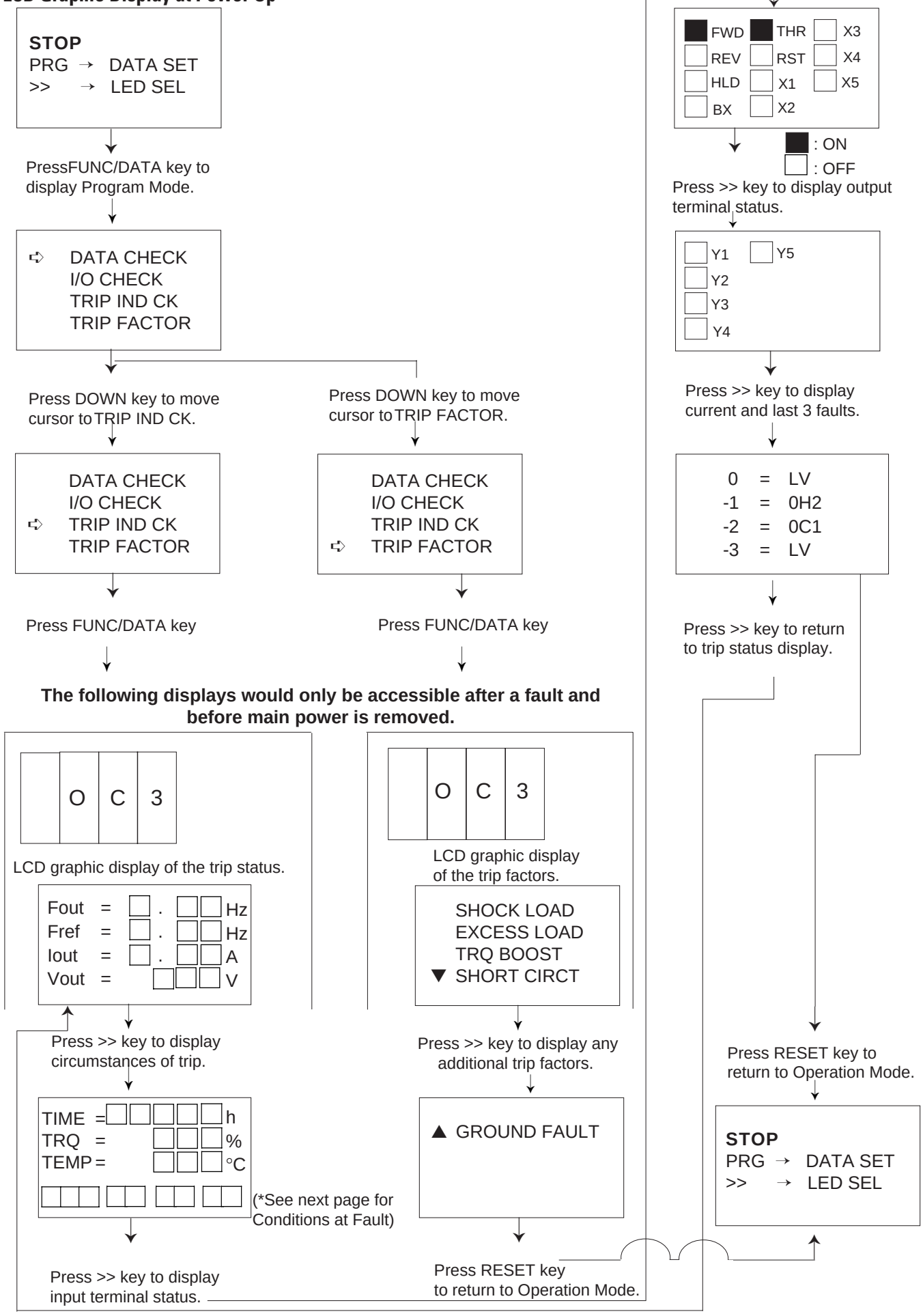
Program Mode Example of Checking Function Codes (Also Allows Changing Settings)



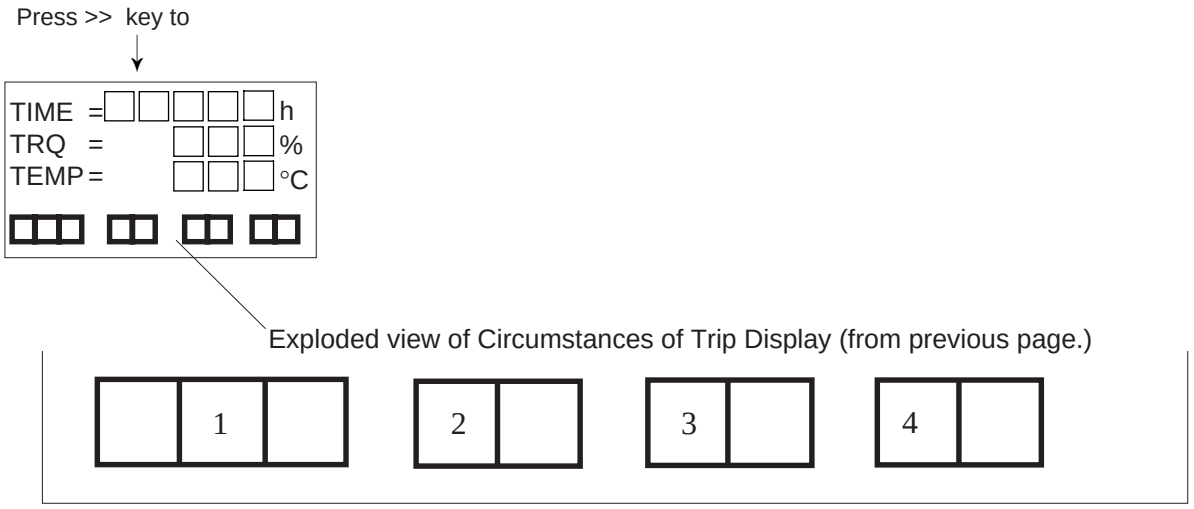
LCD Graphic Display at Power Up



LCD Graphic Display at Power Up



Circumstances of Trip



The above drawing shows the spacing of the display.

Conditions at Fault

1

			Blank – Normal Operation
F	W	D	Forward Direction
R	E	V	Reverse Direction

2

		Normal Condition
I	L	Current Limit Reached

3

		Normal Condition
U	V	Undervoltage Condition
V	L	Voltage Limit Reached

4

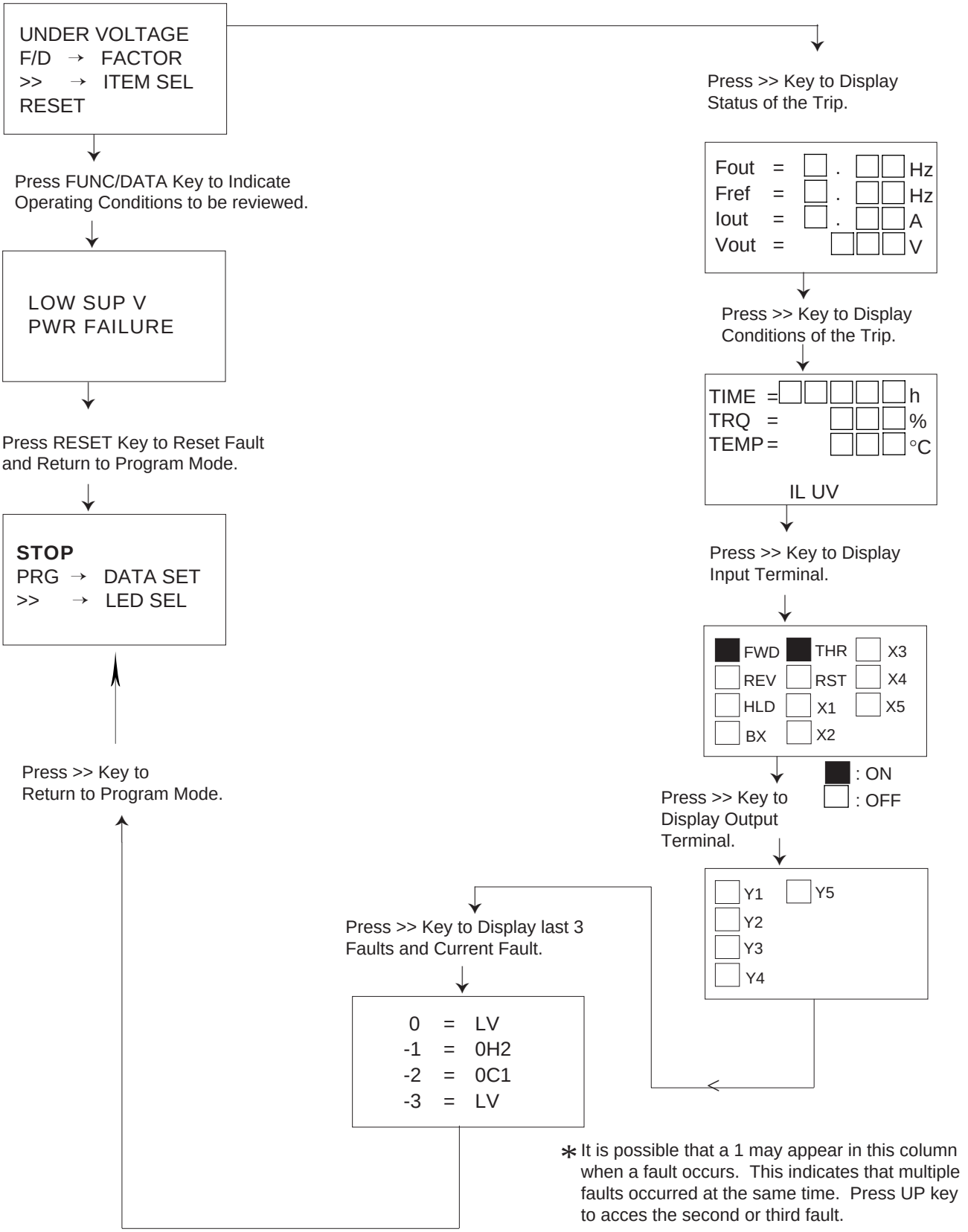
		Normal Condition
T	L	Torque Limit Reached

Display at a Fault

*	L	U	

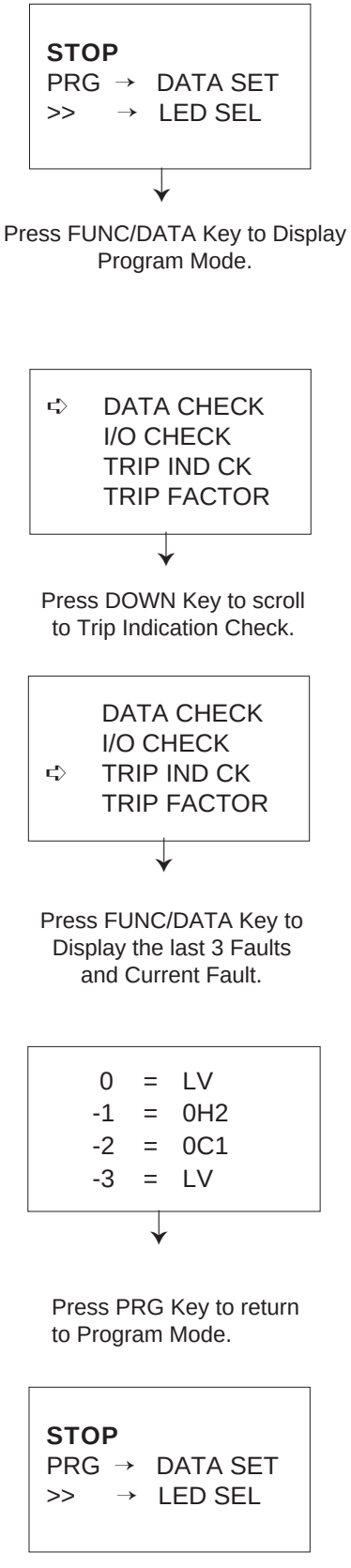
LED Display on Digital Monitor

LCD Graphic Display



* It is possible that a 1 may appear in this column when a fault occurs. This indicates that multiple faults occurred at the same time. Press UP key to acces the second or third fault.

Accessing Fault History



Notes

Table 7: Function Code Settings

Function Code Numbers Followed by Function Descriptions

* Function can be changed while the Drive is operating.

BasicFunctions	
00	Frequency Command
01	Operation Method
02	Maximum Frequency
03	Base Frequency 1
04	Rated Output Voltage 1
05	* Acceleration Time 1
06	* Deceleration Time 1
07	* Torque Boost 1
08	* Electronic Thermal Overload Relay (Select)
09	* OL Level
10	Restart After Instantaneous Power Failure
11	* High Limiter
12	* Low Limiter
13	* Bias Frequency
14	* Frequency Setting Signal Gain
15	* Torque Limiter (Driving)
16	* Torque Limiter (Braking)
17	* DC Brake Starting Frequency
18	* DC Brake Level
19	* DC Braking Time
20	* Multistep Frequency Setting 1
21	* Multistep Frequency Setting 2
22	* Multistep Frequency Setting 3

BasicFunctions(cont'd)	
23	* Multistep Frequency Setting 4
24	* Multistep Frequency Setting 5
25	* Multistep Frequency Setting 6
26	* Multistep Frequency Setting 7
27	* Electronic Thermal Overload Relay (For Braking Resistor)
28	* Slip Compensation Control
29	Torque Vector Control
30	Number of Motor Poles
31	* Function Block (32–41)
InputTerminalFunctions	
32	X1 – X5 Terminal Function Select
Acc/DecTimes	
33	* Acceleration Time 2
34	* Deceleration Time 2
35	* Acceleration Time 3
36	* Deceleration Time 3
37	* Acceleration Time 4
38	* Deceleration Time 4
Motor#2	
39	Base Frequency 2
40	Rated Output Voltage 2
41	* Torque Boost 2
42	* Function Block (43–51)

AnalogMonitorOutput	
43	* FMP Terminal Pulse Rate Multiplier
44	* FMP Terminal Voltage Adjust
45	* FM Terminal Output Voltage Adjust
46	* FM Terminal Function
OutputTerminalFunctions	
47	Y1 – Y5 Terminal Function
48	* FAR Function Signal (Hysteresis)
49	* FDT Function Signal (Level)
50	* FDT Function Signal (Hysteresis)
51	* OL Function Signal (Level)
52	* Function Block (53–59)
FrequencyControl	
53	Jump Frequency 1 (Frequency Rejection)
54	Jump Frequency 2 (Frequency Rejection)
55	Jump Frequency 3 (Frequency Rejection)
56	Jump Frequency Hysteresis
57	Starting Frequency (Frequency)
58	Starting Frequency (Holding Time)
59	* Frequency Setting Signal Filter
60	* Function Block (61–79)

LED & LCD Monitor	
61	* LED Monitor (Function)
62	* LED Monitor (Display at Stop Mode)
63	* Coefficient for Line Speed
64	* LCD Digital Monitor Selection

Pattern Operation	
65	Pattern Operation (mode select)
66	* (Stage 1)
67	* (Stage 2)
68	* (Stage 3)
69	* (Stage 4)
70	* (Stage 5)
71	* (Stage 6)
72	* (Stage 7)
73	Accel/Decel Pattern

Special Functions	
74	N/A
75	Energy Savings
76	Reverse Phase Sequence Lock
77	Data Initializing (Data Reset)
78	* Language
79	* LCD Display (Brightness)
80	* Function Block (81–94)
81	* Motor Sound
82	Auto Restart (Restart Time)
83	Fall Rate
84	* Auto Reset (Times)
85	* Auto Reset (Reset Interval)

Special Functions (cont'd)	
Motor Characteristics	
86	Motor 1 (Capacity)
87	Motor 1 (Rated Current)
88	Motor 1 (No Load Current)
89	Motor 2 (Rated Current)
90	Motor 1 Impedance (Tuning)
91	* Motor 1 Impedance (% R1 Setting)
92	* Motor 1 Impedance (% X Setting)
Special Functions	
93	Dedicated Function for Manufacturer
94	Dedicated Function for Manufacturer
95	Data Protection

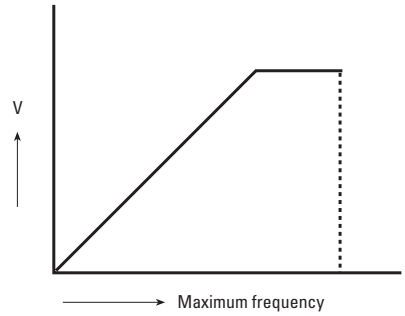
Notes

Section 6: Function Code Descriptions

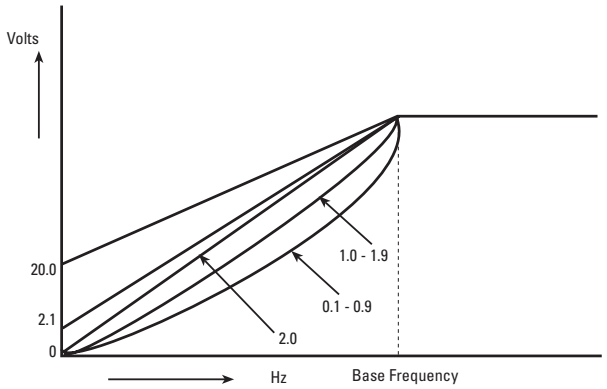
BASIC FUNCTIONS

NOTE: * = Function can be changed while the Drive is operating.

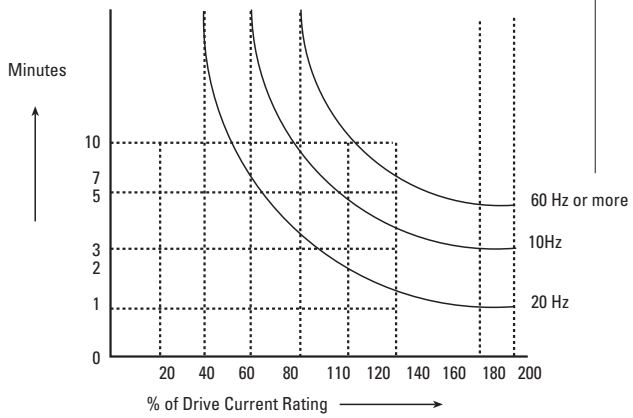
FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
00	FREQ COMND		FREQUENCY COMMAND Frequency reference can be supplied by three different methods: Keypad (digital), 0 to +10 VDC, 4 to 20 mA.	0
		0:	Keypad operation (Digital setting with /\ or \/ keys).	
		1:	0 to +10 VDC analog signal (terminal 12), or a speed potentiometer connected to terminal 11, 12 and 13.	
		2:	Sum of 0 to +10 VDC (terminal 12) and 4 to 20 mA (terminal C1).	
			NOTE : Drives 40HP & greater can use a 0 to ± 10 VDC analog signal input (terminal V1) which is summed with the 0 to +10 VDC input.	
01	OPR METHOD		OPERATION METHOD RUN, STOP, and RESET commands can be supplied by two different methods: Keypad (local) or terminal strip (remote).	0
		0:	Keypad operation (RUN, STOP keys).	
		1:	Terminal strip operation (Keypad STOP key active).	
		2:	Terminal strip operation (Keypad STOP key inactive).	
			NOTE: Remote/local operation can be toggled by pressing RESET and STOP keys simultaneously when the drive is in the STOP condition. **NOTE:** Contact between FWD or REV and CM must be open during power-up or "Er6" trip will occur.	

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
02	MAX Hz		MAXIMUM HERTZ Maximum output frequency is adjustable from 50 Hz to 400 Hz in 1 Hz steps.  **WARNING:** Review motor capabilities for operation above motors's base frequency.	60
03	BASE Hz-1		BASE FREQUENCY #1 Base frequency for motor #1 is adjustable from 30 Hz to 400 Hz in 1 Hz steps. (30 to 120 Hz, 40 Hp & above, var. torque loads.) **WARNING:** Review motor capabilities for operation above motors's base frequency.	60
04	RATED V-1		RATED VOLTAGE #1 Maximum output voltage for motor #1 is adjustable from 80 to 240 VAC (230V Drives), or 320 to 480 VAC (460V Drives) **NOTE:** On 30 Hp and lower when set at zero (0), the maximum output voltage will follow the AC line input. Function Code 29 setting will affect this Function Code.	230 (460)
*05	ACC TIME 1		ACCELERATION TIME #1 Acceleration time #1 is adjustable from 0.01 to 3600 seconds. Note that this setting defines the time to accelerate from zero to maximum frequency (Function Code 02). Smaller frequency steps will result in shorter acceleration times because the rate is constant. Example: ACC TIME 1 = 10 seconds MAX Hz = 60 The acceleration rate is 6 Hz/sec, therefore a step from 8 to 42 Hz would take (42-8)/6 = 5.6 seconds.	6.0 (30HP and less) 20.0 (40HP and greater)
*06	DEC TIME 1		DECELERATION TIME #1 Deceleration time #1 is adjustable from 0.01 to 3600 seconds. Rules are the same as for Function Code 05 except that a setting of zero (0) causes the motor to coast down until it reaches the new set point. (Available up to 30 HP only)	6.0 (30HP and less) 20.0 (40HP and greater)

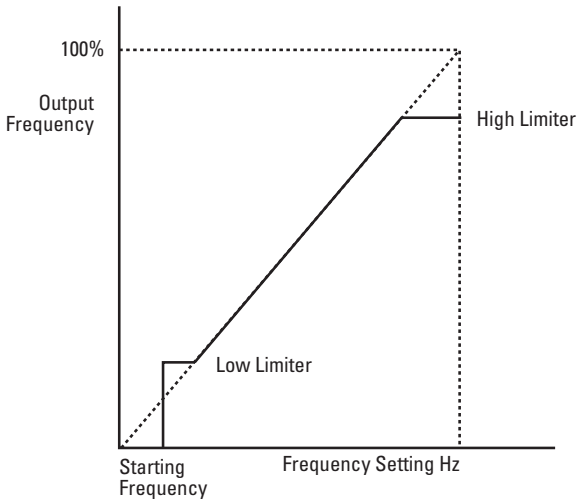
FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
***07**	TRQ BOOST1		TORQUE BOOST #1 Torque boost for motor #1 can be set to optimize the V/Hz characteristics of the drive according to the type of load the motor will see. The factory setting of zero (0) causes the drive to automatically select the boost level according to its torque calculations	2.0
		0.0: **0.1-0.9** **1.0-1.9:** **2.0-20:**	Automatic Variable torque loads (Fans) Proportional torque loads (Machine tool spindle) Constant torque loads (Conveyor) **NOTE** : Function Code 29 setting will affect this Function Code.	
***08**	ELCTRN OL		ELECTRONIC OVERLOAD The Drive's Electronic Overload can be selected to help protect the motor from thermal overload due to various operating conditions. Selection should be based on operating conditions, type of load, motor thermal characteristics and the applicable NEC and local electrical code requirements. The motor thermal characteristics and the diagram shown in Function Code 09 should be reviewed, and their characteristics coordinated, to determine what is the protection level available with the drive/motor combination, and what additional protection will be required. (Refer to Function Code 09.)	1
		0: **1:** **2:**	Inactive (Internal thermal overload device) Active (Review motor thermal characteristics) Special factory setting (Consult Company)	



CAUTION: When using Automatic (0.0 setting) be sure Function Codes 87 & 88 are set for the connected motor. With the motor connected, not rotating, and with load disconnected, if possible, activate Function Code 90 (Tuning) to reset Function Code 91 & 92.

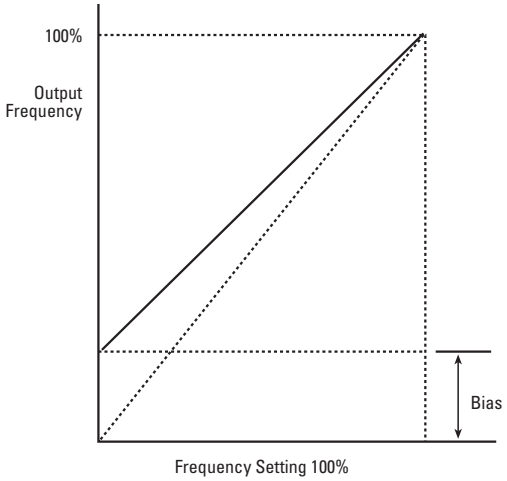
FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
*08	(cont'd)		Forced air cooled mo **NOTE:** If the carrier frequency is set higher than 10 KHz and an internal overheating condition occurs, the drive will automatically reduce the carrier frequency to 10 KHz in order to avoid an overheating fault (available up to 30 Hp only).	
*09	OL LEVEL		OVERLOAD LEVEL The overload level for the electronic overload protection algorithm (see Function Code 08) can be adjusted from the factory default setting of rated drive nameplate amps. For example, if a 20 Hp/30A motor were applied to a 30 Hp/45A drive, you would change Function Code 09 from 45 to 30 amps to protect the motor. The setting range is approximately 20 to 135% of rated drive current.  	RATED CURRENT
10	RESTART		RESTART The AF-300E$ family of Drives are designed to tolerate an AC line voltage dip to 165V (230 VAC), 310V (230 VAC), 400V (575 VAC) 70% for 15 msec at 85% of full load without any disturbance in output power delivered to the load. However, in the event of a more serious power dip or outage, the drive may act in one of five ways depending on the setting of this Function Code.	0

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
10	(cont'd)	0:	Restart inactive - Drive will trip and alarm when low voltage point is detected.	
		1:	Restart inactive - Drive will trip but will not alarm until voltage recovers.	
		2:	Restart active - Normal smooth recovery method: drive will continuously decrease speed until voltage recovers, then accelerate normally back to set point.	
		3:	Restart active - Drive stops (motor coasts) when low voltage detected, then restarts from set frequency when power returns.	
		4:	Restart active - Drive stops (motor coasts) when low voltage detected, then restarts at starting frequency when power returns.	
*11	H LIMITER		HIGH FREQUENCY LIMITER The high frequency limiter sets a clamp on the maximum drive output frequency regardless of the frequency reference setting. Adjustable from 0 to 400 Hz.	70
*12	L LIMITER		LOW FREQUENCY LIMITER The low frequency limiter sets a clamp on the minimum drive output frequency regardless of the frequency reference setpoint. Adjustable from 0 to 400 Hz.	0



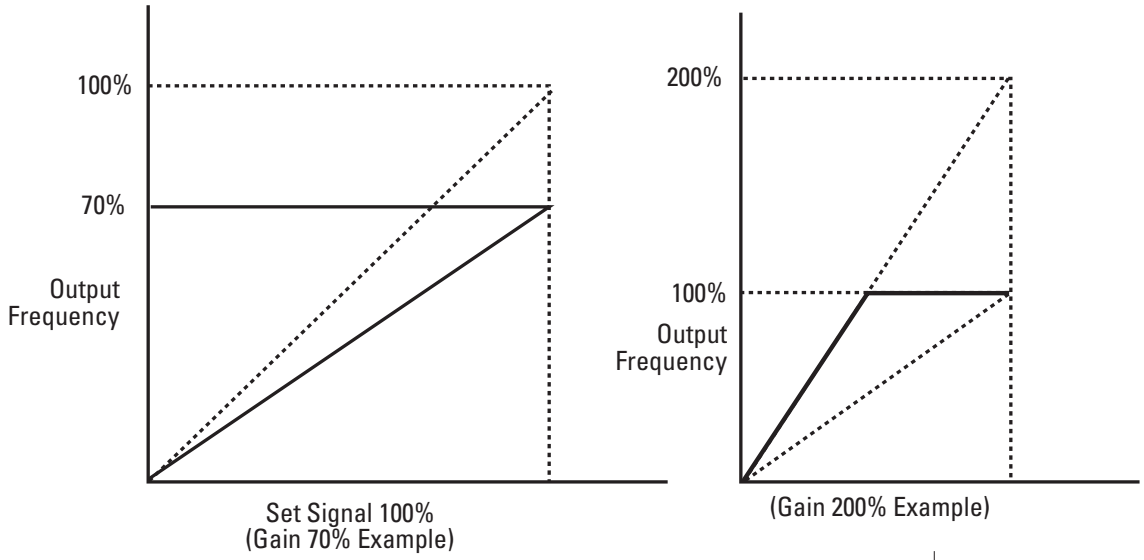
NOTE: If L Limiter is set higher than H Limiter, the H Limiter setting takes priority. If set frequency is higher than H Limiter, the H Limiter takes effect.

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
***13**	FREQ BIAS		FREQUENCY BIAS Frequency bias is an offset which is added to the frequency set point when an analog reference is selected. This will allow for improved resolution when adjustment over the entire speed range is not required. Adjustable from 0 to 400 Hz.	0



WARNING: Bias is operational only when frequency setting method is analog (Function Code 00 = 1 or 2). When the drive does not have a run command, the reference or output flashes on the display (see Function Code 62). When bias is operational and the speed reference is zero, the display flashes bias frequency. When a RUN command is given, the motor runs at the bias setting.

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
*14	FREQ GAIN		FREQUENCY GAIN Frequency gain is a multiplier on the frequency set point when an analog reference is selected (100% equals unity gain). Adjustable from 0 to 200%.	100.0



NOTE: Frequency gain is operative only when frequency setting method is analog (Function Code 00 = 1 or 2).

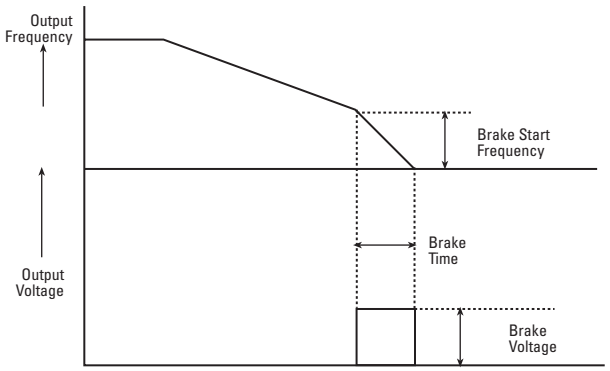
*15	DRV TORQUE		DRIVING TORQUE This limit puts a hard clamp on the amount of torque which the drive will provide in the driving direction (i.e. delivering power). It is set as a percentage of rated torque and is adjustable from 20 to 180%. Setting this Function Code to 999 will remove the limit. This Function Code can be used to avoid the breakdown torque region of the motor (see related Function Code 86 concerning motor capacity.)	999

CAUTION: If this Function Code is set too low when compared to the actual load requirement, the motor may not accelerate.

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
***16**	BRK TORQUE		BRAKING TORQUE This limit puts a hard clamp on the amount of torque which the drive will provide in the braking direction (i.e. absorbing power). It is set as a percentage of rated torque and is adjustable from 20 to 180%. Setting this Function Code to 999 will remove the limit. A setting of zero (0) will activate automatic deceleration control. This feature will decelerate according to programmed rate unless the absorption capability of the Inverter is exceeded. Normally this would result in a dc link overvoltage fault (OU2) but automatic deceleration control will stop deceleration long enough to avoid tripping. This feature should not be used if smooth decel torque is a requirement. Instead set torque limit according to dynamic braking capability and deceleration time proportionate to load inertia to avoid overvoltage faults.	999
***17**	DC BRK Hz		DC INJECTION BRAKE STARTING Hz DC injection braking can provide an effective means of stopping the motor, especially after the motor has already reached a low speed This setting determines the frequency at which dc braking takes affect during a deceleration. Adjustable from 0 to 60 Hz. (See related Function Codes 18 and 19).	0.0
***18**	DC BRK LVL		DC INJECTION BRAKE LEVEL (STRENGTH) The dc injection braking level is adjustable from 0 to 100%. Note that the actual braking strength is dependent on the motor characteristics. (See related Function Codes 17 and 19.)	0.0%

CAUTION: Setting this Function Code too low when compared to actual load requirement could cause the motor to decelerate slower than the decel time setting. If motor decel exceeds three (3) times the decel time setting, Torque Limiter (Braking) will be ignored.

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
***19**	DC BRK t		DC INJECTION BRAKING TIME "ON" The dc injection brake time is adjustable from 0.1 to 30.0 seconds using this setting. A setting of zero (0) causes dc braking to be inactive.	0.0S



CAUTION: Use care when applying dc braking as motor currents & temperatures can build up to very high levels in a short period of time possibly resulting in motor damage.

MULTISTEPFREQUENCIES

Seven (7) digitally preset speeds can be programmed into Function Codes 20 through 26. These can be used as part of a pattern operation (see Function Code 65) or individually selectable through switching of control terminals X1, X2, and X3 (see Function Code 32.)

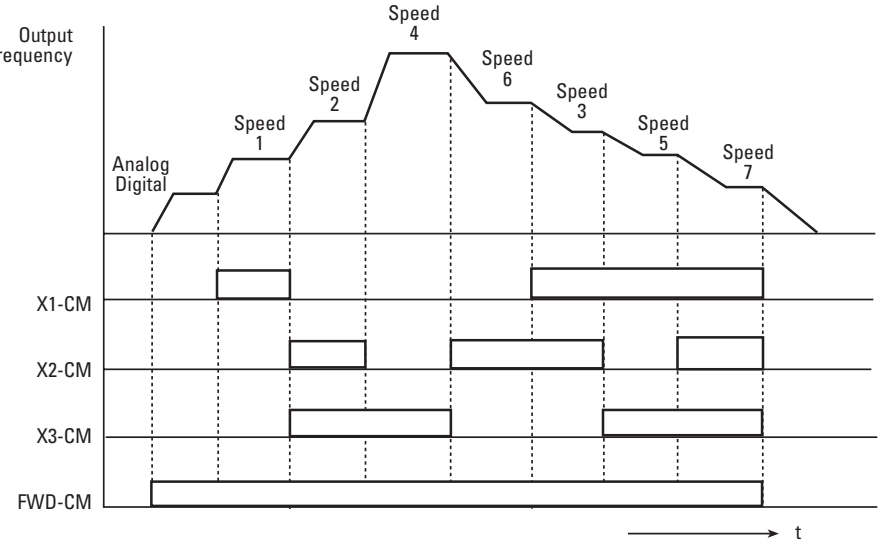
***20**	MULTI Hz-1		MULTI STEP FREQUENCY #1	0.0
***21**	MULTI Hz-2		MULTI STEP FREQUENCY #2	0.0
***22**	MULTI Hz-3		MULTI STEP FREQUENCY #3	0.0
***23**	MULTI Hz-4		MULTI STEP FREQUENCY #4	0.0
***24**	MULTI Hz-5		MULTI STEP FREQUENCY #5	0.0
***25**	MULTI Hz-6		MULTI STEP FREQUENCY #6	0.0
***26**	MULTI Hz-7		MULTI STEP FREQUENCY #7	0.0

(Relationship between the terminals and multi-step frequency 1 to 7)

s	**00**	**20**	**21**	**22**	**23**	**24**	**25**	**26**
Multi-step Frequency	Analog Digital	Speed 1	Speed 2	Speed 3	Speed 4	Speed 5	Speed 6	Speed 7
X1 – CM	OFF	ON	OFF	ON	OFF	ON	OFF	ON
X2 – CM	OFF	OFF	ON	ON	OFF	OFF	ON	ON
X3 – CM	OFF	OFF	OFF	OFF	ON	ON	ON	ON

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING

MULTI STEP FREQUENCIES (Cont'd)



NOTES:
- When X1 – CM, X2 – CM, and X3 – CM are all OFF, frequency reference is set by keypad (/\ \/ keys) or by the analog inputs per Function Code 00 setting.
- A setting in Function Code 20 through 26 above the maximum frequency in Function Code 02 is NOT possible.
- When Function Code 65 equals 1, 2, or 3, pattern operation is active.

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
*27	DBR OL		DYNAMIC BRAKING RESISTOR OVERLOAD The drive has a pre-programmed electronic thermal overload protection function for the dynamic braking resistors for Drives rated 10 Hp and below. Drives rated 15 Hp and above, or for non-standard braking resistor packages, use a thermal overload sensing device.	0 (15 Hp and UP) 1 (UP TO 10 Hp)
		0:	Inactive (15 Hp and greater or non-standard DB resistors)	
		1:	Active (for internal braking resistor, up to 10 Hp.	

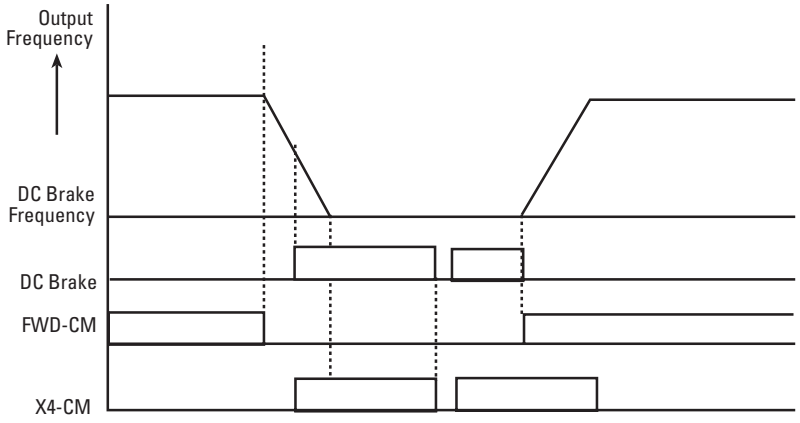
FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
*28	SLIP COMP		SLIP COMPENSATION Slip compensation provides a means of improving speed accuracy without employing speed feedback (i.e. open-loop method). It does this by adjusting output frequency as a function of load and can be expected to improve speed fluctuations to within 1/3 of normal slip. Adjustable from -9.9 Hz to +5 Hz. **NOTE:** Function Code 29 setting will affect this Function Code. Example: A 4 pole motor is nameplated at a full load speed of 1740 RPM for 60 Hz operation. Therefore, $w_{sync} = \frac{60 \text{ Hz} \times 120 \text{ (Constant)}}{4 \text{ Poles}} = 1800 \text{ RPM}$ $\text{Slip} = \frac{1800 - 1740}{1800} = 0.0333$ Slip Freq = 0.0333 x 60 Hz = +2.0 Hz setting at Function Code 28. Note that slip compensation can also be less than zero. A negative setting has the effect of reducing speed fluctuations in the presence of overhauling loads. A negative setting might also be used when trying to get two motors with a common shaft to load share better.	0.0
29	TRQ VECTOR		TORQUE VECTOR CONTROL Sensorless torque vector control is a recently developed control strategy which provides much of the performance of AC flux vector drives without the cost of an expensive motor mounted encoder. The algorithm uses knowledge of motor parameters (see Function Codes 90 through 92) to adjust voltage and current in a way which optimizes motor torque under all operating conditions.	0
		0:	Inactive	
		1:	Active (SINGLE MOTOR APPLICATIONS ONLY)	
			NOTE: If this Function Code is set (i.e. active) it will affect the following function codes as follows: -Function Code 04 (Rated Voltage) If “0” (Free) is set, the following will apply: 230 VAC Drives, 230 VAC maximum output	

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
29(cont'd)			460 VAC Drives, 460 VAC maximum output voltage to motor #1. If a value other than “0” is set then value will apply. -Function Code 07 (Torque Boost) Automatic torque boost will always apply even if a value other than “0.0” is set. -Function Code 28 (Slip Compensation) If “0.0” (no slip compensation) is set, the slip compensation for a 4-pole GE Energy $aver® motor will be used. If a value other than “0.0” is set then that value will apply. Torque vector control will not work correctly if more than one motor is to be driven from one drive or if the motor does not have either 2, 4, or 6 poles. If either of these situations apply, torque vector control should be made inactive. If the motor cables exceed 164 feet (50m) in length, or if filters or reactors are connected between the drive and the motor, the auto-tune feature (see Function Code 90) may not be able to measure the motor parameters accurately enough to provide the specified performance. However, torque vector control may still be used if performance is adequate for the application. For your convenience we have pre-installed the parameters for the 4-pole GE Energy $aver® motor with horsepower rating corresponding to the drive rating. If you are using any other motor you should set Function Code 04 (Rated Voltage #1) and Function Code 28 (Slip Compensation) per the motor's name-plate and use Function Code 90 (Motor Tuning) so the drive can learn the motor's equivalent circuit para-meters (Function Code 91 and 92.)	

WARNING: An incorrect setting in Function Code 87 (Motor Full Load Current), Function Code 88 (Motor No Load Current), Function Code 91 (% Motor Resistance), and Function Code 92 (% Motor Impedance) will cause an error in the torque calculation. This could result in motor hunting or abnormal vibration. If a STOP command is applied, the motor could decel at a slow rate and if that rate exceeds three (3) times the decel time setting, Torque Limiting (Braking) setting, Function Code 16, will be ignored.

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
30	MTR POLES		MOTOR POLES The number of motor poles is set only for the display of synchronous RPM. It has NO effect on drive operation. Adjustable from 2 to 14 (even numbers only). 2 Poles = 3600 RPM 4 Poles = 1800 RPM 6 Poles = 1200 RPM 8 Poles = 900 RPM 10 Poles = 720 RPM 12 Poles = 600 RPM 14 Poles = 514 RPM Example: When a 4 pole motor is operated at 60 Hz, the synchronous RPM display should read 60 x 120/4 = 1800 RPM. Recall, synchronous speed (in RPM) = Hz x 120(Constant) / # poles	4
***31**	■■ 32-41 ■■		FUNCTION CODE BLOCK DISPLAY This setting determines whether or not Function Codes 32 through 41 will be displayed and available for adjustment.	0
		0:	Function Codes 32 through 41 NOT displayed.	
		1:	Function Codes 32 through 41 displayed.	
INPUT TERMINAL FUNCTIONS				
32	X1-X5 TERM		X1 THROUGH X5 TERMINAL FUNCTIONS This Function Code determines the functions of the X1 through X5 contact inputs on the terminal block. It is adjustable from 0000 to 2223. Each of the four digits has a separate meaning as defined below. **X1** and **X2** - function selected by 1st digit:	0000
		0 - - -	Multistep speed selection (four steps)	
		1 - - -	UP/DOWN control 1 (start from 0 Hz)	
		2 - - -	UP/DOWN control 2 (start from previous setting).	
			X3 - function selected by 2nd digit:	
		- **0** - -	Multistep speed selection (8 steps using X1, X2, and X3).	
		- **1** - -	Switching operation from line to drive (50 Hz)	
		- **2** - -	Switching operation from line to drive (60 Hz)	

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
32(cont'd)			**X4** - function selected by 3rd digit:	
		- - **0** -	ACC/DEC time selection (two steps)	
		- - **1** -	Selects 4 to 20 mA as an input for frequency reference at terminal (C1) (will ignore speed pot, V1 inputs and keypad)	
		- - **2** -	DC brake command (can be used to maintain stopped motor rotor position - see diagram and notes)	



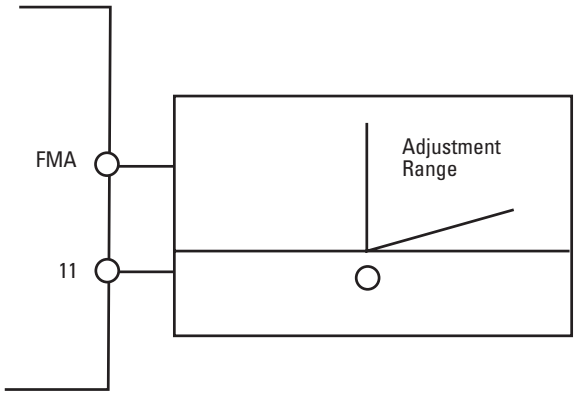
NOTES:
- Strength of the dc brake is set by Function Code 18. Operation command takes precedence (RUN, FWD, REV) (While X4 to CM is ON, if FWD to CM is ON: dc brake reset.
- As dc current continues to flow to the motor during the X4 to CM - ON period, be careful of motor temperature rise. (When long periods of dc braking are required measure the motor's temperature continuously).
- DC brake time (Function Code 19) is ignored.

CAUTION: Motor may overheat if the dc brake is left ON for too long.

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
32(cont'd)			**X5** - function selected by 4th digit:	
		- - - **0**	ACC/DEC time selection (four steps using X4 and X5)	
		- - - **1**	Select motor #2 Function Codes Function Code 03 to Function Code 39 Function Code 04 to Function Code 40 Function Code 07 to Function Code 41 Function Code 87 to Function Code 89 (This would **ONLY** be useful for applications where a second motor can be connected to the drive with mechanical switchgear.)	
		- - - **2**	Selects data protection mode (only Function Code 95 can be changed) X5 to CM contacts open - Protected (Change prevented) X5 to CM contacts closed - Not Protected (Changeable)	
		- - - 3	Restart Function NOTE: In order to bypass GE Safety software (Er6), select "3" and install a wire jumper between Terminal X5 and CM.	
ACCEL/DECEL TIMES				
***33**	ACC TIME 2		ACCELERATION TIME #2 Adjustable from 0.01 to 3600 seconds.	10.0 (30Hp and less) 100 (40 Hp and greater)
***34**	DEC TIME 2		DECELERATION TIME #2 Adjustable from 0.01 to 3600 seconds. **NOTE:** 100 Seconds for 40 Hp and greater. Acceleration/Deceleration times 2 through 4 are identical in behavior to Function Codes 05 and 06 respectively. They can be activated via the X4 and X5 terminals as explained for Function Code 32 and the following chart. Adjustable from 0.01 to 3600 seconds.	10.0 (30Hp and less) 100 (40 Hp and greater)
***35**	ACC TIME 3			15.0 (30Hp and less) 100 (40 Hp and greater)
***36**	DEC TIME 3			15.0 (30Hp and less) 100 (40 Hp and greater)
***37**	ACC TIME 4			3.0 (30Hp and less) 100 30 Hp and greater)
***38**	DEC TIME 4			3.0 (30Hp and less) 100 (40 Hp and greater)

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
MOTOR #2				
			NOTE: Motor #2 is a second motor NOT multi-motor.	
39	BASE Hz-2		BASE FREQUENCY #2 Base frequency for motor #2 is adjustable from 30 Hz to 400 Hz in 1 Hz steps. Motor #2 Function Codes become active when Function Code 32 equals - - 1 and X5 – CM contacts are closed. (30 Hz to 120 Hz, 40 Hp & above, var. torque loads.)	60
			WARNING: Review motor capabilities for operation above base frequency.	
40	RATED V-2		RATED VOLTAGE #2 Maximum output voltage for motor #2 is adjustable from 80 to 240 V (230 V Drives) or 320 to 480 V (460 V Drives). Motor #2 Function Codes become active when Function Code 32 equals - - - 1 and X5 – CM contacts are closed. **NOTE:** When set at zero (0), the maximum output voltage will follow the input AC line voltage. (30 Hp & lower only)	230 (460)
***41**	TRQ BOOST2		TORQUE BOOST #2 Torque boost for motor #2 can be set to optimize the V/Hz characteristics of the drive according to the type of load the motor will see. Motor #2 Function Codes become active when Function Code 32 equals - - - 1 and X5 – CM contacts are closed.	2.0
		0.1-0.9: **1.0-1.9:** **2.0-20:**	Variable torque loads Proportional torque loads Constant torque loads	
***42**	■■ 43-51 ■■		FUNCTION CODE BLOCK DISPLAY This setting determines whether or not Function Code 43 through 51 will be displayed and available for adjustment.	0
		0: **1:**	Function Code 43 through 51 NOT displayed. Function Code 43 through 51 displayed.	

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
ANALOG MONITOR OUTPUT				
***43**	FMP PULSES		FMP FREQUENCY PULSE OUTPUT The FMP terminal provides a pulse whose output is proportional to drive output frequency. The number of pulses per second is given as output Hz multiplied by the setting in Function Code 43 with a maximum output of 6,000 pulses per second. Function Code 43 is adjustable from 6 to 100. The output frequency is accurate to within ±1 %. Ex: 60Hz, setting 24 – 60x24 = 1440 pulses.	24
***44**	FMP V-ADJ		FMP VOLTAGE ADJUST The average voltage of the FMP terminal pulsed output can be adjusted from approximately 5 to 12 VDC by changing Function Code 44 from 50 to 120, respectively. The voltage will be accurate to ±5%. The peak voltage of the pulses will be approximately 15.6 VDC regardless of this setting, only the average output voltage is changed. Ex: $V_{avg.}$ = 12V x $\frac{100 \text{ setting}}{120}$ = 10V	100
			CAUTION: The minimum load impedance which should be placed between the FMP and CM terminals is 5,000 ohms.	
***45**	FMA V-ADJ		FMA VOLTAGE ADJUST The FMA terminal provides a 0 to +10 VDC analog output which can indicate output frequency, current, torque, or power (see Function Code 46). This Function Code can be used to adjust the voltage output by a factor of 0.65 to 2.00 (note that the maximum available output is 10.3 VDC). Adjustable from 65 to 200% for 10.3VDC output.	100



FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
*46	FMA FUNC		FMA OUTPUT INDICATION This Function Code selects the quantity to be displayed via the analog output between the FMA and II terminals.	0
		0:	Output frequency (0 to 100% full scale)	
		1:	Output current (0 to 200% full scale)	
		2:	Output torque (0 to 200% full scale)	
		3:	Output power (0 to 200% full scale)	
			CAUTION: The load impedance placed between the FMA and 11 terminals should be a minimum of 10,000 OHMS.	
OUTPUT TERMINALS				
47	Y1-Y5 TERM		Y1-Y5 OPEN COLLECTOR OUTPUT TERMINALS This Function Code determines the functions of the Y1-Y5 open collector outputs on the terminal block. It is adjustable from 00000 to FFFFF. Each of the five digits can be set to one of the following selections to configure its corresponding output.	01234
		0:	Drive running (RUN), see Function Code 57.	
		1:	Frequency at reference (FAR), see Function Code 48.	
		2:	Frequency level detection (FDT), see Function Codes 49 and 50.	
		3:	Overload early warning (OL), see Function Code 51.	
		4:	Undervoltage detection (LU).	
		5:	Keypad operation mode.	
		6:	Torque limiting, see Function Codes 15 and 16.	
		7:	Drive stopped (STOP).	
		8:	Auto-restarting, see Function Code 10.	
		9:	Auto-resetting.	
		A:	Initializing restart timer, picks up when power returns.	
		B:	NOT USED.	
		C:	Time-up signal (TP) for pattern operation, picks up when changing to a new stage.	
		D:	Cycle completion signal (TO) for pattern operation, picks up at completion of stage 7, see Function Code 65.	
			NOTE: Auto Restart, setting of A, requires two (2) wire maintained contacts (see Pg. 4-14). Auto Reset requires three (3) wire start/stop. Auto restart and auto reset cannot be activated at the same time.	

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
47(cont'd)	E		Stage number indication for Pattern Operation, requires Y3, Y4, and Y5 outputs, set Function Code 47 equal - - EEE.	

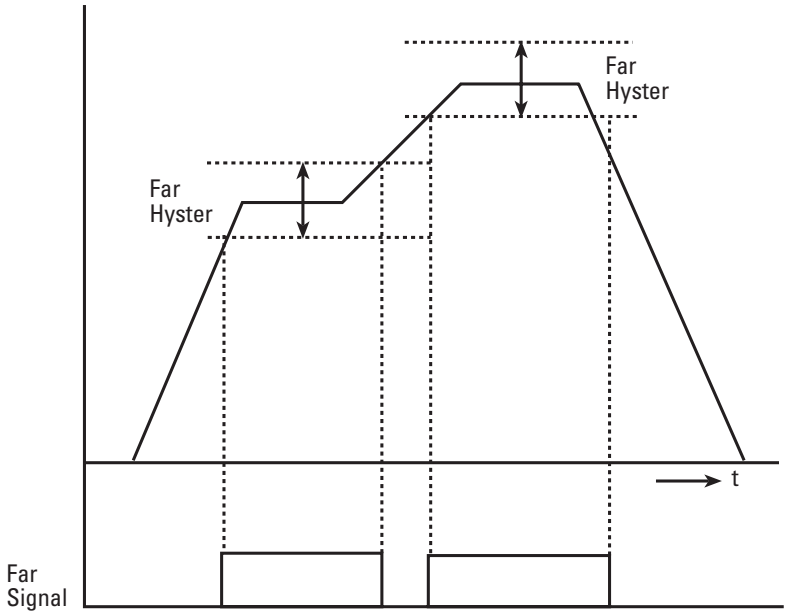
Stage	Y3	Y4	Y5
1	Off	Off	On
2	Off	On	Off
3	Off	On	On
4	On	Off	Off
5	On	Off	On
6	On	On	Off
7	On	On	On

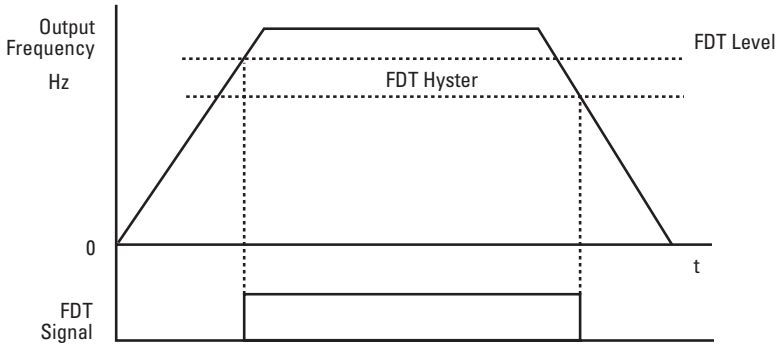
F

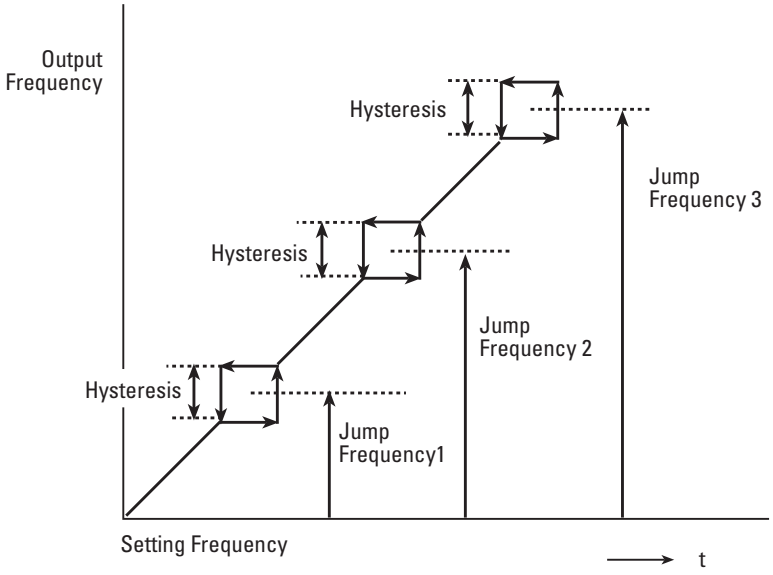
Alarm indication in alarm trip mode, requires Y2, Y3, Y4, and Y5 outputs, set Function Code 47 equal - FFFF.

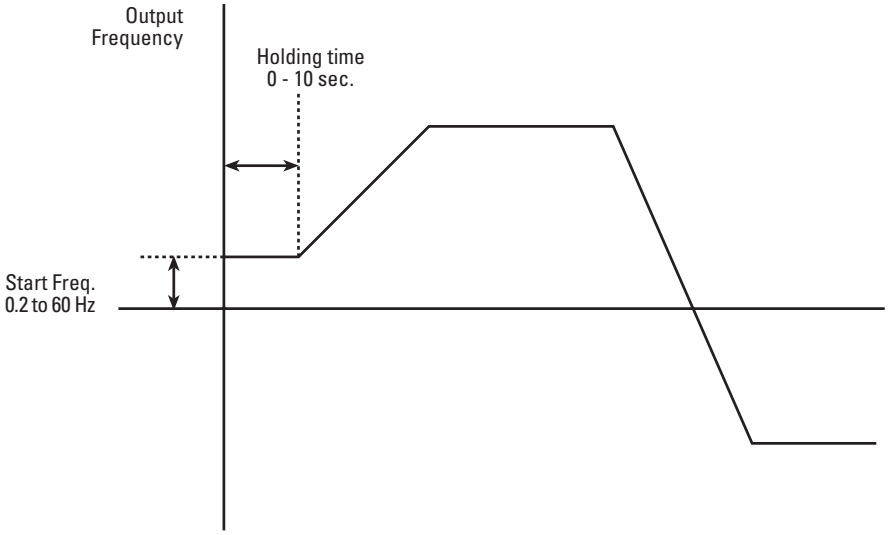
	Cause of trip	Terminal			
		Y2 (F)	Y3 (F)	Y4 (F)	Y5 (F)
0		Off	Off	Off	Off
1	OC1	Off	Off	Off	On
2	OC2	Off	Off	On	Off
3	OC3 and EF	Off	Off	On	On
4	OU1, OU2, OU3	Off	On	Off	Off
5	LU	Off	On	Off	On
6	OL	Off	On	On	Off
7	OLU	Off	On	On	On
8	OH1, OH3	On	Off	Off	Off
9	OH2, dbH	On	Off	Off	On
10	FUS	On	Off	On	Off
11	Er1, Er3	On	Off	On	On
12	Er2	On	On	Off	Off
13	Er4	On	On	Off	On
14	Er5	On	On	On	Off
15	Er6, Er7	On	On	On	On

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
OUTPUT TERMINAL FUNCTIONS				
***48**	FAR HYSTR		FREQUENCY AT REFERENCE HYSTERESIS (WIDTH) The signal is on when the output frequency equals the frequency reference's set point. This is an open collector output and can be used in conjuction with a relay unit to allow connection to system control circuitry. Adjustable from 0.0 to 10 Hz in 0.1 Hz steps.	2.5
***49**	FDT LEVEL		FREQUENCY DETECTION THRESHOLD The signal is on when the output frequency exceeds the detection level setting. This is an open collector output and can be used in conjuction with a relay unit to allow connection to system control circuitry. Adjustable from 0 to 400 Hz.	60



FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
*50	FDT HYSTR		FREQUENCY DETECTION HYSTERESIS The setting is the offset that FDT will have from the FDT level. Adjustable from 0.0 to 30 Hz.	1.0
				
*51	OL WARNING		OVERLOAD EARLY WARNING This open collector output is active when the output current exceeds the OL setting. This output can be used in conjunction with a relay unit to allow connection to system control circuitry. Adjustable from approximately 20 to 135% of drive rated current. NOTE: This is a timed function similar to Function Code 08 and 09 (ELCTRN OL).	RATED CURRENT
*52	■■53-59■■		FUNCTION CODE BLOCK DISPLAY This setting determines whether or not Function Codes 53 through 59 will be displayed and available for adjustment.	0
		0: 1:	Function Codes 53 through 59 NOT displayed. Function Codes 53 through 59 displayed.	

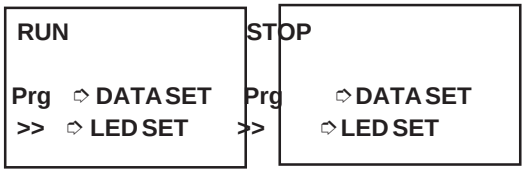
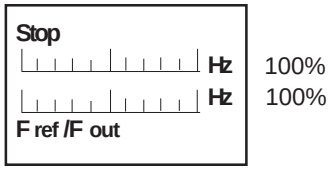
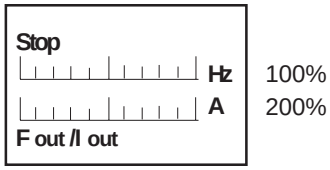
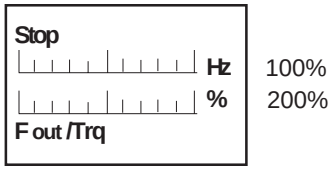
FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
FREQUENCY CONTROL				
			These Function Codes are used to avoid the natural mechanical vibration of the load. The three jump frequencies can be set independently and are adjustable from 0 to 400 Hz.	
53	JUMP Hz-1		FREQUENCY JUMP SETTING	0
54	JUMP Hz-2		FREQUENCY JUMP SETTING	0
55	JUMP Hz-3		FREQUENCY JUMP SETTING	0
				
56	JUMP HYSTR		FREQUENCY JUMP HYSTERESIS This setting determines the hysteresis (jump width) of the jump frequency setting. Adjustable from 0 to 30 Hz. Example: Function Code 53 set at 20 Hz, Function Code 56 set at 4 Hz. Output frequency will reach 18 Hz, jump to 22 Hz and continue ramping if input reference is set above 20 Hz. On a decel, output frequency will reach 22 Hz and jump to 18 then continue to decel.	3

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
57	START Hz		START FREQUENCY Starting frequency set range is adjustable from .2 to 60 Hz (used to optimize available starting torque.)	0.5
				
58	HOLDING t		START FREQUENCY HOLD TIME A starting frequency and holding time can be set that is suitable for the starting torque characteristics of the load. Function Codes 57 and 58 are only effective from a START command. Adjustable from 0.0 to 10.0 seconds. This function will also operate when Pattern Operation has been selected using Function Code 65, and includes the timer's time.	0.0
***59**	FILTER		REFERENCE SIGNAL FILTER This Function Code is used to set the time constant for the input filter in order to eliminate the effects of noise present in the analog signals (voltage and current references). If the time constant set point is too long, the response to changes in analog commands will become inadequate for the required performance level. Adjustable from 0.01 to 5.00 seconds.	0.05
***60**	■■ 61-79 ■■		FUNCTION CODE BLOCK DISPLAY This setting determines whether or not Function Codes 61 through 79 will be displayed and available for adjustment.	0
		0: **1:**	Function Codes 61 through 79 NOT displayed. Function Codes 61 through 79 displayed.	

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
LED & LCD MONITOR				
***61**	LED MNTR 1		LED MONITOR SELECTION #1 Setting from 0 to 8 for a total of nine (9) selectable indicating modes. See table below:	0

Setting	Running	Stopping	When speed is controlled from KEYPAD (00=0), displays changes to indication below if speed is changed	Unit
0	Output Frequency	Set frequency	Setting frequency	Hz
1	Output current		Setting frequency	A, Hz
2	Output voltage		Setting frequency	V, Hz
3	Motor Speed (w/o slip)	Set Motor Speed (w/o slip)	Setting Motor Speed (w/o slip)	r/min
4	Line Speed	Set Line Speed	Setting line speed	m/min
5	Machine rotating Speed	Set Machine Rotating speed	Setting Machine Rotating Speed	r/min
6	Torque Limiter/Driving		Setting Frequency	%, Hz
7	Torque Limiter/Braking		Setting Frequency	%, Hz
8	Calculated torque		Setting Frequency	%, Hz

***62**	LED MNTR 2		LED MONITOR SELECTION #2 This setting determines the LED display in the STOP Mode of operation.	0
		0: **1:**	Setting value Output value	
***63**	SPEED COEF		MOTOR POLE SPEED CONVERSION COEFFICIENT The LED display for machine speed and line speed can be changed by setting this Function Code. Output Hz indication multiplied by this value will be shown on the LED display. Adjustable from 0 to 200.	0.01

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
*64	LCD MNTR		LCD GRAPHIC DISPLAY SELECTION LCD GRAPHIC DISPLAY is selectable from the the following:	0
		0:	RUN or STOP 	
		1:	Bar graph (set frequency and output frequency) 	
		2:	Bar graph (output frequency and output current) 	
		3:	Bar graph (output frequency and motor torque) 	

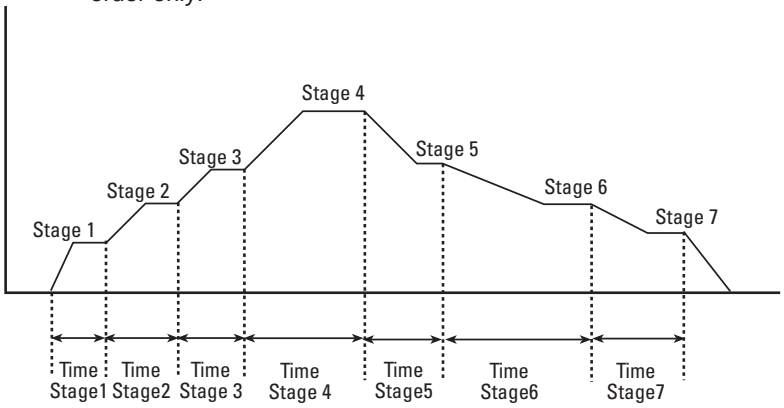
FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
PATTERN OPERATION				
65	PATTERN		PATTERN OPERATION A pattern operation can be set for seven (7) individually set speeds (Function Codes 20 through 26) to run up to 6,000 seconds each, forward or reverse direction (Function Codes 66 through 72) with the following choice of cycles:	0
		0:	Inactive	
		1:	Single cycle	
		2:	Continuous cycle (repeating)	
		3:	Single cycle with continuous seventh speed	
***66**	STAGE 1		PATTERN STAGES	0.00S:F1
***67**	STAGE 2		Each of the pattern operation's seven (7) stages can be set based on the following codes that includes direction of rotation, selection of acceleration/deceleration times (Function Codes 5, 6, 33 through 38), and a maximum duration running time of 6,000 seconds each.	
***68**	STAGE 3			
***69**	STAGE 4			
***70**	STAGE 5			
***71**	STAGE 6			
***72**	STAGE 7			
			Code FWD/REV ACC/DECEL	
			F1 FWD ACC1/DEC1	0.00S:F1
			F2 FWD ACC2/DEC2	0.00S:F1
			F3 FWD ACC3/DEC3	0.00S:F1
			F4 FWD ACC4/DEC4	0.00S:F1
			R1 REV ACC1/DEC1	0.00S:F1
			R2 REV ACC2/DEC2	0.00S:F1
			R3 REV ACC3/DEC3	0.00S:F1
			R4 REV ACC4/DEC4	0.00S:F1
			Example: Function Code 66 set at 15.00F2 15:00 -Run time is 15 seconds to include accel rate. F2 -Foward direction, ACC2/DEC2 timing set in Function Codes 33 and 34.	
			NOTES: –If a stage's timer is set at 0.00, it will be skipped. – /\ or \/ keys select the direction of rotation, rate of acceleration and deceleration, and length of pattern stage run time. The SHIFT >> key selects the digit of the run time to be set using the /\ or \/ keys.	

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
65			Pattern Operation (cont'd)	

NOTES : – When Function Code 65 is set to 1, 2 or 3, pattern operation is made possible by setting the multi-step frequency combination of stages 1 through 7 (Function Codes 66 through 72).

– When in the pattern operation, frequency changeover via the X1, X2 and X3 terminals is not required.

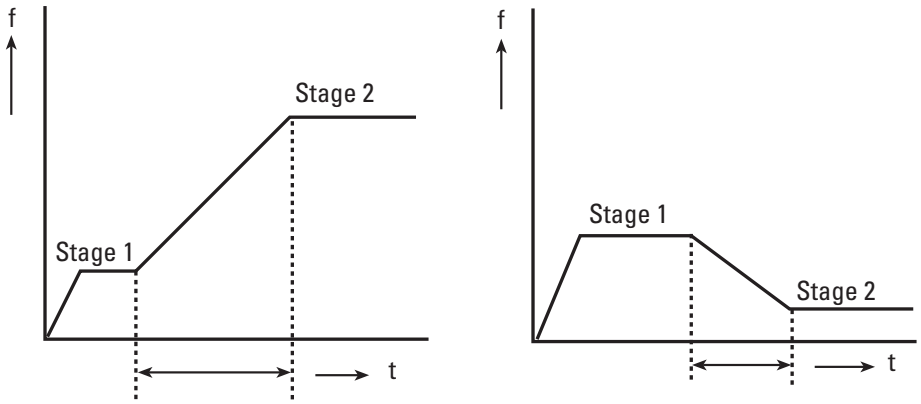
– Pattern operation switches to set frequencies 1 through 7 in ascending numerical order only.



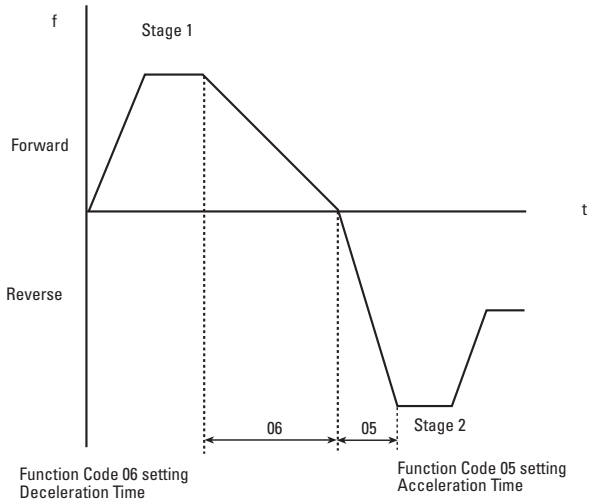
– To set motor's direction of rotation and acceleration/deceleration time, utilize Function Codes 66 through 72.

– If each subsequent frequency is higher or lower than the present frequency, the acceleration or deceleration time will be automatically selected based on the Stage setting (Function Codes 66 through 72).

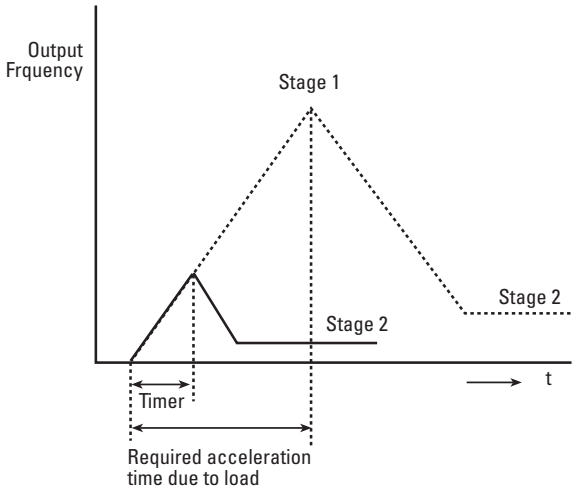
Example 1: when Function Code is 67 (stage 2) 5.00 F1.



Example 2: when Function Code is 67 (stage 2) is set at 5.00R1.



The timer's setting includes the time required for the motor to accelerate or decelerate to the set frequency. Therefore, if the time set on the timer is less than the time required for the acceleration/deceleration conditions, it will proceed to the next process, before the original set frequency is reached.



Pattern Operation Method #1: Keypad Panel

The key functions are changed as follows:

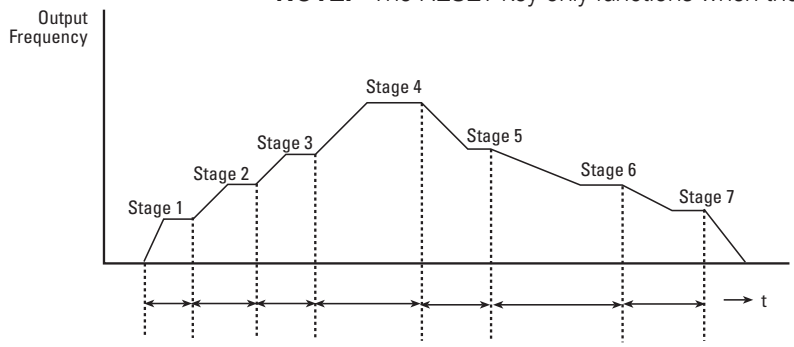
RUN key: Start operation

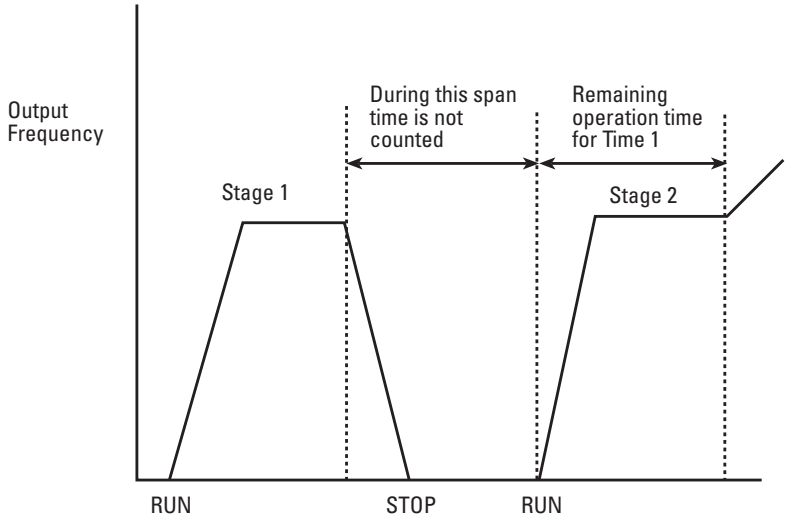
STOP key: Temporary stop of drive operation (pause)

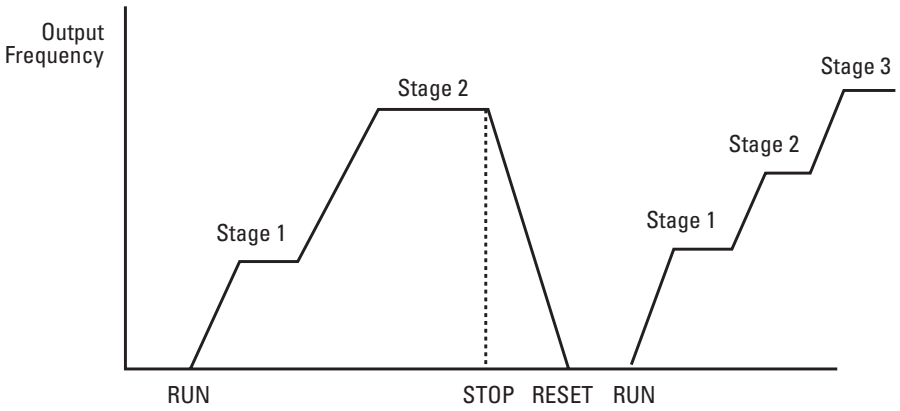
RESET key: Resets pattern to original starting point.

The next RUN input will start operation from pattern stage 1.

NOTE: The RESET key only functions when the drive is stopped or paused.







PATTERN OPERATION METHOD #2: CONTROL TERMINAL BOARD

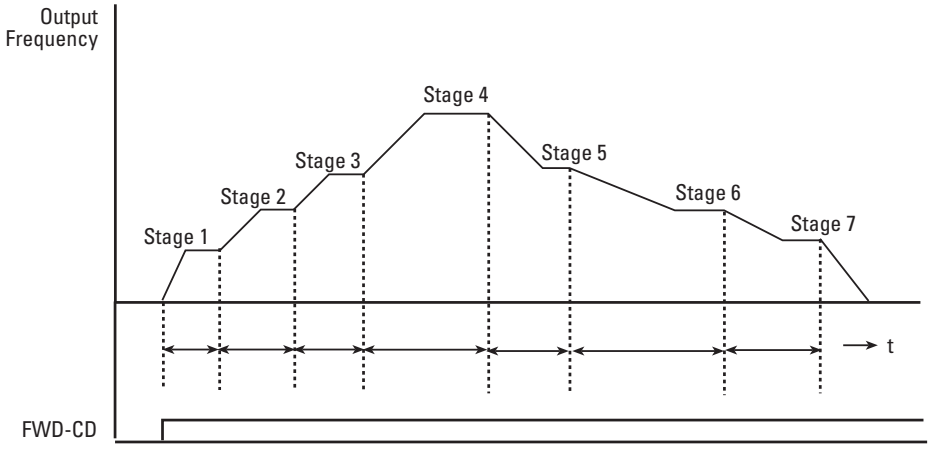
"REMOTE"

The terminal functions are changed as follows:
FWD-CM = ON :Start operation
FWD-CM = OFF :Stops timer operation (Pause)

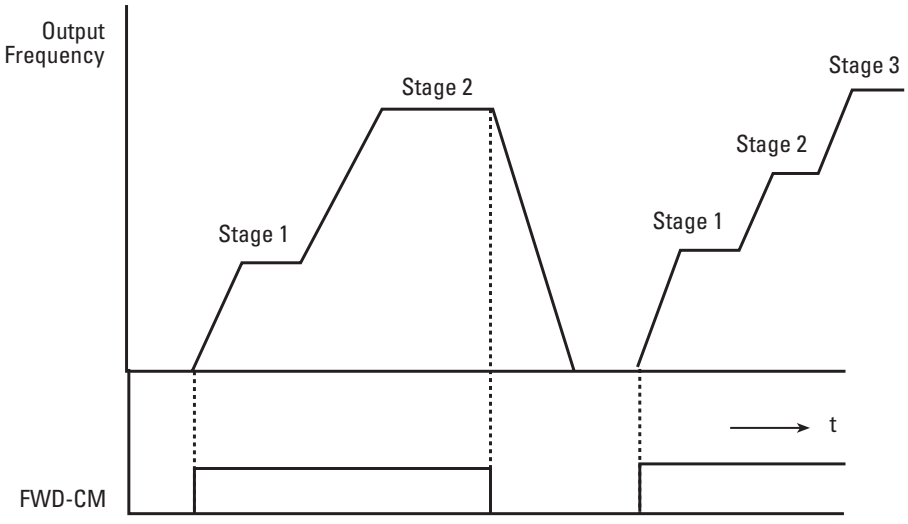
RESET key :Timer reset

NOTE: The RESET key only functions when the drive is stopped or paused.

Example #1:



Example #2:



FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
73	ACC PTN		ACCELERATION/DECELERATION PATTERN Selection can be made from the following types:	0
		0:	Linear acceleration/deceleration (Fig. a)	
		1:	S curve acceleration/deceleration (Fig. b)	
		2:	Non-linear for variable torque load (Fig. c)	

Fig. A

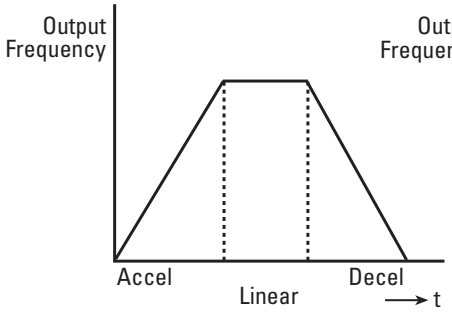


Fig. B

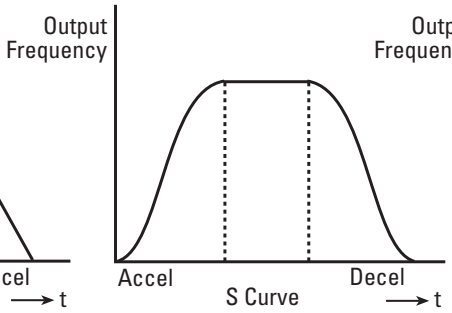
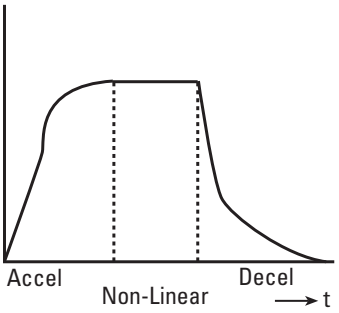


Fig. C



SPECIAL FUNCTIONS

74	N/A		NOT USED	0
75	ENERGY SAV		ENERGY SAVINGS Automatically saves energy by weakening the V/Hz pattern during light load operation.	0
		0:	Inactive	
		1:	Active-Volt/Hz ratio is decreased automatically at light loads. Not active during acceleration or deceleration.	
76	REV-PH LOC		REVERSE DIRECTION LOCK OUT Prevents the drive from operating in a reverse direction.	0
		0:	Inactive	
		1:	Active-Will not allow the motor to run in reverse direction even in pattern mode.	
77	DATA INIT		DATA INITIALIZATION Allows resetting Function Codes to factory settings.	0
		0:	Manual setting value (customized drive settings).	
		1:	Return to factory default setting values.	
*78	LANGUAGE		LANGUAGE SELECTION Allows selection of the language in which the LCD Graphic Display will be shown.	1
		0:	Japanese	
		1:	English	
		2:	Spanish	
		3:	French	

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
*79	BRIGHTNESS		LCD GRAPHIC DISPLAY MONITOR BRIGHTNESS	5
		1 TO 10	Bright (1) to Dark (10)	
*80	■■ 81-94 ■■		FUNCTION CODE BLOCK DISPLAY This setting determines whether or not Function Codes 81 through 94 will be displayed and available for adjustment.	0
		0:	Function Codes 81 through 94 NOT displayed.	
		1:	Function Codes 81 through 94 displayed.	
*81	MTR SOUND		MOTOR SOUND Allows the selection of the carrier frequency that determines the quality of the sound produced by the motor.	0
		0 TO 10	Low carrier (0) to High carrier (10)	
82	RESTART t		RESTART TIME Time from frequency output reaching zero to frequency output restarting. See Function Code 10 (Restart)	0.1S (30HP and less) 0.5S (40HP and greater)
		0.0 TO 5.0	Time in seconds	
83	FALL RATE		RATE OF FALL This Function Code sets the deceleration rate for the motor during lead-in when Function Code 10 (RESTART) is active and a momentary power failure occurs.	10.00
		0:	Deceleration occurs for the set decel time.	
		1 TO 100	Deceleration occurs for the value set in Hz per second.	
*84	AUTO-RESET		AUTOMATIC RESET TIMES Selects the number of times the drive will attempt to reset after a fault condition.	0
		0 TO 7	Reset after overcurrent, overvoltage, low voltage, overheating and overload faults.	

WARNING: Personal safety must be considered when activating this function.

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
***85**	RESET INT		RESET INTERVAL Time interval between reset attempts as set in Function Code 84.	5
		2 TO 20	Time in seconds.	
MOTOR CHARACTERISTICS				
86	MOTOR CAP		MOTOR Hp CAPACITY This Function Code is used to select the motor Hp capacity in relation to the drive Hp capacity.	1
		0:	One frame up in Hp capacity (variable torque application).	
		1:	Standard capacity (constant torque application).	
		2:	One frame down in Hp capacity.	
		3:	Two frames down in Hp capacity.	
87	MOTOR 1-Ir	**0.00 TO 2000**	MOTOR #1 NAMEPLATE FULL LOAD CURRENT	RATED AMPS
88	MOTOR 1-Io	**0.00 TO 2000**	MOTOR #1 NO LOAD CURRENT (Magnitizing current).	
89	MOTOR 2-Ir	**0.00 TO 2000**	MOTOR #2 NAMEPLATE FULL LOAD CURRENT	RATED AMPS
90	TUNING		MOTOR TUNING	0

CAUTION: When using motor tuning, be sure the correct values are set in Function Code 03, 04 and 87.

This Function Code is used to tune the primary resistance and inductance of the motor.

0: Inactive
1: Active

WARNING: Ensure the motor is connected, free to rotate and at a standstill. Upon setting Function Code 90 equal to 1, the drive will pulse the motor three (3) times in order to calculate the settings in Function Codes 91 and 92.

FUNCTION	LCD GRAPHIC DISPLAY	SETTING	DESCRIPTION	FACTORY SETTING
***91**	%R1 SET	**0.00 TO 50.00 %:**	MOTOR #1 CALCULATED % PER UNIT RESISTANCE Percent of motor resistance. $\%R1 = \frac{R1 + \text{Cable R}}{V/(\sqrt{3} \times I)} \times 100$ R1 is motor resistance; Cable R is resistance of cable between drive and motor; V is rated motor voltage.	%
***92**	%X SET	**0.00 TO 50.00 %:**	MOTOR #1 CALCULATED % PER UNIT IMPEDANCE Percent of motor impedance. $\%X = \frac{X1 + X2 \times XM/(X2 + XM) + \text{Cable X}}{V/(\sqrt{3} \times I)} \times 100$ X1, X2, XM are motor values; Cable X is inductance of cable between drive and motor; V is rated motor voltage.	%

SPECIAL FUNCTIONS

93	DD FUNC 1		DO NOT USE	
94	DD FUNC 2		DO NOT USE	
95	DATA PRTC		DATA PROTECTION Once the Function Codes have been set, the data protection can be activated and prevent any further changes.	0
		0:	Not protected (changeable)	
		1:	Protected (change prevented)	
			Press >> and UP Key together to change Function Code 95 to 1. Press >> and DOWN Key together to change Function Code 95 to 0. Press FUNC DATA to store change in software.	

Section 7: Maintenance and Inspection

So that the AF-300E$ drive may give long periods of trouble-free operation and to prevent potential problems from occuring, the following items should be periodically inspected.

CAUTION: Do not conduct any inspections until after disconnecting the power supply and after the "CRG" light on the drive has gone out.

MEGGER TEST

1. Disconnect all drive terminals and never apply test voltage to the drive when conducting an external circuit megger test.
2. Perform the test only on the main circuit as shown in Figure 7-1 when conducting a megger test on the drive itself.

   — Do not conduct a megger test on the control circuits.

   — Short L1, L2, L3, U, V, W, P, N, DB, and P, then megger to ground.
3. Use a high resistance range type tester to conduct a continuity test on the control circuits and not a megger or a buzzer.

PERIODIC PARTS REPLACEMENT

The life of the drive will vary according to the installation environment and the amount of running time. However, if continuous operation is within the allowable limits, the life of the dc Link capacitor is approximately five years and the life of the cooling fan is approximately three years. It is recommended that these parts be replaced before failure occurs.

INSPECTION ITEMS

Refer to the Inspection Items Chart in this section for inspection points and corrective action.

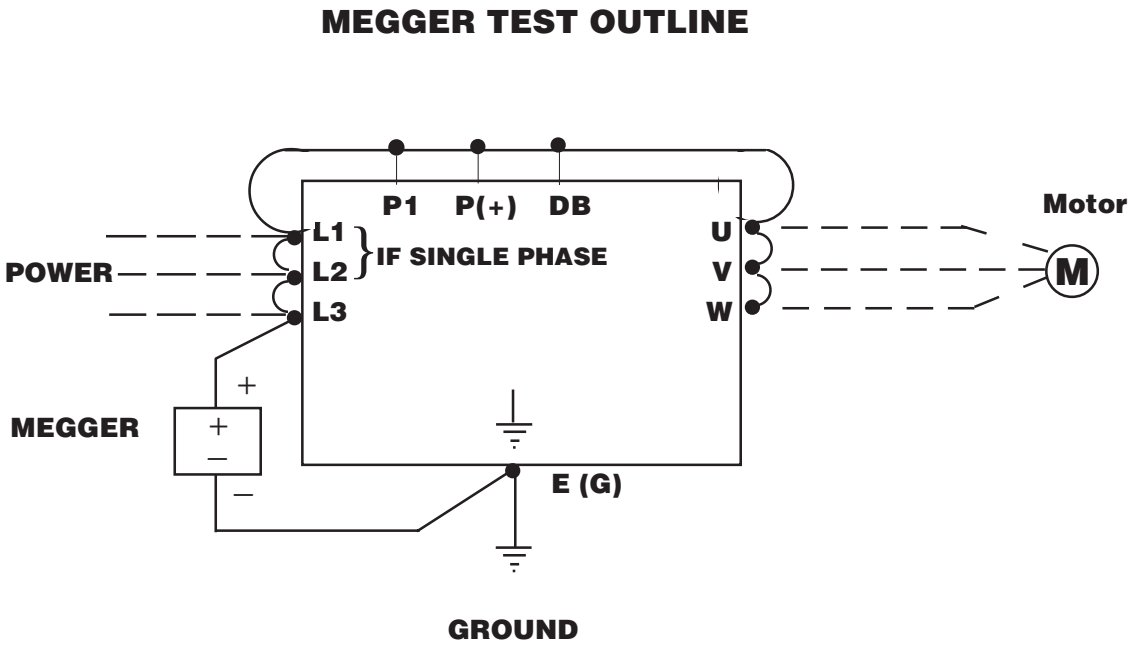


Figure 7-1. MAIN CIRCUIT MEGGER TEST CONNECTIONS

INSPECTION ITEMS CHART

Item	Inspection Criteria	Corrective Action
Power Source Voltage	Within permissible limits (170 - 253 VAC) for 230 VAC drives; or (323 - 506) for 460 VAC drives; or (480-575) for 575 VAC drives.	Adjust the power supply voltage
Ambient Temperature	Within permissible limits (-10° to +50° C) (+14° to +122°F)	Investigate cause and make corrections until environment is within permissible limits.
Ambient Humidity	Within permissible limits (20 - 90% RH) No dew condensation or freezing	Investigate cause and make corrections until environment is within permissible limits.
Vibration	Within permissible limit (0.6G or less)	Investigate cause and make adjustments until within permissible limits.
Noise	Abnormal Audio Noise from cooling fan, etc.	Contact the supplier where the Drive was purchased.
Odor	Smell or burning	Contact the supplier where the Drive was purchased.
Dust	Dust accumulation on cooling fins, cooling fan, or on the control board.	Clean and blow out with compressed air.
Screws/ Connectors	Check for any loosening	Retighten as needed.

MEASUREMENT POINTS AND METERS

Since the Drive's input/output voltage and current contain high frequencies, selection of the wrong measuring device can lead to gross miscalculations. When using a CT (current-detection transformer) to measure the current, the amount of error will be large if the frequency is low. Because of this, always use a CT with as large a capacity as possible. See the following chart and Figure 7-2 for recommended measurement devices.

RECOMMENDED MEASUREMENT DEVICE CHART

Item	Simple Measurement	Precision Measurement
Input Voltage	Tester	Moving-Iron type voltmeter
Input Current	Clamp Meter	Moving-Iron type ammeter
Input Power	—	Electrodynamometer type wattmeter
Output Voltage	Tester	Rectifier type voltmeter
Output Current	Clamp Meter	Moving-Iron type ammeter
Output Power	—	Electrodynamometer type wattmeter

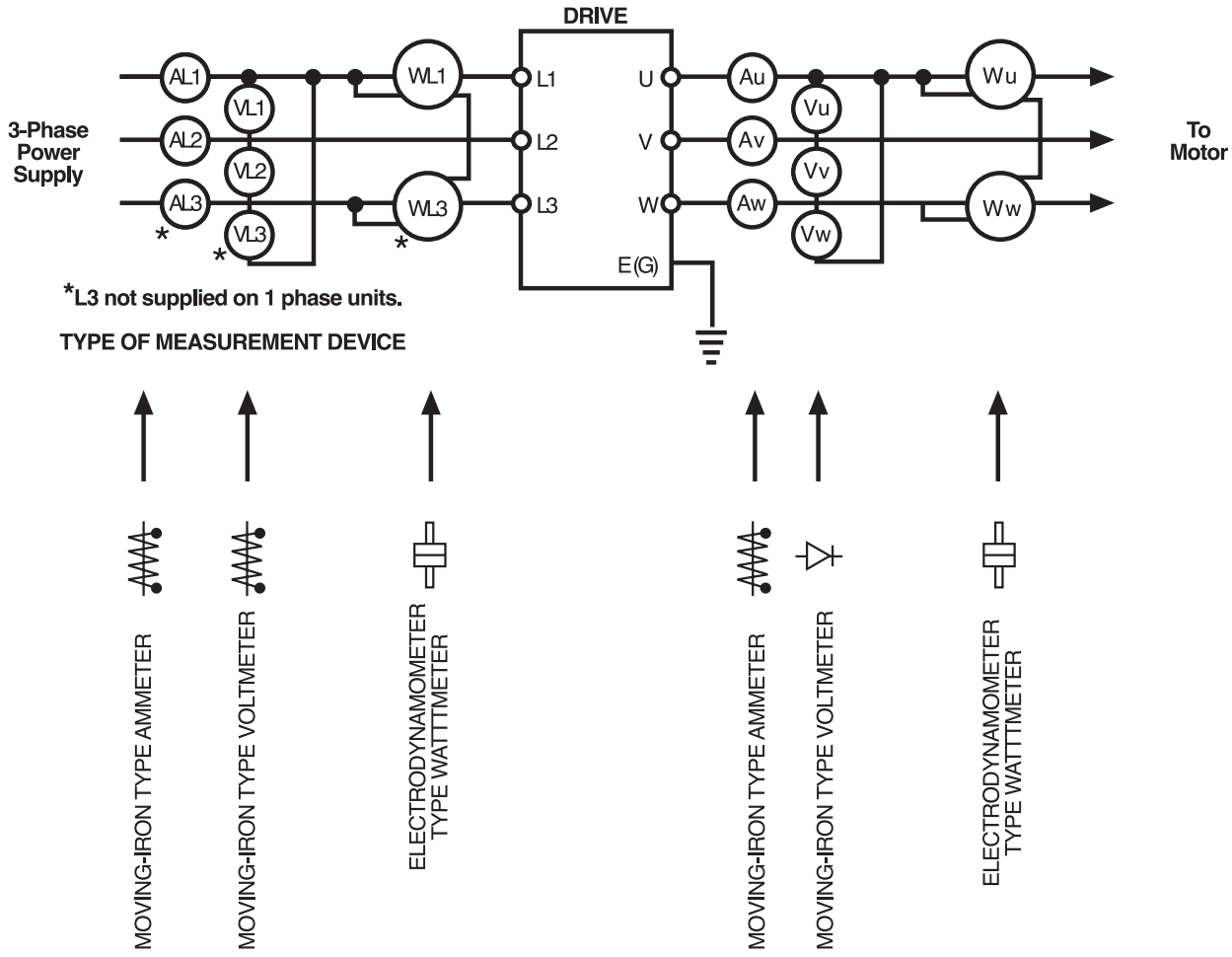


Figure 7-2. MEASUREMENT LOCATIONS AND DEVICES EXAMPLE

Notes:

Section 8: Troubleshooting

TABLE 11: Fault Condition Description and Operation

The following GE AF-300E$ drive protection functions have been incorporated in the basic drive software and will be indicated in the LED display as well as listed in the fault table display.

Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
Overcurrent	Protects the Drive when the output current reaches the momentary overcurrent protection level. The protection is effective for Drive output terminals- U, V, W.	O C 1 O C 2 O C 3	At accel At decel At oper	X
Ground Fault	Grounded output. The protecction is effective for Drive output terminals - U, V, W.	EF	Grnd Fault	X
Over voltage	Protects the Drive when the DC bus voltage reaches the momentary overvoltage protection level by a braking operation. (Drive cannot protect against an input line overvoltage.)	O U 1 O U 2 O U 3	At accel At decel At oper	X
Under voltage	Protects the Drive when the DC bus voltage reaches the momentary low voltage protection level. Output alarm relay (30a, b & c) is dependent on function.	L U	Function 10: 0 or 1 10: 2,3,4	X - no
Over heat	Protects the Drive against overheating caused by overload operation, cooling fan failure, abnormal high ambient temperatures, etc.	O H 1 O H 3	Fin temp. Internal temp.	X
DB (Dyn Brk)	Protects the dynamic brake resistor from over-heating	d b H		X
Electronic thermal overload	Protects the Drive with electronic overload. Protects the motor with electronic overload sense Range of setting: 20 to 135% of Drive rated current.	O L U O L		X
Inside fuse	Detects the DC bus failed fuse, 15 Hp and above.	F U S		X
External	Stops Drive by an external alarm signal.	O H 2		X
Memory error	Detects memory EE-PROM malfunction.	E r 1		X
Keypad communication	Detects a continuous communication error between control PCB and keypad panel.	E r 2		X
CPU error	Detection of a CPU malfunction.	E r 3		X
Option communication	Detects a continuous communication error between control PCB and option PCB.	E r 4		X
Option error	Detects Drive option failure.	E r 5		X
Operating Proc. Error	Detects Drive operating procedure error during Drive startup. FWD or REV connected to terminal CM at time of main power being applied to Drive. Stop keypad in remote operation.	E r 6		X
Tuning error	Detects missing connection to the motor @ auto-tune.	E r 7		X
Prevent stall	Prevents OC-trip by ceasing frequency output at high current when torque limit is disabled and drive is accelerating, or when high impact loads are applied to the motor. Second, by decreasing frequency level when torque limit is activated and its value is being exceeded during steady state operation and load acceleration.			

FAULT CONDITION DISPLAY AND CORRECTIVE ACTION

CAUTION:

Electrostatic Discharge: The AF-300E$ has components and board assemblies that are sensitive to electrostatic charges. These parts can be damaged if electrostatic discharge procedures are not implemented during disassembly, handling of electronic components, re-assembly and equipment checkout.

CAUTION:

Do not conduct any inspection until after disconnecting the power supply and after the "CHG" light on the drive has gone out.

PROTECTIVE FUNCTIONS: (Individual listings & drive displays.)

Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
Overcurrent	Protects the Drive when the output current reaches the momentary overcurrent protection level. The protection is effective for Drive output terminals- U, V, W.	O C 1 O C 2 O C 3	At accel At decel At oper	X

OVERCURRENT OC1, (during ACC) Operating conditions that need to be reviewed:

Drive Display	
ACCEL TIME	▲ GROUND FAULT
EXCESS LOAD	
TRQ BOOST	
▼ SHORT CIRCT	

OVERCURRENT OC2, (during DEC) Operating conditions that need to be reviewed:

Drive Display	
DECEL TIME	▲ GROUND FAULT
EXCESS LOAD	
TRQ BOOST	
▼ SHORT CIRCT	

OVERCURRENT OC3, (during CONST. SPD) Operating conditions that need to be reviewed:

Drive Display	
SHOCK LOAD	▲ GROUND FAULT
EXCESS LOAD	
TRQ BOOST	
▼ SHORT CIRCT	

Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
Ground Fault	Grounded output. The protecction is effective for Drive output terminals - U, V, W.	EF	Grnd Fault	X

GROUND FAULT EF, (during CONST. SPD) Operating conditions that need to be reviewed:

Drive Display

GROUND FAULT

(40 Hp and Greater)

Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
Over voltage	Protects the Drive when the DC bus voltage reaches the momentary overvoltage protection level by a braking operation. (Drive cannot protect against an input line overvoltage.)	O U 1 O U 2 O U 3	At accel At decel At oper	X

OVERVOLTAGE OU1 – OU3, Operating conditions that need to be reviewed:

Drive Display

DECEL TIME
HIGH SUPV
SHOCK LOAD
DB SPEC

Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
Under voltage	Protects the Drive when the DC bus voltage reaches the momentary low voltage protection level. Output alarm relay (30a, b & c) is dependent on function.	L U	Function 10: 0 or 1 10: 2,3,4	X - no

UNDERVOLTAGE LU, Operating conditions that need to be reviewed:

Drive Display

LOW SUPV
PWR FAILURE

Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
Over heat	Protects the Drive against overheating caused by overload operation, cooling fan failure, abnormal high ambient temperatures, etc.	O H 1 O H 3	Fin temp. Internal temp.	X

OVER HEAT OH1 (drive heatsink), Operating conditions that need to be reviewed:

Drive Display
FAN FAILURE
HIGH TEMP
FIN STUFF
L AIR FLOW

OVER HEAT OH3 (drive PCB), Operating conditions that need to be reviewed:

Drive Display
HIGH TEMP
L AIR FLOW

Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
DB (Dyn Brk)	Protects the dynamic brake resistor from over-heating	d b H		X

OVER HEAT dbH (Drive Dynamic Braking), Operating conditions that need to be reviewed:

Drive Display
BRK INTERVAL
2 8 SETTING

Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
Electronic thermal overload	Protects the Drive with electronic overload. Protects the motor with electronic overload sense Range of setting: 20 to 135% of Drive rated current.	O L U O L		X

OVER LOAD OL (Motor Overload), Operating conditions that need to be reviewed:

Drive Display
EXCESS LOAD
O L LEVEL
O L PROPERTY

OVERLOAD OLU (Drive Overload), Operating conditions that need to be reviewed:

Drive Display
EXCESS LOAD

Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
Inside fuse	Detect the DC bus failed fuse, 15 Hp and above.	F U S		X

INSIDE FUSE (FUS) (DC Fuse Open), Operating conditions that need to be reviewed:

Drive Display
DC FUSE OPEN

Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
External	Stops Drive by an external alarm signal.	O H 2		X

OVER HEAT OH2 (external equip. alarm), Operating conditions that need to be reviewed:

Drive Display
THR OPEN

Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
Memory error	Detects memory EE-PROM malfunction.	E r 1		X

MEMORY ERROR Er 1 (drive), Operating conditions that need to be reviewed:

Drive Display
ELEC NOISE
HARDWARE MALF

Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
Keypad communication	Detects a continuous communication error between control PCB and keypad panel. (If Inverter is operated from control circuit terminals, it will continue to operate without an alarm signal, enen if E r 2 occurs. When communication is restored, the E r 2 display will be cleared.)	E r 2		X

COMMUNICATION ERROR Er 2 (keypad), Operating conditions that need to be reviewed:

Drive Display
ELEC NOISE
HARDWARE MALF
WIRING

Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
CPU error	Detection of a CPU malfunction.	E r 3		X

CPU RUNAWAY Er 3 (drive), Operating conditions that need to be reviewed:

Drive Display
ELEC NOISE
HARDWARE MALF

Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
Option communication	Detects a continuous communication error between control PCB and option PCB.	E r 4		X

COMMUNICATION ERROR Er 4 (option), Operating conditions that need to be reviewed:

Drive Display
ELEC NOISE
HARDWARE MALF

Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
Option error	Detects Drive option failure.	E r 5		X

OPTION ERROR Er 5, Operating conditions that need to be reviewed:

Drive Display
ELEC NOISE
EXT SYSTEM
OPTION MALF

Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
Operating Proc. Error	Detects Drive operating procedure error during Drive startup. FWD or REV connected to terminal CM at time of main power being applied to Drive. Stop keypad in remote operation.	E r 6		X

TUNING ERROR Er 6, Operating conditions that need to be reviewed:

Drive Display

SEE MANUAL

Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
Tuning error	Detects missing connection to the motor @ auto-tune.	E r 7		X

TUNING ERROR Er 7, Operating conditions that need to be reviewed:

Drive Display

OPEN OUTPUT
MOTORCAP
BX ON

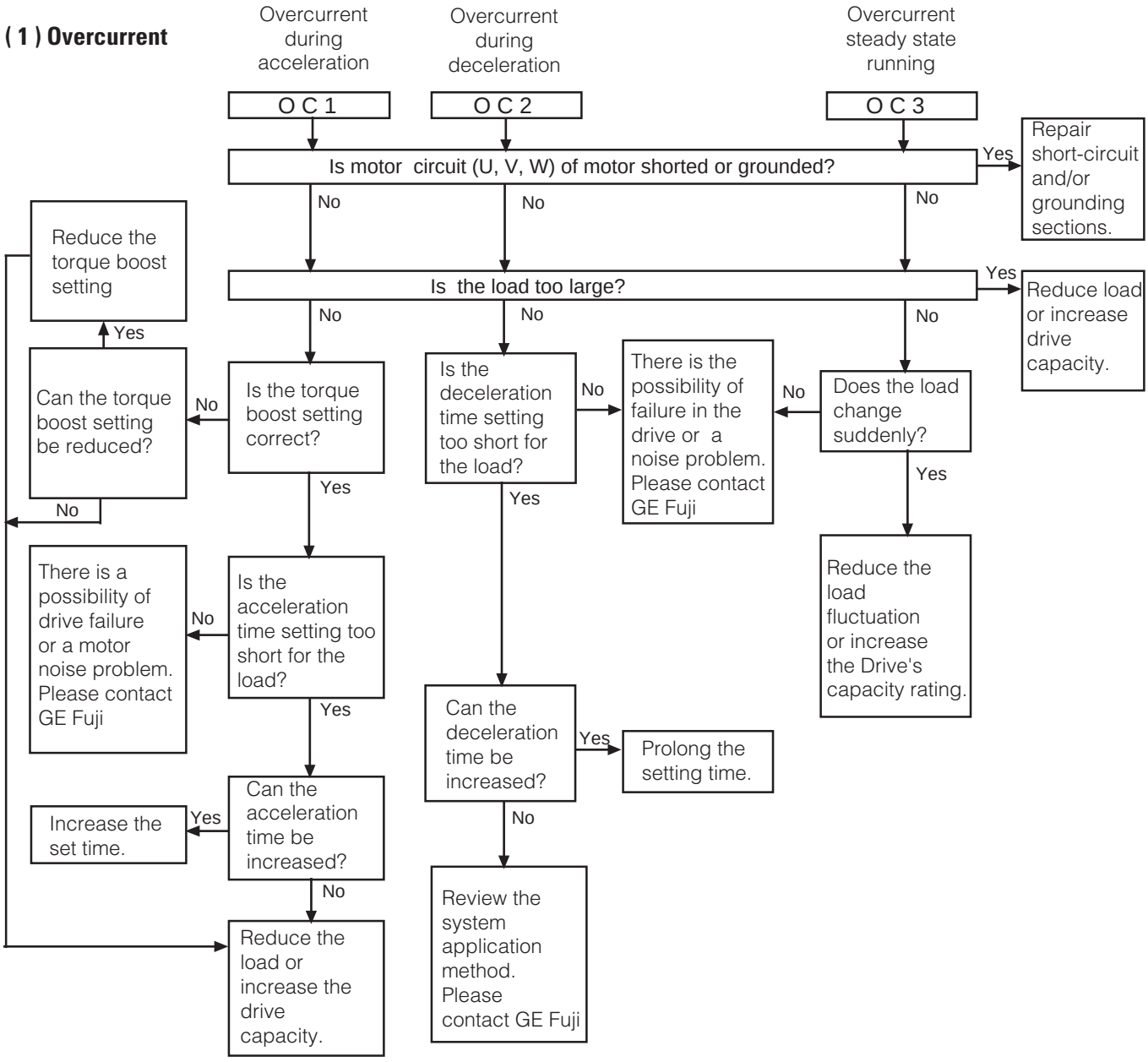
Protective Function	Function Explanation	LED Display	Remarks	Alarm RY (30A, B & C)
Prevent stall	Prevents OC-trip by ceasing frequency output at high current when torque limit is disabled and drive is accelerating, or when high impact loads are applied to the motor. Second, by decreasing frequency level when torque limit is activated and its value is being exceeded during steady state operation and load acceleration.			

Troubleshooting

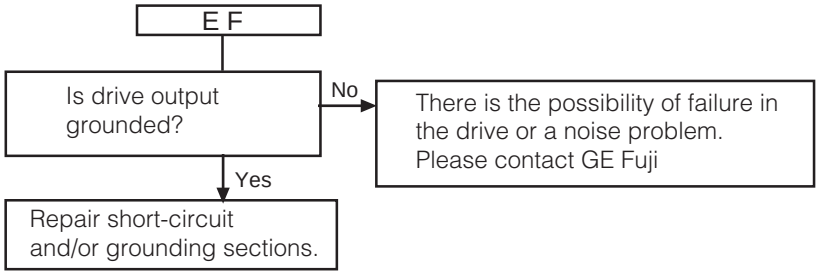
If the function of the drive is lost by a failure or if an abnormal phenomenon has occurred, refer to the following diagnosis for its probable cause. If the cause does not fall under the following explanation, or if the drive is damaged, please contact your distributor.

1 Diagnosis and remedy in case protective function activation.

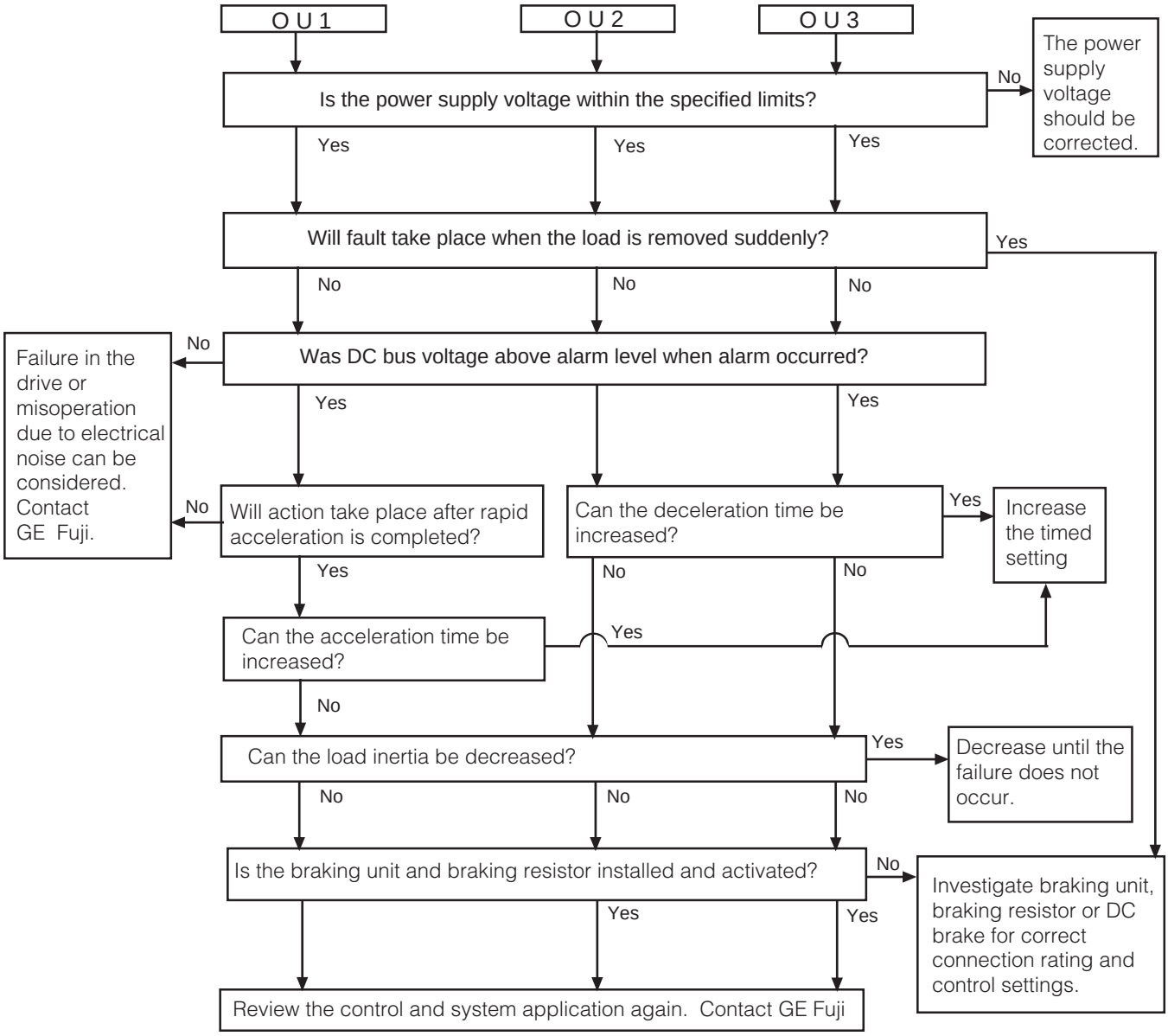
(1) Overcurrent



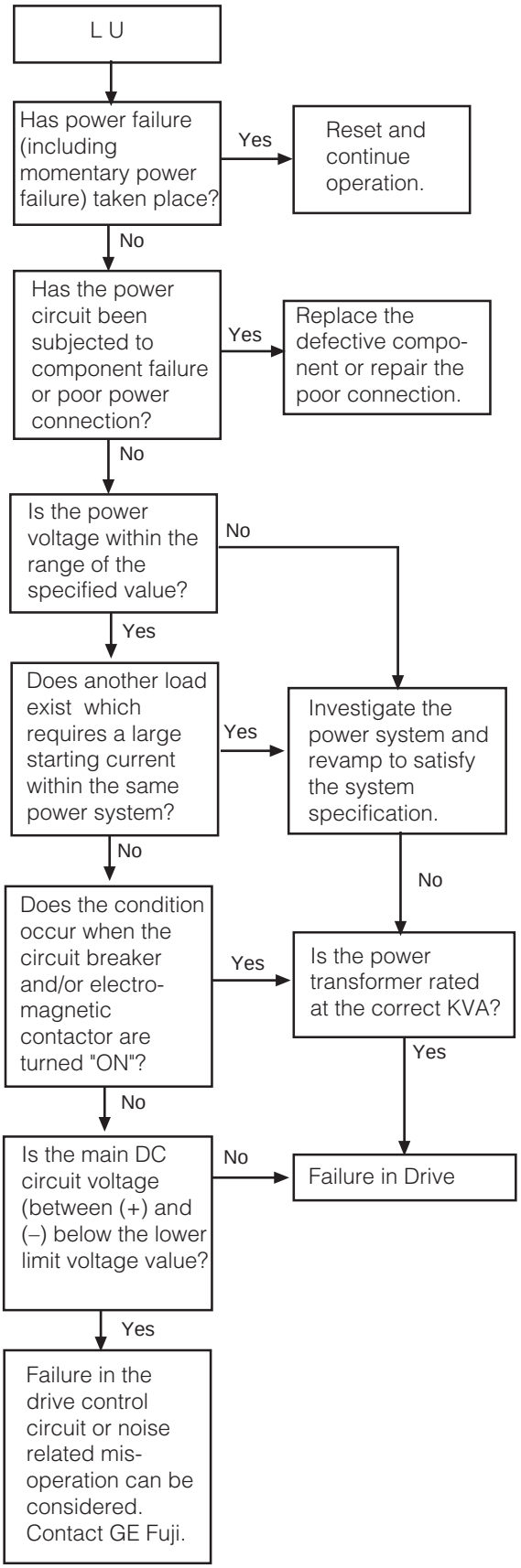
(2) Ground Fault



(3) Overvoltage

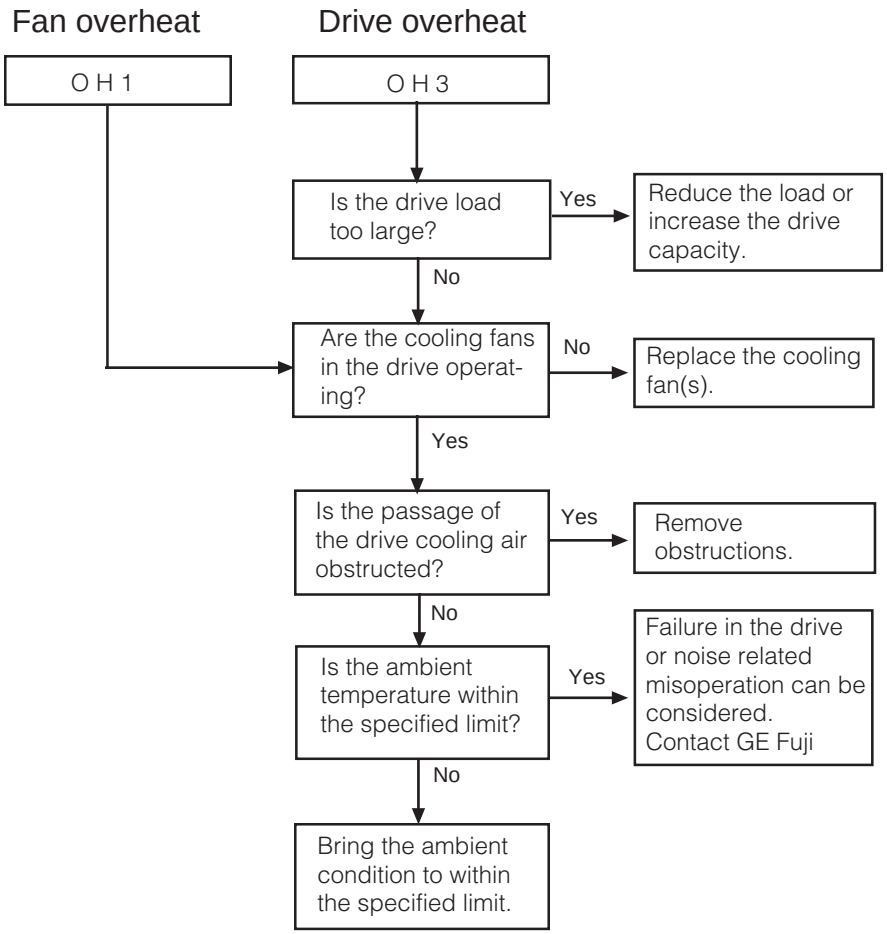


(4) Under-voltage

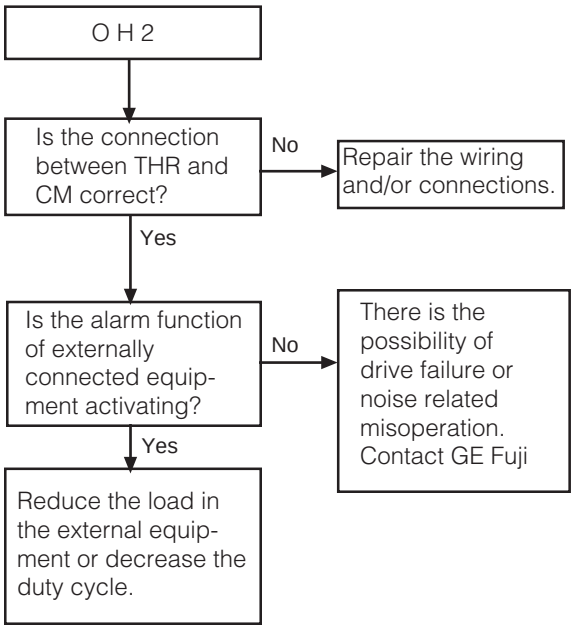


Note 1 – When the DC bus capacitor is discharged by a system power failure and the control power of the drive is reduced,automatic restart after momentary power outage may take place. (Refer to Function Code 10 setting.) When the Function Codes 82, 83, 84 and 85 are selected, no resetting is required. After the power is restored, automatic restart will begin. The length of time of the power ride thru will be determined by drive rating.

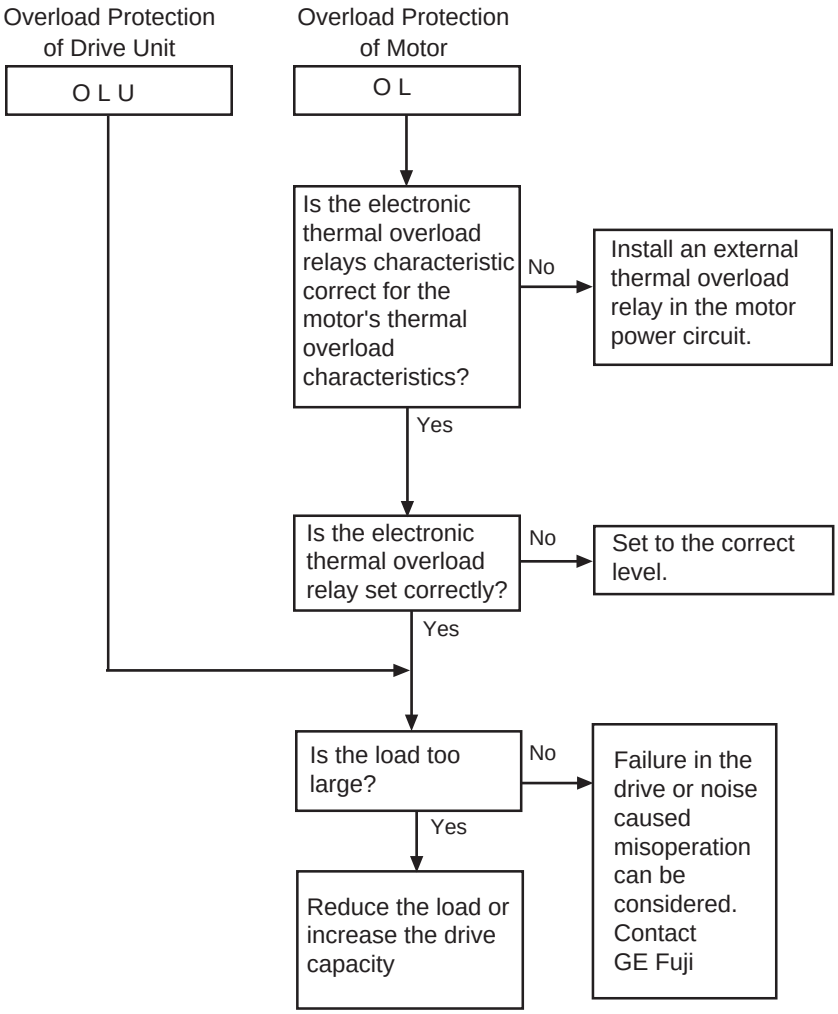
(5) Drive overheat



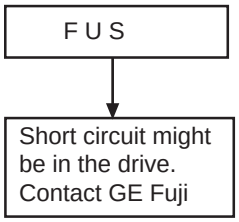
(6) External failure



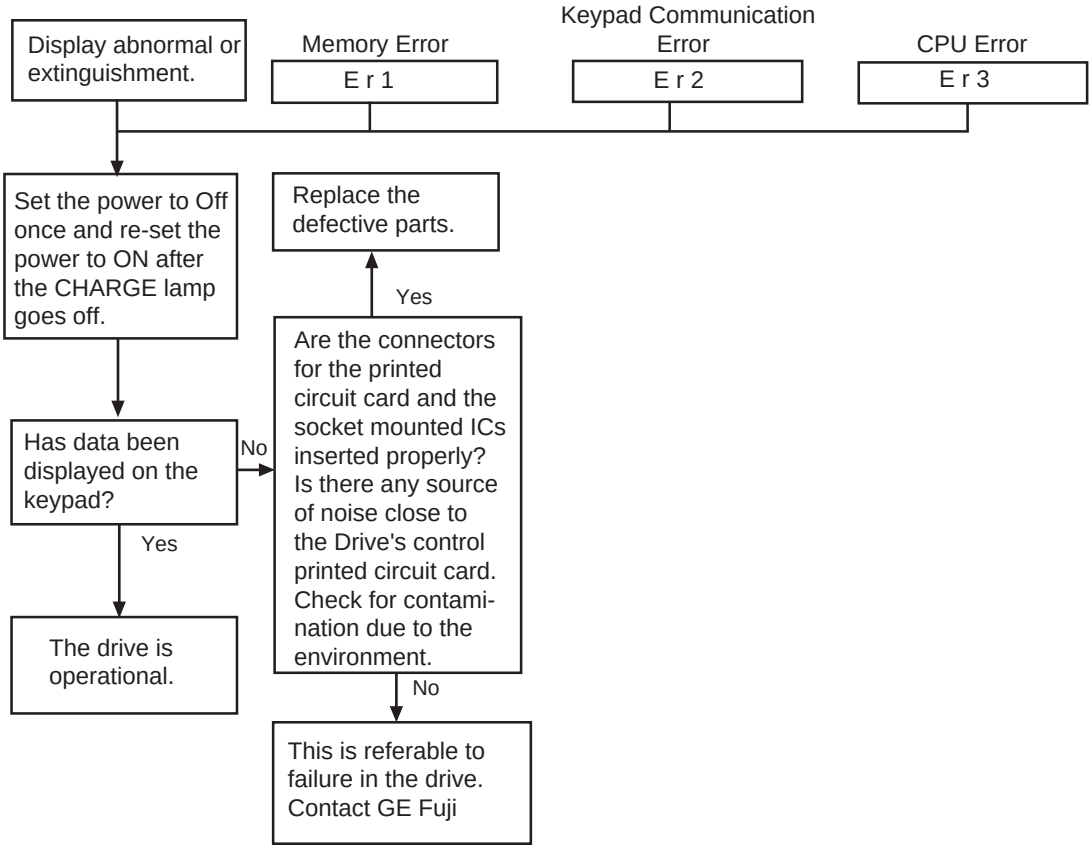
(7) Overload



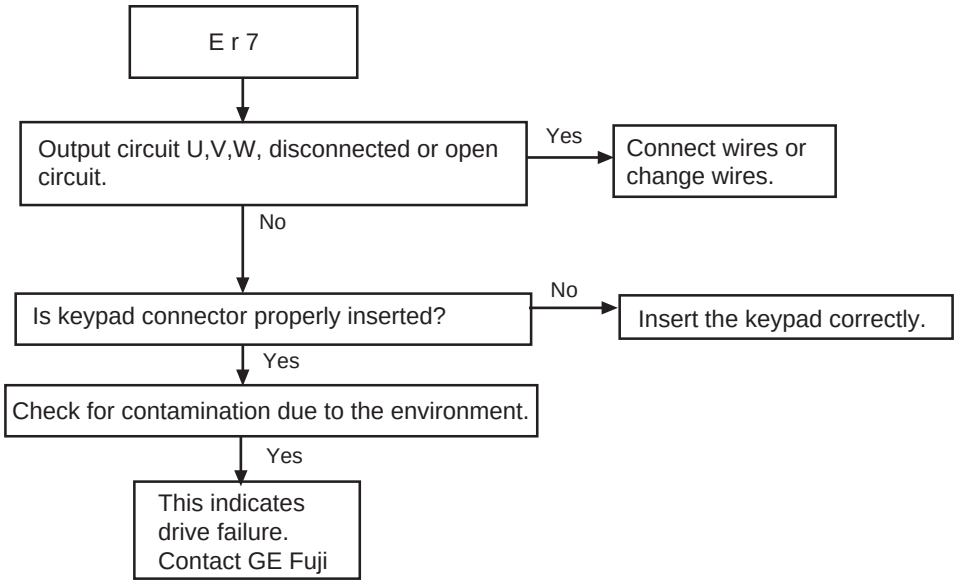
(8) DC Link fuse blown



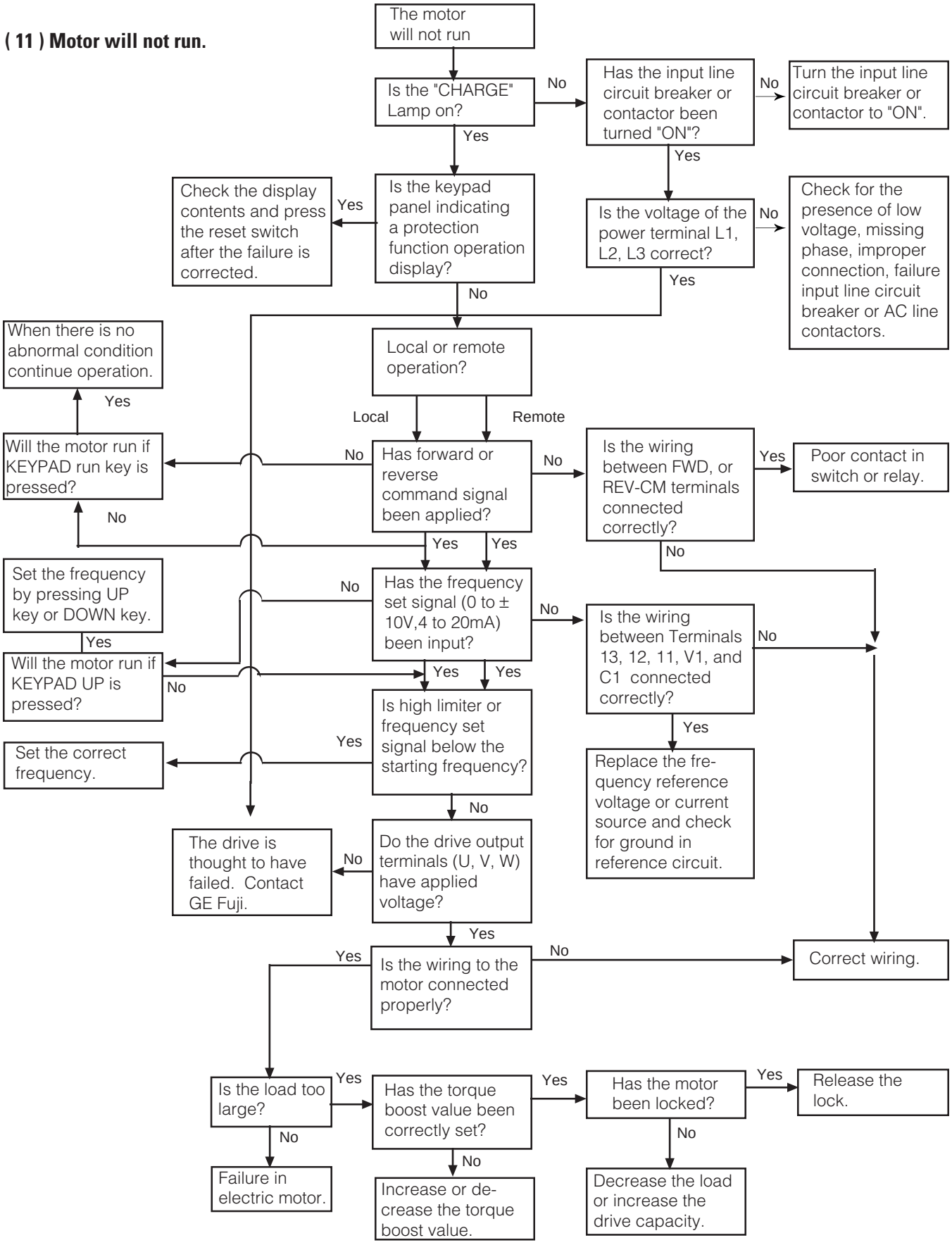
(9) Memory error, keypad communication error, CPU error



(10)Tuning error



(11) Motor will not run.

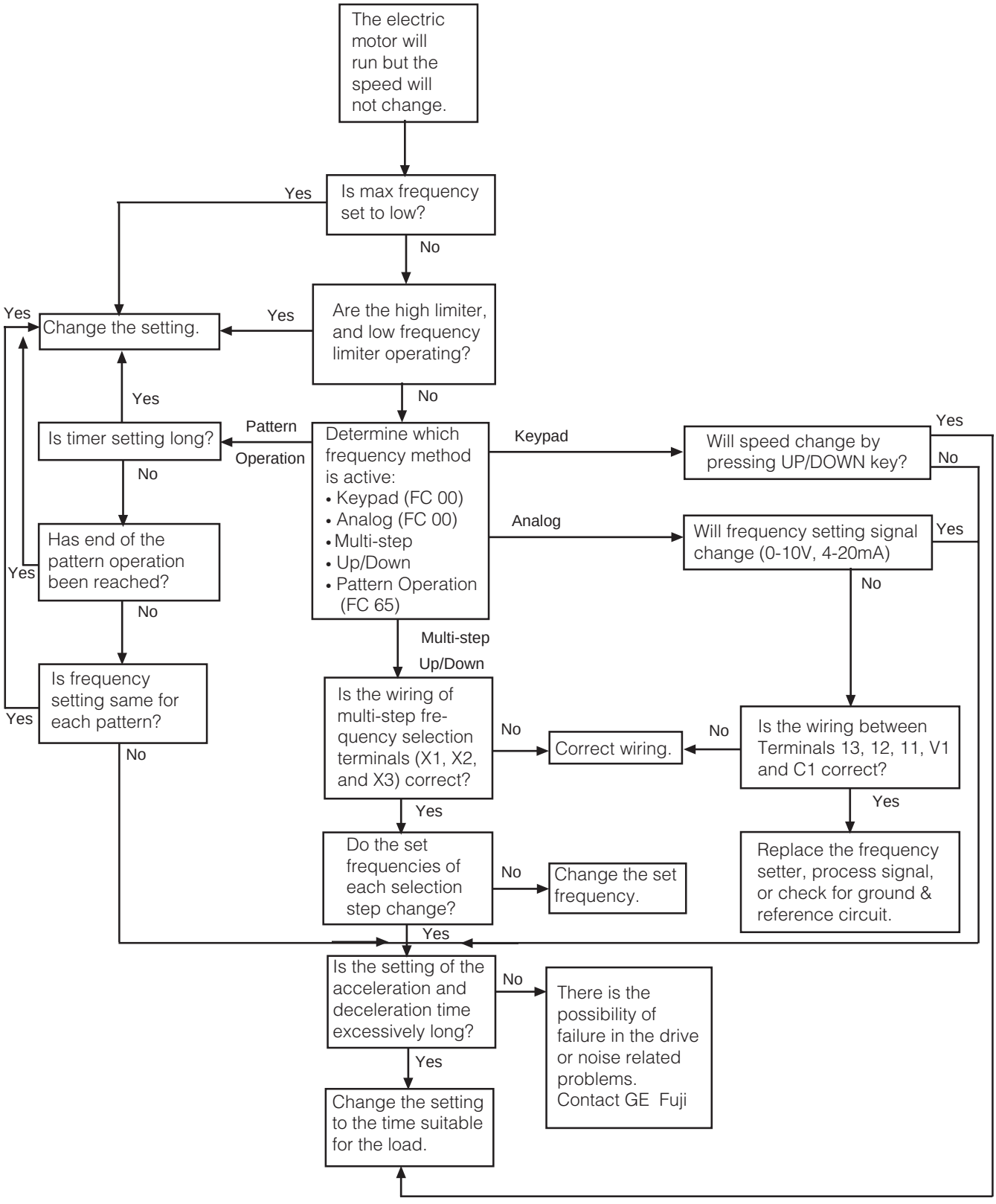


Motor will not run under these conditions:

1. BX coast to stop command on. REV on when REV phase sequence lock is Active.

2. Wrong setting at one of F87, 88, 89, 91, or 92. When FC 07 torque boost setting is 00 or F29 torque vector control is active while using the wrong capacity motor (FC86, 91, 92)

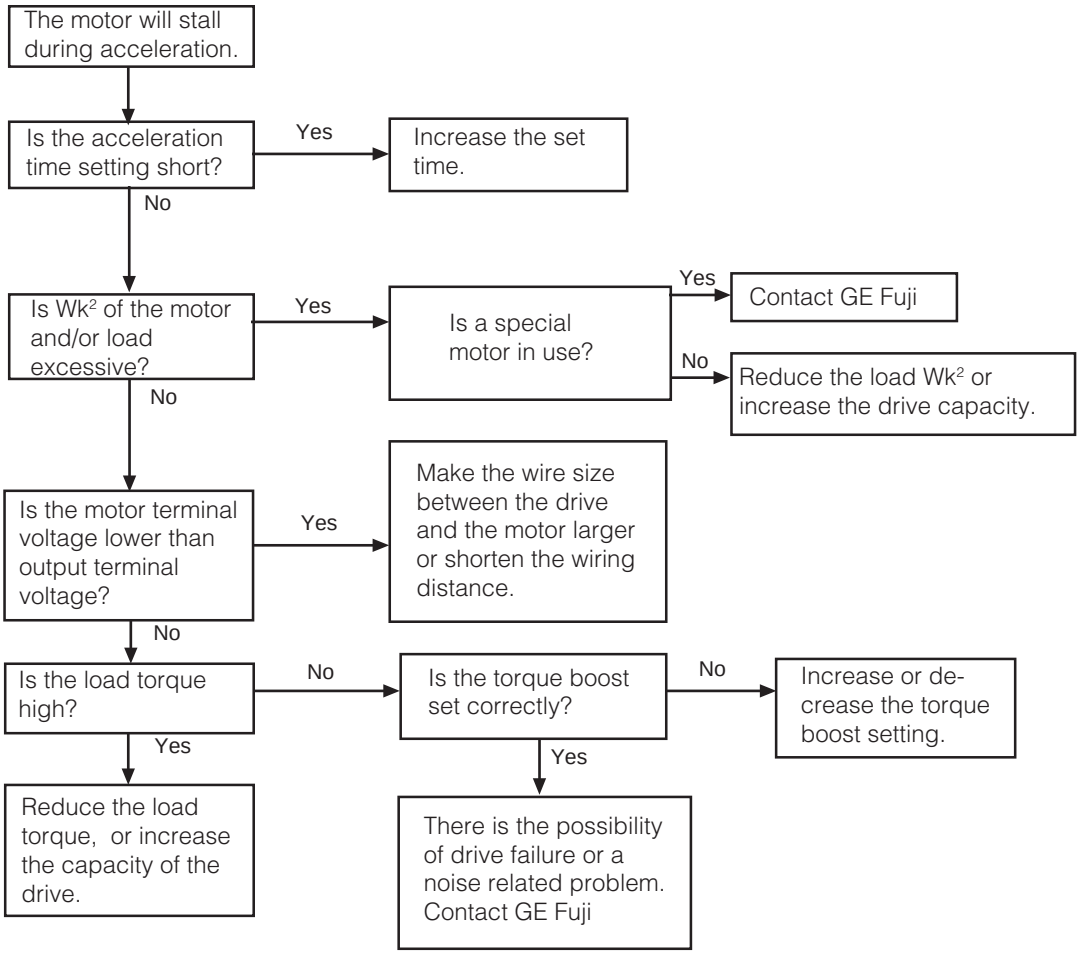
(12) Motor will run but speed will not change.



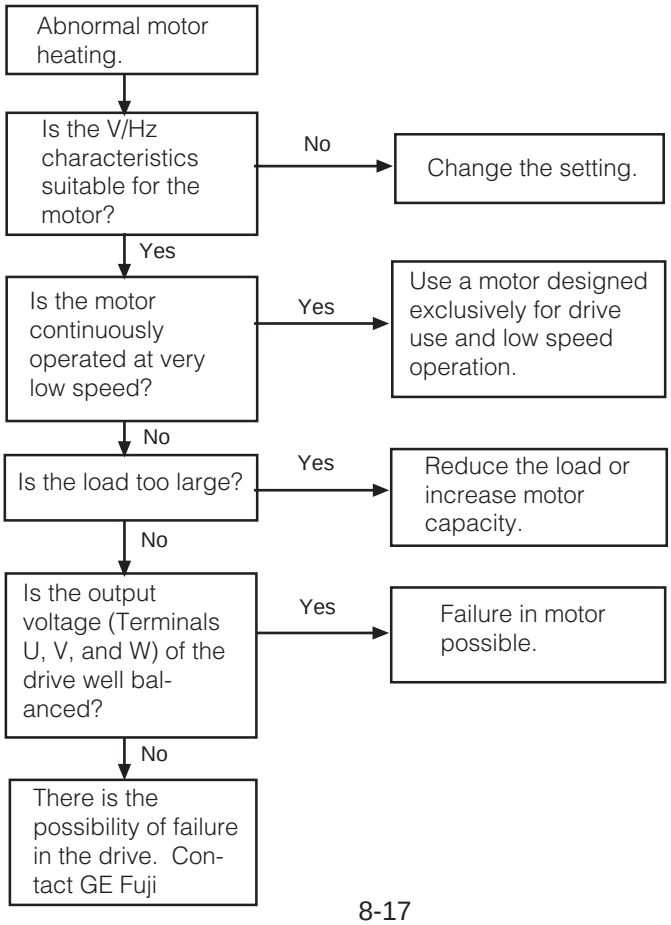
Motor speed change is very small under these conditions:

1. Wrong setting of FC13 bias frequency, FC14 gain for frequency setting.
2. If using terminal 12, V1, and C1 check polarity inputs to insure they are correct and do not offset.
3. During torque limiting or current limiting with excessive load.

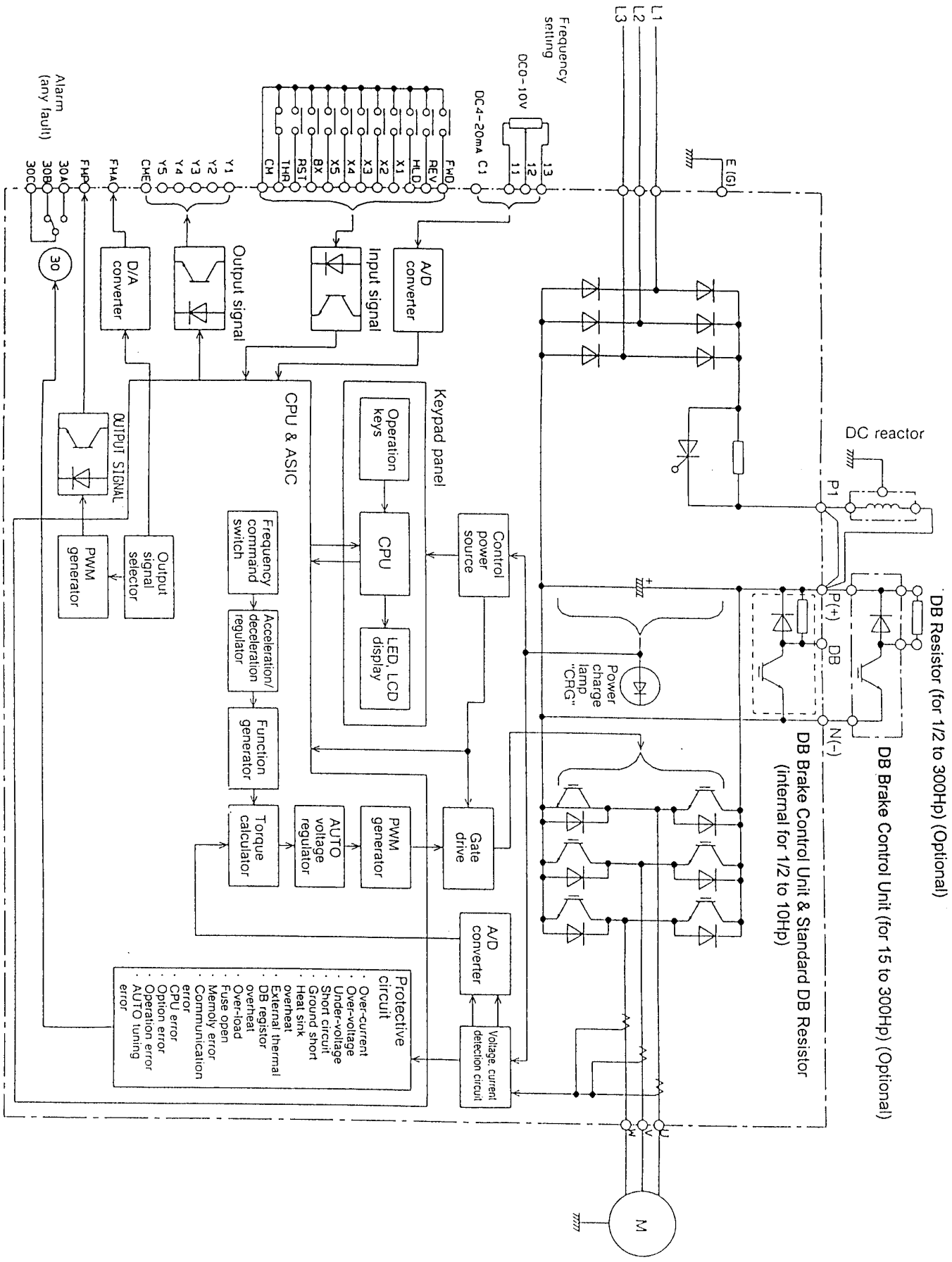
(13) Motor will stall during acceleration.



(14) Motor heating abnormal.



AF-300E$ Adjustable Frequency Drive Control Block Diagram



Section 9: Warranty Parts and Service

The purpose of the following section is to provide specific instructions to the user of the AF-300E$ drive regarding warranty administration and how to obtain assistance on both in-warranty and out-of-warranty equipment.

For all warranty procedures, refer to Section 10 of this Instruction Book to identify the part or assembly.

If assistance is required to either determine warranty status, identify defective parts, or obtain the name of your local distributor, call:

GE Fuji Drives USA, Inc.

Salem, VA

(540) 387-5739

(8 AM to 5 PM EST, Mon. thru Fri.)

or

(540) 387-8292 (24 Hour Emergency Only)

WARRANTY COVERAGE

The Warranty covers all major parts of the drive such as the main printed circuit boards, transistor modules, etc. The warranty does not cover replacement of fuses or of the entire drive.

"Warranty period is 12 months after installation or 18 months after shipment from the Company, whichever occurs first."

Before calling the number at left to determine warranty status, the drive serial number will be required. This is located on the drive nameplate. If the drive is still under warranty, further information will be required per the "In-Warranty Failure Checklist" shown on page 9-2 of this Instruction Book.

OUT-OF-WARRANTY PROCEDURES

When the defective part has been identified, contact your local Authorized AF-300E$ Distributor to order replacement parts.

MOTORS

Motor repairs on General Electric motors are generally handled by GE Authorized Electric Motor Servicenters or GE Apparatus Service Shops. For specific instructions on your motor, call the distributor from which it was purchased and be prepared to furnish complete nameplate data.

IN-WARRANTY FAILURE CHECKLIST

To assist with warranty troubleshooting, the following information is required. This data is needed to evaluate the cause in an effort to eliminate any further failures.

Model No.: _____

Serial No.: _____

Start-Up Date: _____

Failure Date: _____

Status When Failure Occurred (check one):

Power-Up _____ Running _____ Accel _____ Decel _____

Explanation of Failure _____

Application Information (check Yes or No)

Input Transformer: Yes _____ No _____

If Yes: KVA _____

L1 Volts _____ L2 Volts _____ L3 Volts _____

Power Factor Correction Capacitors: Yes _____ No _____

If Yes: Microfarrad _____

Other Equipment on Same Power Yes _____ No _____

If Yes, what?

Line Reactor on Input Yes _____ No _____

Input Starter Yes _____ No _____

Output Starter Yes _____ No _____

Motor Overloads Yes _____ No _____

Control Terminals Used (circle if used)

THR	X1	X2	X3	X4	X5	30A	30B	30C
RST	BX	FWD	REV	C1	V1	11	12	13
Y1	Y2	Y3	Y4	Y5	AX1	AX2	HLD	

Function Codes Different From Factory Settings

Function Code	Setting	Function Code	Setting

Failure Message (see Section 5)

Latest Fault _____ **Previous Faults:** **No Message** _____

Hz _____ 1. _____

A _____ 2. _____

V _____ 3. _____

After all of the Checklist information is acquired, contact the following number for assistance: **(540) 387-5739**

When returning failed parts, reference the C_ _ _ _# on the shipping documents that came with the replacement parts and ship failed parts to:

GE Fuji Drives USE, Inc. • Attn: Product Service Dept. • Rm 191 • 1501 Roanoke Boulevard • Salem, VA 24153

(Marked C_ _ _ _ #)

Section 10: Replacement Parts

Catalog No.	Rating	Drive horsepower & quantity per drive											L" x W" x H"	Weight	
		0.5	1	2	3	5	7.5	10	15	20	25	30		lbs.	Kg.
AF-300E$ 230 VAC, 30 Hp and Below															
Main Control Card															
G9CPCBG204		1											4 x 5.75 x 1.25	0.5	0.23
G9CPCBG2075			1										4 x 5.75 x 1.25	0.5	0.23
G9CPCBG215				1									4 x 5.75 x 1.25	0.5	0.23
G9CPCBG222					1								4 x 5.75 x 1.25	0.5	0.23
G9CPCBG237						1							4 x 5.75 x 1.25	0.5	0.23
G9CPCBG255							1						4 x 5.75 x 1.25	0.5	0.23
G9CPCBG275								1					4 x 5.75 x 1.25	0.5	0.23
G9CPCBG211									1				4 x 5.75 x 1.25	0.5	0.23
G9CPCBG2150										1			4 x 5.75 x 1.25	0.5	0.23
G9CPCBG2185											1		4 x 5.75 x 1.25	0.5	0.23
G9CPCBG2220												1	4 x 5.75 x 1.25	0.5	0.23
Base Driver & PS Card															
G9PPCB04		1											9 x 4 x 2	1	0.455
G9PPCB075			1										9 x 6 x 2	1	0.455
G9PPCB15				1									9 x 6 x 2	1	0.455
G9PPCB22					1								9 x 6 x 2	1	0.455
G9PPCB37						1							9.5 x 6 x 1	1	0.455
G9PPCB55							1						9 x 8 x 1	1	0.455
G9PPCB75								1					9 x 8 x 1	1	0.455
G9PPCB11									1				9 x 8 x 1	1	0.455
G9PPCB150										1			9 x 8 x 1	1	0.455
G9PPCB185											1		9.5 x 8 x 1	1	0.455
G9PPCB220												1	9.5 x 8 x 1	1	0.455
Capacitor Unit															
G9CU075	330uf		1										4 x 2 x 2	0.44	0.2
G9CU15	330uf			1									7.5 x 1.5 x 2	0.44	0.2
G9CU22	30uf				1								7.5 x 1.5 x 2	0.44	0.2
G9CU37	330uf					1							7.5 x 1.5 x 2	1	0.46
G9CU55	2700uf						1						3 x 3 x 3	1	0.46
G9CU75	3900uf							1					3 x 4 x 4	2	0.91
G9CU11	3300uf								1				3 x 4 x 4	2	0.91
G9CU150	4700uf									1			3 x 4 x 4	2	0.91
G9CU185	4700uf										1		4 x 4 x 4	2	0.91
G9CU220	5400uf											1	4 x 4 x 4	2	0.91
Fan															
G9FAN37				1	1	1							3 x 3 x 3	1	0.455
G9FAN75							1	1					5.5 x 3 x 1	1	0.455
G9FAN220									1	1	1	1	8 x 4.25 x 1	1	0.455
IGBT Gate Card															
G9GPCB									1	1	1	1	5.5 x 1.25 x 1	0.044	0.02
Power Module															
6MB1100J060B	100A 600V	*	*	*	*	*	1	1					4 x 3.5 x 1.5	1	0.455
CM150DY12H	150A 600V								3	3			4 x 2 x 1	1	0.455
CM200DY12H	200A 600V										3	3	4 x 2 x 1	1	0.455
Diode Module															
CVM75CD80	75A 800V	*	*	*	*	*	1	1					3 x 3 x 1	1	0.455
CVM100BB80	100A 800V								1	1			4.5 x 2.5 x 1	1	0.455
CVM180BB80	180A 800V										1	1	4.5 x 2.5 x 1	1	0.455
Keypad															
TPG9SUX		1	1	1	1	1	1	1	1	1	1	1	3 x 5 x 1	0.2046	0.09

* Located on the Base Driver and PS Card.

Catalog No.	Rating	Drive horsepower & quantity per drive											L" x W" x H"	Weight	
		0.5	1	2	3	5	7.5	10	15	20	25	30		lbs.	Kg.
AF-300E$ 230 VAC, 30 Hp and Below (continued)															
Fuse															
Cr6L150/UL	150A								1	1			1.5 x 4 x 1.5	0.3	0.14
Cr6L260/UL	260A										1	1	1.5 x 4 x 1.5	0.3	0.14
Charge Resistor															
RBS40N5ROKI	5.0 Ohm 40W	*	*	*	*	*	*	*	2	2	2	2	4 x 1 x 1	0.2	0.091
AF-300E$ 460 VAC, 30 Hp and Below															
Main Control Card															
G9CPCBG4075			1										4 x 5.75 x 1.25	0.5	0.23
G9CPCBG415				1									4 x 5.75 x 1.25	0.5	0.23
G9CPCBG422					1								4 x 5.75 x 1.25	0.5	0.23
G9CPCBG437						1							4 x 5.75 x 1.25	0.5	0.23
G9CPCBG455							1						4 x 5.75 x 1.25	0.5	0.23
G9CPCBG475								1					4 x 5.75 x 1.25	0.5	0.23
G9CPCBG411									1				4 x 5.75 x 1.25	0.5	0.23
G9CPCBG4150										1			4 x 5.75 x 1.25	0.5	0.23
G9CPCBG4185											1		4 x 5.75 x 1.25	0.5	0.23
G9CPCBG4220												1	4 x 5.75 x 1.25	0.5	0.23
Base Driver & PS Card															
G9PPCB4075CE			1										9 x 6 x 3	1	0.455
G9PPCB415CE				1									9 x 6 x 2	1	0.455
G9PPCB422CE					1								9 x 6 x 2.5	1	0.455
G9PPCB437CE						1							9 x 6 x 2	1	0.455
G9PPCB455CE							1						8.5 x 7.5 x 1	1	0.455
G9PPCB475CE								1					10 x 8 x 1	1	0.455
G9PPCB411CE									1				10 x 8 x 1	1	0.455
G9PPCB4150CE										1			10 x 8 x 1	1	0.455
G9PPCB4185CE											1		10 x 8 x 1	1	0.455
G9PPCB4220CE												1	10 x 8 x 1	1	0.455
Capacitor Unit															
G9CU415	270uf		*	1									7.5 x 1.5 x 2	0.44	0.2
G9CU422	330uf				1								7.5 x 1.5 x 2	0.44	0.2
G9CU437	330uf					1							2.25 x 3 x 3	1	0.455
G9CU455	1500uf						1						2.25 x 3 x 3	1	0.455
G9CU475	2200uf							1					3 x 3 x 3	1	0.455
G9CU411	3300uf								1				3 x 4 x 4	2	0.91
G9CU4150	3900uf									1			4 x 3.5 x 3.5	2	0.91
G9CU4185	4700uf										1		4 x 4 x 4	2	0.91
G9CU4220	5400uf											1	4 x 4 x 4	2	0.91
Fan															
G9FAN37				1	1	1							3 x 3 x 1	1	0.455
G9FAN75							1	1					5.5 x 3 x 1	1	0.455
G9FAN220									1	1	1	1	8 x 4.25 x 1	1	0.455
IGBT Gate Card															
G9GPCB									1	1	1	1	5.5 x 1.25 x 1	0.044	0.02
Power Module															
6MB150J120A	50A 1200V		*	*	*	*	1	1					4 x 1.5 x 1	0.8	0.364
CM75DY24H	75A 1200V								3	3			4 x 1.5 x 1	0.8	0.364
CM100DY24H	100A 1200V										3	3	4 x 2 x 1	1	0.455

* Located on Base Driiver and PS Card.

Catalog No.	Rating	Drive horsepower & quantity per drive											L" x W" x H"	Weight	
		0.5	1	2	3	5	7.5	10	15	20	25	30		lbs.	Kg.
AF-300E$ 460 VAC, 30 Hp and Below (continued)															
Diode Module															
CVM40CD160	40A 1600V		*	*	*	*	1	1					4 x 2 x 1	1	0.46
CVM50BB160	50A 1600V								1				4 x 2 x 1	1	0.46
CVM75BB160	75A 1600V									1			4 x 2 x 1	1	0.46
CVM100BB160	100A 1600V										1	1	4 x 2 x 1	1	0.46
DC Fuse															
CR6L100	100A								1	1	1	1	3.75 x 1 x 1.5	0.44	0.2
Charge Resistor															
RBS40N200K0	20 Ohm 40W		*	*	*	*	*	*	2	2	2	2	3.75 x 1.5 x 0.75	0.3	0.14
Keypad															
TPG9SUX		1	1	1	1	1	1	1	1	1	1	1	3 x 5 x 1	0.2046	0.09

Catalog No.	Rating	Drive horsepower & quantity per drive											L" x W" x H"	Weight	
		35	40	50	60	75	100	125	150	200	250	300		lbs.	Kg.
AF-300E$ 460 VAC, 40 Hp and Above															
IGBT															
CM200DY24H	1200V 200A	3	3										4.25 X 2.5 X 0.75	0.81	0.37
CM300DY24H	1200V 200A			3			6						4.25 X 2.5 X 0.75	0.9	0.41
	1200V 300A				3	3		6	9	9	12	12	4.5 X 3 X 0.75	1.11	0.51
Diode Module															
DD60HB160	1600V 60A	3	3										3.75 X 1 X 1	0.31	0.14
DD100HB160	1600V 100A			3	3	6	6	6	9	12	15	15	3.75 X 1 X 1	0.31	0.14
IGBT Snub Module															
NSKE1213C	1200V 1.1UF	3	3	3	3	3	6						2.75 X 3 X 1	0.34	0.16
SCK78P122D205K5	1200V 2UF							6	9	9	12	12	3 X 3 X 1.5	0.54	0.25
DM Snub Module															
WMTBP1200105K	1200V 1UF	1	1	1	1	1	1	1	3	3	3	3	6.5 x 1.5 x 0.75	0.07	0.03
Surge Module															
VCR2521	AC506V 50/60Hz	1	1	1	1	1	1	1	1	1	1	1	2.25 x 1 x 1.5	0.28	0.13
Spark Killer															
S2A0	250VAC 0.2uf 500Ohm	1	1	1	1	1							3 x 1 x 0.75	0.05	0.02
Capacitor Unit															
HCGF5AL2G472	4700UF 400VDC	4	4										3 x 3 x 4.5	1.62	0.75
HCGF5AX2G682	6800UF 400VDC			4				6	8				3 x 3 x 6	2.3	1.04
HCGF5AX2G822	8200UF 400VDC				4		4			8	12	12	3 x 3 x 6.75	2.74	1.24
HCGF5AX2G562	5600UF 400VDC					6							2.5 x 2.5 x 6.75	1.91	0.87
Balancing Resistor															
TCR20W333J	20W 33,000 Ohm	4	4	4	4		4	6	8	8	12	12	2.5 x 0.5 x 1	0.06	0.03
TCR20N333JS	20W 33,000 Ohm					6							2.5 x 0.5 x 1	0.06	0.03
Surge Absorber															
ENC911D20A		1	1	1	1	1	1	1	1	1	1	1	N/A	NA/	N/A
Magnetic Control															
SC2N2A2B	200-220V 50 Hz	1	1										3 x 3.5 x 4	1.43	0.65
SC3N2A2B	200-220V 60 Hz			1	1	1							3.5 x 4.5 x 4.5	2.82	1.28
SC4N/UL2A2B							1	1	1				3.5 x 5 x 5.5	3.4	1.55
SC7N/UL2A2B	200-250V 50/60 Hz									1			5 x 6 x 6.5	7.74	3.52
SC8N/UL2A2B											1	1	5.5 x 8 x 7.5	11.55	5.25
Charging Resistor															
HF5A6141	80W 30 OHM	1	1	1	1	1	1	2	2	2	3	3	5.5 x 1.5 x 0.75	0.36	0.16

Catalog No.	Rating	Drive horsepower & quantity per drive											L" x W" x H"	Weight	
		35	40	50	60	75	100	125	150	200	250	300		lbs.	Kg.
AF-300E$ 460 VAC, 40 Hp and Above (continued)															
Hall Effect Current Transformer															
NC10GET	40MV/60AT	3	3										2 x 1.25 x 1.25	0.10	0.05
NC10GAT	40MV/90AT			3	3								2 x 1.25 x 1.25	0.10	0.05
NC10GCT	40MV/110AT					3	3						2 x 1.25 x 1.25	0.10	0.05
NC10GDT	40MV/130AT							3					2 x 1.25 x 1.25	0.10	0.05
NC200GT	40MV/250AT								3	3	3	3	2 x 1.25 x 1.25	0.10	0.05
DC Line Fuse															
CR6L150/UL	150A AC600V	1	1	1									1 x 3.75 x 1.25	0.32	0.15
CR6L200/UL	200A AC600V				1								4.25 x 1.25 x 1.5	0.54	0.25
CR6L300/UL	300A AC600V					1	1						4.25 x 1.25 x 1.5	0.54	0.25
A70Q4004	400A AC600V							1					5 x 1.5 x 2	0.95	0.43
A70Q5004	500A AC600V								1				7 x 2 x 1.75	2.35	1.07
A70Q6004	6000A AC600V									1			7 x 2 x 2.5	2.35	1.07
A70QS8004	800A AC600V										1	1	7 x 2 x 2.5	2.35	1.07
Transformer															
HF5A5806	80VA + 16VA	1	1	1									2.5 x 3 x 2.5	3.51	1.59
HF5A3542A	150VA + 30VA				1	1	1						2.5 x 3 x 2.5	4.38	1.99
HF5A6196	300VA + 16VA							1	1	1	1	1	4.5 x 3.75 x 3.75	9.88	4.49
Cooling Fan															
4715PS22TB30	220V	3	3	3	1	1	2	1					4.75 x 4.75 x 1.5	1.14	0.52
2750MPT15	220V				2	2			2	2			5.5 x 5.5 x 2	2.35	1.07
6250MG1	220V						2	3	3	3	6	6	6.25 x 6.25 x 2.25	2.92	1.33
Fuse															
ATM1		1	1	1									0.5 x 0.5 x 1.5	0.02	0.01
ATM2					1	1	1	1	1	1	1	1	0.5 x 0.5 x 1.5	0.02	0.01
A60Q5-2		1	1	1	1	1	1	1	1	1	1	1	0.5 x 0.5 x 1.5	0.02	0.01
Fuse Holder															
30321		2	2	2	2	2	2	2	2	2	2	2	3 x 0.75 x 1.5	0.09	0.04
Thermal Switch															
OHD360B		1	1	1			1						1 x 0.5 x 0.5	0.00	0.00
OHD365B					1	1	1						1 x 0.5 x 0.5	0.00	0.00
OHD385B		1	1										1 x 0.5 x 0.5	0.00	0.00
OHD390B				1	1		1		1	1	2	2	1 x 0.5 x 0.5	0.00	0.00
OHD375B								1					1 x 0.5 x 0.5	0.00	0.00
OHD395B						1		1					1 x 0.5 x 0.5	0.00	0.00
OHD3100B											2	2	1 x 0.5 x 0.5	0.00	0.00
OHD3110B									2	2			1 x 0.5 x 0.5	0.00	0.00
Resistor															
RMP1607Y001001	23.5K Ohm 12W								2	2	2	2			
Thermal Block															
AYBN0281	600V 25A	1	1	1	1	1	1	1	1	1	1	1	4.5 x 1.5 x 1	0.19	0.09
TBM8	600V 200A	1	1	1	1	1							12.25 x 4 x 6	1.96	0.89
TBM10	600V 300A						1	1	1				12.5 x 4.5 x 3.5	22.1	0.96
AYBN0131	600V 15A				1	1		1					1.75 x 1.5 x 1	0.04	0.02
AYBN0141	600V 15A						1						2 x 1.5 x 1	0.06	0.03
Insulator															
RECL662U										9	9	9	2.25 x 1 x 2	0.37	0.17
Diode															
ERA3202	200V 1A								3	3	3	3	2.5 x 0.125 x 0.125	0.00	0.00
Zener Diode															
RD39FB	1W 3.9V								6	6	6	6	2.5 x 0.125 x 0.125	0.00	0.00

Catalog No.	Rating	Drive horsepower & quantity per drive											L" x W" x H"	Weight	
		35	40	50	60	75	100	125	150	200	250	300		lbs.	Kg.
AF-300E$ 460 VAC, 40 Hp and Above (continued)															
Keypad Assembly															
HF5A2685B		1	1	1	1	1	1	1	1	1	1	1	9.5 x 4.75 x 3.5	0.45	0.21
Keypad															
TPG9SUX		1	1	1	1	1	1	1	1	1	1	1	3 x 5 x 1	0.2046	0.09
Control Card															
EP3496G422		1											8 x 5.25 x 2	0.59	0.27
EP3496G430			1										8 x 5.25 x 2	0.59	0.27
EP3496G437				1									8 x 5.25 x 2	0.59	0.27
EP3496G445					1								8 x 5.25 x 2	0.59	0.27
EP3496G455						1							8 x 5.25 x 2	0.59	0.27
EP3496G475							1						8 x 5.25 x 2	0.59	0.27
EP3496G490								1					8 x 5.25 x 2	0.59	0.27
EP3496G4120									1				8 x 5.25 x 2	0.59	0.27
EP3496G4160										1			8 x 5.25 x 2	0.59	0.27
EP3496G4200											1		8 x 5.25 x 2	0.59	0.27
EP3496G4220												1	8 x 5.25 x 2	0.59	0.27
Base Driver & PS Card															
EP3563C1		1	1												
EP3563D2				1											
EP3515G1		1	1	1									8 x 5 x 1.5	1.17	0.53
EP3515G2					1	1							8 x 5 x 1.5	1.17	0.53
EP3531C1							1						8.25 x 5.5 x 1.5	1.21	0.55
EP3531C2								1					8.25 x 6.25 x 2.75	1.45	0.66
EP3603C1									1	1			8.25 x 6.25 x 2.75	1.45	0.66
EP3603C2											1	1	8.25 x 6.25 x 2.75	1.45	0.66
EP3603C3													8.25 x 6.25 x 2.75	1.45	0.66

Notes

Section 11: Glossary - Drives Terminology

The following are standard definitions of terms that are used when discussing adjustable frequency drives:

+BUS: +Bus is the portion of the DC bus that is at a positive potential.

-BUS: -Bus it the portion of the DC bus that is at a negative potential.

AC contactor: An alternating-current (AC) contactor is designed for the specific purpose of establishing or interrupting an AC power circuit.

Adjustable Speed: The concept of varying the speed of a motor, either manually or automatically. The desired operating speed (set speed) is relatively constant regardless of load.

Adjustable Speed Drive (Electrical): The adjustable speed drive is comprised of the motor, drive controller and operator's controls (either manual or automatic).

Ambient Temperature: Ambient temperature is the temperature of air, water or a surrounding medium where equipment is operated or stored.

Axis: A principal direction along which movement to the tool or workpiece occurs. The term axis also refers to one of the reference lines of a coordinate system.

Bandwidth: Generally, frequency range of system input over which the system will respond satisfactorily to a command.

Base Speed: Base speed is the manufacturer's nameplate rating where the motor will develop rated Hp at rated load and voltage. With DC drives, it is commonly the point where full armature voltage is applied with full rated field excitation. With AC systems, it is commonly the point where 60Hz is applied to the induction motor.

Bias: The steady state deviation of a controlled variable from a fixed setpoint.

Braking: Braking provides a means of stopping an AC or DC motor and can be accomplished in several ways:

A. Dynamic Braking (AC Drives) - Dynamic braking is accomplished by continuing to excite the motor from the drive. This causes a regenerative current to the drive's DC intermediate bus circuit. The dynamic brake resistors are then placed across the DC bus to dissipate the power returned. The brake resistor is usually switched by a transistor or other power switch controlled by the drive.

B. Regenerative Braking - Similar to dynamic braking, but is accomplished electronically. The generated power is returned to the line through the power converter. It may also be just dissipated as losses in the converter (within its limitations).

C. Squirrel-cage Motor Dynamic Braking - "DC Injection Braking" (This form is not the same as that noted for AC drives.) It is another form of braking which uses a control circuit that applies a dc voltage across the ac motor's stator windings at a set frequency point for a set duration of time. This type of braking results in a low amount of braking torque until the motor reaches a speed well below 50%. At a speed below 7 Hz the available braking torque increases sharply.

D. Motor Mounted or Separately Mounted Brake is a positive action, mechanical, friction device. Normal configuration is such that when the power is removed, the brake set is set. This can be used as a holding brake. (Note: A separately Mounted Brake is one which is located on some part of the mechanical drive train other than the motor.)

Breakaway Torque: The torque to start a machine from standstill. It is always greater than the torque needed to maintain motion.

Breakdown Torque: The AC motor maximum torque which is developed with rated voltage applied at rated frequency.

Bridge Rectifier: A full-wave rectifier that conducts current in only one direction. AC applied to the input results in approximate DC at the output.

Bridge Rectifier (Diode): A diode rectifier is a non-controlled full wave rectifier that produces a constant rectified DC voltage.

Closed Loop: Closed loop refers to a regulator circuit in which the actual value of the controlled variable (e.g. speed) is sensed and a signal proportional to this value (feedback signal) is compared with a signal proportional to the desired value (reference signal). The difference between these signals (error signal) causes the actual value to change in the direction that will reduce the difference in signals to zero.

Cogging: A condition in which a motor does not rotate smoothly but "steps" or "jerks" from one position to another during shaft revolution. Cogging is most pronounced at low motor speeds and can cause objectionable vibrations in the driven machine.

Commutation (Inverter): The process by which forward current is interrupted or transferred from one switching device to the other. In most circuits where power is supplied from an AC source, turn-on control is adequate and turn-off occurs naturally when the AC cycle causes the polarity across a given device to reverse.

Constant Horsepower Range: A range of motor operation where motor speed is greater than base rating of the motor, in the case of the ac motor operation usually above 60Hz where the voltage remains constant as the frequency is increased.

Constant Torque Range: A speed range in which the motor is capable of delivering a constant torque, subject to motor thermal characteristics. This essentially is when the inverter/motor combination is operating at constant volts/Hz.

Constant Voltage Range (AC Drives): The range of motor operation where the drive's output voltage is held constant as output frequency is varied. This speed range produces motor performance similar to a DC drive's constant horsepower range.

Constant Volts per Hertz (V/Hz): This relationship exists in AC drives where the output voltage is varied directly proportional to frequency. This type of operation is required to allow the motor to produce constant rated torque as speed is varied.

Continuous Duty (CONT): A motor that can continue to operate within the insulation temperature limits after it has reached normal operating (equilibrium) temperature.

Converter: The process of changing AC to DC. This is accomplished through use of a diode rectifier circuit. The term "converter" may also refer to the process of changing AC to DC to AC (e.g. adjustable frequency drive). A "frequency converter" such as that found in an adjustable frequency drive, consists of a Rectifier, a DC intermediate circuit, an inverter and a control circuit.

Current Limiting: An electronic method of limiting the maximum current available to the motor. This is adjustable so that the motor's maximum current can be controlled. It can also be preset as a protective device to protect both the motor and control from extended overloads.

Damping: Damping is the reduction in amplitude on an oscillation in the system.

Dead Band: The range of values through which a system input can be changed without causing a corresponding change in system output.

Deviation: Difference between an instantaneous value of a controlled variable and the desired value of the controlled variable corresponding to the set point. Also called error.

di/dt: The rate of change in current versus a rate of change in time. Line reactors and isolation transformers can be used to provide the impedance necessary to reduce the harmful effects that unlimited current sources can have on phase controlled rectifiers (SCR).

Diode: A device that passes current in one direction, but blocks current in the reversed direction.

Drift: Drift is the deviation from the initial set speed with no load change over a specific time period. Normally the drive must be operated for a specified warm-up time at a specified ambient temperature before drift specifications apply. Drift is normally caused by random changes in operating characteristics of various control components.

Drive Controller: (Variable Speed/Frequency Drive) An electronic device that can control the speed, torque, horsepower and direction of an AC motor.

dv/dt: The rate of change in voltage versus a rate of change in time. Specially designed resistor-capacitor networks can help protect the diodes from excessive dv/dt which can result from line voltage spikes, line disturbances and circuit configurations with extreme forward conducting or reverse blocking requirements.

Dwell: The time spent in one state before moving to the next. In motion control applications for example, a dwell time may be programmed to allow time for a tool change or part clamping operation.

Duty Cycle: The relationship between the operating and rest times or repeatable operation at different loads.

Eddy Current: Currents induced in motor components from the movement of magnetic fields. Eddy currents produce waste heat and are minimized by lamination of the motor poles and armature.

Efficiency: Ratio of mechanical output to electrical input indicated by a percent. In motors, it is the effectiveness with which a motor converts electrical energy into mechanical energy and electrical drives the effectiveness with which the drive converts electrical power into adjustable frequency operation at various operating points.

EMF: The initials of 'electromotive force' which is another term for voltage or potential difference.

Enable: To allow an action or acceptance of data by applying an appropriate signal to the appropriate input.

Enclosure: Enclosure refers to the housing in which the control is mounted. Enclosures are available in designs for various environmental conditions.

Encoder: An electromechanical transducer that produces a serial or parallel digital indication of mechanical angle or displacement. Essentially, an encoder provides high resolution feedback data related to shaft position and is used with other circuitry to indicate velocity and direction. The encoder produces discrete electrical pulses during each increment of shaft rotation.

Error: Difference between the set point signal and the feedback signal. An error is necessary before a correction can be made in a controlled system.

Feedback: The element of a control system that provides an actual operation signal for comparison with the set point to establish an error signal used by the regulator circuit.

Filter: A device that passes a signal or a range of signals and eliminates all others.

Floating Ground: A circuit whose electrical common point is not at earth ground potential or the same ground potential as circuitry it is associated with. A voltage difference can exist between the floating ground and earth ground.

Flux: The electro-magnetic field created by passing current through a conductor. For motors, the magnetic field created by energizing the motor windings.

Flux Vector: The mathematical represenation of flux indicating both filed strength and orientation.

Force: The tendency to change the motion or position of an object with a push or pull.

Four-Quadrant Operation: The four combinations of forward and reverse rotation and forward and reverse torque of which a regenerative drive is capable. The four combinations are:

1. Forward rotation/forward torque (motoring)

2. Forward rotation/reverse torque (regeneration)

3. Reverse rotation/reverse torque (motoring)

4. Reverse rotation/forward torque (regeneration)

Full-Load Torque: The full-load torque of a motor is the torque necessary to produce rated horsepower at full-load speed.

GTO: Gate turn-off power semiconductor device.

Harmonics: A sinusoidal component of a periodic wave or quantity having a frequency that is an integral multiple of the fundamental frequency.

Head: A measurement of pressure, usually in feet of water.

Horsepower: A measure of the amount of work that a motor can perform in a given period of time. Refer to power for KW equivalent.

Hunting: Undesirable fluctuations in motor speed that can occur after a step change in speed reference (either acceleration or deceleration) or load.

Hysteresis Loss: The resistance offered by materials to becoming magnetized results in energy being expended and corresponding loss. Hysteresis loss in a magnetic circuit is the energy expended to magnetize and demagnetize the core.

IGBT (Insulated Gate Bi-polar Transistor): Semi-conductor devices used for power circuits that are capable of high power output that operate at carrier frequencies of 20KHz or more. IGBT's have a faster rate of rise resulting in high di/dt that occurs when the device is turned off.

Induction Motor: An alternating current motor in which the primary winding on one member (usually the stator) is connected to the power source. A secondary winding on the other member (usually the rotor) carries the induced current. For a squirrel cage induction motor there is no physical electrical connection to the secondary winding, it's current is induced.

Interposing Relay: A relay that accepts control signals of one logic level in order to provide isolated contact signals in a circuit operating a different logic level.

Inertia: A measure of a body's resistance to changes in velocity, whether the body is at rest or moving at a constant velocity. The velocity can be either linear or rotational. The moment of inertia (WK^2) is the product of the weight (W) of an object and the square of the radius of gyration (K^2). The radius of gyration is a measure of how the mass of the object is distributed about the axis of rotation. WK^2 is usually expressed in units of $lb\text{-}ft^2$.

Instability: A situation where the output of a system does not track the input. For closed loop systems, the control system error is either increasing or oscillating.

Intermittent duty (INT): A motor that never reaches equilibrium temperature (equilibrium), but is permitted to cool down between operations. For example, a crane, hoist or machine tool motor is often rated for 15 or 30 duty.

Inverter: A term commonly used for an AC adjustable frequency drive. An inverter is also a term used to describe a particular section of an AC drive. This section uses the DC voltage from a previous circuit stage (Intermediate DC circuit) to produce an AC current or voltage having the desired frequency.

Isolation Transformer: A transformer that electrically separates the drive from the AC power line. An isolation transformer provides the following advantages:

1. It guards against inadvertent grounding of plant power lines through grounds in the drive.

2. Enhances protection of semiconductors from line voltage transients.

3. Reduces disturbances from other solid state control equipment such as Drives without isolation transformers, time clock systems, electronic counters, etc.

Jogging: Jogging is a means of accomplishing momentary motor movement by repetitive closure of a circuit using a single pushbutton or contact element.

Kinetic Energy: The energy of motion possessed by a body.

Linearity: A measure of how closely a characteristic follows a straight line function.

Linear Acceleration/Deceleration: A circuit that controls the rate at which the motor is allowed to accelerate to a set speed or decelerate to zero speed. On most drives, this circuit is adjustable and can be set to accommodate a particular application.

Locked-Rotor Current: Steady state current taken from the line with the rotor at standstill (at rated voltage and frequency). This is the current when starting the motor and load.

Locked-Rotor Torque: The minimum torque that a motor will develop at rest for all angular positions of the rotor (with rated voltage applied at rated frequency).

Mechanical Safe Speed: Defined by the operating limits of the driven equipment being controlled by the adjustable frequency drive which should not be exceeded. The manufacture's specification is to be followed carefully.

Megger Test: A test used to measure an insulation system's resistance. This is usually measured in megohms and tested by passing a high voltage at low current through the motor windings and measuring the resistance of the various insulation systems.

Negative Feedback: A condition where feedback is subtractive to the input reference signal. Negative feedback forms the basis for automatic systems.

NEC: The National Electric Code is recommendations of the National Fire Protection Association and is revised every three years. City or state regulations may differ from code regulations and take precedence over NEC rules.

NEMA: The National Electrical Manufacturers Association is a non-profit organization organized and supported by manufacturers of electrical equipment and supplies. Some of the standards NEMA specifies are: Hp ratings, speeds, frame sizes and dimensions, torques and enclosures.

Open Loop: A control system that lacks feedback.

Operating/Service Deviation: A means of specifying the speed regulating performance of a drive controller generally in percent of base speed.

Operating Deviation defines speed change due to load change and typically assumes:

1. A change from one steady state load value to another (not transient).

2. A 95% maximum load change.

Service Deviation defines speed change due to changes in ambient conditions greater than typical variations (Noted in basic AFD unit's specification.

Overload Capacity: The ability of the drive to withstand currents beyond the systems continuous rating. It is normally specified as a percentage of full load current for a specified time period. Overload capacity is defined by NEMA as 150% of rated full load current for one minute.

Overshoot: The amount that a controlled variable exceeds desired value after a change of input.

Plugging: Plugging refers to a type of motor braking provided by reversing either line voltage polarity or phase sequence so that the motor develops a counter-torque which exerts a retarding force to brake the motor.

PCC (Point of Common Coupling): Defined as the electrical connecting point or interface between the utility distribution system and the customer's or user's electrical distribution system. The selection of the PCC within the system is often done by the utility.

Position Transducer: An electronic device (e.g. encoder or resolver) that measures actual position and converts this measurement into a feedback signal convenient for transmission. This signal may then be used as an input to a programmable controller which controls the parameters of the positioning system.

Positive Feedback: Positive feedback is a condition where the feedback is additive to the input signal. This generally results in an unstable system.

Power: Work done per unit of time. Measured in horsepower or watts:1 Hp = 33,000 ft-lbs. = 746 Watts.

Power Factor: A measurement of the time phase difference between the voltage and current in an AC circuit. It is represented by the cosine of the angle of this phase difference. Power Factor is the ratio of Real Power (kW) to total kVA or the ratio of actual power (W) to apparent power (voltamperes).

Displacement Power Factor: The displacement component of power factor; the ratio of the active power of the fundamental wave, in watts, to the apparent power of the fundamental wave, in voltamperes.

Total Power Factor: The ratio of the total power input, in watts, to the total voltampere input to the converter. The power factor is determined at the ac line terminals of the converter.

Distortion Factor: The ratio of the root-mean-square of the harmonic content to the root-mean-square value of the fundamental quantity, expressed as a percent of the fundamental.

Preset Speed: Preset speed refers to one or more fixed speeds at which the drive will operate.

PLC (Programmable Logic Controller): Solid-state control logic for machines and processes where a sequence of operations can be changed easily with programming (software).

Pull-up Torque: The torque required to accelerate the load from standstill to full speed (where breakdown torque occurs), expressed in percent of running torque. It is the torque required not only to overcome friction, windage and product loading but also to overcome the inertia of the machine. The torque required by a machine may not be constant after the machine has started to turn. This load type is characteristic of fans, centrifugal pumps and certain machine tools.

PWM (Pulse Width Modulated): A type of AC adjustable frequency drive that accomplishes frequency and voltage control at the output section (inverter) of the drive. The drive's output voltage is always a constant amplitude and by "chopping" (pulse width modulating) the average voltage is controlled.

Reactance: Any force that opposes changes in current voltage. The inertia of electrons causes them to oppose sudden changes in current flow or voltage.

Rectifier: A device that transforms alternating-current to direct-current.

Regeneration: The characteristic of a motor to act as a generator when the rotor synchronous frequency is greater than the applied frequency.

Regenerative Braking: The technique of slowing or stopping a drive by regeneration.

Regenerative Control: A regenerative drive contains the inherent capability and/or power semi-conductors to control the flow of power to and from the motor.

Regulation: The ability of a control system to hold a speed once it has been set. Regulation is given in percentages of either base speed or set speed. Regulation is rated upon two separate sets of conditions:

A. Load Regulation (speed regulation) is the percentage of speed change with a defined change in load. Assuming all other parameters to be constant.

B. Line Regulation is the percentage of speed change with a given line voltage change, assuming all other parameters to be constant.

Resolution: The smallest distinguishable increment into which a quantity can be divided (e.g. position or shaft speed). It is also the degree to which nearly equal values of a quantity can be discriminated. For encoders, it is the number of unique electrically identified positions occurring in 360 degrees of input shaft rotation.

SCR (Silicon Control Rectifier): A solid state device that has an anode, a cathode, and gate which controls when it allows conduction.

Service Factor: When used on a motor nameplate, a number which indicates how much above the nameplate rating a motor can be loaded without causing serious degradation (i.e. A motor with 1.15 S.F. can produce 15% greater torque than one with 1.0 S.F.). When used in applying motors or gearmotors, it is a figure of merit which is used to adjust measured loads in an attempt to compensate for conditions which are difficult to measure or define.

Set Speed: The desired operating speed.

Shock Load: The load seen by a clutch, brake or motor in a system which transmits high peak loads. This type of load is present in crushers, separators, grinders, conveyors, winches and cranes.

Slewing: Slewing is an incremental motion of the motor shaft or machine table from one position to another at maximum speed without losing position control.

Slip: The difference between rotating magnetic field speed (synchronous speed) and rotor speed of AC induction motors. Usually expressed as a percentage of synchronous speed.

Speed Range: The speed minimum and maximum at which a motor must operate under constant or variable torque load conditions. A 10:1 speed range for a motor with top speed of 1800 RPM means the motor must operate as low as 180 RPM and still remain within regulation specifications. Controllers are capable of wider controllable speed ranges than motors because there is no thermal limitation, only electrical. Controllable speed range of a motor is limited by the ability to deliver 100% torque below base speed without additional cooling.

Speed Regulation: The numerical measure in percent, of how accurately the motor speed can be maintained. It is the percentage of change in speed between full load and no load.

Stability: The ability of a drive to operate a motor at constant speed (under varying load), without "hunting" (alternately speeding up and slowing down). It is related to both the characteristics of the load being driven and electrical time constants in the drive regulator circuits.

Surge Protection: The process of absorbing and clipping voltage transients on an incoming AC line or control circuit. MOV's (Metal Oxide Varistors) and specially designed R-C networks are usually used to accomplish this.

Synchronous Speed: The speed of an AC induction motor's rotating magnetic field. It is determined by the frequency applied to the stator and the number of magnetic poles present in each phase of the stator windings. Mathematically, it is expressed as: Sync Speed (RPM) = 120 X Applied Freq. (Hz)/Number of poles per phase.

Tachometer - Generator (Tach): A small generator normally used as a rotational speed sensing device. Tachometers are typically, coupled to the shaft of DC or AC motor requiring close speed regulation. The tach feeds a signal to a controller which then adjusts the output voltage or frequency to the motor. This feedback signal can be either an analog DC signal (V/RPM) or digital (pulses/Revolution).

Thread Speed: A fixed low speed, usually adjustable, supplied to provide a convenient method for loading and threading machines. May also be called a preset speed.

Torque: A turning force applied to a shaft, tending to cause rotation. Torque is normally measured in ounce-inches or pound-feet and is equal to the force applied, times the radius through which it acts.

Torque Constant (in-lbs): This motor parameter provides a relationship between input current and output torque. For each ampere of current applied to the rotor, a fixed amount of torque will result.

Torque Control: A method of using current limit circuitry to regulate torque instead of speed.

Transducer: A device that converts one energy form to another (e.g. mechanical to electrical). Also, a device that when actuated by signals from one or more systems or media can supply related signals to one or more other systems or media.

Transient: A momentary deviation in an electrical or mechanical system.

Transistor: A solid-state three-terminal device that allows amplification of signals and can be used for switching and control. The terminals are called the emitter, base and collector.

Vector: A quantity that has magnitude, direction and sense. This quantity is commonly represented by a directed line segment whose length represents the magnitude and worse orientation in space represents the direction.

VVI: A type of AC adjustable frequency drive that controls the voltage and frequency of the motor to produce variable speed operation. A VVI type drive controls the voltage in a section other than the output section where frequency generation takes place. The frequency control is accomplished by an output bridge circuit which switches the variable voltage to the motor at the desired frequency.

X-Axis: The axis of motion that is always horizontal and parallel to the work holding surface.

Y-Axis: The axis of motion that is perpendicular to both the X and Z axes.

Z-Axis: The axis of motion that is always parallel to the principal spindle of the machine.

Section 12: Electromagnetic Compatibility (CE Mark)

General

In accordance with the provisions described in the European Commission Guidelines Document on Council Directive 89/336/EEC GE Fuji had chosen to classify the AF-300E$ range of drives as “Complex Components”. Classification as a “Complex Components” allows a product to be treated as an “apparatus”, and thus permits compliance with the essential requirements of the EMC Directive to be demonstrated to both an integrator of AF-300E$ drives. AF-300E$ drives up to 30 Hp 400V series are supplied “CE-marked”, signifying compliance with EC Directive 89/336/EEC when fitted with specified filter units installed and grounded in accordance with this sheet. This Specification requires the following performance criteria to be met.

Immunity : EN50082-2

Emissions : EN50081-1

RFI Filters

It is strongly recommended that the appropriate AF-300E$ input filter is used, as shown in the followings, to limit RF current flowing into the main AF-300E$ supply circuit. Without an input filter a AF-300E$ installation may not meet statutory requirement. AF-300E$ drives contain high-power semiconductor devices which are switched at high speeds to synthesize a near-sinusoidal current wave form across the frequency range of output. Rapidly-changing voltages and currents will generate some degree of electromagnetic emission. Emissions will be predominantly conducted through the motor and the mains supply cables, although some radiated emissions will be detected in close proximity to the drive system. It is essential that precautions are taken both at the design stage and at the time installation to prevent radio-frequency interference (RFI) from the drive system affecting sensitive equipment in close proximity.

The RFI filters range are designed especially for the AF-300E$ drive and help to ensure EMC compliance of machinery and installations using the drive. The drives may be mounted on top of the filter using the integral fixing positions, the intention being that valuable space inside wiring cabinets may be saved.

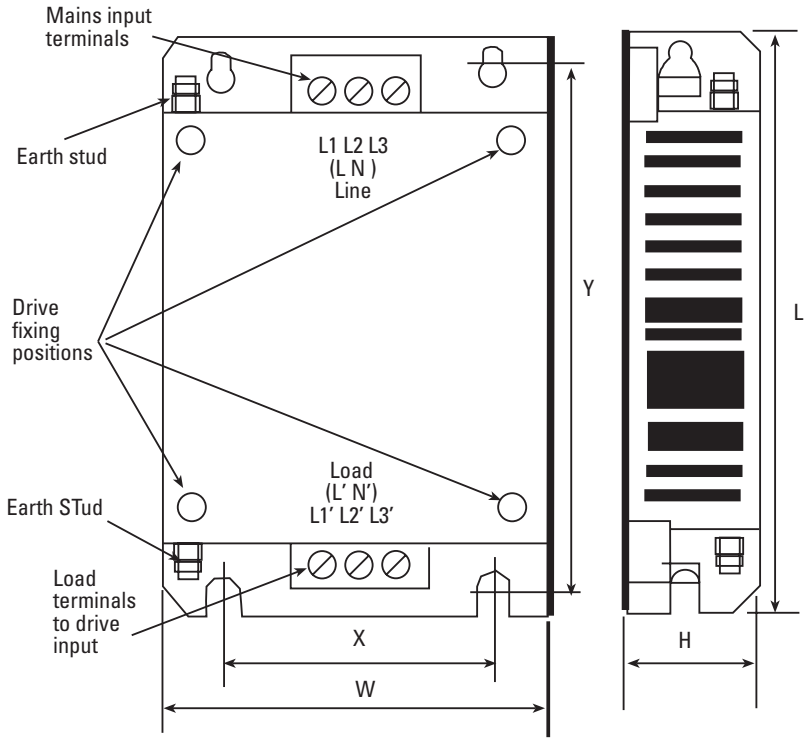


Figure 12-1: RFI Filters

Table 12-1 RFI filter dimensions **Conforms to EN55011 Class B**

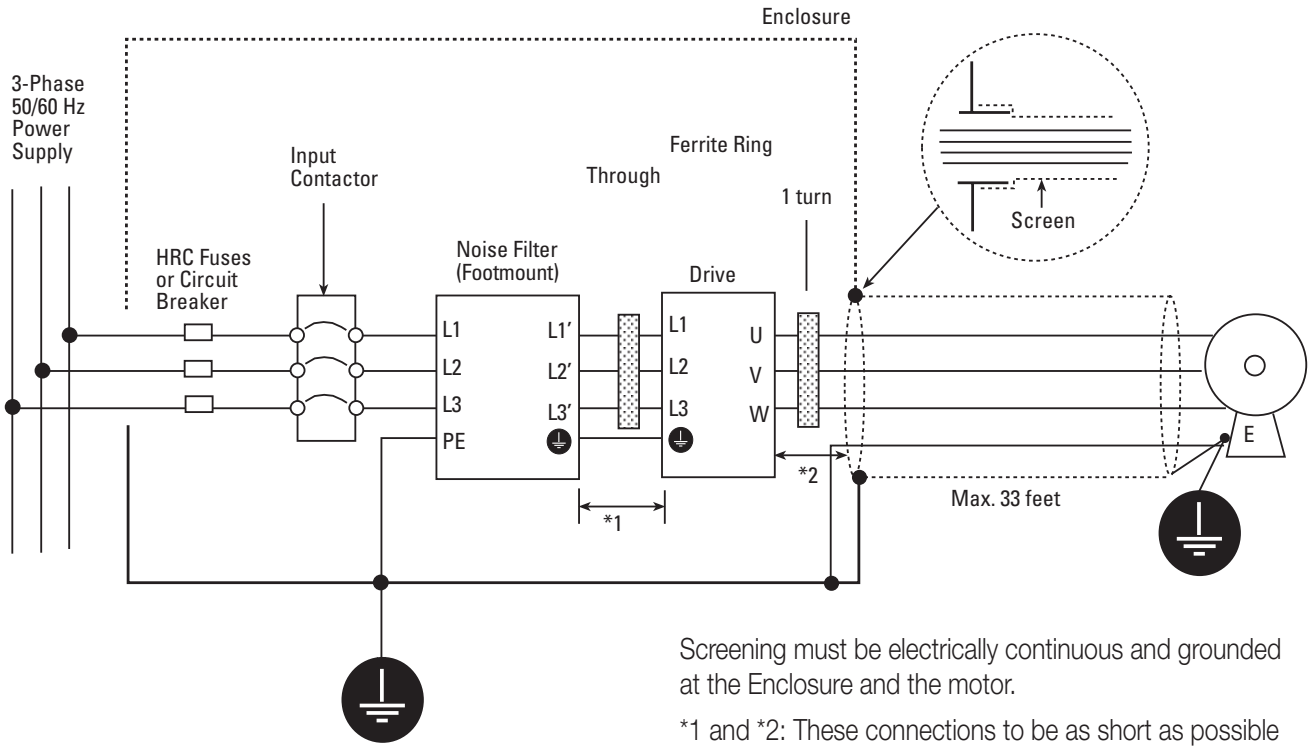
Filter Part No.	Applied Drive	Rated Current	Max. Rated Voltage	Dimension L x W x H inches (mm)	Mounting Dim. X, Y inches (mm)	Drive Fixing	Required Sub Filter
EFL-1.5 G9-4	6KE$243001X1B1 6KE$243002X1B1	5.5A	3-phase 415 VAC	12.2 x 6.1 x 1.8 (310 x 155 x 45)	4.1 x 11.6 (105 x 295)	M5 x 12 (4)	Ferrite Ring OC1 (2)
EFL-4.0 G9-4	6KE$243003X1B1 6KE$243005X1B1	12A		12.2 x 6.1 x 1.8 (310 x 155 x 45)	4.1 x 11.6 (105 x 295)	M5 x 12 (4)	
EFL-7.5 G9-4	6KE$243007X1B1 6KE$243010X1B1	35A		13.0 x 8.9 x 1.8 (330 x 225 x 45)	6.6 x 12.2 (167 x 310)	M8 x 16 (4)	Ferrite Ring OC2 (2)
EFL-15 G9-4	6KE$243015X1B1 6KE$243020X1B1	50A		18.9 x 9.8 x 2.6 (480 x 250 x 65)	7.3 x 17.8 (185 x 450)	M8 x 16 (4)	
EFL-22 G9-4	6KE$243025X1B1 6KE$243030X1B1	72A		18.9 x 9.8 x 2.6 (480 x 250 x 65)	7.3 x 17.8 (185 x 450)	M8 x 16 (4)	

12-001

Recommended Installation Instructions

It is necessary that to conform to EMC Directive, these instructions must be followed. Follow the usual safety procedures when working with electrical equipment. All electrical connections to the filter, drive and motor must be made by a qualified electrical technician. (Refer to Figure 12-2 and Figure 12-3.)

1) Check the filter rating label to ensure that the current, voltage rating and part number are correct.
2) The back panel of the wiring cabinet of board should be prepared for the mounting dimensions of the filter. Care should be taken to remove any paint etc. from the mounting holes and face area around the hole of the panel. This will ensure the best possible grounding of the filter.
3) The filter should then be securely mounted in position, and the drive mounted to the front of the filter with the screws provided.
4) Connect the incoming mains supply to the filter terminals marked “LINE” and ground cables to the ground stud provided. Fit the Input Ferrite Ring, then connect the filter terminals marked “LOAD” to the mains input of the drive using a short length of appropriate gauge wire.
5) Fit the Output Ferrite Ring as close to the drive as possible and connect the motor. Armored or screened cable should be used with the 3 phase conductors only passing twice through the center of the Output Ferrite Ring. The ground conductor should be securely grounded at both grand terminal in the cabinet and motor ends. The screen should be connected to enclosure.
6) It is important that all lead lengths are kept as short as possible and that incoming mains and outgoing motor cables are kept well separated.
7) Segregate power cables from control wiring as much as possible, and avoid parallel cable runs to minimize “noise coupling”. Whenever runs of power and control cable must cross, try to achieve this at right angles.
8) AF-300E$ drives should be installed, and are designed to operate, within an electrically-shielded metal enclosure.



Screening must be electrically continuous and grounded at the Enclosure and the motor.

*1 and *2: These connections to be as short as possible and ground conductor to be as thick as possible.

Figure 12-2: Recomended Installation

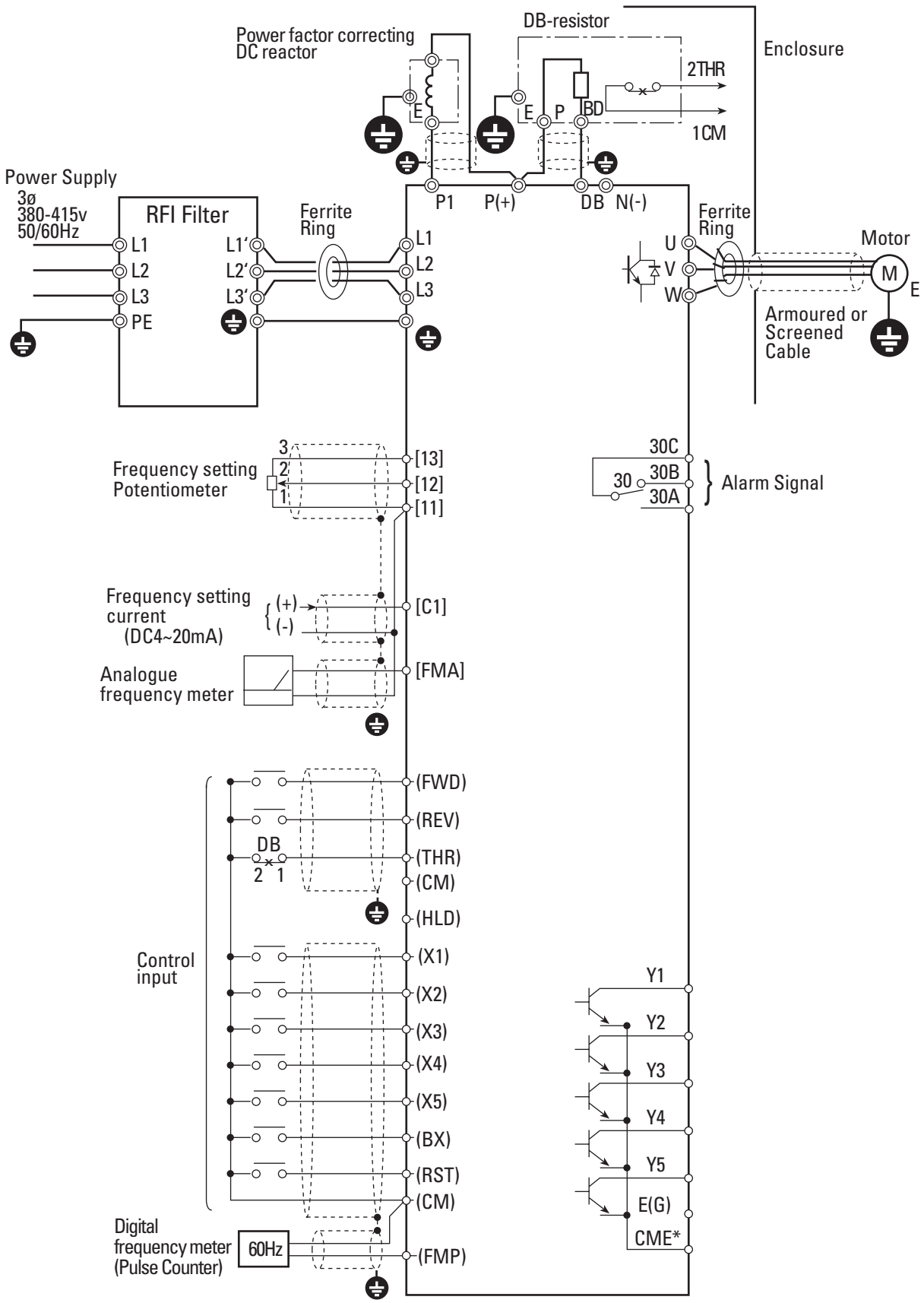


Fig.12-3: Recommended installation detail inside the enclosure

EC Declaration of Conformity

We GE Fuji Drives declare under our sole responsibility that the following products

Product Identification

- Product: AC Drive
- Brand: GE Fuji Drives
- Model/Type: 6KE$243001X1B1 to 6KE$243030X1B1

to which this declaration relates is in conformity with the EMC requirements of the following standard(s):

Immunity: EN50082-2 “Generic immunity standard Part 2 (Industrial environment)”

Emission: EN50081-1 “Generic emission standard Part 1 (Residential, commercial and light industrial)”
and conforms to the protection requirements of Council Directive:
89/366/EEC
relating to Electromagnetic Compatibility.

When: Wired and grounded with the installation instructions.
Installed within a steel enclosure.
Used in conjunction with power input filter and ferrite rings which are recommended by GE Fuji Drives.

EC Declaration of Conformity

We GE Fuji Drives declare under our sole responsibility that the following products

Product Identification

- Product: AC Drive
- Brand: GE Fuji Drives
- Model/type: 6KE$243001X1B1 to 6KE$243030X1B1

to which this Declaration relates is in conformity with the Low Voltage requirements of the following standard(s):

DIN VDEO160/1988

Category: Over voltage category 2/Pollution degree 2

and conforms to the protection requirements of Council Directive :

73/23/EEC

relating to low voltage.

When : Wired and grounded in accordance with the installation instructions.
Installed within a steel enclosure satisfied “Pollution degree 2”.
Used in conjunction with 3 AC power supply (Line) which is recognized “Over voltage category 2” and has a grounded neutral-point.

Notes

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