YASKAWA

E7B Drive / Bypass System with TouchPad Control Panel (option T or Y) Control Wiring and Start-up Procedure

Model: E7B_ _ _T and E7B_ _ _Y **Document Number: IG.E7B.02**

Introduction

The E7B 3 Contactor Bypass unit with the (T) option (E7B_ _ _T) is for single motor operation with Hand/Off/Auto touchpad control and an LED Drive keypad display.

The E7B 3 Contactor Bypass unit with the (Y) option (E7B_ _ _Y) is for single motor operation with Hand/Off/Auto touchpad control and an LCD multi line keypad display.

Control Wiring

◆ Bypass Field Control Wire Landing

The Bypass field control wiring is terminated on the control PCB A2, Terminal blocks TB1 through TB5. The terminal designations are labeled on the enclosure, adjacent to PCB A2 (see Figure 1.1).

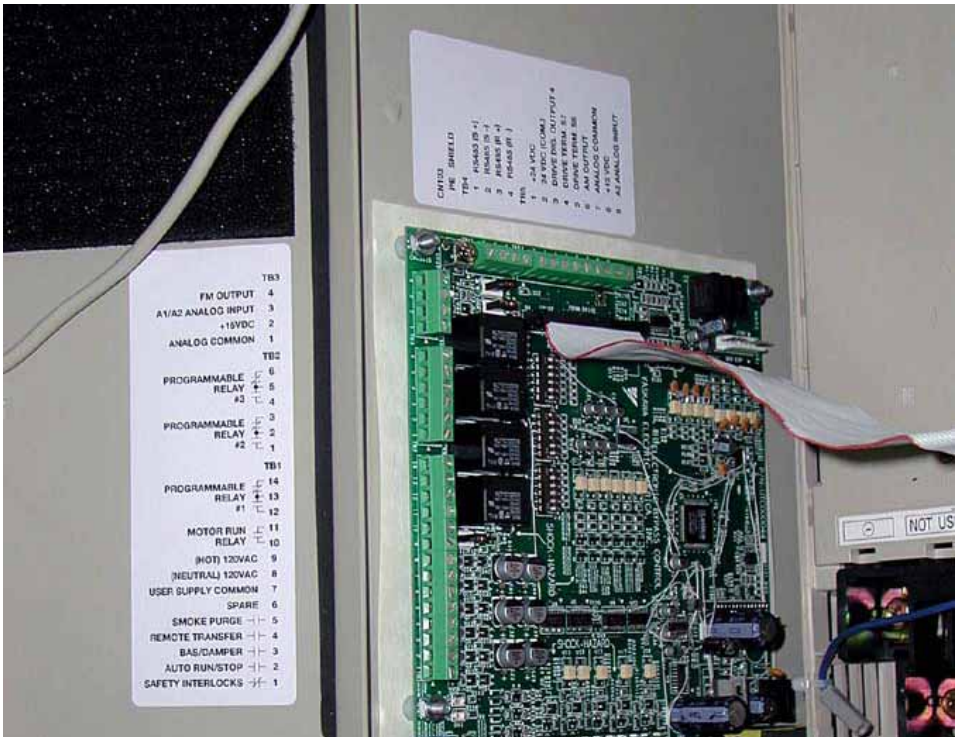


Fig 1.1 TB1 Control Terminal Locations, All Models

◆ Annunciation Contacts

Contacts for customer use are provided and wired to TB1 and TB2 as follows for use as annunciators of Bypass unit operation. All are 5 amp at 120 VAC contacts.

Table 1.1 Output Relays - Factory Defaults

Function	Name (E7L-00)	Terminal Block	Terminals	Type
Motor Run	Motor Run *	TB1	10-11	Form A
Hand Mode	Relay 1 @	TB1	12-13-14	Form C
Auto Mode	Relay 2 @	TB2	1-2-3	Form C
System Fault	Relay 3 @	TB2	4-5-6	Form C

* = Dedicated
@ = Programmable

Programmable Output Relays 1, 2 and 3 may be re-programmed via DIP switches S2 and S3 on the Bypass Control PCB A2. These relays provide form C “dry contacts” for customer use in annunciation to Building Automation Systems or general duty in other control logic circuits. Each contact is rated for 5 amps at 120 VAC.

The additional programmable output relay functions are described in the table below:

Table 1.2 Programmable Output Relay Functions

Function	Description	Factory Default
Bypass Run	Annunciates running in Bypass mode	No
Damper Actuator	Intended to close a contact in a damper actuator circuit whenever the motor is running (operation similar to the dedicated “Motor Run” relay)	No
Auto Transfer	Annunciates automatic transfer to Bypass operation due to a Drive fault	No
Drive Run	Annunciates running in Drive mode	No
Serial Com Run	Annunciates that the run command is coming from serial communications	No
Hand Mode	Annunciates that the Drive or Bypass is being operated in Hand (local) mode	Relay 1
Auto Mode	Annunciates that the Drive or Bypass is being operated in Auto (remote) mode	Relay 2
System Fault	Annunciates that a Drive, motor overload or control circuit fault has occurred	Relay 3

See Table 1.3 for DIP switch positions required to achieve these functions.

Table 1.3 DIP Switch Settings for Output Relay Functions

No.	Function	Programmable Relay 1			Programmable Relay 2			Programmable Relay 3			Active*	Function Description
		S2(6)	S2(5)	S2(4)	S3(3)	S3(2)	S3(1)	S3(6)	S3(5)	S3(4)		
1	Bypass Run	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ENERGIZED	Running in Bypass mode
2	Damper Coil	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	ON	ENERGIZED	Damper actuator activation
3	Auto Transfer	OFF	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	ENERGIZED	Auto-Transfer is active
4	Drive Run	OFF	ON	ON	OFF	ON	ON	OFF	ON	ON	ENERGIZED	Drive is in the Run mode
5	Serial Com. Run	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	ENERGIZED	Serial Comm. Run command
6	Hand Mode	ON	OFF	ON	ON	OFF	ON	ON	OFF	ON	ENERGIZED	Manual mode operation
7	Auto Mode	ON	ON	OFF	ON	ON	OFF	ON	ON	OFF	ENERGIZED	Auto mode operation
8	System Fault	ON	ON	ON	ON	ON	ON	ON	ON	ON	DEENERGIZED	Drive, motor or control fault
Factory Settings		ON	OFF	ON	ON	ON	OFF	ON	ON	ON		

* Active = Relay condition during function

◆ Building Automation system Run/Stop circuit:

A control terminal block position (TB1, terminals 2 and 9) is provided to connect the Normally Open (NO) Run/Stop contact from a BAS or other remote controller for auto mode control.

There must be continuity between these terminals in order for the motor to run, in auto mode.

◆ Safety Interlock Circuit:

A control terminal block position (TB1, terminals 1 and 9) is provided to connect the series circuit of Normally Closed (NC) safety devices such as: freeze up thermostats, smoke/fire sensors, high pressure limits, temperature limits or vibration detectors.

On power up the E7B_ _ _T or E7B_ _ _Y will display a red “Safety Open” LED in the “System Status” area of the front control panel if a normally closed “Safety Circuit” has not been installed between TB1-1 and TB1-9 on PCB A2. This condition will prevent Drive or Bypass operation.

1 of 3 items needs to be done before the motor can be started:

1) Install a NC “Safety Circuit” between TB1-1 and TB1-9 on PCB A2.

2) Install a jumper between TB1-1 and TB1-9 on PCB A2. This method should be used if a “Safety Circuit” will be added later in the installation.

3) De-activate these terminals by moving DIP switch S2-7 to the ON position (toward the enclosure door). This solution is only suggested if a “Safety Circuit” will <u>never</u> be applied to the drive system.

◆ Building Automation System Interlock Circuit (Drive and Bypass enable input):

A control terminal block position (TB1, terminals 3 and 9) is provided to connect Normally Open (NO) enabling contacts such as: damper end switches or occupied cycle timers.

When a Run command is received in HAND or AUTO mode, the E7B_ _ _T or E7B_ _ _Y will display a red “Damper/BAS” LED in the “System Status” area of the front control panel. This condition will prevent Drive or Bypass operation.

1 of 3 items needs to be done before the motor can be started:

1) Install a “BAS Interlock Circuit” between TB1-3 and TB1-9 on PCB A2.

2) Install a jumper between TB1-3 and TB1-9 on PCB A2. This method should be used if a “BAS Interlock Circuit” will be added later in the installation.

3) De-activate these terminals by moving DIP switch S2-8 to the ON position (toward the enclosure door). This solution is only suggested if a “Safety Circuit” will <u>never</u> be applied to the drive system.

◆ Analog Inputs

The Drive has two analog input terminals for use as auto mode speed command (terminals A1 & A2) and feedback (terminal A2) input.

Table 1.4 Drive Analog Input Terminals	
Terminal	Signal Level
A1	0 to 10 VDC
A2	4 to 20 mA or 1 to 10 VDC (programmable via parameter H3-08 and DIP switch S1-2)

■ Control Circuit Analog Input Terminals on PCB A2

All control inputs are landed on TB1 through TB5 on PCB A2.

TB3-3 is an analog input terminal and may be connected to either Drive terminal A1 or Drive Terminal A2, to maximize input flexibility, using DIP switches S1-3 and S1-4. The factory default is TB3-3 connected to Drive terminal A2. With this connection, the input signal level can be either 0 to 10 VDC or 4 to 20 mA. The signal level selection is controlled by DIP switch S1-2 and Drive parameter H3-08.

TB5-9 is also an analog input terminal, it is always connected to Drive terminal A2.

See Table 1.5, Figure 1.2 and Schematic Diagram E7B-10 for clarification of the analog input configuration and applications.

Table 1.5 Analog Input - Auto Mode								
	DIP Switches			Drive Param. H3-08	Drive Terminal Connected	Applications		
	S1-2	S1-3	S1-4			Speed Command	Feedback	Diff. Feedback
TB3-3 Signal Level								
0 to 10 VDC	N/A	OFF	ON	N/A	TB3-3 to A1	X	X	X
4 to 20 mA	ON	ON	OFF	2	TB3-3 to A2	X	X	
0 to 10 VDC	OFF	ON	OFF	0	TB3-3 to A2	X	X	
TB5-9 Signal Level								
4 to 20 mA	ON	N/A	N/A	2	TB5-9 to A2	via 3-15 Transducer		
0 to 10 VDC	OFF	N/A	N/A	0	TB5-9 to A2			X

■ Analog Input PCB A2 Configuration

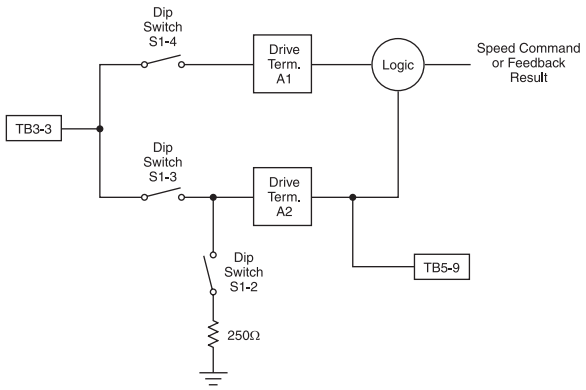


Fig 1.2 Analog Input PCB A2 Configuration

■ Analog Input (Drive Speed Control Circuit) Wiring

Keep this lead length as short as possible (50 m max.) to maintain signal quality. Insulated twisted shielded pair wire (2 conductor # 18 ga, Belden 8760 or equivalent) is required. Do not run these wires in the same conduits as other AC power or control wires. The shield must be connected on this end only, stub and isolate the other end. The signal employed is 4 to 20 mA with parameter H3-08 set for “2: 4 - 20 mA”. For 0 to 10 VDC, parameter H3-08 is set for “0: 0 - 10 VDC” and the control PCB DIP switch S1-2 must be in the OFF position.

When setting speed commands from an external speed potentiometer (and not from a Digital Operator), use shielded twisted-pair wires and ground the shield to terminal PE, as shown in Figure 1.3. Terminal numbers and wire sizes are shown in Table 1.11.

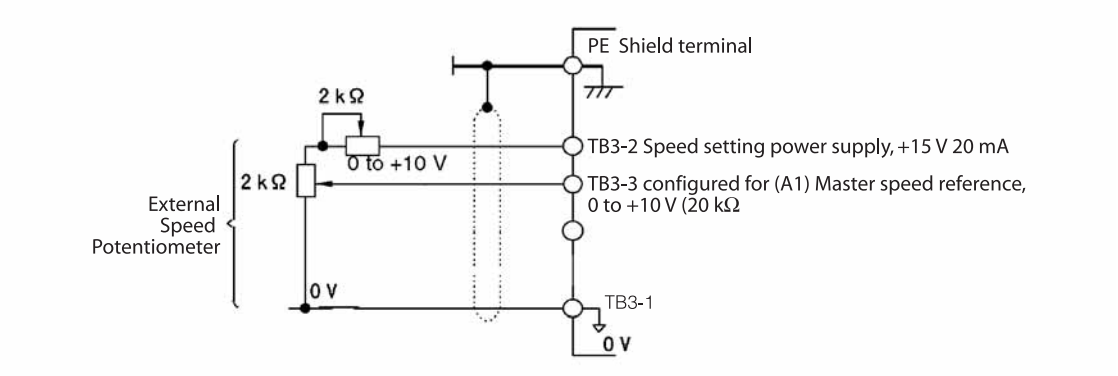


Fig 1.3 Analog Input Terminal Configuration

◆ Analog Outputs

Two analog outputs are provided, both can be configured for a signal level of 0 to 10 VDC or 4 to 20 mA. The signal level is controlled by the position of jumpers J2 and J3 on Control PCB A2 and by the values selected for Drive parameters H4-07 and H4-08.

■ Configuring the Analog Outputs:

Table 1.6 Analog Outputs

Terminals			Jumper Position		Drive		
Analog Output	AC Common	Signal Level	J2	J3	Terminal *	Parameter H4-07	Parameter H4-08
TB3-4	TB3-1	4-20 mA	1-2	N/A	FM	2: 4-20 mA	N/A
TB3-4	TB3-1	0-10 VDC	2-3	N/A	FM	0: 0-10 V	N/A
TB5-6	TB5-7	4-20 mA	N/A	1-2	AM	N/A	2: 4-20 mA
TB5-6	TB5-7	0-10 VDC	N/A	2-3	AM	N/A	0: 0-10 V

* = For Drive programming reference

■ Programming the Analog Outputs:

The TB3-4 and TB5-6 analog outputs can be programmed to be proportional to any of the following Drive variables.

Table 1.7 Analog Output Proportional Variables

Setting	Description	Setting	Description
1	Frequency Ref	20	SFS Output*
2	Output Freq	24	PI Feedback
3	Output Current	31	Not Used
6	Output Voltage	36	PI Input
7	DC Bus Voltage	37	PI Output
8	Output kWatts	38	PI Setpoint
15	Term A1 Level	51	Auto Mode Fref
16	Term A2 Level	52	Hand Mode Fref
18	Mot SEC Current	53	PI Feedback 2

* SFS is the internal soft starter signal. This signal is generated from the reference and often it passes through the accel/ decel functions.

See the H4-0X parameters in programming manual TM.E7.02 for additional programming details.

◆ Serial Communications:

Terminals are provided for “full duplex” or “half duplex” connections to the Drive for RS422/RS485 serial communication.
For “half duplex” operation via Metasys N2 protocol (enabled with option J), APOGEE FLN protocol (enabled with option U) or Modbus protocol (enabled with option V) field configuration of these terminals is required.

When no cost options J, U or V are ordered:

- Jumpers are provided for field installation on terminals TB4-1 to TB4-3 and TB4-2 to TB4-4.
- The E7 Drive is programmed to enable the appropriate protocol (parameter H5-08), baud rate (parameter H5-02), RTS control (parameter H5-07) and error detection time (parameter H5-09).

Option L (LonWorks) does not require jumpers and (with the exception of H5-07) employs the same parameter settings as Modbus.

Table 1.8 Factory Programming for Serial Communication

Parameter (Function)	Option			
	J	U	V	L
H5-02 (Baud Rate)	3: 9600 Baud	2: 4800 Baud	3: 9600 Baud	3: 9600 Baud
H5-07 (RTS Control)	1: Enabled	1: Enabled	1: Enabled	0: Disabled
H5-08 (Protocol)	1: N2 (Metasys)	2: FLN (APOGEE)	0: Modbus	0: Modbus
H5-09 (Error Time)	10	10	10	10

For co-ordination with other E7 Technical Manuals, the table below provides the equivalency between E7B_ _ _T or E7B_ _ _Y Control PCB A2 terminal designations and E7 Drive terminal designations used in TM.E7.01, TM.E7.02, TM.E7.21, TM.E7.22 and TM.E7B.01.

Table 1.9 Serial Communications Terminal Designation Cross Reference

E7L RS485 Terminal	E7 Drive RS485 Terminal
TB4-1	S+
TB4-2	S-
TB4-3	R+
TB4-4	R-

■ Terminating Resistor

The terminating resistance must be turned ON only if the Drive is at the very end of the Serial Communication chain. Set the terminating resistance by turning ON DIP switch S1-1.

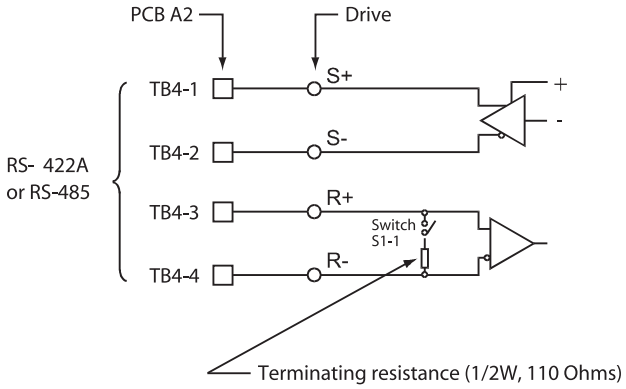


Fig 1.4 Terminating Resistor

IMPORTANT

1. Separate the communication cables from the main circuit cables and control circuit wiring.
2. Use shielded cables for the communication wiring, and use proper shield clamps.
3. When using RS-485 communication, connect TB4-1 to TB4-3, and TB4-2 to TB4-4, on the control circuit terminal board. See Fig 1.5 below.
4. Connect shield at one end only.

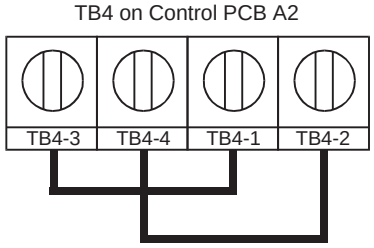


Fig 1.5 RS-485 Communication Connection

◆ Remote Transfer to Bypass

Terminal TB1-4 on the Control PCB A2 is a dedicated terminal for “Remote Transfer” to Bypass operation.

This function allows a contact closure from a BAS, between terminals **TB1-4** and **TB1-9**, to transfer motor operation from Drive mode to Bypass mode. This remote transfer to Bypass function overrides the **Drive Select** manual button. An open contact causes operation in Drive mode and a closed contact results in Bypass mode.

◆ Smoke Purge Operation

Terminal TB1-5 on the Control PCB A2 is a dedicated terminal for “Smoke Purge” operation.

This function allows a contact closure between terminals **TB1-5** and **TB1-9** to transfer motor operation to Bypass for a maximum capacity smoke control function. When in smoke purge mode, during emergency fire/smoke situations, the motor overloads and safety interlock circuit are overridden to shift the priority to protecting people rather than equipment. [**Note:** Smoke purge overrides all other control inputs and selector buttons. Smoke purge operation can only be terminated by opening the contact closure at terminal **TB1-5** or by opening the circuit breaker (CB1 on schematic E7B-10).]

◆ Multi-Function Digital Inputs

The Bypass 120 VAC logic circuit is interconnected with the Drive multi-function digital input terminals to allow a single customer interface to control both Drive and Bypass circuits.

As a result, only Drive digital input terminals S6 and S7 are available for other uses. Drive Terminals S6, S7 and SN have been brought out to TB5-5, TB5-4 and TB5-2 respectively. See Appendix A and Chapter 5 in TM.E7B.01, parameter H1-04 and H1-05 for programming instructions.

◆ DIP Switch Programmable Functions Summary

TABLE 1.10 DIP Switch Functions

DIP SWITCH	POS.	DESCRIPTION	SETTINGS		FACTORY SETTING
			ON	OFF	
S1	1	SERIAL COMMUNICATIONS TERMINATING RESISTANCE	IN	OUT	SEE TABLE 5.2
	2	DRIVE ANALOG INPUT 2 (A2) SIGNAL (H3-08="0", FOR 0-10VDC)	4-20MADC	0-10VDC	ON
	3	TB3(3) CONNECTED TO DRIVE ANALOG INPUT 2 (A2)	YES		ON
	4			YES	OFF
	3	TB3(3) CONNECTED TO DRIVE ANALOG INPUT 1 (A1)		YES	
	4		YES		
S2	1	AUTO TRANSFER TO BYPASS UPON A DRIVE FAULT	ACTIVE	INACTIVE	OFF
	2	POWER UP IN THE "OFF" OR "AUTO" MODE	AUTO	OFF	OFF
	3	POWER UP IN THE MAINTENANCE MODE	ACTIVE	INACTIVE	OFF
	4-6	SEE TABLE 2.6			
	7	SAFETY INTERLOCKS AT TB1(1)	INACTIVE	ACTIVE	OFF
	8	BAS/DAMPER INTERLOCKS AT TB1(3)	INACTIVE	ACTIVE	OFF
S3	1-6	SEE TABLE 2.6			SEE TABLE 5.2
S4	1	RESERVED FOR FUTURE EXPANSION MUST BE AT FACTORY SETTING	ACTIVE	INACTIVE	OFF
	2	SPEED COMMAND FROM DRIVE TERMINAL A2, WITH SERIAL COMM.	YES	NO	
	3	RESERVED FOR FUTURE EXPANSION MUST BE AT FACTORY SETTING	ACTIVE	INACTIVE	OFF
	4	RESERVED FOR FUTURE EXPANSION MUST BE AT FACTORY SETTING	ACTIVE	INACTIVE	OFF
	5	RESERVED FOR FUTURE EXPANSION MUST BE AT FACTORY SETTING	ACTIVE	INACTIVE	OFF
	6	RESERVED FOR FUTURE EXPANSION MUST BE AT FACTORY SETTING	ACTIVE	INACTIVE	OFF

■ Auto Transfer to Bypass

When enabled (DIP switch S2-1 ON), the Bypass unit will automatically switch into Bypass mode on a Drive fault. After clearing the Drive fault condition, the function resets by moving the disconnect switch to the **OFF** position and waiting for the keypad to go blank. **CAUTION:** Before selecting this function in fan applications, care must be taken to ensure that the ductwork is designed to handle the pressure resulting from full speed operation with the VAV terminal unit dampers at minimum position or closed. The factory default for this function is disabled.

■ Power Up Mode

The Drive/Bypass electronic interface can be configured (via a DIP switch) to be in the AUTO mode or OFF when power is applied to the unit. This function is controlled by DIP switch S2-2, ON for AUTO operation on power up. The factory default is to power up to the OFF mode.

◆ Bypass Controller PCB

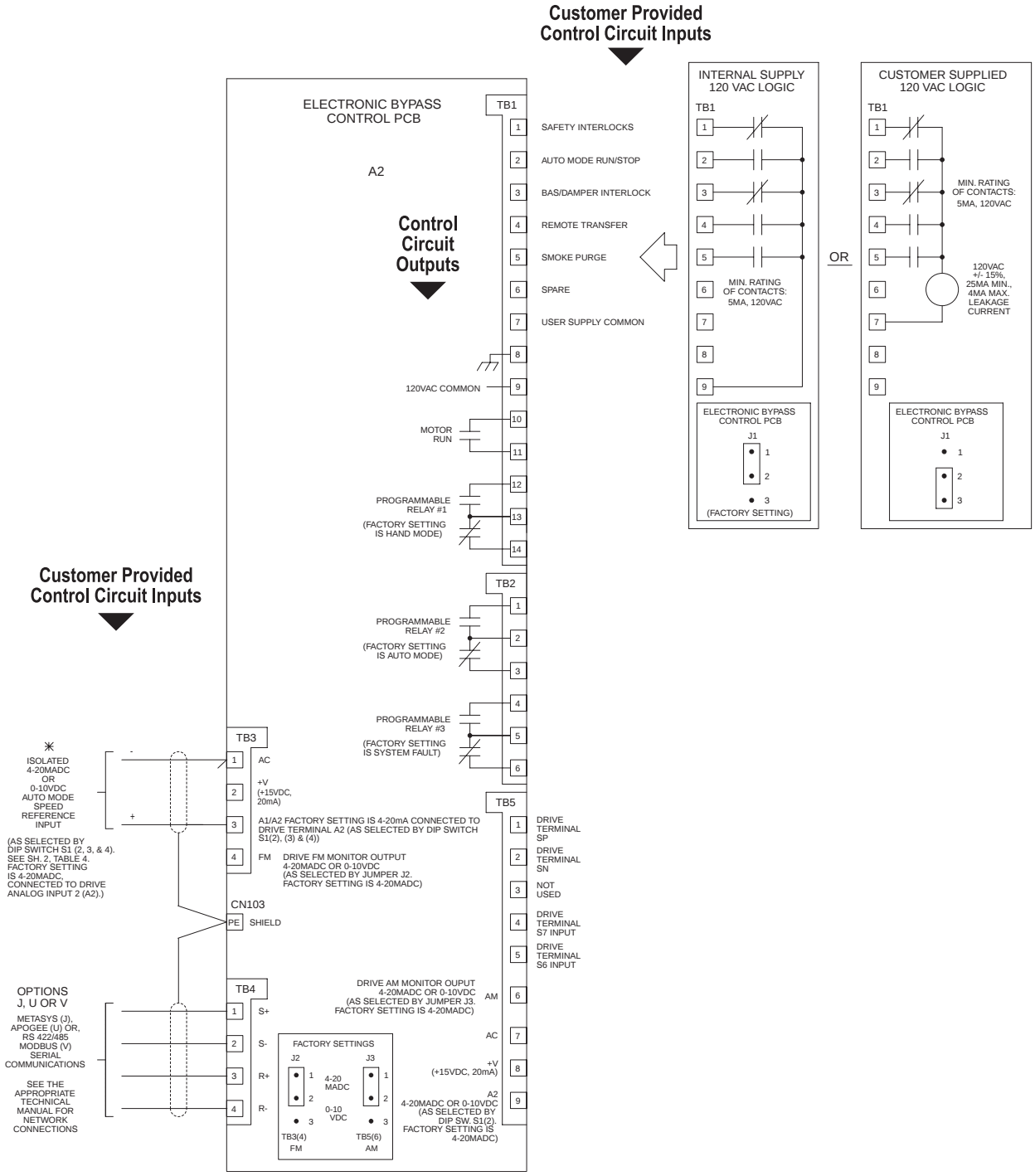


Fig 1.6 Bypass Control Circuit Inputs and Outputs

Customer provided contact closure inputs must have a minimum rating of 5 mA at 120 VAC.

Table 1.11 Terminal Numbers and Wire Sizes (Same for all Bypass Units)					
Terminals	Terminal Screws	Tightening Torque lb.-in. (N•m)	Possible Wire Sizes AWG (mm^2)	Recommended Wire Size AWG (mm^2)	Wire Type
TB1-1 to 14 TB2-1 to 6 TB3-1 to 4 TB4-1 to 4 TB5-1 to 9	Phoenix type *3	4.2 to 5.3 (0.5 to 0.6)	Stranded wire: 26 to 16 (0.14 to 1.5)	18 (0.75)	• Shielded, twisted-pair wire*1 • Shielded, polyethylene-covered, vinyl sheath cable
PE	M3.5	7.0 to 8.8 (0.8 to 1.0)	20 to 14 (0.5 to 2*2)	12 (1.25)	
*1. Use shielded twisted-pair cables to input an external speed command. *2. We recommend using straight solderless terminals on digital inputs to simplify wiring and improve reliability. *3. We recommend using a thin-slot screwdriver with a 3.5 mm blade width.					

◆ Wiring Checks

After all wiring is completed, perform the following checks:

1. Is all wiring correct?
2. Have all wire clippings, screws or other foreign material been removed from the Drive and Bypass enclosure?
3. Are all terminal screws tight?

◆ Control Circuit Wiring Precautions

Observe the following precautions when wiring control circuits:

1. Separate control wiring from power/motor wiring and other high-power lines.
2. Separate wiring for control circuit terminals for digital outputs from wiring to other control circuit terminals.
3. If using an optional external power supply, it should be a UL Listed Class 2 power supply source.
4. Use twisted-pair or shielded twisted-pair cables for control circuits to prevent operating faults. Prepare cable ends as shown in Figure 1.7.
5. Connect the shield wire to terminal PE.
6. Insulate the shield with tape to prevent contact with other signal lines and equipment.

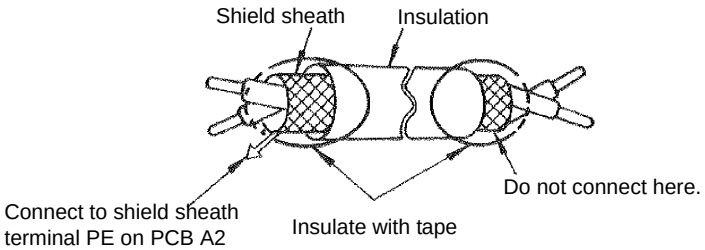


Fig 1.7 Preparing the Termination of Shielded Twisted-Pair Cables

◆ Bypass Control Circuit Terminal Functions

The functions of the control circuit terminals are shown in Table 1.12.

Table 1.12 Bypass Control Circuit Terminals

Type	No.	Signal Name	Function		Signal Level
Digital input signals	TB1-1 TB1-9	NC Safety Circuit	Fault when OPEN		Dry Contacts
	TB1-2 TB1-9	Auto Mode run/stop command	Run when CLOSED; stopped when OPEN.		
	TB1-3 TB1-9	BAS Interlock	Enable Drive when Closed		
	TB1-4 TB1-9	Remote Transfer	Transfer to Bypass when Closed		
	TB1-5 TB1-9	Smoke Purge	Transfer to Bypass when Closed		
	TB5-4 TB5-2	Drive Input Terminal S7	Programmable Input		
	TB5-5 TB5-2	Drive Input Terminal S6	Programmable Input		
Analog input signals	TB3-2	+15 VDC power supply	+15 VDC power supply for analog Transmitters		+15 VDC (Max. current: 20 mA)
	TB3-3	Analog input or Speed Command when connected to Drive Terminal A2 by DIP switches S1-3 and S1-4	4 to 20 mA/100% or 0 to +10 VDC/100% (H3-08 and DIP switch S1-2)	Function set by H3-09.	4 to 20 mA(250Ω) 0 to +10 V(20 kΩ)
		Analog Input or Speed Command when connected to Drive Terminal A1 by DIP switches S1-3 and S1-4	0 to +10 VDC/100%		0 to +10 V(20 kΩ)
	TB5-9	Multi-function analog input connected to Drive terminal A2	4 to 20 mA/100% or 0 to +10 VDC/100% (H3-08 and DIP switch S1-2)	Function set by H3-09.	4 to 20 mA(250Ω) 0 to +10 V(20 kΩ)
	TB3-1 TB5-7	Analog input common	–		–
	PE	Shield wire, optional ground line connection point	–		–
Digital output signals	TB1-10 TB1-11	Motor Run	CLOSED During Motor Operation		Dry contacts Contact capacity: 5 A max. at 250 VAC 5 A max. at 120 VAC
	TB1-12 TB1-13 TB1-14	Programmable Relay 1	Form C Relay Function Selections: 1. Bypass Run 2. Damper Actuator 3. Auto Transfer 4. Drive Run 5. Serial Com. Run 6. Hand Mode 7. Auto Mode 8. System Fault See Table 2.6 for DIP Switch programming		
	TB2-1 TB2-2 TB2-3	Programmable Relay 2			
	TB2-4 TB2-5 TB2-6	Programmable Relay 3			
Analog output signals	TB3-4	Multi-function analog output (Drive terminal FM)	Frequency Output 0 to +10 VDC/100% frequency	Multi-function analog monitor 1 Function set by H4-01	0 to +10 VDC or 4-20 mA set by Jumper J2 and H4-07
	TB3-1 TB5-7	Analog output common	–		
	TB5-6	Multi-function analog output (Drive terminal AM)	Current Monitor 0 to +10 VAC/100% Drive's rated current	Multi-function analog monitor 2 Function set by H4-04	0 to +10 VDC or 4-20 mA set by Jumper J3 and H4-08

Table 1.12 Bypass Control Circuit Terminals (Continued)				
Type	No.	Signal Name	Function	Signal Level
RS-485/ 422	TB4-1	Communication input	For 2-wire RS-485, short TB4-3 to TB4-1 and TB4-4 to TB4-2.	Differential input, optical isolation
	TB4-2			
	TB4-3	Communication output		Differential input, optical isolation
	TB4-4			
	PE	Signal common	-	-

Electrical Overview

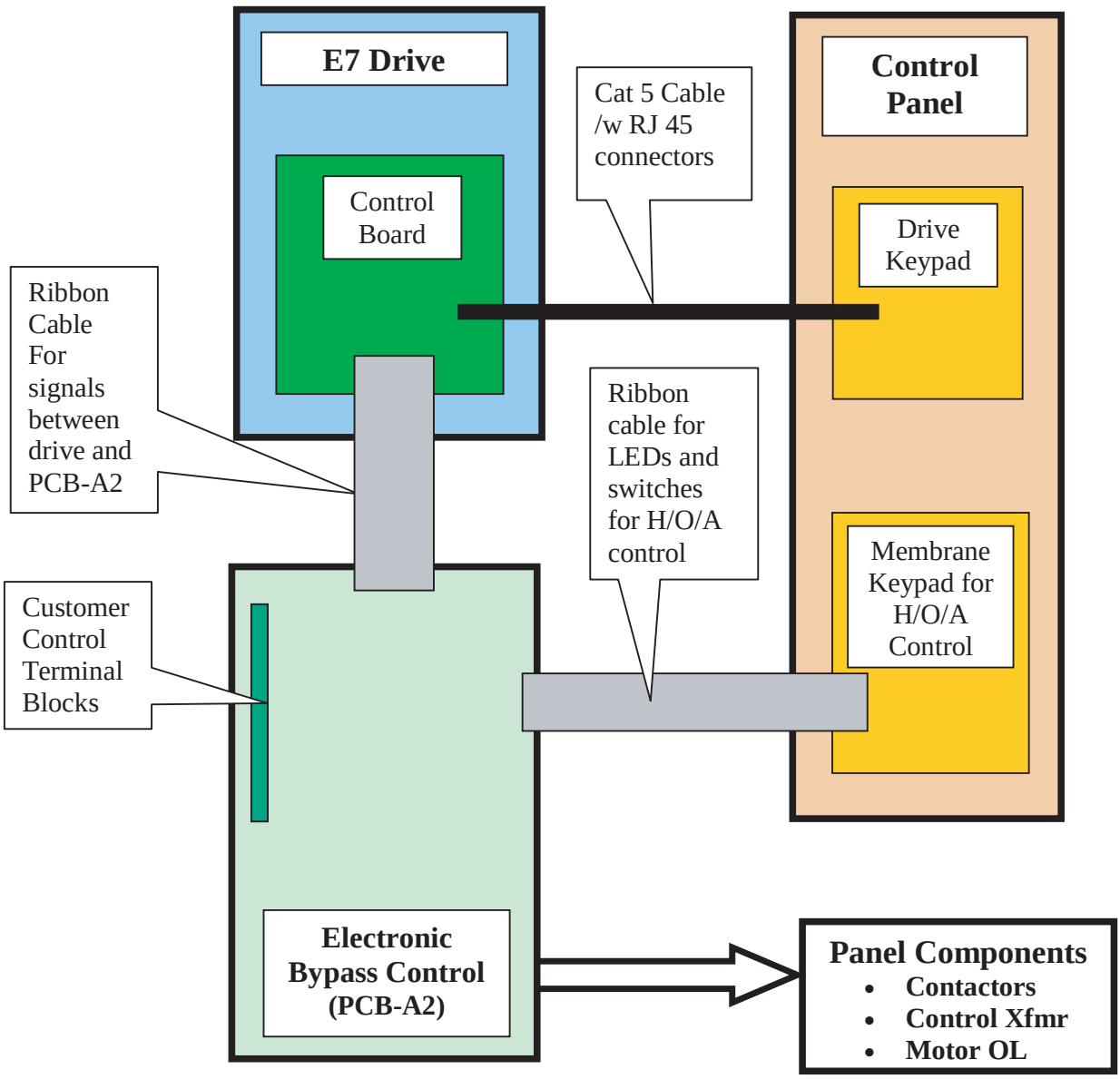


Fig 1.8 E7B_ _ _T or E7B_ _ _Y Electronic Control Interconnection of Components

Digital Operator and Control Panel Display

The various items included on the Digital Operator Display and Control Panel are described below.

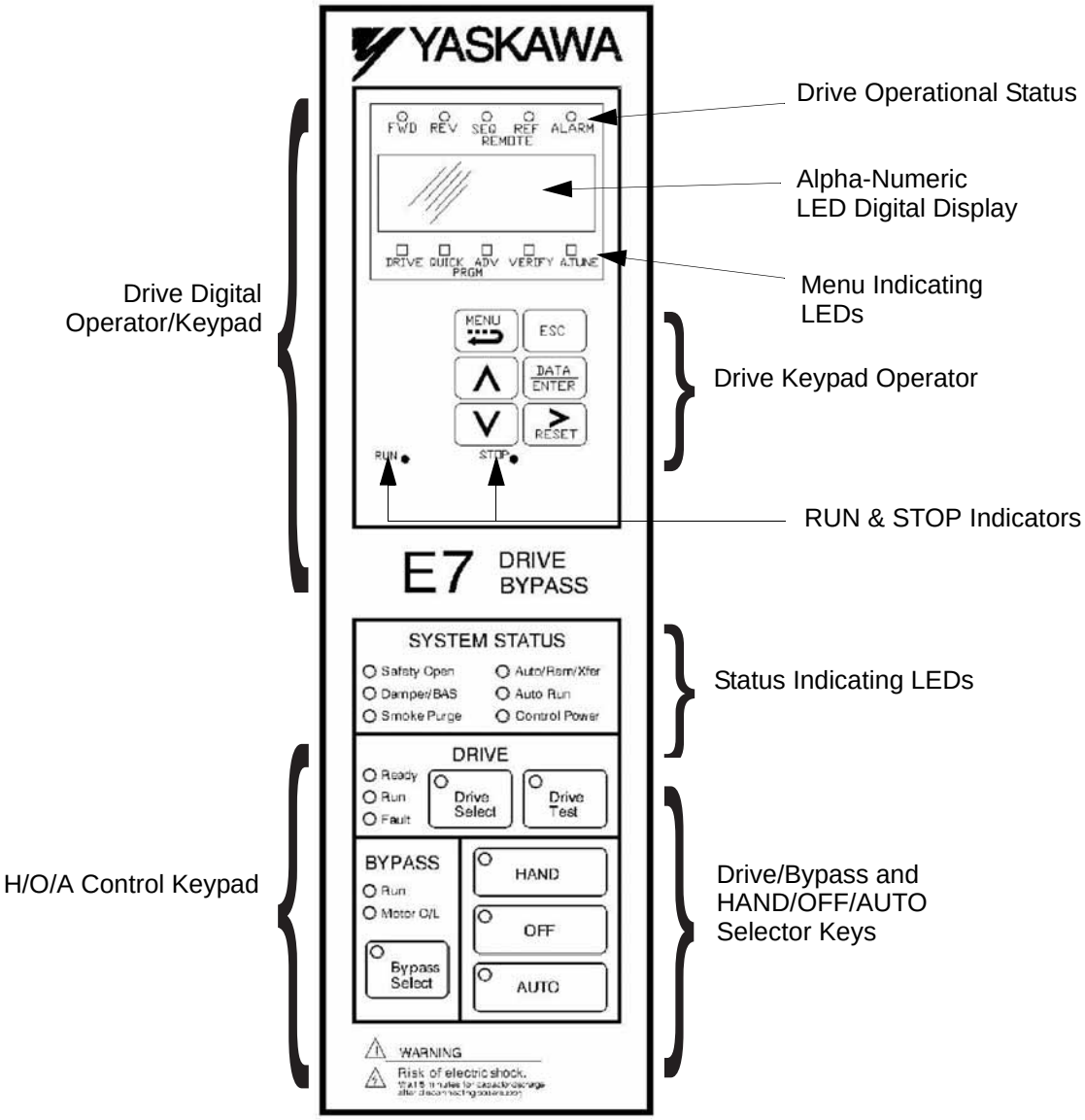


Fig 1.9A E7B_ _ _T Bypass Control Panel Component Names and Functions

The front control panel has a digital alpha/numeric display and keypad, in the upper portion, for Drive operation and programming. The row of LEDs above the alpha/numeric display indicate Drive operational status. See Table 1.14 for an explanation. The row of LEDs below the alpha/numeric display indicate the Drive menu that is presently active.

The lower portion of the front control panel displays the operating mode status via LEDs and controls the HAND/ OFF/AUTO functions for both the Drive and Bypass. The general rule for LED colors, in the lower portion of the control panel, is:

Green = Normal Status
Amber = Abnormal Status
Red = Fault Status

Digital Operator and Control Panel Display

The various items included on the Digital Operator Display and Control Panel are described below.

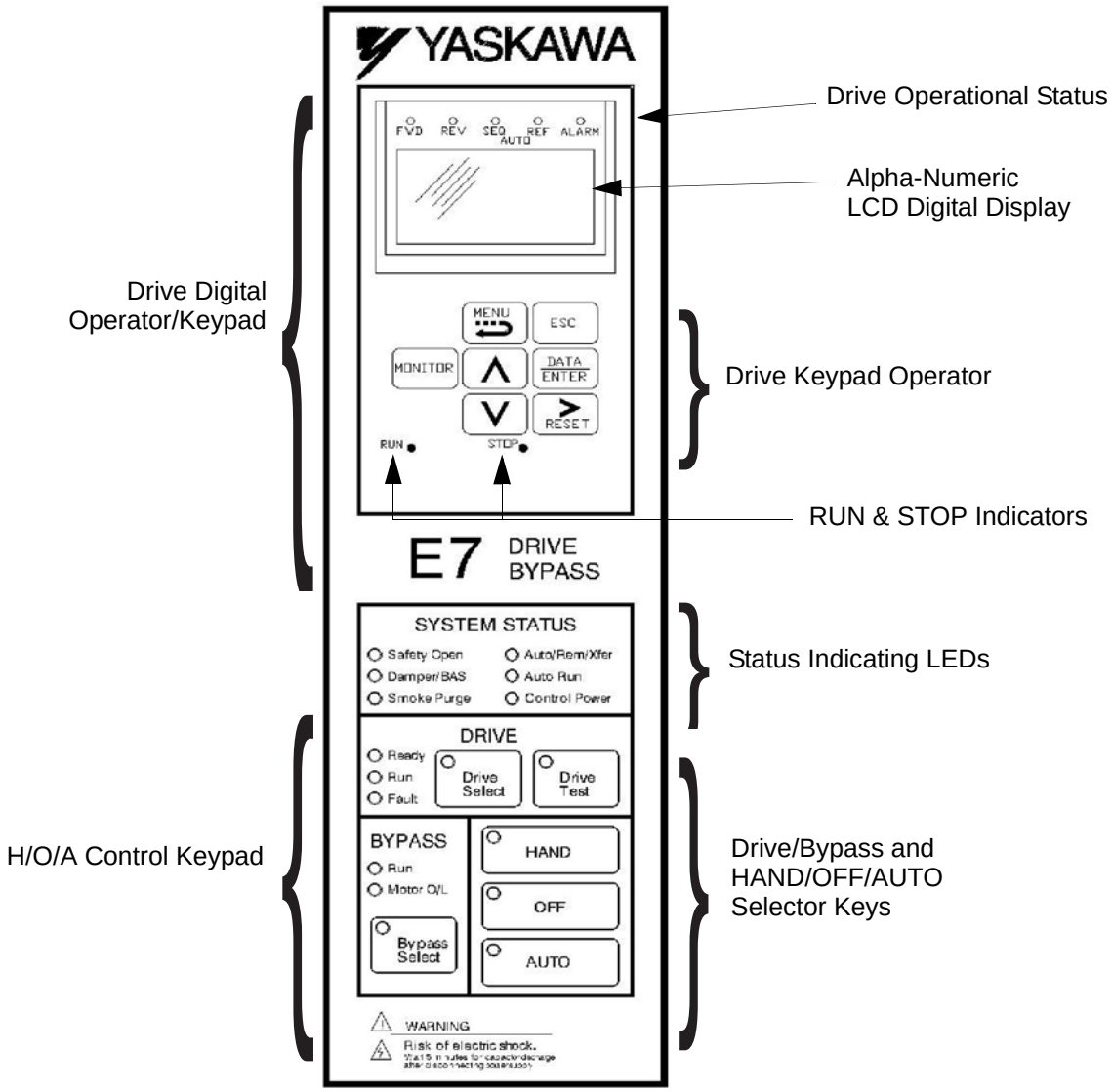


Fig 1.9B E7B_ _ _Y Bypass Control Panel Component Names and Functions

The front control panel has a digital alpha/numeric display and keypad, in the upper portion, for Drive operation and programming. The row of LEDs above the alpha/numeric display indicate Drive operational status. See Table 1.14 for an explanation.

The lower portion of the front control panel displays the operating mode status via LEDs and controls the HAND/ OFF/AUTO functions for both the Drive and Bypass. The general rule for LED colors, in the lower portion of the control panel, is:

Green = Normal Status
Amber = Abnormal Status
Red = Fault Status

◆ Digital Operator and H/O/A Control Panel Keys

The names and functions of the Digital Operator and H/O/A Control Panel Keys are described in Table 1.13.

Table 1.13 Digital Operator and H/O/A Control Panel Keys

Key	Name	Function
	MENU Key	Scrolls from one of the five main menus to the next.
	ESCAPE Key	Returns to the display before the DATA/ENTER key was pressed.
	MONITOR Key	Selects the monitor (-DRIVE-) mode from any display location.
	INCREASE Key	Increases parameter numbers and set values. Used to move to the next item or data.
	DECREASE Key	Decreases parameter numbers and set values. Used to move to the previous item or data.
	SHIFT/RESET Key	Selects the digit to be changed. The selected digit will blink. Also resets the Drive when a fault has occurred.
	DATA/ENTER Key	Pressed to enter menus and parameters as well as to set values.
	Drive Select Key	Selects the Drive mode of operation.
	Bypass Select Key	Selects the Bypass mode of operation.
	HAND Key	Operates the Drive or Bypass via the local control panel. A Run command is automatic.
	OFF Key	Removes the Run command.
	AUTO Key	Enables the Drive or Bypass to be operated by a remote device such as a DDC or BAS.
	Drive Test Key	Provides local control of the Drive while the motor is operating in Bypass mode.

◆ Drive Digital Operator/Keypad

■ Drive Operational Status Indicators

The definition of the Drive operational status indicators are shown in Table 1.14.

Table 1.14 Drive Operational Status Indicators

Indicator	Definition
FWD	Lit (red) when a forward run command is input. Also lit when the Drive is in “Hand” Mode.
REV	Lit (red) when a reverse run command is input.
REMOTE SEQ	Lit (red) when set up for remote run command, see Table 1.15.
REMOTE REF	Lit (red) when set up for remote speed command, see Table 1.15.
ALARM	Lit (red) when a fault has occurred and flashing when an alarm has occurred.

■ Drive REMOTE Sequence (SEQ) and REMOTE Reference (REF) indicators

The Bypass operates differently than a stand alone Drive with regard to these two indicators. The Bypass control logic interfaces with the Drive via terminals that would be used, in a Drive only installation, for the REMOTE Sequence (Run Command), and REMOTE Reference (Speed Command).

Since these terminals are active and the appropriate parameters configured for the Bypass unit operation, the REMOTE Sequence and REMOTE Reference LED’s will be lit even when the H/O/A HAND button is pressed (local control), providing both the run and speed command from the local control panel. The control signals are “Local” to the Drive and Bypass unit, but “Remote” from the Drive itself.

An exception to this rule occurs for the REMOTE REF indicator when serial communication is employed. See Table 1.15.

Table 1.15 Drive REMOTE Sequence (SEQ) and REMOTE Reference (REF) Indicators

Indicator		HAND	AUTO
Analog Input	REMOTE SEQ	ON	ON
	REMOTE REF	ON	ON
Serial COM Input	REMOTE SEQ	OFF	ON
	REMOTE REF	OFF	ON

■ Drive Run Indicator

The status of the “RUN” indicator is shown in Table 1.16 when the Drive is either in the “Hand” or “Auto” mode.

Table 1.16 RUN Indicator	
Indicator Status	Description
On (Red)	Drive is running
Blinking (Red)	Drive is decelerating to a stop
Off	Drive is stopped

■ Drive Stop Indicator

The status of the “STOP” indicator is shown in Table 1.17 when the Drive is either in the “Hand” or “Auto” mode.

Table 1.17 STOP Indicator	
Indicator Status	Description
On (Red)	Drive is decelerating to a stop or stopped
Blinking (Red)	Drive is in a run condition but the speed command is zero
Off	Drive is running

The relationship between the indicators for RUN and STOP and the Drive status is shown in Fig. 1.10.

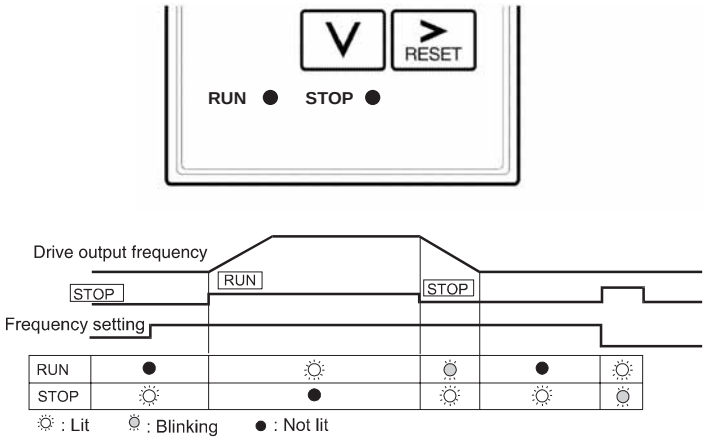


Fig 1.10 RUN and STOP Indicators

◆ Control Panel Indicator Lights (LEDs)

■ Control Power Status Indicator

Table 1.18 Control Power Indicator	
Indicator Status	Condition
On (Green)	3 Phase Power is applied to the Bypass unit and the control power transformer is functioning.
Off	3 Phase Power is disconnected from the Bypass unit or a control power transformer fuse has cleared.

■ Drive Run Indicator

Table 1.19 Drive Run Indicator	
Indicator Status	Condition
On (Green)	The Drive has been given a run command in **HAND** or **AUTO** mode and the Bypass circuit is de-energized.
Off	The Drive has no run command in either the **HAND** or **AUTO** modes. The unit may be operating in Bypass mode.

■ Bypass Run Indicator

Table 1.20 Bypass Run Indicator	
Indicator Status	Description
On (Amber)	The Bypass has been given a run command in the **HAND** or **AUTO** mode. Or, the operation has been remotely transferred to Bypass using the "Remote Transfer to Bypass" feature via a BAS contact closure at terminals TB1-4 and TB1-9. Or, the operation has been automatically transferred to Bypass after a Drive fault condition via the DIP switch selectable "Auto Transfer to Bypass" feature (S2-1). Or, the operation has been transferred to Bypass using the "Smoke Purge" feature via a contact closure at terminals TB1-5 and TB1-9. The motor is running at full speed across-the-line and the Drive is disconnected from the motor.
Off	The Bypass has no run command in either the **HAND** or **AUTO** modes. The unit may be operating in Drive mode.

■ Bypass Motor OL Indicator

Table 1.21 Motor OL Indicator	
Indicator Status	Description
On (Red)	The motor overload (S10 on schematic E7B-10) has tripped OFF de-energizing both the Drive and Bypass Circuits.
Off	The motor overload (S10) is satisfied.

■ Safeties Open Status Indicator

Table 1.22 Safeties Open Indicator	
Indicator Status	Description
On (Red)	The NC “motor safety circuit” connected to terminals TB1-1 and TB1-9 has an open circuit condition.
Off	The NC “motor safety circuit” is satisfied or this function is disabled by DIP switch S2-7.

■ Drive Fault Indicator

Table 1.23 Drive Fault Indicator	
Indicator Status	Description
On (Red)	The Drive has tripped OFF due to an internal Drive fault.
Off	The Drive is ready for operation, or operating normally.

■ Smoke Purge Status Indicator

Table 1.24 Smoke Purge Indicator	
Indicator Status	Description
On (Amber)	The Smoke Purge function has been activated, the building fire control system has closed a contact between terminals TB1-5 and TB1-9.
Off	Smoke Purge is not active, the Drive & Bypass are operating normally.

■ Auto Run Status Indicator

Table 1.25 Auto Run Indicator	
Indicator Status	Description
On (Green)	The E7B_ _ _T or E7B_ _ _Y is in AUTO mode and has received a Run command at TB1-2.
Off	The E7B_ _ _T or E7B_ _ _Y is not in AUTO mode or has not received a Run command when in AUTO mode.

■ Drive Ready Indicator

Table 1.26 Drive Ready Indicator	
Indicator Status	Description
On (Green)	The Drive is ready to run or is running (no faults).
Off	The Drive has a fault that will prevent operation.

■ Auto/Rem Xfer Status Indicator

Table 1.27 Auto/Rem Xfer Status Indicator	
Indicator Status	Description
On (Amber)	Auto Transfer to Bypass operation or Remote Transfer to Bypass operation is active.
Off	Auto or Remote Transfer to Bypass are not active (Auto Transfer may be disabled by DIP switch S2-1).

■Damper/BAS Status Indicator

Table 1.28 Damper/BAS Status Indicator	
Indicator Status	Description
On (Red)	A NC damper end switch or other BAS interlock contact at TB1-3 is open.
Off	This function is disabled by DIP switch S2-8 or a contact closure exists between terminals TB1-3 and TB1-9.

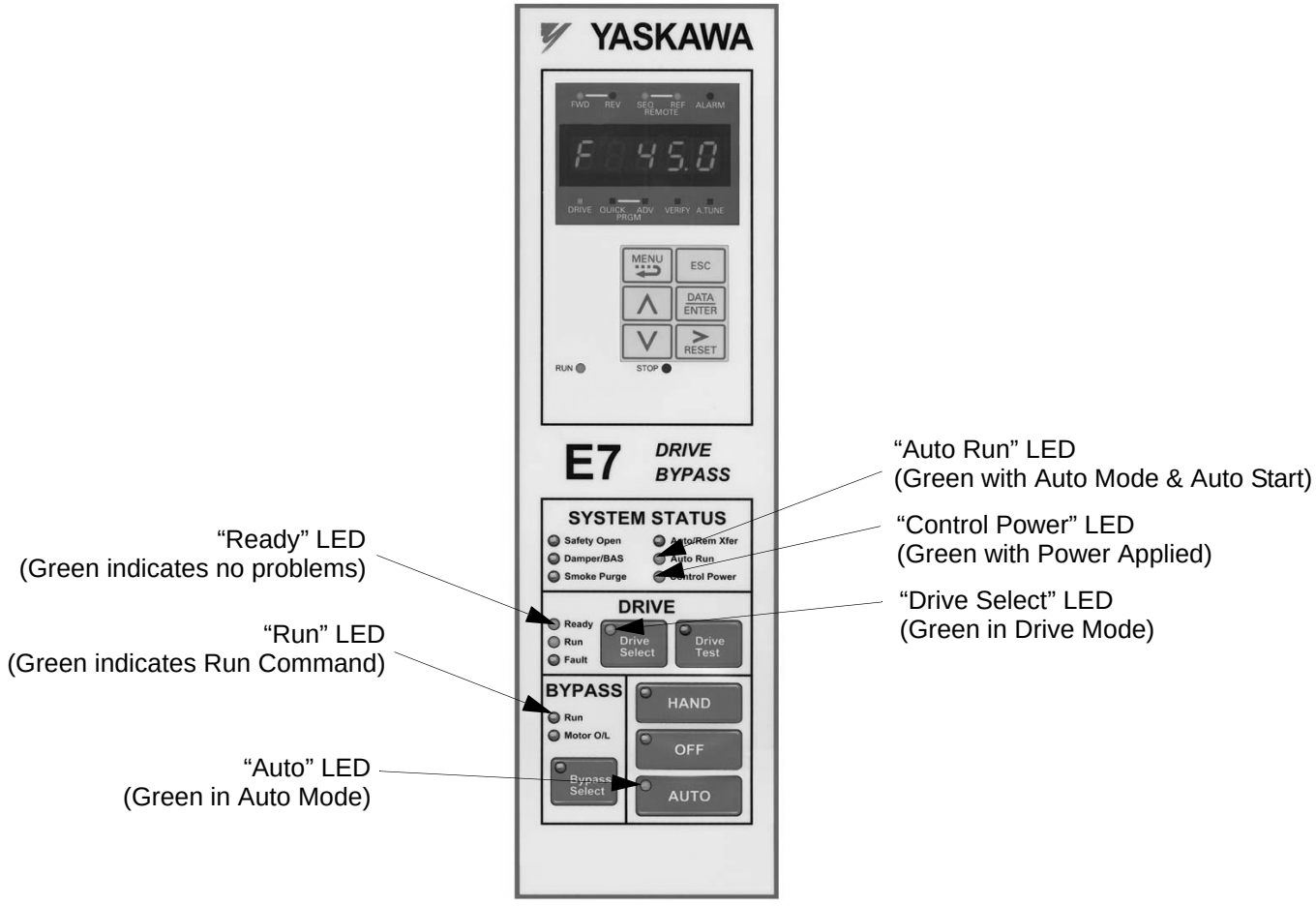
◆ Selector Key Indicators

When off these selector key indicators simply mean that the function has not been selected. The table below describes the operation when these functions are selected and the key indicator is lit.

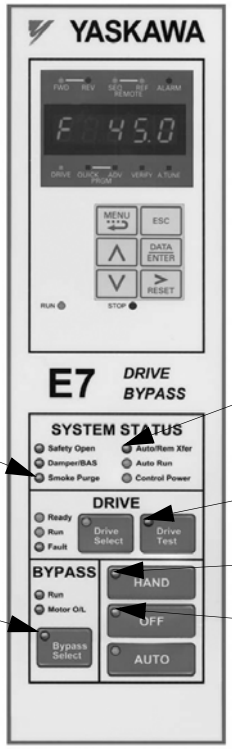
Table 1.29 Selector Key Indicators

Selector Key	LED Color	Function When Lit
Drive Select	Green	The Drive mode of operation is selected.
Bypass Select	Amber	The Bypass mode of operation is selected.
HAND	Amber	The Drive or Bypass is operated via the local control panel. A Run command is automatic.
OFF	Amber	The Run command has been removed from the Drive or Bypass.
AUTO	Green	The Drive or Bypass is operated via a remote device (DDC or BAS).
Drive Test	Amber	The Drive is operated via the local control panel while the motor is operating in Bypass mode.

◆ Normal Control Panel Indicators



◆ Abnormal Control Panel Indicators



"Smoke Purge" LED
(Amber when Smoke Purge activated)

"Bypass Select" LED
(Amber in Bypass Mode & Run)

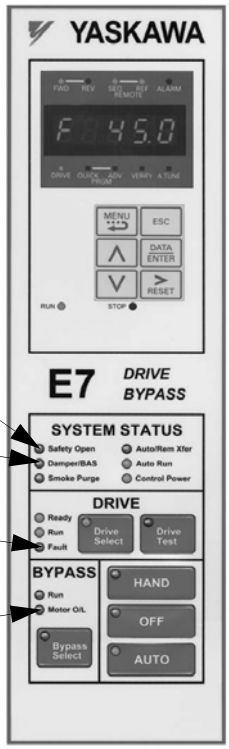
"Auto Transfer" LED
(Amber in Auto X-fer to Bypass Mode;
Amber in Remote X-fer to Bypass Mode)

"Drive Test" LED
(Amber in "Drive Test" Mode)

"HAND" LED
(Amber in Hand Mode)

"OFF" LED
(Amber in Off Mode)

◆ Fault Control Panel Indicators



"Safety Open" LED
(Red when Customer Safety is open)

"Damper/BAS" LED
(Red when Damper Circuit or BAS open)

"Fault" LED
(Red when Drive is faulted)

"Motor O/L" LED
(Red when Thermal Overload is tripped)

Drive Main Menus

The Drive's parameters and monitoring functions are organized into groups called menus that make it easier to read and set parameters. The Drive is equipped with five menus. The five menus and their primary functions are shown in Table 1.30 and are directly available by pressing the **MENU** key.

Table 1.30 Drive Main Menus

Main Menu	Primary Function(s)
- DRIVE - Operation	The Drive can be run in this menu. Also called the "Monitor" menu. Use this menu for monitoring values such as frequency reference or output current, displaying fault history or displaying the fault traces.
- QUICK - Quick Setting	The Drive can be programmed in this menu. Use this menu to set/read the most commonly used parameters.
- ADV - Programming	The Drive can be programmed in this menu. Use this menu to set/read every parameter.
- VERIFY - Modified Constants (Parameters)	The Drive can be programmed in this menu. Use this menu to set/read the parameters that have been modified from their factory default settings.
- A.TUNE - Auto-Tuning	For Bypass units Auto-Tuning can only be accomplished through the DriveWizard software (Part Number DWST616-C2). A free download from www.drives.com. The Drive can be programmed in this menu. Auto-tune the Drive in order to utilize the bi-directional speed search feature.

◆ Main Menu Structure (Shown for E7B_ _ _T, LED Keypad Display. See TM-E7B-01 for the E7B_ _ _Y, LCD Keypad Display)

The menu selection display will appear when the MENU key is pressed from a monitor or setting display.
Press the MENU key from the menu selection display to switch between the menus.

Press the DATA/ENTER key from the menu selection key to monitor data and from a monitor display to access the setting display.

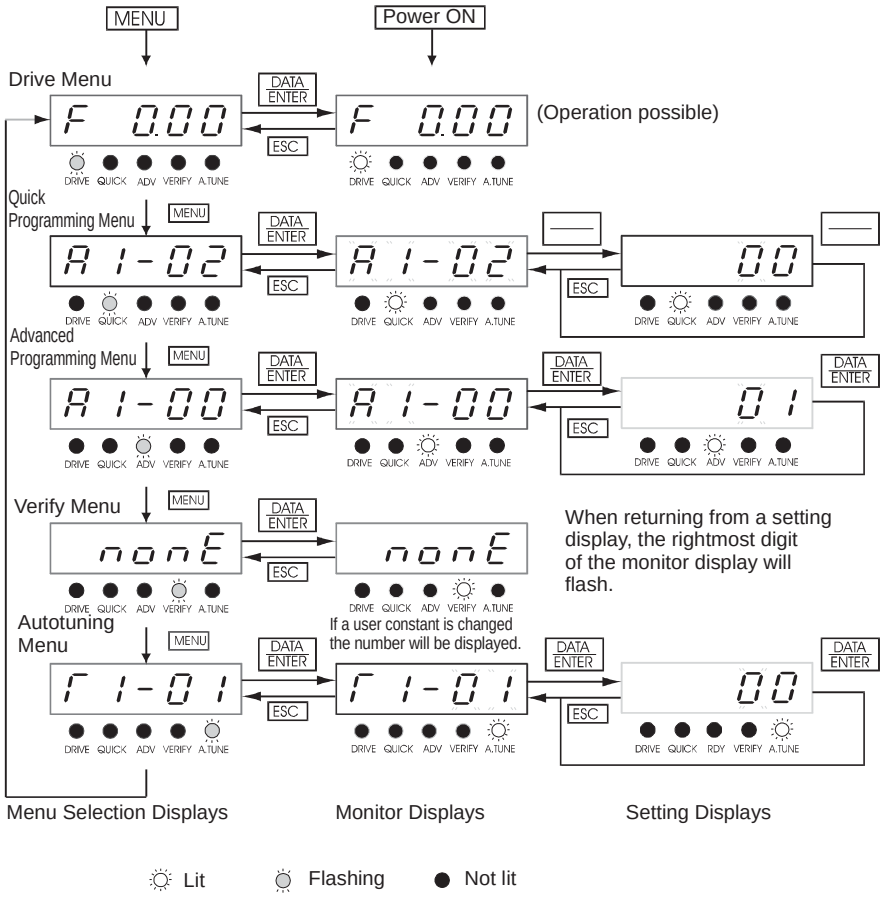


Fig 1.11 Menu Transitions

WARNING When running the Drive after using the Digital Operator, press the MENU Key to enter the Drive menu (DRIVE indicator will flash) and then press the DATA/ENTER Key from the drive menu display to bring up the monitor display (DRIVE indicator will light). (Monitor display in the drive menu will appear when the power is turned ON.)

◆ - DRIVE - Operation Menu

This menu is used for setting a speed command or monitoring values such as output frequency and output current. It is also used for displaying the fault history and the fault traces. *The Drive may be limited to this menu in order to accept a run command, see parameter b1-08 in Chapter 5 of TM.E7B.01*.

■ Example Operations (Shown for E7B_ _ _T, LED Keypad Display. See TM-E7B-01 for the E7B_ _ _Y, LCD Keypad Display)

Key operations in drive menu are shown in the following figure.

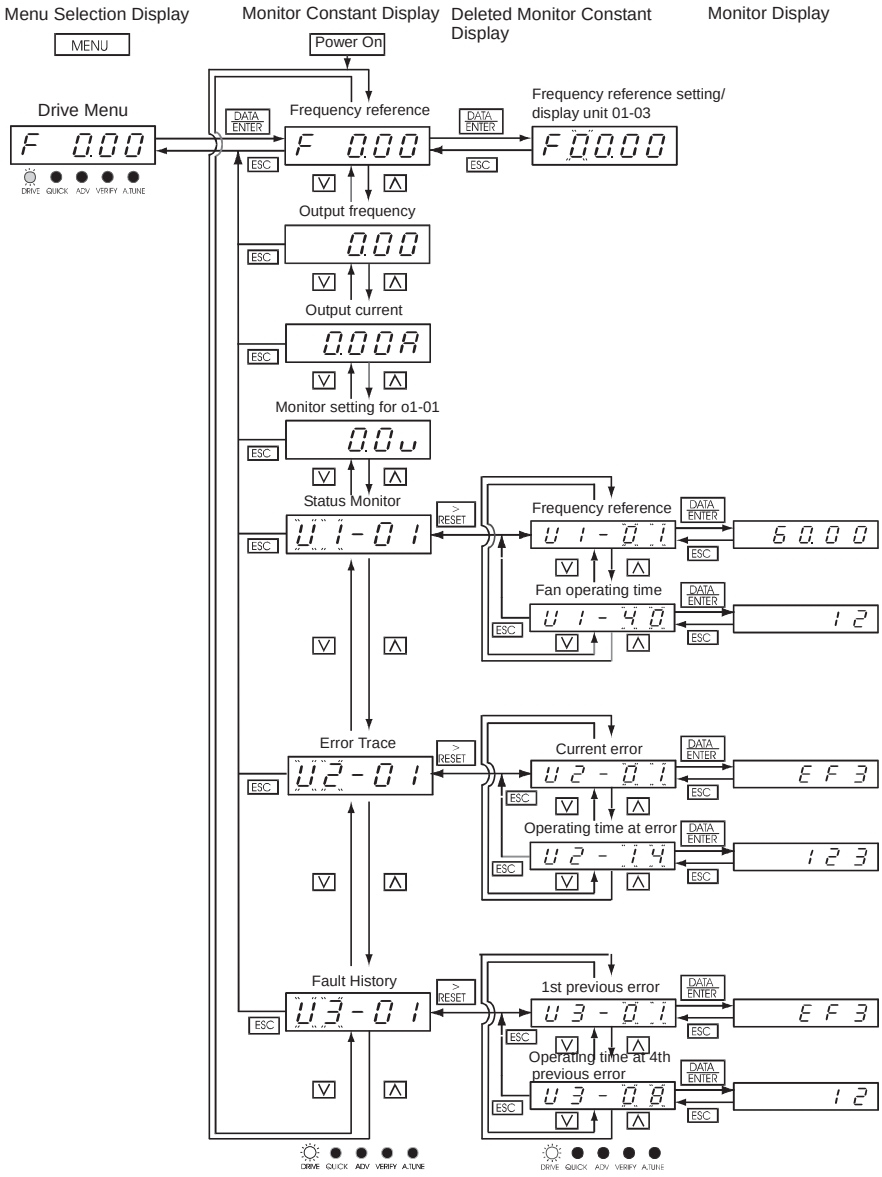


Fig 1.12 Operations in Drive Menu

■ U1 Monitor Parameter List

Use [∧] and [∨] keys to scroll through the U1 "Monitor" parameter list.

Monitor Parameters	
U1-01	Frequency Ref
U1-02	Output Freq
U1-03	Output Current
U1-06	Output Voltage
U1-07	DC Bus Voltage
U1-08	Output kWatts
U1-10	Input Term Sts
U1-11	Output Term Sts
U1-12	Int Ctl Sts 1
U1-13	Elapsed Time
U1-14	FLASH ID
U1-15	Term A1 Level
U1-16	Term A2 Level
U1-18	Mot SEC Current
U1-20	SFS Output
U1-24	PI Feedback
U1-28	CPU ID
U1-29	kWh
U1-30	MWh
U1-34	OPE Detected
U1-36	PI Input
U1-37	PI Output
U1-38	PI Setpoint
U1-39	Transmit Err
U1-40	FAN Elapsed Time
U1-51	Auto Mode Fref
U1-52	Hand Mode Fref
U1-53	PI Feedback 2

■ U2 Fault Trace Parameter List

After viewing the “Monitor” parameter list, one may view the “Fault Trace” parameter list.

Use [∧] and [∨] keys to scroll through the U2 “Fault Trace” parameter list.

Fault Trace Parameters	
U2-01	Current Fault
U2-02	Last Fault
U2-03	Frequency Ref
U2-04	Output Freq
U2-05	Output Current
U2-07	Output Voltage
U2-08	DC Bus Voltage
U2-09	Output kWatts
U2-11	Input Term Sts
U2-12	Output Term Sts
U2-13	AC Drive Status
U2-14	Elapsed Time

■ U3 Fault History Parameter List

After viewing the “Fault Trace” parameter list, one may view the “Fault History” parameter list.

Use [∧] and [∨] keys to scroll through the U3 “Fault History” parameter list.

Fault History Parameters	
U3-01	Last Fault
U3-02	Fault Message 2
U3-03	Fault Message 3
U3-04	Fault Message 4
U3-05	Elapsed Time 1
U3-06	Elapsed Time 2
U3-07	Elapsed Time 3
U3-08	Elapsed Time 4
U3-09	Fault Message 5
U3-10	Fault Message 6
U3-11	Fault Message 7
U3-12	Fault Message 8
U3-13	Fault Message 9
U3-14	Fault Message 10
U3-15	Elapsed Time 5
U3-16	Elapsed Time 6
U3-17	Elapsed Time 7
U3-18	Elapsed Time 8
U3-19	Elapsed Time 9
U3-20	Elapsed Time 10

◆ - QUICK - Quick Setting Menu

This menu is used to set/read a limited set of parameters in the Drive. Follow the key operations below to access the Quick Setting Menu.

■ Example Operations (Shown for E7B_ _ _T, LED Keypad Display. See TM-E7B-01 for the E7B_ _ _Y, LCD Keypad Display)

Key operations in quick programming menu are shown in the following figure.

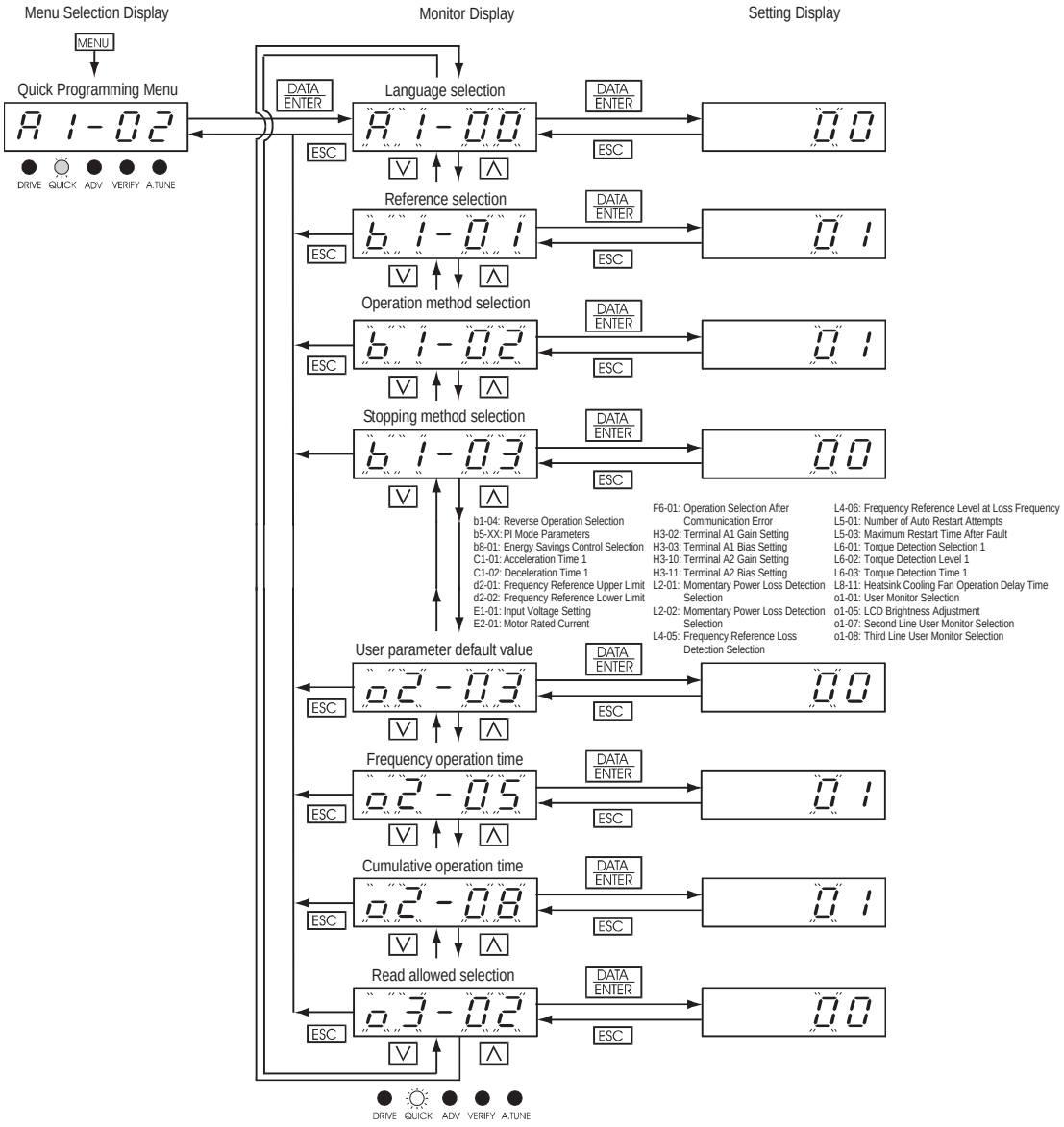


Fig 1.13 Operations in Quick Programming Menu

Use [∧] and [∨] keys to scroll through the “Quick Setting” parameter list.

Parameter Number	Parameter Name
A1-00	Language Selection
b1-01	Frequency Reference Selection
b1-02	Run command Selection
b1-03	Stopping Method Selection
b1-04	Reverse Operation Selection
b5-XX	PI Mode Parameters
b8-01	Energy Savings Control Selection
C1-01	Acceleration Time 1
C1-02	Deceleration Time 1
d2-01	Frequency Reference Upper Limit
d2-02	Frequency Reference Lower Limit
E1-01	Input Voltage Setting
E2-01	Motor Rated Current
F6-01	Operation Selection After Communication Error
H3-02	Terminal A1 Gain Setting
H3-03	Terminal A1 Bias Setting
H3-10	Terminal A2 Gain Setting
H3-11	Terminal A2 Bias Setting
L2-01	Momentary Power Loss Detection Selection
L2-02	Momentary Power Loss Ride-thru Time
L4-05	Frequency Reference Loss Detection Selection
L4-06	Frequency Reference Level at Loss Frequency
L5-01	Number of Auto Restarts Attempts
L5-03	Maximum Restart Time After Fault
L6-01	Torque Detection Selection 1
L6-02	Torque Detection Level 1
L6-03	Torque Detection Time 1
L8-11	Heatsink Cooling Fan Operation Delay Time
o1-01	User Monitor Selection
o1-05	LCD Brightness Adjustment
o1-07	Second Line User Monitor Selection
o1-08	Third Line User Monitor Selection
o2-03	User Parameter Default Value
o2-05	Frequency Operation Time Selection
o2-08	Cumulative Operation Time Selection
o3-02	Read Allowed Selection

◆ - ADV- Programming Menu

This menu is used to set/read every parameter in the Drive. Follow the key operations below to access the Programming Menu.

■ Example Operations (Shown for E7B_ _ _T, LED Keypad Display. See TM-E7B-01 for the E7B_ _ _Y, LCD Keypad Display)

Key operations in advanced programming menu are shown in the following figure.

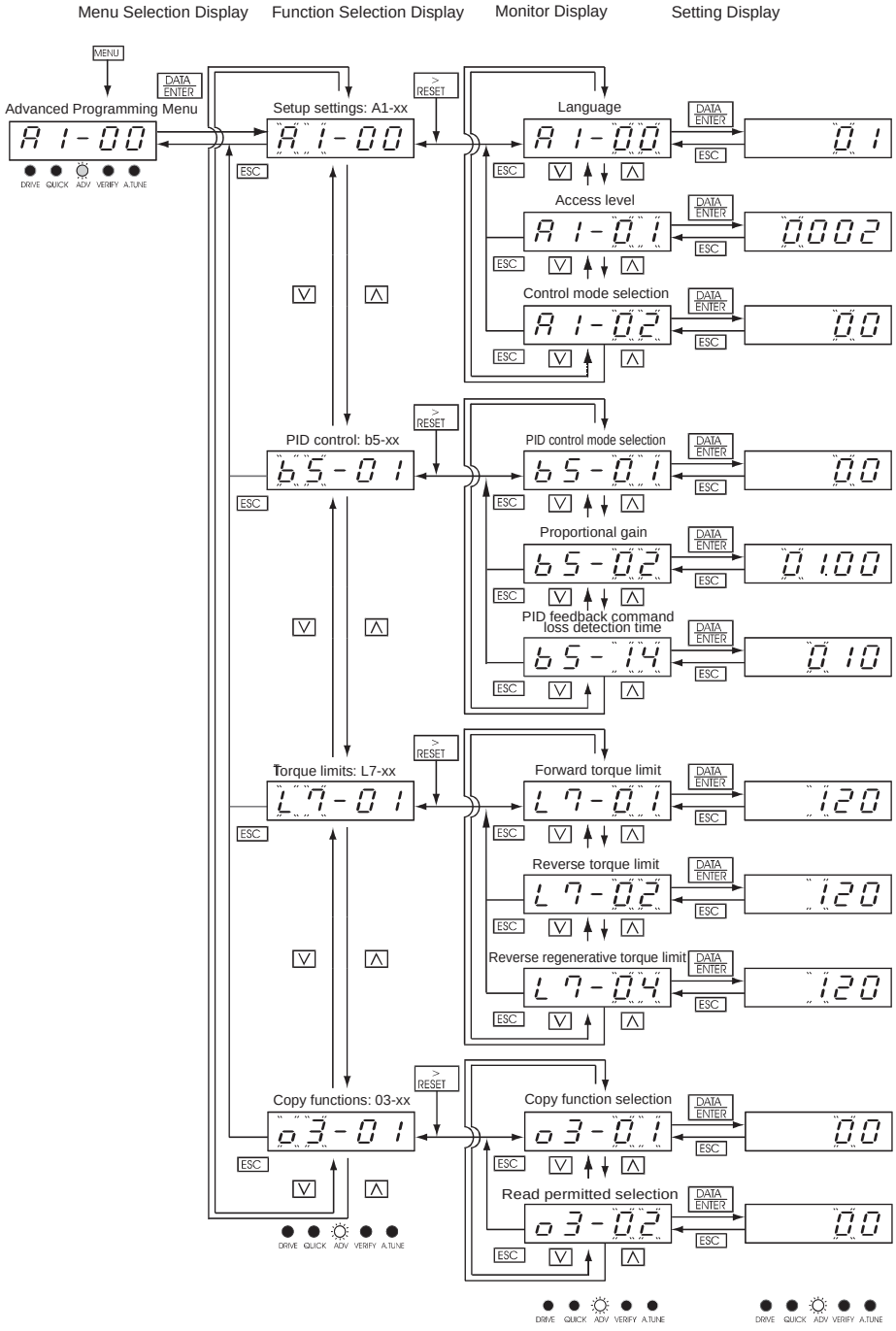


Fig 1.14 Operations in Advanced Programming Menu

Use [∧], [∨], and [RESET] keys to scroll through the “Programming” parameter group list. For a complete parameter list see Appendix A.

Parameter Group Functions	
A1	Initialization
A2	User Parameters
b1	Sequence
b2	DC Braking
b3	Speed Search
b4	Delay Timers
b5	PI Control
b8	Energy Saving
C1	Accel/Decel
C2	S-Curve Acc/Dec
C4	Torque Comp
C6	Carrier Freq
d1	Preset Reference
d2	Reference Limits
d3	Jump Frequencies
d4	Sequence
d6	Field-Weakening
E1	V/F Pattern
E2	Motor Setup
F6	Com OPT Setup
H1	Digital Inputs
H2	Digital Outputs
H3	Analog Inputs
H4	Analog Outputs
H5	Serial Com Setup
L1	Motor Overload
L2	PwrLoss Ridethru
L3	Stall Prevention
L4	Ref Detection
L5	Fault Restart
L6	Torque Detection
L8	Hdwe Protection
n1	Hunting Prev
n3	High Slip
o1	Monitor Select
o2	Key Selections
o3	COPY Function

◆ - VERIFY - Modified Constants (Parameters) Menu

Verify menu is used to display any parameters that have been changed from their default settings in a programming menu or by autotuning. “None” will be displayed if no settings have been changed.

For the initialization parameters, only A1-00 will be displayed if it has been changed. Other initialize mode settings will not be displayed even if they have been changed from their default settings.

In the verify menu, the same procedures can be used to change settings as they are used in the programming menus. Use the INCREASE, DECREASE, and Shift/RESET keys to change the parameters. When the DATA/ENTER key is pressed after changing the setting, the user parameter will be written into memory and the display will return to parameter monitor automatically.

■ Example Operations (Shown for E7B_ _ _T, LED Keypad Display. See TM-E7B-01 for the E7B_ _ _Y, LCD Keypad Display)

An example of key operations is given below for when the following settings have been changed from their default settings: b1-01 (Reference Selection), C1-01 (Acceleration Time 1), E1-01 (Input Voltage Setting), and E2-01 (Motor Rated Current).

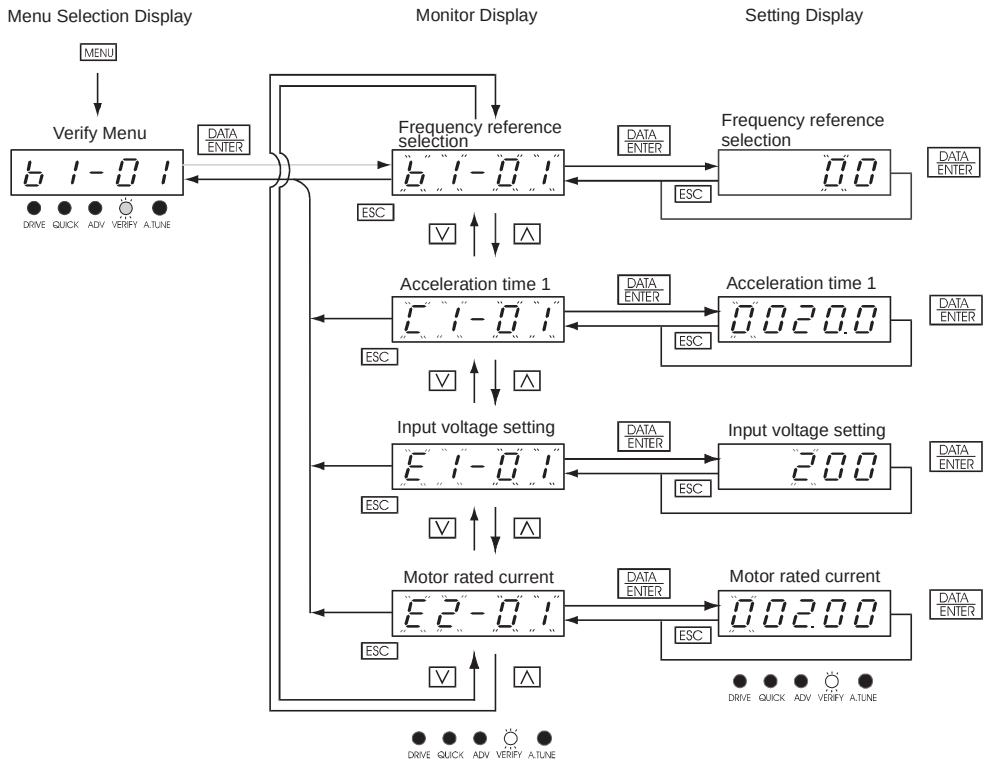


Fig 1.15 Operations in Verify Menu

◆ - A.TUNE - Auto-Tuning Menu

For E7 Bypass units Auto-Tuning can only be accomplished through the DriveWizard software (Part Number DWST616-C2). A free download from www.drives.com.

This menu is used in non-bypass Drives to auto-tune the Drive in order to utilize the bi-directional speed search feature. Follow the key operations below to access the Auto-Tuning Menu.

■ **For Reference Purposes** (Shown for E7B_ _ _T, LED Keypad Display. See TM-E7B-01 for the E7B_ _ _Y, LCD Keypad Display)

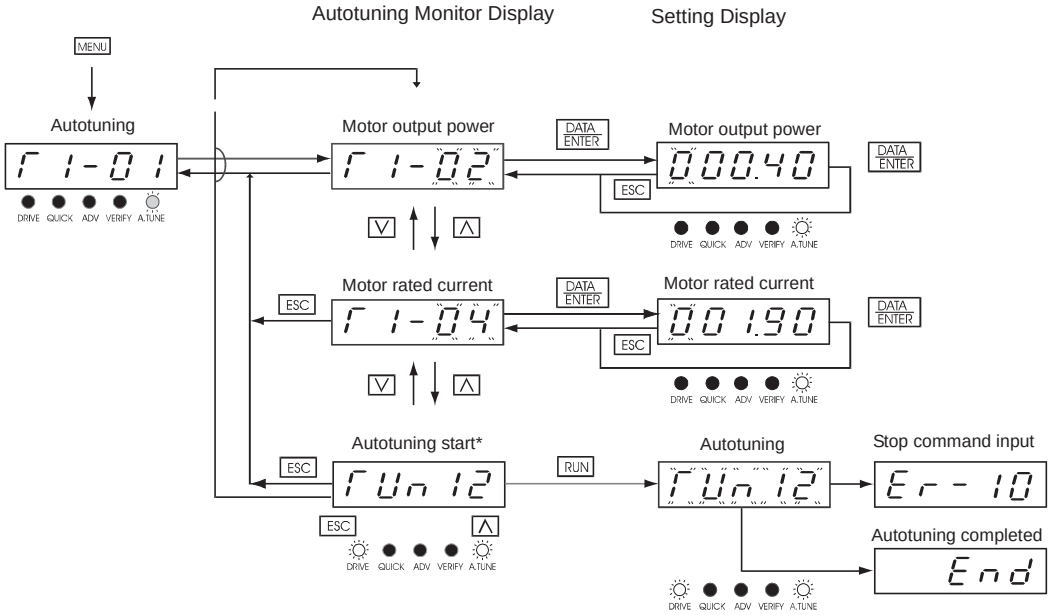
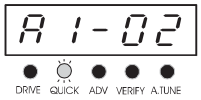
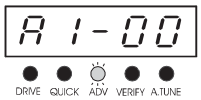
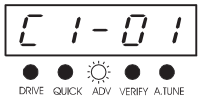


Fig 1.16 Operation in Autotuning Menu

Example of Changing a Parameter

Table 1.31 provides an example of how to change parameter “C1-01” (Acceleration Time 1) from 30 sec to 20 sec.

Table 1.31 Changing a Parameter in the Programming Menu

Step Number	Digital Operator Display	Description
1		Power supply turned ON.
2		MENU Key pressed to enter drive menu.
3		MENU Key pressed to enter quick programming menu.
4		MENU Key pressed to enter advanced programming menu.
5		DATA/ENTER pressed to access monitor display.
6		INCREASE or DECREASE Key pressed to display C1-01 (Acceleration Time 1).
7		DATA/ENTER Key pressed to access setting display. The setting of C1-01 (30.00) is displayed.
8		Shift/RESET Key pressed to move the flashing digit to the right.
9		DECREASE Key pressed to change set value to 20.00 s.
10		DATA/ENTER Key pressed to enter the set data. “END” is displayed for 10 s and then the entered value is displayed for 0.5 s.
11		The monitor display for C1-01 returns.

Start Up Introduction

In order to provide you with the most reliable Drive and Bypass unit available, and to avoid any extra costs related to loss or reduction of warranty coverage, an authorized Yaskawa service representative should complete this start up procedure. Please complete the checklist in this document and maintain it in a secured location. Should you have a need to contact Yaskawa in the future, technical service personnel may request information from this document.

⚠ CAUTION

Procedures within this document assume that start up is being accomplished by a Yaskawa authorized service person who has training on the product and is capable of working through the detailed steps with power applied to the Bypass unit while the enclosure door is open.

Start-Up Date: _____ Start-Up Location: _____

Start-Up Person: _____ Company Name: _____

Phone Number: _____ Signature: _____

Sales Order Number: _____ E7B Unit Tag Number: _____

Drive Model Number: _____ Drive Serial Number: _____

In this Start-Up chapter, when referring to the keypad display, the complete description of the parameter setting choices are presented for clarity purposes. For example, one of the setting choices for parameter **b1-02** is “1: terminals.” Keep in mind that on the LED keypad display (option T), only the number of the choice will be shown. The LCD keypad display (option Y) is required to see the complete description.

IMPORTANT INFORMATION

◆ The Safety Interlock Circuit at Power Up

On power up the E7B_ _ _T or E7B_ _ _Y will display a red “Safety Open” LED in the “System Status” area of the front control panel if a normally closed “Safety Circuit” has not been installed between TB1-1 and TB1-9 on PCB A2. This condition will prevent Drive or Bypass operation.

One of the following three items needs to be done prior to start-up:

1) Install an NC “Safety Circuit” between TB1-1 and TB1-9 on PCB A2.
2) Install a jumper between TB1-1 and TB1-9 on PCB A2. This method should be used if a “Safety Circuit” will be added later in the installation.
3) De-activate these terminals by moving DIP switch S2-7 to the ON position (toward the enclosure door). This solution is only suggested if a “Safety Circuit” will <u>never</u> be applied to the drive system.

◆ The BAS Interlock Circuit at Power Up

When a Run command is received in HAND or AUTO mode, the E7B_ _ _T or E7B_ _ _Y will display a red "Damper/Bas" LED in the "System Status" area of the front control panel. This condition will prevent Drive or Bypass operation.

One of the following three items needs to be done prior to start-up:

1) Install a "BAS Interlock Circuit" between TB1-3 and TB1-9 on PCB A2.

2) Install a jumper between TB1-3 and TB1-9 on PCB A2. This method should be used if a "BAS Interlock Circuit" will be added later in the installation.

3) De-activate these terminals by moving DIP switch S2-8 to the ON position (toward the enclosure door). This solution is only suggested if a "Safety Circuit" will never be applied to the drive system.

BYPASS UNIT START UP PREPARATION

Note: These instructions assume that all jumpers and DIP switches are in the factory default position as defined by schematic diagram E7B-10.

☐ 1. Review Bypass Technical Manual TM.E7B.01and any option instructions and schematics (E7B-10) shipped with the Drive and Bypass unit.

☐ 2. Verify that the model numbers and voltage ratings are as specified in the purchase order by matching the nameplate data for each unit to the purchase order.

☐ 3. Verify that the unit has been installed in accordance with TM.E7B.01 Chapter 1, *Physical Installation* and Chapter 2, *Electrical Installation*.

☐ 4. Inspect the security of the supply line power, ground connections and all control circuit connections as identified in TM.E7B.01 Chapter 2, *Electrical Installation* and "Control Wiring" in this document.

Double check all the power wires and motor wires.

Verify that the electrical supply power lines (L1, L2, L3) are connected to the input circuit breaker (CB1 on the schematic E7B-10) and that the motor leads (T1, T2, T3) are connected to the output terminals of the overload relay (S10 on the schematic E7B-10). Ensure that all connections are tight, loose wire connections may cause intermittent problems or overheating. Factory connections sometimes come loose during shipment.

☐ 5. Review the installer's "as wired" schematic. Determine if a driven motor "safety circuit" is connected. This is a series circuit of NC contacts from devices such as a smoke/fire sensor, freeze-up thermostat or high static pressure limit switch. Verify that these customer emergency contacts are properly terminated in the Bypass safety shutdown circuit. These contacts should be wired between terminal **TB1-1** and **TB1-9**. No field programming is required.

Verify that all other field installed wires are correctly terminated (included the shields).

☐ 6. Verify that the motor is wired for the application voltage. Record the motor nameplate information:

Voltage _____ Motor Rated Amps

☐ 7. Verify that the input voltage matches the Bypass unit rating.

☐ 8. Verify that the motor rated full load amps (FLA) does not exceed the rated output current of the Drive and Bypass controlling it. When multiple motors are simulaneously operated by the Drive, the sum of all motor FLA values must be less than or equal to that of the Drive and Bypass controlling them.

☐ 9. Record any other connections to the Bypass unit, by terminal number to determine if special programming of any of the following is required. (see Chapter 5 or TM.E7.02 for programming details).

- Multi-function Digital Inputs
- Multi-function Digital Outputs
- Analog Outputs
- Differential PI control

☐ 10. Verify that the building automation system logic is ready for the start, stop and speed command functions.

BYPASS UNIT START UP PROCEDURE

(Please review “Bypass Start Up Preparation” on page 41)

The front control panel has a digital alpha/numeric display and keypad, in the upper portion, for Drive operation and programming. The row of LEDs above the alpha/numeric display indicate Drive operational status. The **REMOTE SEQ** and **REF** LEDs in this row are always lit in most Bypass unit applications of the E7 Drive. The row of LEDs below the alpha/numeric display indicate the Drive menu that is presently active, for the E7B_ _ _T units. This information is part of the LCD display for the E7B_ _ _Y units.

The lower portion of the front control panel displays the operating mode status via LEDs and controls the HAND/OFF/AUTO functions for both the Drive and Bypass. The general rule for LED colors, in the lower portion of the control panel, is:

Green = Normal Status
Amber = Abnormal Status
Red = Fault Status

☐ 1. Before applying power, make sure that the following conditions are met:

- The VAV terminal unit dampers, in supply fan applications, are open to prevent duct flexing or damage in a fullspeed, across the line starting situation.
- The electro-mechanical motor OverLoad Relay (OLR) (S10) is adjusted to equal the Full Load Amps (FLA) valuefrom the motor nameplate.

The OLR is mounted to the contactor assembly or back panel (depending on rating), just above the Bypass contactor. See Figure 1.17. Electrically on the output power side of the Bypass unit, the adjustable thermal OLR provides overload protection for the motor in both the Drive and Bypass operating modes. The OLR is set up in the factory to be a manual reset device, requiring operator attention if an overload trip-out is experienced.

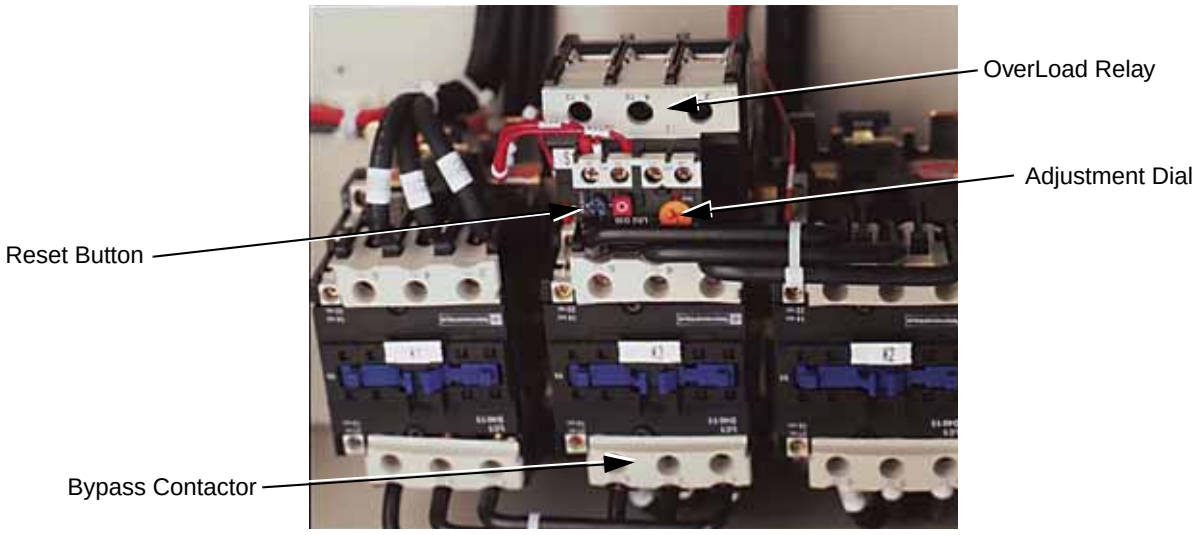


Fig 1.17 Typical Motor Overload and Contactors

Fig 1.18 Overload Relay Detail

IMPORTANT To maintain overcurrent, short-circuit, and ground-fault protection, the manufacturer's instructions for setting the motor OLR must be followed.

☐ 2. Apply power to the Drive and Bypass package. Using a VOM, ensure that all three phases are present and that the input voltage is correct for the system being set up. When power is applied to the E7B unit, the control logic will briefly (<3 seconds) self test all the control panel operating mode LEDs, located on the lower half of the control panel. Then, the **SEQ** and **REF** LEDs (red), **DRIVE** menu LED (red), **STOP** LED (red), **Control Power** LED (green), **Ready** LED (green), **Drive Select** LED (green) and **OFF** LED (amber) will be lit when the Drive and Bypass are ready for operation. The alpha/numeric display will show input frequency (speed command), at power up. [Note: If the **Motor O/L** LED (red) is lit, press the reset button on the motor overload relay.]

☐ 3. Various menus are directly available by pressing the **MENU** key (see Chapter 3). When in the **DRIVE** menu, the Drive can accept a run command from local (Hand mode) or remote (Auto mode) sources. Press the **MENU**key until the **ADV/PRGM** menu LED (red) is lit. From here, any of the E7 parameters can be accessed and changed using the ⮝, ⮟, and **DATA/ENTER** keys. See Appendix A (TM.E7B.01) for a list of programmable features. The **VERIFY** menu can be used to review or modify only those parameters that have been changed from the Drive's default values. Using the ⮝, ⮟, and **DATA/ENTER** keys as needed, verify that the parameters are correct for the Drive and installation conditions. See the *Factory Parameter Settings* printed in Table 1 and Table 6 on page 2 and 3 of the E7B-10 Schematic Diagram. Consider any additional parameter settings that may be needed by this specific application.

The *Factory Parameter Settings,* table 1, documents E7 Drive parameter settings, required to interface with the Bypass logic circuit, that have been established at the factory and stored in a dedicated location in the E7 memory as "UserInitialization" values (think of it as a "back-up file"). If additional parameters are set to the specific needs of theapplication project, and the system operation has been checked and verified, then the "User Initialization" values should be stored in memory again by entering "1: Set Default" in parameter **o2-03**.

When there is a need for re-initialization (resetting to a known factory starting point for troubleshooting purposes) of the E7 Drive, then a 2-wire initialization should be carried out by entering "2220: 2 Wire Initial" in parameter **A1-03**, followed by entering the "1110: User Initialize" function, also in parameter **A1-03**. This will re-establish the E7 Drive set-up required for the E7B Bypass application and any "user" parameter values that have been stored.

Table 1 is also used to document parameters that have been factory set to typical values for fan and pump applications. These parameters [**b1-08**, **L4-05**, **L5-01**, **L5-03**, **o2-03** and **o3-02**] may be changed to meet the needs of the specific application.

☐ 4. From the **ADV/PRGM** menu, press **DATA/ENTER**, go to parameter **E1-01** and enter the nominal input voltage that the Drive will receive in this specific application. The overall voltage classification of the Drive cannot be changed by this parameter. However, the input voltage should be adjusted within the range available for the given voltage "class" of the Drive to match the input voltage level normally found on the jobsite. For example, 480 VAC class Drives may be employed on nominal three phase voltage distribution systems of: 380, 400, 415, 440, 460 or 480 VAC. The factory default values may need to be changed to meet the needs of the application distribution voltage.

☐ 5. From parameter **E1-01**, use the ESC, ⮝ and **DATA/ENTER** keys as necessary, to go to parameter **E2-01** and enter the Motor Rated Current. Set this parameter to the motor rated Full Load Amps (FLA) shown on the motor nameplate. This is essential for proper Drive operation and motor overload protection. [**Note:** Do not include the "service factor" amps.]

☐ 6. Press the **MENU** key to return to the **DRIVE** menu and the same operational status LED configuration described in step 2 above. The alpha/numeric display will show the speed command frequency.

To start the motor in Drive mode, press the **HAND** key. The **DRIVE Run** LEDs (red and green) and the **HAND** LED (amber) will light and the Drive output will ramp up to "6 HZ." Verify that motor rotation is correct.

If the direction of motor rotation is wrong, press the **OFF** key and turn the Power *OFF*! Wait for the red **CHARGE** LED (near the Drive power terminals) to go out. When it does, swap the wires for **T1** & **T2** on the output terminals of the motor Overload Relay. Tighten the terminal lugs, reapply the power, press the **HAND** key and re-check the rotation direction.

☐ 7. With correct motor rotation, press the **MENU** key, if necessary, to return to the **DRIVE** menu. Press **DATA/ENTER** (as needed to get "F" flashing) then using the ⮝ and ⮟ keys, manually run the Drive throughout its entire speed range, while observing operation. If excessive vibration of the driven load is noted at specific frequencies (speeds), the Jump Frequency function may be used to eliminate this vibration, by programming **d3-01** through **d3-04**. Press the **OFF** key.

☐ 8. Determine whether the remote speed command is a 0-10 VDC or a 4-20 mA signal. The positive side of the signal should be connected to terminal **TB3-3** of the E7B terminal strip. The "common" of the remote speed command signal should be connected to terminal **TB3-1** of the E7B. See the connection diagram on page 1 of the E7B Bypass unit schematic E7B-10. [**Note:** The factory default is 4-20 mA, to change to 0 to 10 VDC adjust parameter **H3-08** to "0: 0-10VDC" and move E7B DIP switch **S1-2**, on the terminal PCB to the OFF position (toward the unit rear).]

☐ 9. For the Auto mode, request a run command and speed command signal from the building automation system to confirm remote (auto) operation.

☐ 10. Press the **AUTO** key, the **DRIVE Run** LEDs (red and green), the **AUTO** LED (green) and **AUTO Run** LED (green) will light and the Drive output will ramp up to the Auto mode speed command. Observe if the remote speed command can achieve the minimum and maximum speeds desired. If not, perform the following: - See Chapter 5 of TM.E7B.01.

For 0-10 VDC input at Terminal **TB3-3**

1. With no input, adjust the Bias (**H3-11** setting) until an output of "0.0 Hz" is obtained.
2. With full scale input, adjust the Gain (**H3-10** setting) until an output of "60.0 Hz" (or other desired maximum frequency) is obtained.

For 4-20 mA input at Terminal **TB3-3**

1. With 4 mA input, adjust Bias (**H3-11** setting) until an output of "0.0 Hz" is obtained.
2. With 20 mA input, adjust Gain (**H3-10** setting) until an output of "60.0 Hz" (or other desired maximum frequency) is obtained.

☐ 11. In preparation for testing the Bypass, observe the trip setting of the Circuit Breaker. The trip point is factory set at the lowest possible setting and must be adjusted for each application. This breaker will trip due to inrush current and load inertia unless it is reset!
- For fan applications adjust the trip setting to ten times motor FLA.
- For pump applications adjust the trip setting to six times motor FLA.

If Circuit Breaker tripping is experienced at these settings during motor starting on Bypass, increase the setting gradually until the motor can be started without Circuit Breaker tripping.

☐ 12. Press the **OFF** key and press the **BYPASS Select** key. The Drive will ramp the motor to zero speed, then the control will be transferred to Bypass mode. Be prepared to monitor the rotation direction of the motor in Bypass operation. "Bump" the **HAND** key and quickly press the **OFF** key. Check the motor rotation. Do not allow the motor to continue operating in Bypass mode until rotation is correct!

If the rotation direction in Bypass is correct, skip the rest of this step. If not, carry out the following corrections:

1. Turn *OFF* the incoming power feed to the E7B unit. Since the correct rotation in Drive mode was previously established, do not change any output wires at the motor.
2. Instead, verify that power is *OFF*. Then swap the wires for **L1** & **L2** on the input side of the Disconnect Switch or Circuit Breaker. This will effect rotation in Bypass operation only. Once connections are complete and tight, reapply the incoming power and repeat the previous step to re-check the rotation direction in Bypass mode.

☐ 13. Run the motor in Bypass by pressing the **HAND** key. Record all the phase voltages and currents at this time.

☐ 14. Press the **OFF** key and press the **DRIVE Select** key. Press the **HAND** key and press the **DATA/ENTER** key, then scroll the Speed Command to "60 HZ" operation. Monitor the voltages and currents in each of the output phases at full speed to make sure that the voltages are balanced and that the currents are within the motor nameplate rating during accel, stable speed, and decel.

☐ 15. If this application requires the Drive to operate in PI mode, see Chapter 5 of TM.E7B.01.

For serial communication, refer to Appendix D in TM.E7B.01 or TM.E7.21 (APOGEE FLN) and TM.E7.22 (Metasys N2).

E7B Drive / Bypass System with TouchPad Control Panel (option T or Y) Control Wiring and Start-Up Procedure

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