MOTORTRONICS™

Solid State AC Motor Control

MVC4

MEDIUM VOLTAGE SOLID STATE SOFT STARTER

USER MANUAL

1.0 - 7.2 kV

2.2 Control Connections - TCB (Terminal and Control Board)

2.2.1 TCB Board

The TCB board, FIG. 2.2.1 shown below, provides interconnections between the main power and CPU boards and the customer's control logic connections. It is a 120 VAC control board with several auxiliary dry contacts, built-in time delay circuits and an emergency bypass function. It also controls the inline isolation and bypass contactor and provides provisions for shutdown interlocks. (See **Section 2.2.2** for terminal designations and descriptions)

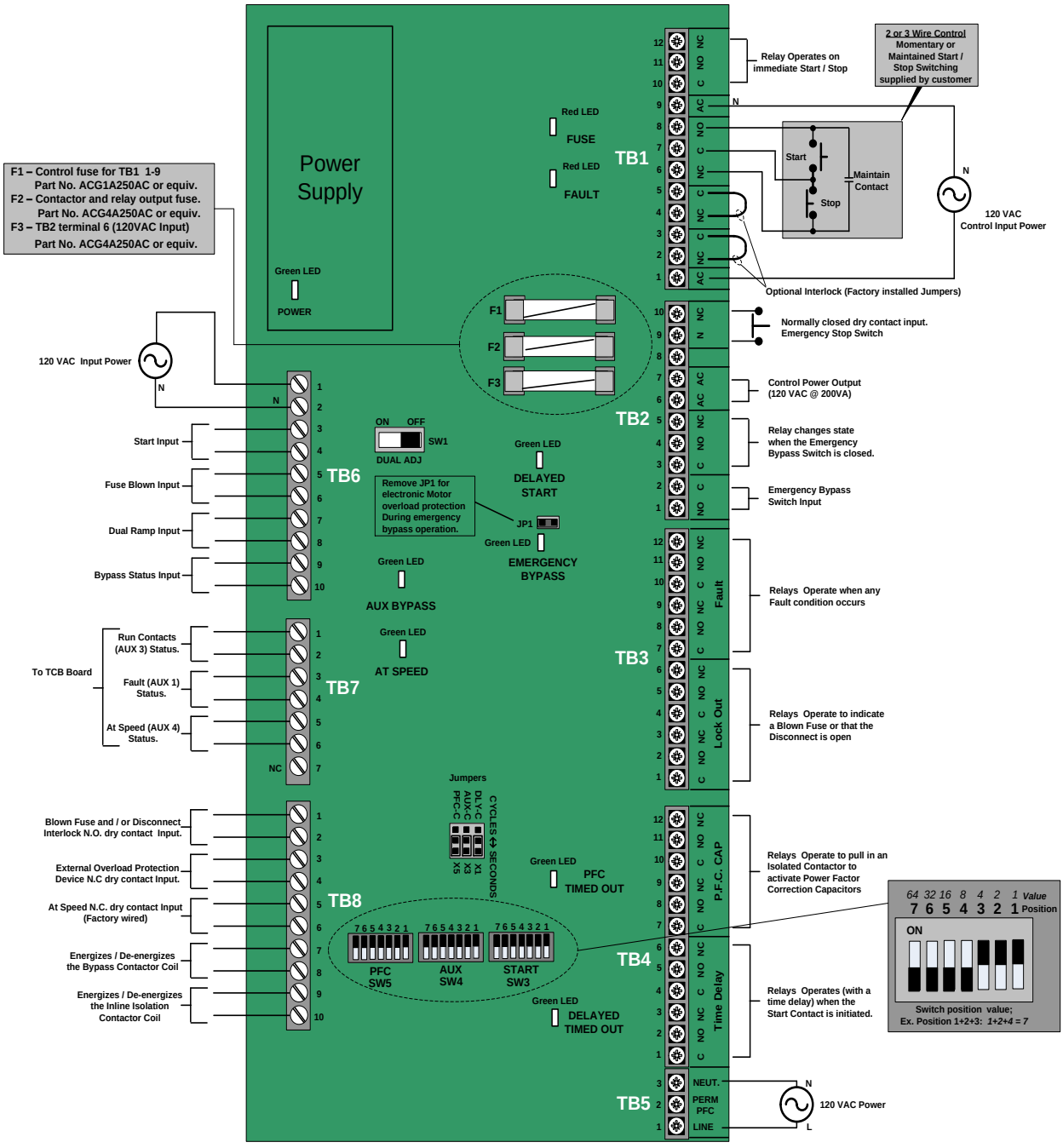


FIG. 2.2.1 TCB Terminal and Control Board

2.2.2 Description of Terminal Connections

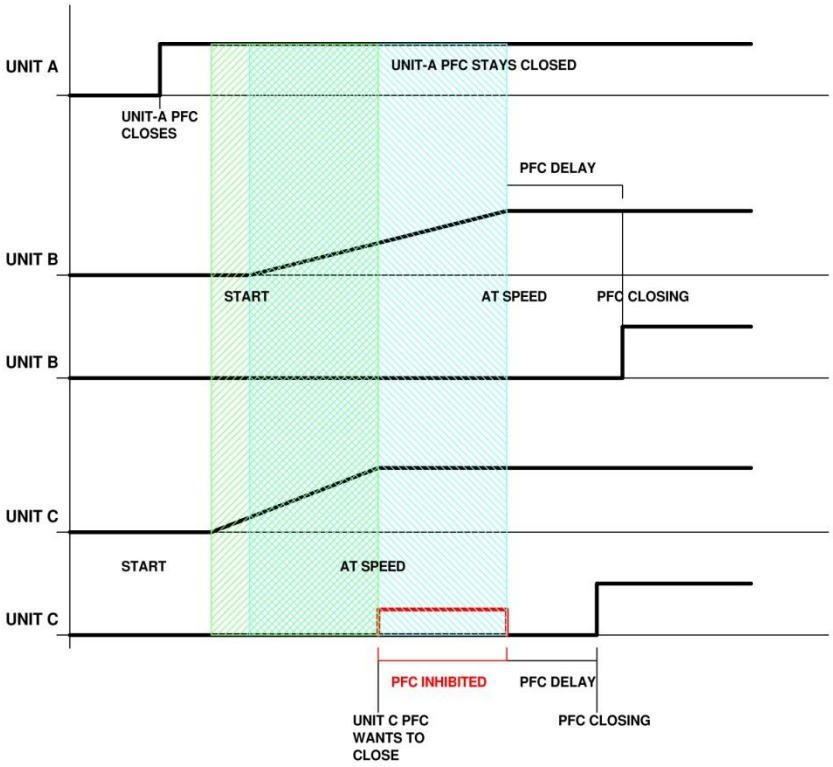
TB1 Start / Stop Control		
T	**Description**	
1	**AC**	120 VAC Control Power (Line)
2 **3**	**NC** **C**	Shutdown Input – Accepts customer N.C dry contact (Factory jumper installed)
4 **5**	**NC** **C**	Shutdown Input – Accepts customer N.C dry contact (Factory jumper installed)
6 **7** **8**	**NC** **C** **NO**	Terminal 6, 7 & 8;"2-wire control is connected to pins 6 & 8". Also; "For 3 wire control, connect the N.C. STOP button to pins 6 & 7 and the N.O. START button to pins 7 & 8
9	**AC**	120 VAC Control Power (Neutral)
10 **11** **12**	**C** **NO** **NC**	Common Normally Open Normally Closed, Form C Relay that changes state on Start and Stop commands

TB2 Emergency Bypass Control		
T	**Description**	
1 **2**	**NO** **C**	When the N.O. contact closes the unit reverts to an electromechanical starter. When a start command is given the unit will start the motor across the line.
3 **4** **5**	**C** **NO** **NC**	Terminals 3, 4 and 5 is a form C output relay that changes state when the contact at TB2 pins 1 & 2 is closed
6 **7**	**NO** **NC**	120 VAC @ 200VA Aux Control Power output.
8	**-**	Not Used
9 **10**	**N** **NC**	Normally Closed Emergency Stop Dry Contact Input. Open to activate the Emergency Stop Feature.

TB3 Fault Relay Outputs		
T	**Description**	
1 **2** **3**	**C** **NO** **NC**	(2) Form C relay output that transfer on blown fuse or disconnect open indication.
4 **5** **6**	**C** **NO** **NC**	(2) Form C relay output that transfer on blown fuse or disconnect open indication.
7 **8** **9**	**C** **NO** **NC**	(2) Form C relay output that transfer on ***any*** fault indication.
10 **11** **12**	**C** **NO** **NC**	(2) Form C relay output that transfer on ***any*** fault indication.

TB4 Optional Relay Outputs		
T	**Description**	
1 **2** **3**	**C** **NO** **NC**	2 Form C time delay Aux relay output contacts. Time delay starts when the Start commend is given.
4 **5** **6**	**C** **NO** **NC**	
7 **8** **9**	**C** **NO** **NC**	2 Form C time delay Aux relay output contacts. Time delay starts when the "At Speed" condition is reached ideal for controlling a PFC contactor.
10 **11** **12**	**C** **NO** **NC**	

TB5 TCB Power		
T	**Description**	
1	**L**	By connecting TB5 of multiple units in parallel, PFC contactors will be inhibited from closing while a unit is soft starting. PFCs that are already on line will remain on line. The lead unit in the parallel string requires TB5 pins 1 & 3 to be connected to the 120Vac source and neutral respectively.
2	**PFC**	
3	**N**	



Example: PFC Automatic inhibit control

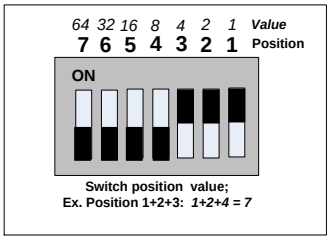
TB6 Main and CPU Circuit Board Control Inputs		
T	**Description**	
1 **2**	**L** **N**	120 Vac output to Control Power Input (Main & CPU Circuit)
3 **4**	**-** **-**	Start Input
5 **6**	**-** **-**	Fuse Blown Input
7 **8**	**-** **-**	Dual Ramp Input
9 **10**	**-** **-**	Bypass Status Input

TB7 Main and CPU Circuit Board Control Outputs	
T	**Description**
1 **2**	Run contacts (AUX3) to the TCB board. *(Signal is used to hold the Main Contactor closed during deceleration)*
3 **4**	To the TCB board indicating the status of AUX 1.
5 **6**	At Speed Contacts (AUX 4) used to signal the Bypass Contactor to close.
7	Not Connected / Not Used

TB8 Control Inputs and Outputs	
T	**Description**
1 **2**	N.C. dry contact input from blown fuse and/or disconnect interlock.
3 **4**	N.C. dry contact input from an external Overload Protection device. *(Required if emergency bypass is used)*
5 **6**	N.C. dry contact input from the Bypass Contactor for at speed indication.
7 **8**	Output connected to the Bypass Contactor and energizes / de-energizes the Contactor. *(Factory wired)*
9 **10**	Output connected to the Inline Isolation Contactor and energizes / de-energizes the Contactor. *(Factory wired)*

2.2.3 Description of Jumper Selections and Functions

Jumper Selection			
Jumper		**Time Delay**	**Function**
DLY-C	**X1**	Seconds /Cycles	**Start Delay** Jumper selects between seconds or cycles (1/60th of a second) for the start delay when a Start command is received and when the CPU actually receives the start signal. Default jumper setting is seconds.
AUX-C	**X3**	Seconds /Cycles	**Auxiliary (Start) Delay** Jumper selects between seconds or cycles (1/60th of a second) for the auxiliary start delay when a Start command is received and when the CPU actually receives the start signal. Default jumper setting is seconds.
PFC-C	**X5**	Seconds /Cycles	**PFC Contactor Delay** Jumper selects between seconds or cycles (1/60th of a second) for the delay when the Bypass Contactor closes to when the Power Factor Capacitors Contactor is activated. Default jumper setting is seconds.
JP1		N/A	**Motor Protection Jumper** When this jumper is in place, the CPU will be disabled during operation in the Emergency Bypass Mode. ***In this case, insure that there is an external means of overload protection.*** When the jumper is removed, the CPU will be enabled to provide electronic motor protection when operating in the Emergency Bypass Mode.

DIP Switches		
Switch	**Function**	
SW1	ON: Sets Dual Adjustment OFF: Disabled	
SW2	Not Used	
SW3	Sets the Start Delay Value	SW3, SW4 and SW5 are 7 position DIP Switches that use binary coding to set the value of the time delay in Cycles or Seconds as selected via jumpers X1 to X6. (See Jumper Table.) The setting range is 0 to 127 (1+2+4+8+16+32+64). The example shown results in a value of 7 (1+2+4) 
SW4	Sets the AUX Start Delay Value	
SW5	Sets the PFC Contactor Delay Value	

2.2.5 Description of LED Indicators Functions

LED Indicators			
Function	**Location**	**Color**	**Function**
Fuse Blown/ Disconnect	D4	Red	ON: When a Fuse is blown and / or a Disconnect is open.
Fault	D16	Red	ON: When any Fault has occurred.
Start	D7	Yellow	ON: When a Start signal has been initiated.
PFC Timed Out	D17	Yellow	ON: When the Power Factor Correction Capacitors Contactor is energized.
Delay Timed Out	D15	Yellow	ON: When the Auxiliary Start Contacts have been energized.
+24V	D28	Green	ON: +24V supply is good.