MOTORTRONICS
Solid State AC Motor Control

Manual Addendum for VMX-B Configured Soft Start Packages

For use with wiring diagram # 93-3880 Rev B (CB/FS), or 93-3881 Rev B (MLO), and VMX2 user manual.

Introduction: The VMX-B is a configured enclosed soft start, available as a Combination (with C/B or Fused disconnect) package, or as an MLO (Main Lug Only) package, intended for use in Industrial, Commercial, Agricultural, or Infrastructure applications.

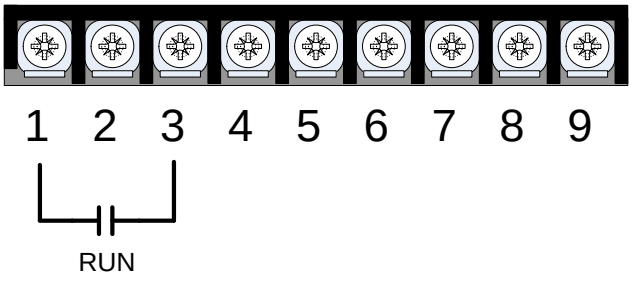
Line Voltage:
By default units are set-up for 460VAC line power, but can be adjusted to operate on 230VAC or 208VAC at the reduced HP rating. To adjust the operating voltage simply move wire #1L2B from the 480V (H4) terminal to the 230V (H3) or 208V (H2) terminal.

Power Connections:
Line Power input is connected directly to the bottom terminals of the Circuit Breaker, or line terminals on MLO (Main Lug Only) units, and the motor is connected to the lugs at the bottom of the VMX2 soft start.

Remote Start / Stop Control connections:
The VMX-B is set up for 2 or 3 wire remote control using dry contacts rated at 120VAC (0.1Amp).

Remote Two Wire Control:
Connect a dry (voltage free) maintained contact closure between terminals 1 and 3 of the customer terminal strip as shown here.

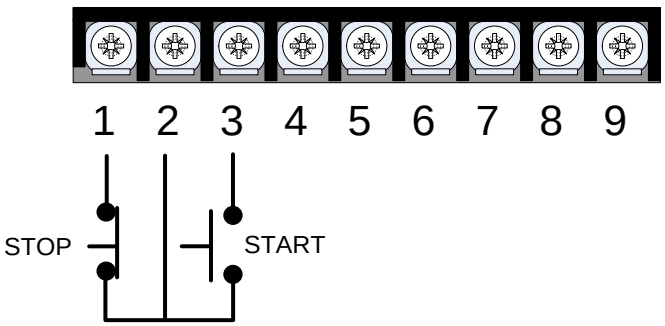
Customer Terminals TBC on TCB3000 PCB



See page 3.
TCB3000 Terminal Control Board

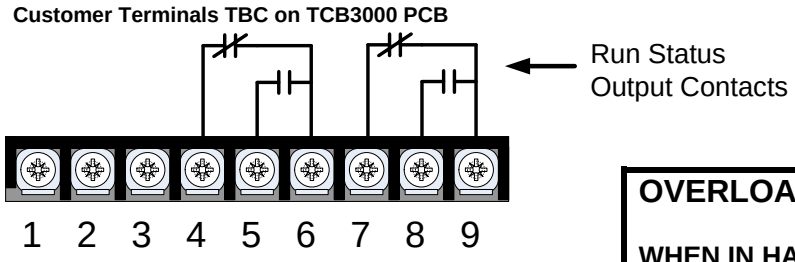
Remote Three Wire Control:
For standard 3-wire control, connect dry (voltage free) contacts for the Stop / Start buttons as shown below of the customer terminal strip. Connect the normally closed “STOP” pushbutton across terminals 1 & 2, and the normally open “START” pushbutton across terminals 2 & 3 of the customer terminal strip. **Note:** the unit can be operated in the “Local” position without any external control.

Customer Terminals TBC on TCB3000 PCB



See page 3.
TCB3000 Terminal Control Board

Run Status Output Contacts
The VMX-B unit offers 2 Form-C (N.O and N.C.) “RUN” contacts located on the customer terminal strip, terminals 4 (NC), 5 (NO), 6 (Common), and terminals 7 (NC), 8 (NO) 9 (Common). These contacts reflect a successful RUN command in “SOFT” or “X-LINE” mode, and should be used for any required “Run / Running” status outputs.



See page 3.
TCB3000 Terminal Control Board

VMX2 Auxiliary Contacts
(TB2 of Soft Starter)

There are 3 programmable Aux contacts available on TB2 of the VMX2 soft start (2 form-C and 1 form-A). The function of these contacts are labeled on the wiring diagrams, but can be changed in the VMX2 programming. Note however, that the contacts may not function properly when operating in the X-LINE mode. (see description below).

X-LINE Operation:
VMX-B packages are supplied with a **SOFT/X-LINE** selector switch, located on the TCB3000 PCB that allows the operator to select Full Voltage operation of the motor via the bypass contactor for emergency operation when the soft start may be inoperable.

When operated in the X-LINE mode full start/stop control is maintained, and the “Run Status Output Contacts” will function correctly.

During X-LINE operation, the motor will be protected by the external Bi-Metal overload relay which must be set according to the motor FLA and the Current transformer ratio of the unit.

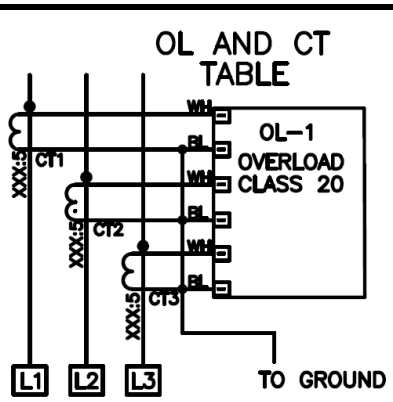
Important:

Motor FLA and Service Factor must be entered prior to a start attempt see next section on how to set Motor FLA and Service Factor parameters.

OVERLOAD RELAY OPERATION

WHEN IN HAND (H) POSITION: USER MUST RESET OL (BY PUSHING GREEN BUTTON)

WHEN IN AUTO (A) POSITION: RELAY WILL AUTOMATICALLY RESET AFTER TRIPPING



OL SET FORMULA

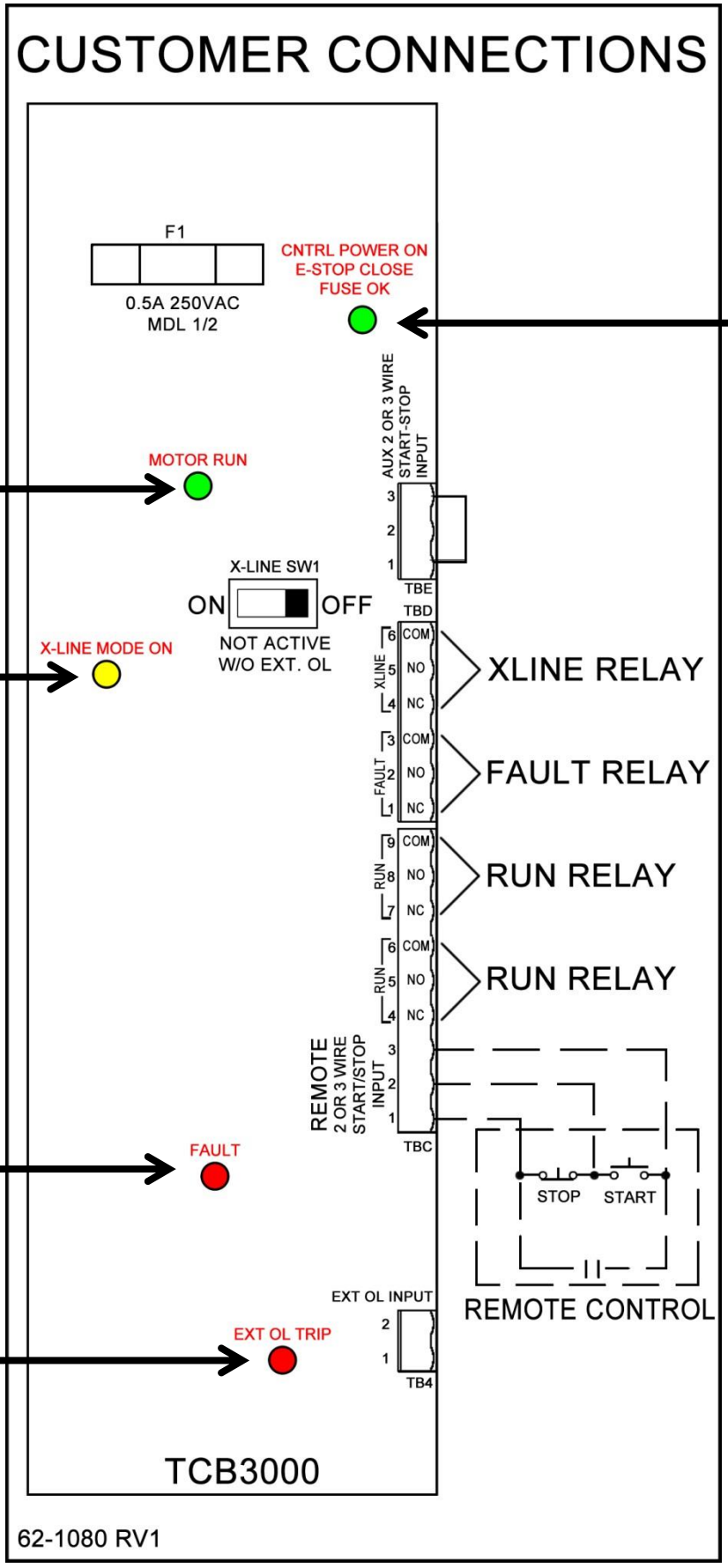
$$\text{OL SET} = \frac{\text{MOTOR FLA X 5}}{\text{CT RATING}}$$

NOTE: YELLOW OVERLOAD DIAL MUST BE SET IN ACCORDANCE WITH THE MOTOR “FULL LOAD AMPS” PER MOTOR NAME PLATE DATA

YELLOW OVERLOAD ADJUSTMENT DIAL

VMX-B MODEL NUMBER	CT RATING XXX:5	4	5	6
VMX-B-21-YY-4	18-25A	18	22	25
VMX-B-27-YY-4	28-40A	28	34	40
VMX-B-40-YY-4	34-50A	34	42	50
VMX-B-45-YY-4	50:5	40	50	60
VMX-B-55-YY-4	75:5	60	75	90
VMX-B-68-YY-4	75:5	60	75	90
VMX-B-96-YY-4	100:5	80	100	120
VMX-B-125-YY-4	120:5	96	120	144
VMX-B-156-YY-4	200:5	160	200	240
VMX-B-220-YY-4	200:5	160	200	240
VMX-B-230-YY-4	250:5	200	250	300
VMX-B-248-YY-4	300:5	240	300	360
VMX-B-400-YY-4	400:5	320	400	480
VMX-B-480-YY-4	500:5	400	500	600
VMX-B-600-YY-4	500:5	400	500	600
VMX-B-690-YY-4	700:5	560	700	840
VMX-B-800-YY-4	700:5	560	700	840
VMX-B-960-YY-4	1000:5	800	1000	1200
VMX-B-1080-YY-4	1200:5	960	1200	N/A

TCB3000 Terminal Board



Green LED
- Control Power ON
- E-Stop Not Active
- Fuse OK

Green LED
Motor Running

Yellow LED
X-Line Mode Enabled
(D.O.L. Start)

Red LED
Fault
(Unit Tripped requires
Reset Command)

Red LED
External O/L Tripped
(Reset O/L Manually
by pressing green
button on overload
relay).

Programming Instructions

This document is intended for use with Models: VMX-B Soft Start Packages

Motor FLA and Service Factor must be entered prior to start attempt

Entering Motor FLA & SF

Press Key…	Means…
	0000 — Default Display
Fn	F001 — Function #1 Selected
Read Enter	0000 — FLA value (0000 is default)
↑	0009 — Set value of ones digit (flashing)
←	0009 — Cursor Position Shift (tens digit flashing)
↑ ←	0179 — Set value of remaining FLA digits
Read Enter	End — Value Accepted (flashes once)
	F001

Use up arrow to scroll to F002 and repeat process to set Service Factor. When programming is complete press Fn key to exit programming mode.

Fn #	Function Description	Range	Default
F001	Motor Nameplate FLA	50-100% of Max Amp Rating.	None
F002	Motor Nameplate Service Factor	1.00 - 1.30 SF	1.0 SF

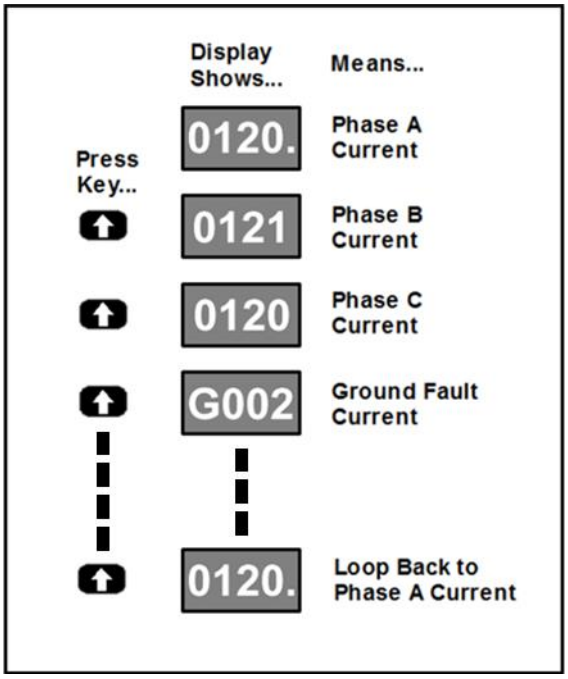
For complete parameter list see pages 6-7 of this document

For Complete Installation instructions see VMX Operation & Installation Manual

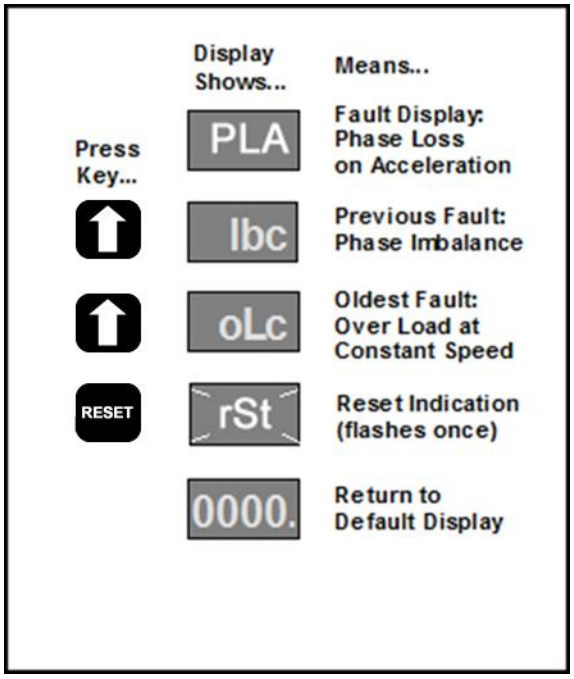
Operation and Troubleshooting

Keypad Operation

Display Mode (Default)



Fault Mode



Fault Code	Description
nFLA	No Full Load Amps set in F001
Inh	Parameter change attempted when in Run Mode or without password
N3Ph	Line Voltage Loss (no 3 phase prior to start)
Loc	Lockout Starter is in overload or duty cycle lockout
Err	Incorrect Password Entered
ocA; occ: ocd	Over Current during Acceleration; Constant speed; Deceleration
PLA; PLc; PLd*	Phase Loss during Acceleration; Constant speed; Deceleration
otA; otc; otd	Over Temperature during Acceleration; Constant speed; Deceleration
oLA; oLc; oLd	Over Load during Acceleration; Constant speed; Deceleration
SSA; SSc; SSd*	Shorted SCR during Acceleration; Constant speed; Deceleration
st	Shunt Trip during Acceleration; Constant speed; Deceleration
IbA; Ibc; Ibd	Current Imbalance during Acceleration; Constant speed; Deceleration
UcA; Ucc; Ucd	Under Current during Acceleration; Constant speed; Deceleration
ScA; Scc; Scd	Short Circuit during Acceleration; Constant speed; Deceleration
GFA; GFc; GFd	Ground Fault during Acceleration; Constant speed; Deceleration
bPA; bPc; bPd	Bypass Discrepancy during Acceleration; Constant speed; Deceleration
LcA; Lcc; Lcd*	Normally closed external lockout is open
rtA; rtc; rtd	Rotation Trip during Acceleration; Constant speed; Deceleration
EIA; Elc; Eld	Voltage Imbalance during Acceleration; Constant speed; Deceleration
oEA; oEc; oEd	Overvoltage during Acceleration; Constant speed; Deceleration
UEA; UEc; UEd	Undervoltage during Acceleration; Constant speed; Deceleration
PFA; PFc; PFd	Power Factor trip during Acceleration; Constant speed; Deceleration
PrA; Prc; Prd	Power (kW) trip during Acceleration; Constant speed; Deceleration
ncPA; ncPc; ncPd	Control Power Loss during Acceleration; Constant speed; Deceleration

***NOTES:**

"PLd" can be caused by a Grounded delta power system. If one input leg measures ZERO volts to ground, reduce the setting of F051 to "0054" for operation on a "Grounded Delta".

"SSd" can be caused by operating without a motor connected, ensure the motor is firmly connected.

"LcA, Lcc, or Lcd" indicates that the Surge absorber is damaged; see NOTE 1 on wiring diagram.

Full Parameter List

Parameter	Description	Adjustment Range		Factory Setting
F001	Motor FLA	50-100% of Max Amp Rating (less Service Factor)		0
F002	Motor Service Factor	1.00-1.30		1.00
F003	Overload Class During Start	NEMA/UL Class 5-30		10
F004	Overload Class During Run	NEMA/UL Class 5-30		10
F005	Overload Reset	0=Manual, 1=Auto, 2=Disabled		0:Manual
F10	Ramp Type (If Ramp 2 is not being used, unit will ignore all settings referenced to Ramp 2)	Ramp #1	Ramp #2	1
	Setting = 1	Voltage	Voltage	
	Setting = 2	Current	Current	
	Setting = 3	Voltage	Current	
	Setting = 4	Current	Voltage	
F011	Initial Voltage of Ramp 1	0-100% Line Voltage		60%
F012	Initial Current of Ramp 1	0-600% Motor Current		200%
F013	Accel Ramp Time of Ramp 1	1-120 seconds		10 sec
F014	Max Current Limit of Ramp 1	200 - 600% Motor Current		350%
F015	Initial Voltage of Ramp 2 (if Ramp 2 is used)	0-100% Line Voltage		60%
F016	Initial Current of Ramp 2 (if Ramp 2 is used)	0-600% Motor Current		200%
F017	Accel Ramp Time of Ramp 2 (if Ramp 2 is used)	1-120 seconds		10Sec.
F018	Max Current Limit of Ramp 2 (if Ramp 2 is used)	200 - 600% Motor Current		350%
F019	Voltage Jog	5-100% Line Voltage		50%
F020	Time of Voltage Jog	1-20 seconds		10 sec
F021	Current Jog	100-500% Motor Current		150%
F022	Kick Start Voltage	0=Disabled or 10-100% Line Voltage		0
F023	Kick Time	0.1-2 seconds		0.8 sec
F024	Deceleration Ramp (Pump Control)	0=Disabled (Coast to Stop) 1=Enabled (except after OL trip) 2=Enabled (Deceleration even during O/L trip)		0
F025	Begin Decel Level (BDL)	0 - 100 % of Output Voltage		60%
F026	Decel Shut Off Voltage	0 to (BDL minus 1)% Voltage		30%
F027	Decel Ramp Time	1-60 seconds		10Sec.
F028	Auto Restart Delay Time	0=Disabled or 1-999sec after Power Loss		0
F029	Voltage Input	200 - 690 Volt		480
F030	Voltage Imbalance Trip %	0, 1 - 30% [0=Disabled]		0
F031	Voltage Imbalance Trip Delay	1 - 20 seconds		10
F032	Over Voltage Trip %	0, 1 - 10% [0=Disabled]		0
F033	Over Voltage Trip Delay	1 - 20 seconds		10
F034	Under Voltage Trip on Start %	0, 1 - 20% [0=Disabled]		0
F035	UV Trip on Start Delay	1 - 180 seconds		10
F036	Under Voltage Trip on Run %	0, 1 - 20% [0=Disabled]		0
F037	UV Trip Delay during Run	1 - 20 seconds		2
F038	Shorted SCR and Trip Delay	0, 1-10 seconds [0=Disabled]		1Sec
F039	Shunt Trip Delay	0, 1-10 seconds [0=Disabled]		1Sec
F040	Current Imbalance Trip %	0=Disabled or 5-30% imbalance		0
F041	Current Imbalance Trip Delay	1-20 seconds		2 sec
F042	Over Current Trip %	0=Disabled or 100-300% of Motor FLA		0
F043	Over Current Trip Delay	1-20 seconds		1 sec
F044	Under Current %	0=Disabled or 10-90% of Motor FLA		0
F045	Under Current Trip Delay	1-60 seconds		2 sec
F046	Ground Fault Current Trip Value	0=Disabled or 5-90% of CT ratio from Fn74		0
F047	Ground Fault Current Trip Delay	1-60 seconds		2 sec
F048	Coast Down Lockout Time	0=Disabled or 1-60 minutes		0
F049	Maximum Starts per Hour	0=Disabled or 1-10 Starts		0
F050	Minimum Time Between Starts	0=Disabled or 1-60 minutes		0
F051	nCP Trip (No Control Power)	0, 1 [0=Disabled, 1=Enabled]		1

Parameter	Description	Adjustment Range	Factory Setting
F052	Auto Reset Selected Trips	Auto Reset Disabled	0
		Reset after Over Temperature Trip only Reset after Over Current (Shear Pin) Trip only Reset after Under Current Trip only Reset after Phase Loss Trip only Reset after Current Unbalance Trip only Reset after Ground Fault Trip only Reset after Short Circuit Trip only Reset after OT Trip or Over/Under Current Trip Reset after Phase Loss, Current Unbal, or GF Trip Reset after all Except Short Circuit Trip Reset after all Except GF or Short Circuit Trip Reset after any Trip	1 2 3 4 (Default) 5 6 7 8 9 10 11 12
F053	Auto Restart Attempts	0=Disabled, 1-10 = # of Attempts	0
F054	Auto Restart Delay Readout	Readout only	
F055	Coast Down Lockout Time Readout	Readout only	
F056	Starts Per Hour Timer Readout	Readout only	
F057	Starts Per Hour Readout	Readout only	
F058	Time Value Between Starts Readout	Readout only	
F059	Thermal Capacity to Start Readout	Readout only	
F060	Aux Relay 1 setting	Run/Stop	1
F061	Aux Relay 2 setting	At Speed/Stop	2
F062	Aux Relay 3 setting	Any Trip	22
F063	Aux. Relay Delay Timer	0=Disabled or 1-999 seconds	0
F065	Communications	0=Disabled 1=Enabled(11bit) 2=Enabled(10 bit)	0:Disabled
F066	Baud Rate	4.8, 9.6, 19.2 KB	9.6
F067	Modbus Address	1-247	1
F068	Remote Starter Control from Communications	0=Disabled 1=Enabled w/Start PB 2=Enabled w/o Start PB 3=Enabled via Remote Jog Input	0
F070	Parameter Lock/ Level 1 Password	0=Disabled or 001-999	0
F071	System Clear / Factory Reset	0=Disabled, 1=Clear Lockouts 2=Reset to Factory Default	0
F073	Frame Rating	10-2000A	by model
F074	CT Value	10-2000	by model
F075	Year	2000-2047	2000
F076	Month	1-12	1
F077	Day	1-31	1
F078	Hour	0-23	0
F079	Minute	0-59	0
F080	Seconds	0-59	0
F081	Software rev # (info purposes only)	rev #	Rev #
F085	Fault History #1 (most recent fault code)	0=No Fault History, or Fault # 1-27 (full manual for fault code descriptions)	0
F086	Time Stamp Fault #1	00.00-23.59 (hh.mm)	00.00
F087	Date Stamp Fault #1	01.01-12.31 (MM-DD)	01.01
F088	Fault History #2 (previous fault code)	0=No Fault History, or Fault # 1-27 (full manual for fault code descriptions)	0
F089	Time Stamp Fault #2	00.00-23.59 (hh.mm)	00.00
F090	Date Stamp Fault #2	01.01-12.31 (MM-DD)	01.01
F091	Fault History #3 (oldest fault code)	0=No Fault History, or Fault # 1-27 (full manual for fault code descriptions)	0
F092	Time Stamp Fault #3	00.00-23.59 (hh.mm)	00.00
F093	Date Stamp Fault #3	01.01-12.31 (MM-DD)	01.01
F094	Run Time Hours	000.9-999.9 hours	0000

Parameter	Description	Adjustment Range	Factory Setting
F095	Run Time in 1,000s of hours	0000-9999K hours	0000
F096	Run Counts	0000-9999	000
F097	Run Counts in 10,000s of counts	0000-9999 (0001 would equal 10,000 counts)	000
F098	Phase Rotation Trip	0, 1 or 2 0=Disabled, 1=ABC, 2=ACB]	0
F099	Phase Rotation Trip Delay	1 - 3 seconds	1 Sec
F100	Phase Loss Trip Delay during Stop	0 - 20 seconds [0 = Disabled]	1 Sec
F101	Phase Loss Trip Delay during Running	0 - 20 seconds [0 = Disabled]	1 Sec
F102	Motor kW Trip	0 - 2 0 = Disabled 1 = Over kW Trip 2 = Under kW Trip	0
F103	Motor kW Trip Point	20 - 100% of full load KW	50(%)
F104	Motor kW Trip Delay Time	1 - 999 seconds	1
F105	Power Factor Trip Range	0, 1 - 3 [0=Disabled, 1=lag, 2=lead, 3= lead/lag]	0
F106	Power Factor Trip Point	.01 - 1	.50
F107	Power Factor Trip Delay Time	1 - 20 seconds	2 Sec
F108	Analog Output	0 - 12 [0: OFF; 1 - 12] (See Table of Default Display)	OFF
F109	Analog Output 4mA	0 - 9999	0
F110	Analog Output 20mA	0 - 9999	9999
F111	Default Display	1-12 (See Table of Default Display)	10
F112	System Settings	Reserved for factory use	-
F113	Alternate functions for Ramp2/Jog inputs	**Setting / Dual Ramp Input / Jog Input** 0 / Dual Ramp / Jog 1 / Dual Ramp / Remote / Local 2 / Dual Ramp / Ext. Lockout N/O button 3 / Dual Ramp / Ext. Lockout N/C button 4 / RESET / Jog 5 / RESET / Remote / Local 6 / RESET / Ext. Lockout N/O button 7 / RESET / Ext. Lockout N/C button	7

VMX-B Door Mounted Operators

Illuminated E-Stop Pushbutton:

- Removes control power from all circuits and VMX2 soft start.
- Push to activate, twist and pull to release.
- Button Lights when E-stop is pressed.

Start/Stop Pushbutton and Run Light Assembly:

- Provides Start/Stop control in "Local" mode.
- Provides "Motor Running" indication in all operating modes.

Local/Off/Remote Selector:

- Local" selects door mounted Start/Stop control.
- Remote" selects Start/Stop control from customer supplied signals at terminals 1-3 on TBC.
- Off' Turns motor off.

Power ON Light:

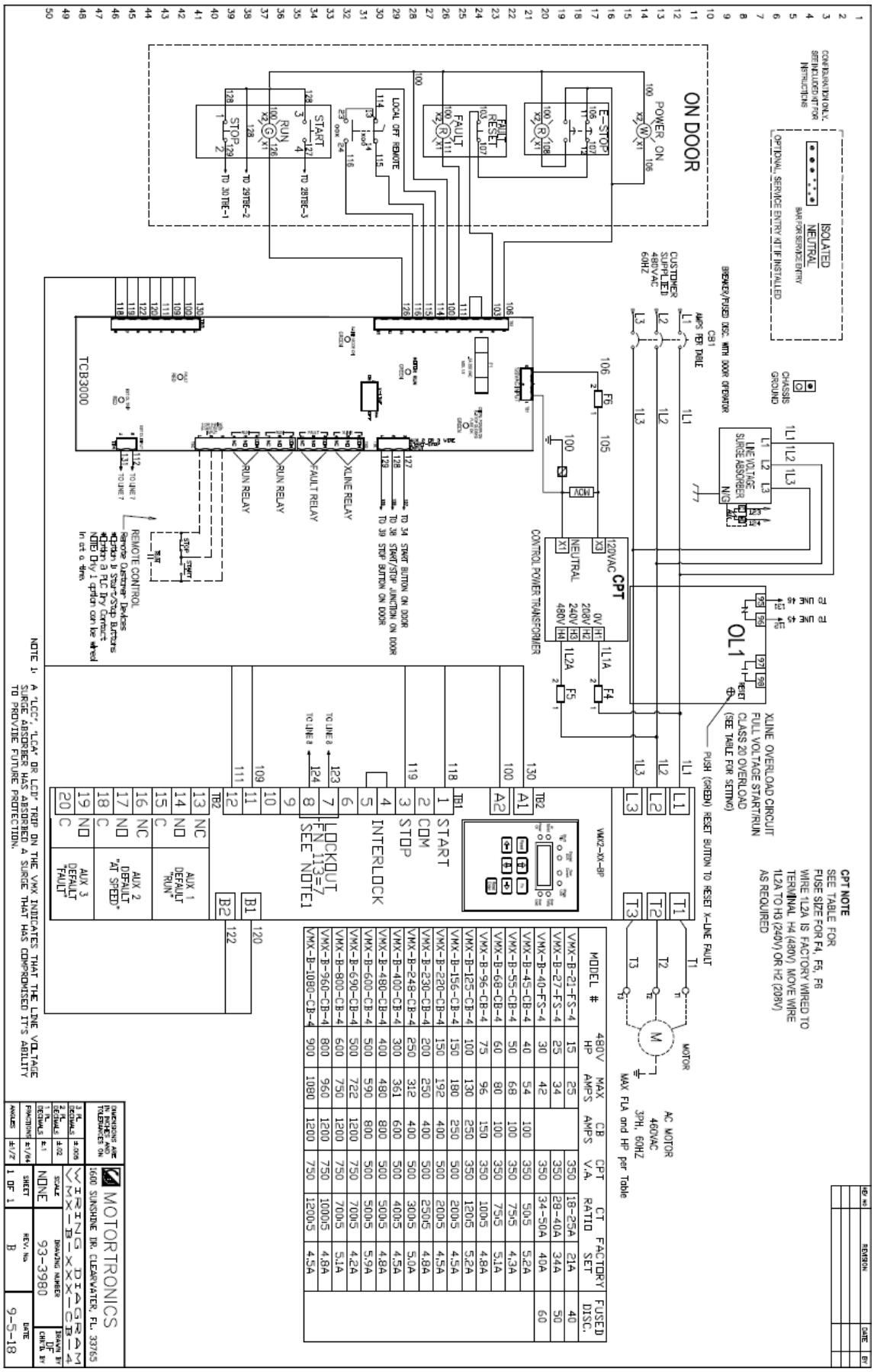
- Indicates presence of 120VAC control power, derived from main (L1 & L2) line voltages.

Fault Light/Reset Pushbutton:

- When lit, indicates that the unit has tripped, and requires "Reset".
- In "Soft" (normal) mode, the "trip" will be displayed on the VMX2 keypad (inside), and will reset upon activation of the reset pushbutton.
- In "X-line" mode, the light indicates that the X-line overload inside the panel is tripped, and must be reset manually by pressing the (green) reset key on the overload itself. Then the unit can be reset, using the pushbutton on the door.

Note: If the green reset key on the X-line overload is turned to the "A" (auto) position, the O/L relay will reset itself after the required cooldown, after that the unit can be reset by pushing the reset pushbutton without opening the enclosure door.

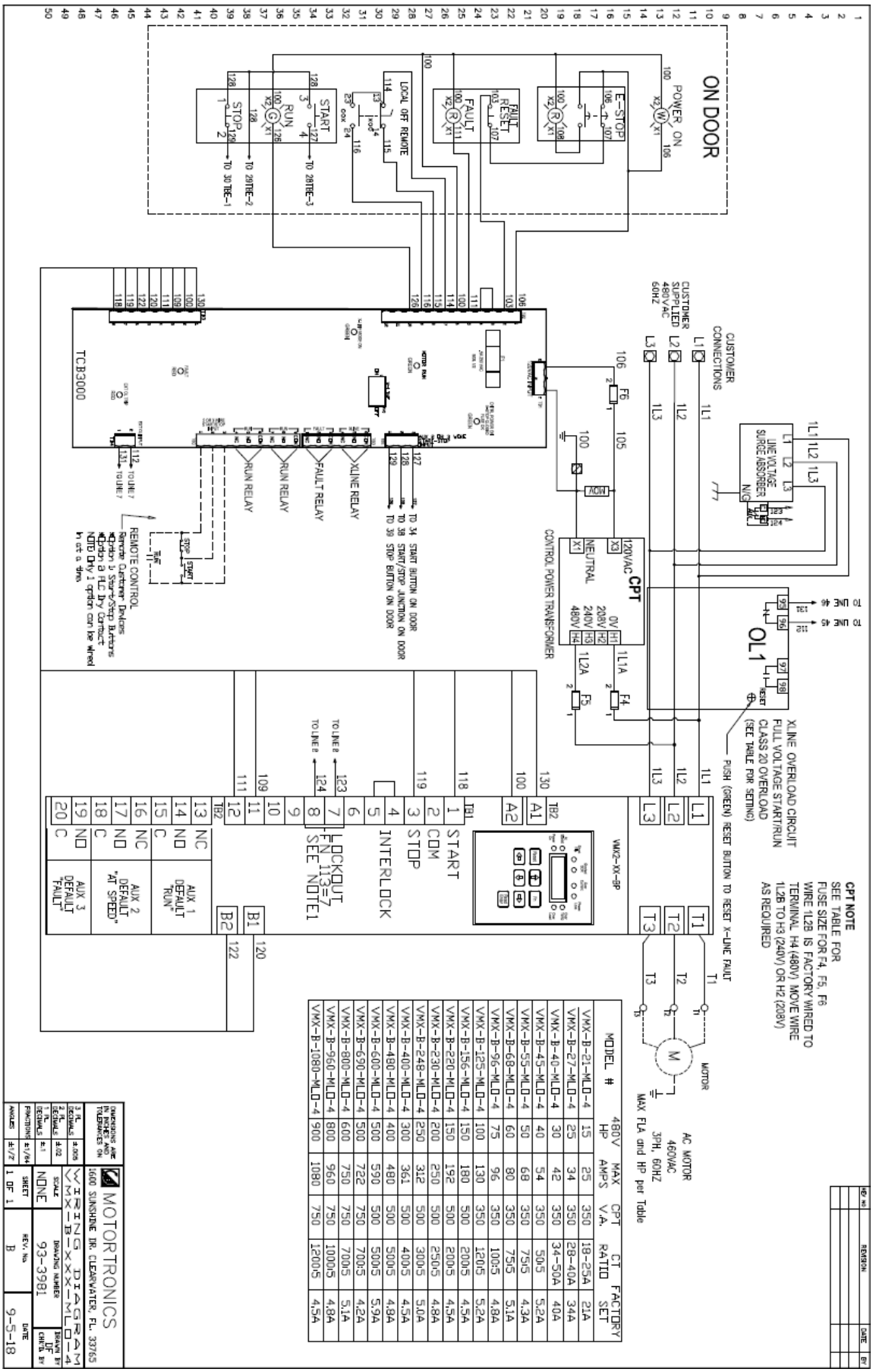
Wiring Diagram # 93-3980



MODEL #	480V HP	MAX AMPS	CB AMPS	CPT V.A.	CT RATIO	FACTORY SET	FUSED DISC.
VMX-B-21-FS-4	15	25	350	350	18-25A	21A	40
VMX-B-27-FS-4	25	34	350	350	28-40A	34A	50
VMX-B-40-FS-4	30	42	350	350	28-40A	40A	60
VMX-B-45-CB-4	40	54	100	350	50:5	5.2A	
VMX-B-55-CB-4	50	68	100	350	75:5	4.3A	
VMX-B-68-CB-4	60	80	100	350	75:5	5.1A	
VMX-B-96-CB-4	75	96	150	350	100:5	4.8A	
VMX-B-125-CB-4	100	130	250	350	120:5	5.2A	
VMX-B-156-CB-4	150	180	250	500	200:5	4.5A	
VMX-B-220-CB-4	150	192	400	500	200:5	4.5A	
VMX-B-230-CB-4	200	250	400	500	250:5	4.8A	
VMX-B-248-CB-4	250	312	400	500	300:5	5.0A	
VMX-B-400-CB-4	300	361	600	500	400:5	4.5A	
VMX-B-480-CB-4	400	480	800	500	500:5	4.8A	
VMX-B-600-CB-4	500	590	800	500	500:5	5.9A	
VMX-B-690-CB-4	500	722	1200	750	700:5	4.2A	
VMX-B-800-CB-4	600	750	1200	750	700:5	5.1A	
VMX-B-960-CB-4	800	960	1200	750	1000:5	4.8A	
VMX-B-1080-CB-4	900	1080	1200	750	1200:5	4.5A	

MOTORTRONICS
1600 SUNSHINE DR. CLEARWATER, FL. 33765
WIRING DIAGRAM VMX-B-XXX-CB-4
DRAWING NUMBER 93-3980
SCALE NONE
SHEET 1 OF 1
REV. No B
DATE 9-5-18
DRAWN BY
CHK'D BY

Wiring Diagram # 93-3981



MODEL #	480V HP	MAX AMPS	CPT V.A.	CT RATIO	FACTORY SET
VMX-B-21-MLO-4	15	25	350	19-25A	21A
VMX-B-27-MLO-4	25	34	350	28-40A	34A
VMX-B-40-MLO-4	30	42	350	34-50A	40A
VMX-B-45-MLO-4	40	54	350	50-5	5.2A
VMX-B-55-MLO-4	50	68	350	75-5	4.3A
VMX-B-68-MLO-4	60	80	350	75-5	5.1A
VMX-B-96-MLO-4	75	96	350	100-5	4.8A
VMX-B-125-MLO-4	100	130	350	120-5	5.2A
VMX-B-156-MLO-4	150	180	500	200-5	4.5A
VMX-B-220-MLO-4	150	192	500	200-5	4.5A
VMX-B-230-MLO-4	200	250	500	250-5	4.8A
VMX-B-248-MLO-4	250	312	500	300-5	5.0A
VMX-B-400-MLO-4	300	361	500	400-5	4.5A
VMX-B-480-MLO-4	400	480	500	500-5	4.8A
VMX-B-600-MLO-4	500	590	500	500-5	5.9A
VMX-B-690-MLO-4	500	722	750	700-5	4.2A
VMX-B-800-MLO-4	600	750	750	700-5	5.1A
VMX-B-960-MLO-4	800	960	750	1000-5	4.8A
VMX-B-1080-MLO-4	900	1080	750	1200-5	4.5A

MOTORTRONICS
1600 SUNSHINE DR. CLEARWATER, FL. 33765
WIRING DIAGRAM
VMX-B-XXX-MLO-4
DRAWING NUMBER 93-3981
REV. No B
SHEET 1 OF 1
DATE 9-5-18
SCALE NONE