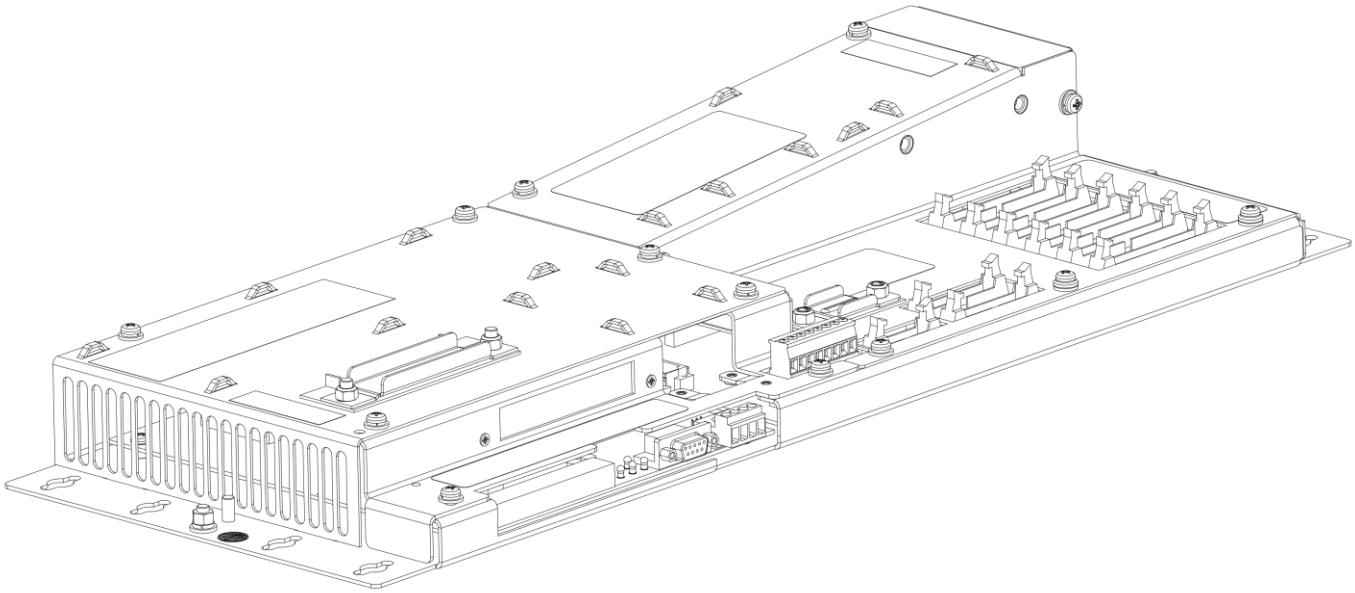

REV 00
November 13, 2024

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1. Introduction

- The MV3000 Controller (CDC) units are manufactured by Avid Controls Inc. under an exclusive license agreement with the General Electric Company.

- The MV3000 Controller (CDC) range is designed for use with Avid Extreme Inverter (AEI) modules, or MV3000 DELTA inverters, which are also available from Avid Controls under the exclusive GE license.

- The controller is supplied as an individual module for mounting into an enclosure. It derives an electrical supply from connected AEI/ Delta modules and includes facilities for communication with both inverter and rectifier bridge modules.

- In a drive system the standard MV3000 Controller provides interfaces between:
    - Up to 6 AEI/Delta inverters.
    - Air or liquid cooled rectifier modules.
    - Mains voltage monitor (MVM) for AFE applications.
    - User Input Output module (I/O).
    - Up to 2 dynamic brake units (DB).
    - RS232 interface for keypad of PC monitoring software.
    - RS422/485 for connection to standard industrial protocols.
    - Electrical CAN port, supporting CANOpen and DeviceNet functionality.
    - Keypad for programming and monitoring.

- Optional communications modules for use with the standard controller are available separately for installation by the user. These are:
    - Single and Dual Channel Ethernet (MVS3012-4001-A & MVS3012-4002-A).
    - Universal Communications Board (UCB) for Dual Ethernet and Profibus (AEC3012-4001-A).
    - Second CAN Port (Electrical MVS3011-4001-A).
    - Second CAN Port (Optical AEC3011-4001-A).

2. Terms and definitions

AEI	Avid Extreme Inverter
CDC	Common Drive Controller (a common name for the MV3000 Controller)
AFE	Active Front End
CAN	Controller Area Network
DSP	Digital Signal Processor
EMC	Electromagnetic Compatability
I/O	Input Output Module
MVM	Mains Voltage Monitor
UCB	Universal Communication Board

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3. WARNINGS

- The unit must be mounted in an enclosure to which personnel access is restricted.
- Although the MV3000 Controller (CDC) is a low voltage device, the enclosure may contain high voltage equipment which may be connected to more than one live circuit.
- All power supplies must be disconnected using lockout/tagout procedures before working on this equipment.
- Wait at least ***EIGHT*** minutes after isolating all supplies and check that the voltage between DC+ and DC- on the inverters has reduced to a safe level before working on the equipment.
- Surfaces on the coolant pipes in liquid cooled drive systems can reach high temperatures and remain hot for some time after power is removed.

4. Related User Documents

- The MV3000 Controller (CDC) is installed as part of a system and instructions are given in the relevant technical manuals provided by the system designer.
- The documents below are available on request from Avid Controls:

Document Number	Description
DTS-MID0198	AEI900L/AEI1000L Avid Extreme Inverter – Data Sheet
DTS-02025-ASY-A	Universal Communications Board (UCB) - Data Sheet
DTS-01552-ASY-A	The MV3000 Controller Keypad - Data Sheet
DTS-MID0012	AEI1250L/AEI1400L Avid Extreme Inverter - Data Sheet
DTS-MID0050	MVDL800/MVDL1000 - Data Sheet
DTS-00873-ASY-A	MVD500-4701-A - Data Sheet
DTS-01056-ASY-A	MVD500-4501-A - Data Sheet
DTS-MID0160	AEI Upgrade Kit 3.6 MW APU E/F - Data Sheet
DTS-MID0161	AEI Upgrade Kit 3.6 MW APU G - Data Sheet
DTS-01804-ASY-A	AEI Upgrade Kit 2.3MW T27 - Data Sheet

- These documents are provided with the purchase of the specific products detailed.
- These should be kept for the life of the product.

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5. Specification

5.1 MV3000 Controller (CDC) Model Numbers Detailed in this Data Sheet

Module	Grade	Options pre-installed	Application
MVC3001-4003-A	New Build	None	General Applications – Drive Systems

5.2 Mechanical

Specification	***Value***
Dimensions	Height:582mm (22.91”) Width: 215mm (8.46”) Depth: 73mm (2.87”) max
Weight	4kg (8.8lbs.)
Ventilation Space	Allow a minimum ventilation space of 50mm (2”) above and below the controller

5.3 Environmental

Specification	***Value***
Ambient Temperature (Internal cabinet temperature) – Operating	0 to 50°C
Temperature – Storage or Transport	-13°F to 131°F (-25 to +55°C)
Altitude – Operating	Up to 3280ft. (1000m) ASL. Between 3280ft. (1000m) and 6551ft. (2000m) apply derating of 7.5% per 3280ft. (1000m).
Altitude – Storage	Up to 9842ft. (3000m) ASL
Altitude – Transport	Will withstand air transport
Vibration – Transport	IEC 60721-3-2:1997 Class 2M1, in transport packaging.
Humidity – Operating, Storage or Transport	5% to 95% RH, Non-condensing.
Cabinet air – Operating	Pollution Degree 2 as per IEC60664-1, UL 840 & CSA C22.2 No. 0.2-93 i.e. clean, free from dust, condensation and conductive or corrosive gases. Maximum chemicals 15ppm H_2S, 25ppm NO_2, 25ppm SO_2

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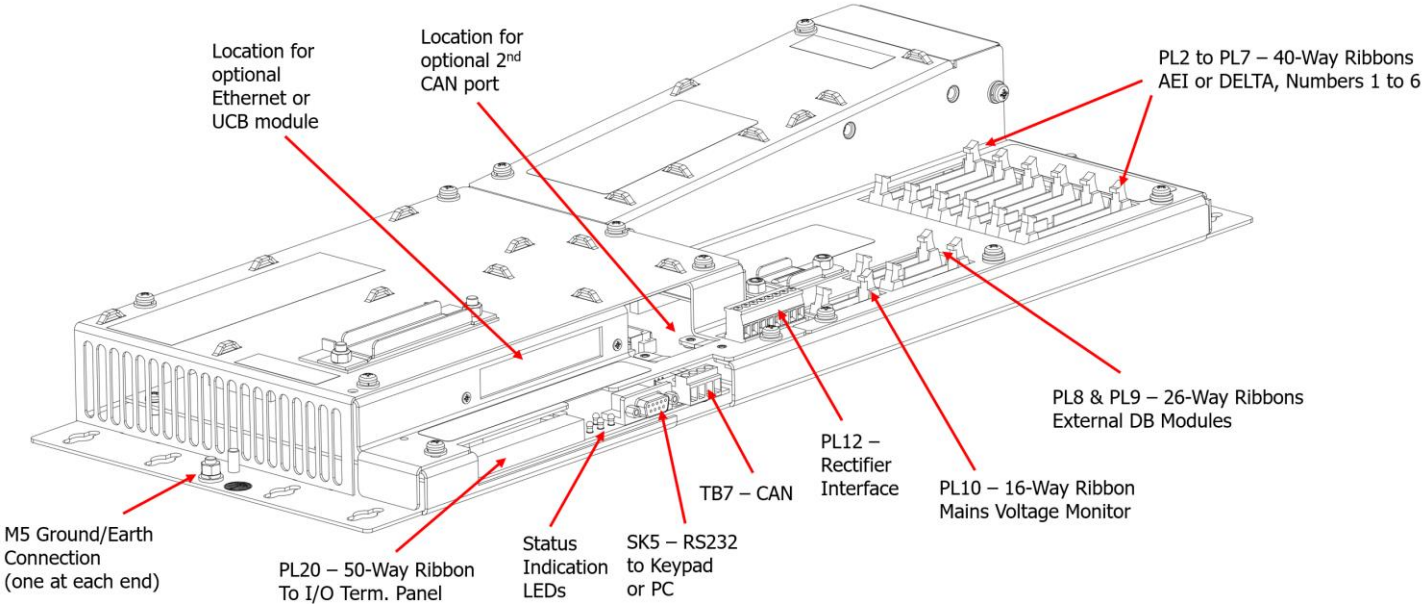
6. Electrical Connections

- The connections from the MV3000 Controller (CDC) to other drive system equipment is shown below:



6.1 PL2 to PL7 - Inverter Connections

- PL2 to PL7 carry the control signals to and from the AEI/Delta modules. Each module is identified by the connector position it occupies. See below:

MV3000 Controller Connection	AEI/Delta Connection
PL2	PL2 of AEI 1 or PL1 of Delta 1
PL3	PL2 of AEI 2 or PL1 of Delta 2
PL4	PL2 of AEI 3 or PL1 of Delta 3
PL5	PL2 of AEI 4 or PL1 of Delta 4
PL6	PL2 of AEI 5 or PL1 of Delta 5
PL7	PL2 of AEI 6 or PL1 of Delta 6

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6.2 PL12 Rectifier - Connections

- PL12 - Pins 1 to 4 allow for monitoring temperatures in the rectifier via thermistor and thermostats providing overtemperature protection.

- Pins 6 to 9 are for the pre-charge operation. The MV3000 Controller measures the DC link. When sufficient DC link voltage is measured, a Pre-Charge Complete signal is output via Pin 8. This signal is nominally +24V and should be used to close a contactor to bypass an external pre-charge resistor. The controller requires a Pre-Charge Acknowledge input on Pin 9 otherwise it will report a pre-charge failure.

- The Pre-Charge Complete signal from the controller will only generate a few hundred milliamps and so would need to operate a relay in order to drive a large pre-charge contactor. For further information please contact Avid.

Pin Number	*Value*
1	NTC Temperature Monitor - Thermistor
2	
3	Rectifier Thermostat (+24V = Healthy)
4	+24V Out
5	N/C
6	0V
7	+24V Out
8	Pre-Charge Relay +24V
9	Pre-Charge Acknowledge (+24V = Healthy)

6.3 TB7 - Electrical CAN Connections

- TB7 provides CAN communications.

Pin Number	*Value*
1	CAN GND
2	CAN LO
3	Screen/Shield
4	CAN HI
5	N/C

- The electrical signals (CAN GND, CAN LO & CAN HI) are isolated from the 0V of the MV3000 Controller electronics and its chassis. This is not safety isolation but is provided for signal integrity.

- The Screen/Shield terminal is connected to the MV3000 Controller steel chassis via a 1MΩ resistor paralleled with a 4.7nF (4700pF) high voltage capacitor.

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6.4 PL12 & TB7 Wire Sizes

Connector	*Value*
PL12 - Rectifier	Min. 0.5mm^2 (20 AWG)
	Max. 2.5mm^2 (14 AWG)
TB7 CAN Port	Min. 0.25mm^2 (23 AWG) (Use a pin or blade crimp)
	Max. 1.5mm^2 (16 AWG)

6.5 PL8 & PL9 – Dynamic Brake Module Connector

- PL8 and PL9 carry the control signals to and from external dynamic braking (DB) modules.
- These connectors are provided for support of legacy DB modules and are currently not used for new systems.

6.6 PL10 – Mains Voltage Monitor Connector

- PL10 carries the signals to and from an external mains voltage monitor (MVM) module.
- This is required to synchronize the MV3000 Controller to the main network voltage for AFE applications.
- Different versions of the MVM are available, please contact Avid for details.

6.7 SK5 – RS232 / Keypad Connector

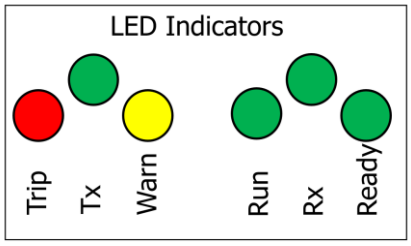
- This connector is used to connect to the MV3000 Keypad, via a standard straight-through 9-way RS232 lead.
- It can also connect to a legacy RS232 COM port on a PC (or a modern USB to COM-port adaptor). In this mode, SK5 must be connected via a NULL-MODEM cable to the PC/adapter.

6.8 PL2 – I/O Termination Panel

- This is a standard 50-way ribbon that is used to connect the MV3000 Controller to the standard I/O Termination Panel.

6.9 Status LEDs

- The status LEDs on the MV3000 Controller have the following meanings:



LED	**Meaning when illuminated**
TRIP	The unit is in a fault condition and is not available to RUN.
WARN	The unit is a non-normal condition but is still available to RUN.
READY	The unit is in a normal condition and is available to RUN.
RUN	The unit is RUNNING the attached inverter modules.
TX & RX	Indicate transmit and receive activity on the RS422/RS485 serial link.

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7. Additional Modules

- The following modules connect to the MV3000 Controller as part of an MV3000 drive system:

Model	Description	*Notes*
MVC3002-4001-A	I/O Termination Panel for MV3000 Controller	Standard digital & analog I/O, connected via PL20
MVS3000-4001-A	Keypad for MV3000 Controller	Connects via SK5
MVC3006-400x-A	Mains Voltage Monitor Unit (MVM) for MV3000 Controller	Used in AFE systems, connects via PL10. Different functional versions of the MVM are available – contact Avid for more details.
MVS3011-4001-A	CAN2 Port – Electrical	Provides a second CAN port with identical electrical signals as the standard CAN port
AEC3011-4001-A	CAN2 Port – Optical	Provides a second CAN port with optical fiber interface
MVS3012-4001-A		Provides communications via the EGD or MODBUS-TCP protocols.
MVS3012-4002-A	Dual Channel Ethernet Board	
AEC3012-4001-A	Universal Communication Board	Provides PROFIBUS and dual channel ethernet communications.

- For a minimal system, at least an I/O Termination Panel and Keypad will be required.

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8. Installation Layout

- A typical layout for an AFE system is shown in **Figure 8.1.**
- This will give good electromagnetic immunity and ensure that the ribbon interconnection cables supplied with the I/O and MVM will be of adequate length.

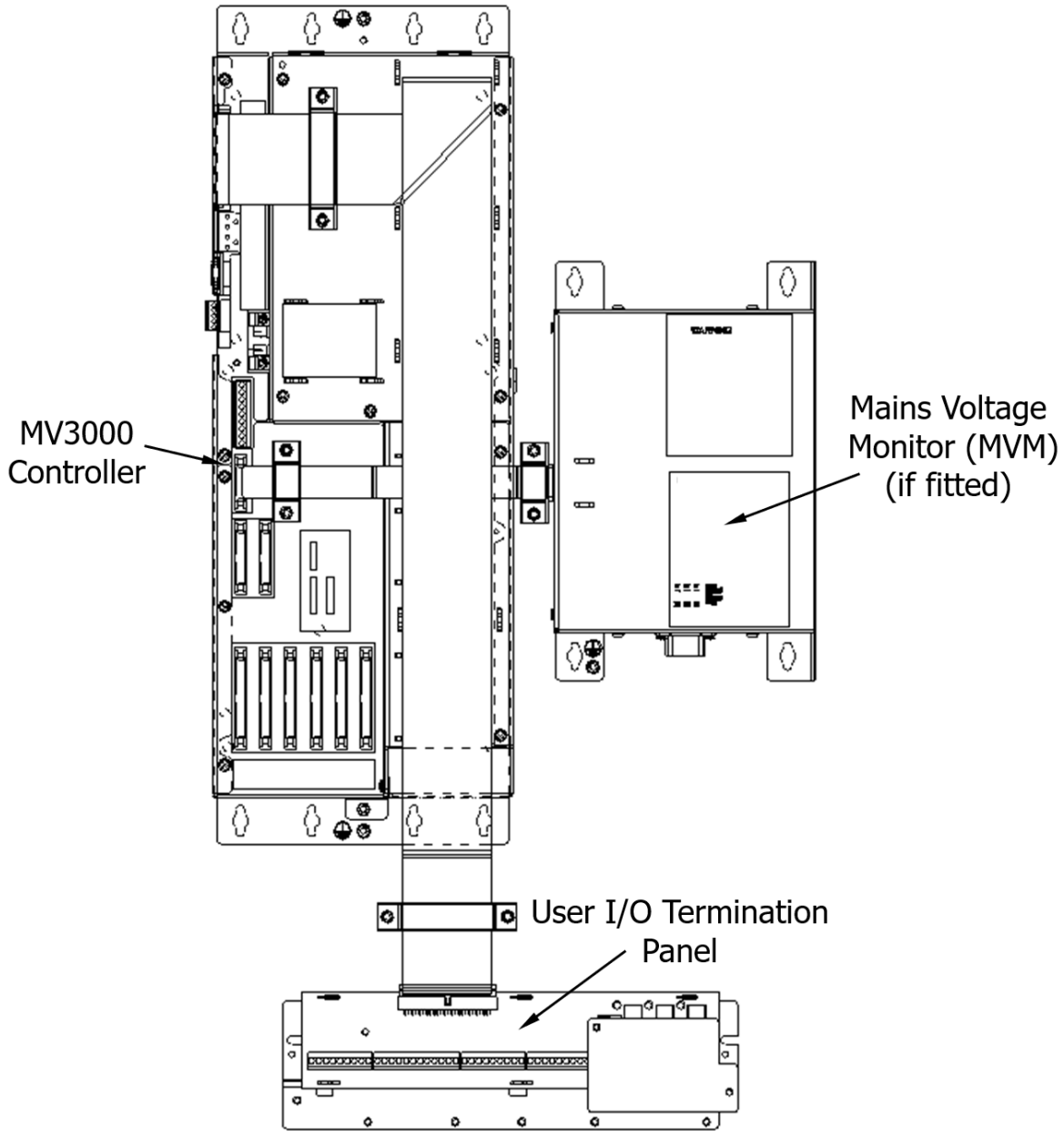

Figure 8.1 – MV3000 Controller Mounted with Associated Modules

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8.1 Drilling Detail

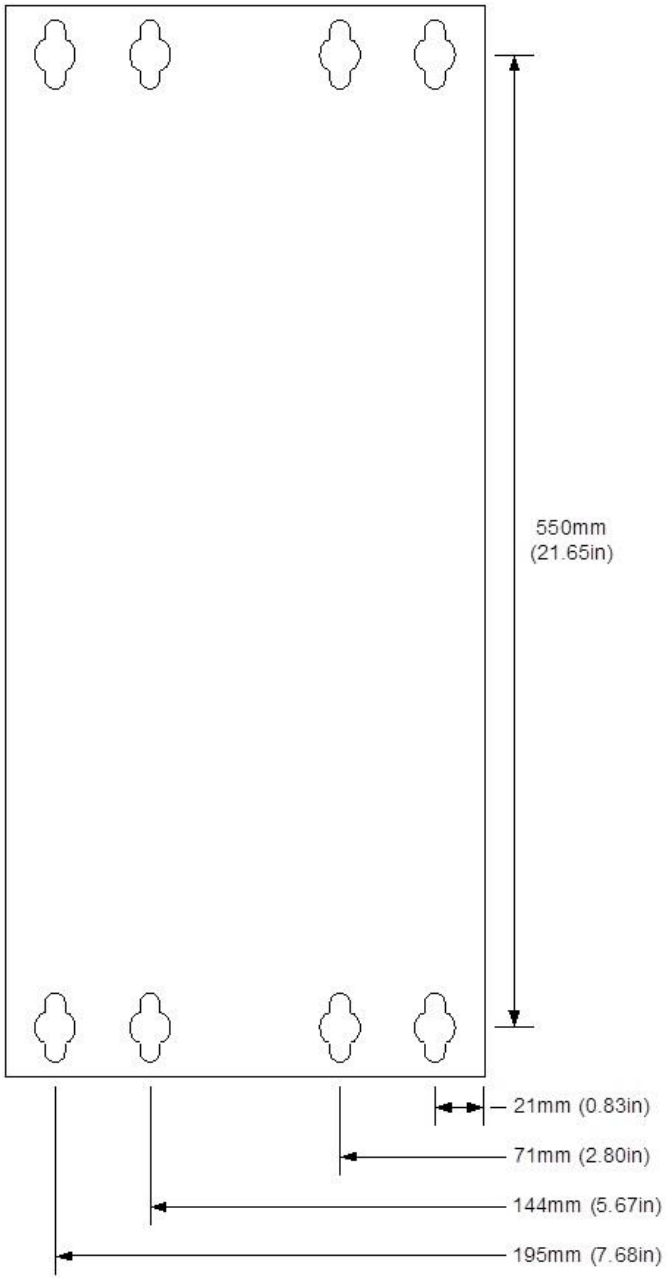

Figure 8.2 – Mounting Information

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9. Installation in the Enclosure

CAUTION

- **This equipment contains solid state devices which may be affected by electrostatic discharge.**

  Observe static handling precautions.

- When designing a new drive system, it is essential to protect personnel from exposure to hazardous voltages. The MV3000 Controller is part of the low voltage section of the drive of which components and wiring should be segregated from dangerously high voltage equipment. A separate enclosure/compartment should be used for the low voltage section allowing technicians to access, monitor and program the equipment without risk.

- The controller should be positioned towards the front of the enclosure for easy access. The LED status indicators on the controller and I/O panel should be visible and allowance should be made for access to the plugs, sockets and terminals. Sufficient space should be provided for routing and retaining cables.

- Mark out the mounting panel for the controller (including ribbon cable clamp fixings), using the dimensions shown in **Figure 8.2.** For EMC compatibility, the MV3000 Controller must be fitted to the same metal mounting panel as the I/O panel and MVM unit (if fitted). The panel should be unpainted to permit good electrical contact (if the panel is painted scrape away the paint on the mounting points).

- Allow a gap of 50mm (2”) above and below the controller to ensure a clear, unobstructed path for air to flow through the equipment.

- The controller should be fitted using 8 x M5 Taptite screws suitable for Aluminum or Steel. Drill all holes 4.5mm diameter.

- Connect ribbon cables as required, these are supplied with MVC3002 (I/O) and MVC3006 (MVM) units (the connectors are polarized).

- Route the cable as shown in **Figure 8.1.** and hold in position with cable ties.

- Secure the ribbon cables in the clamp assemblies provided, only the exposed screen of the cable must be clamped and ensure the ribbon does not get crushed in the clamp edges.

- Should local safety regulations not permit reliance upon bare metal to metal, a separate wire can be connected to the ground/earth stud on the MV3000 Controller (identified by the standard green/yellow ground symbol).

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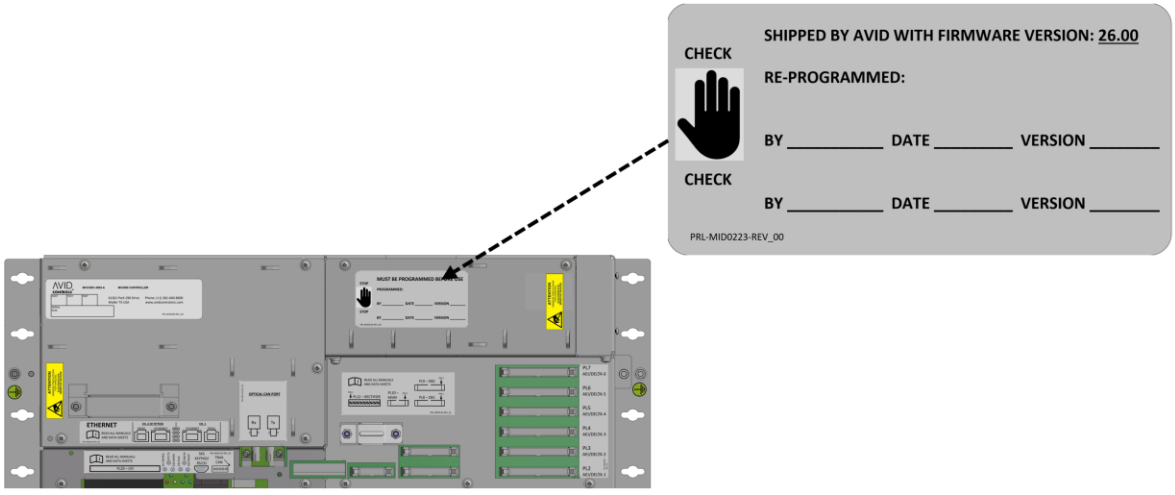
9.1 IMPORTANT: Verify Firmware and Parameter Set Prior to Installation

- All Avid controllers are supplied preloaded with the standard industrial firmware V 26.00.
- If this is not the version preferred by the customer, then the user must program the module with the applicable FIRMWARE (.BFL file) and PARAMETER SET (.DRI file) for the site and application where it is to be installed.
- Following programming add the firmware version information onto the label found on the top of the module:



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10. Typical Steps in Controller Replacement

CAUTION

- **When the product is reset to factory default, all customized parameters will be lost. Record customized parameter settings before the product is reset. They can be re-entered when required.**

- You will require a full copy of the original parameter set to allow the new controller to be configured.
- This information should have been saved after the drive was commissioned, in a ***.DRI*** file via Drive Coach. If you do not have this but can still communicate with the controller, then the Drive parameters must be backed up before the controller is replaced.
- To do this using Drive Coach:
  - Connect the drive, via the keypad port, to the serial port of the PC.
  - Run Drive Coach on the PC and connect to the drive.
  - From the file menu click on “get data from drive”. A save edits dialogue box will open.
  - Type the name of the file you want to save and click OK.
  - When you are sure you have a backup of the parameters replace the Delta Controller, ensuring you observe the static and electrical precautions detailed in the product manuals.

- On power up the drive will show TRIP 19 – NEW PCB.
  - It is important that you set P10.35=2 (New Control PCB).
  - Afterwards, attempt to reset this trip before you proceed.

NOTE: **The drive may still be tripped on other trips but should not be tripped on Trip 18, 19 or 20. If trip 18, 19 or 20 are present when a parameter set is downloaded it will not be backed up on power down.**

- Restore the original drive parameter settings.
- To do this using Drive Coach:
  - Connect the drive, via the keypad port, to the serial port of the PC.
  - Run Drive Coach on the PC and connect to the drive.
  - From the file menu click on “open table”, an open dialogue box will open, choose the file you want to send to the drive, the table will open in Drive Coach.
  - From the file menu click on “send data to drive”.

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- Drive Coach will detect if the Firmware version in the new controller is different to that of the old. If so the warning message “Firmware not fully Compatible” will be displayed.
- Continue with the recall by confirming your choice (ENTER) at which point the parameter settings will be stored to new controller.
- Refer to the guidance given above and check effected parameters, then perform a calibration run if required.

11. Contact Details: Sales, Service and Support

The Common Drive Controller contains no user serviceable parts. For repairs or replacement please contact:

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12. Document Revision History

Rev.	Date	Author	Changes
00	NOV 13 2024	Mark Woods	Converted from 01956-ASY-A to include other MV3000 Controller modules. New content added.

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