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## 1. Introduction

- The AEC3012-4001 upgrade kit allows an Avid Universal Communication Board (UCB) to be installed into a standard MV3000 Controller - often called Common Drive Controller (CDC).
- The AEC3012-4001 may be used as a direct spare for an MVS3007-4001 or MVS3007-4002 Profibus Fieldbus Coupler, or in new systems requiring single or dual Profibus DP support.
- The AEC3012-4001 can also be used as a direct replacement for an MVS3012-4001 and MVS3012-4002 single and dual channel Ethernet, or in a new system requiring single or dual support of MODBUS/TCP protocol.

## 2. Related Documents

- T1694 Profibus Technical Manual
- T2034 MV3000 Ethernet Manual
- T1679 MV3000 Software Manual
- T1689 Technical Manual for MV3000 DELTA.
- T1693 MV DELTA Liquid Cooled Drive System.

These documents may be requested from Avid Controls.

## 3. Software Version History

Version	Details
<b>13.01</b>	Initial release of Universal Comms. Board (UCB) software. It allows the UCB to be used as a direct replacement for a single or dual MV3000 Profibus Card. This version does not support the byte-swap mode and therefore cannot be used as a replacement for MVS3007-400x modules. Contact Avid Controls for support.
<b>25.01</b>	Byte-swap mode enabled allowing use as a replacement of MVS3007-400x modules. Addition of Ethernet functionality to allow use as a spare for MV3000 single or dual Ethernet card.

## 4. Installation into the MV3000 Controller

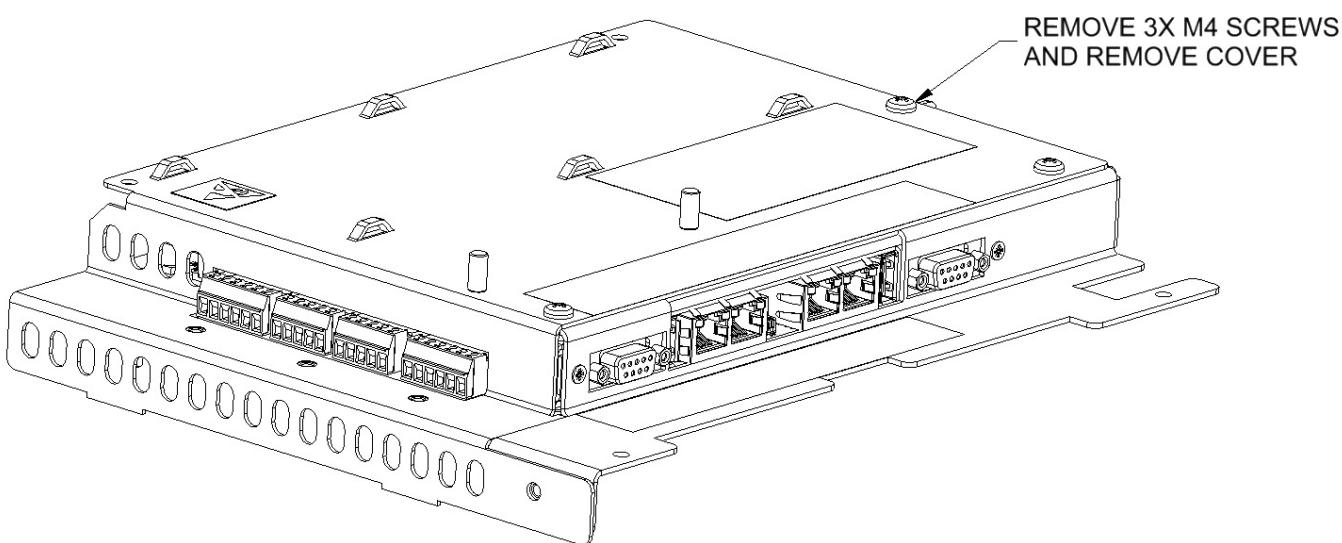
- To install the AEC3012-4001 kit into an MV3000 Controller (CDC), it is necessary to remove the controller from the cabinet in which it is installed, and place on a bench in a clean and well-lit workshop area.
- The following tools will be required:
  - T25 Torx screwdriver.
  - Fine point permanent marker pen.
  - A suitable pointed plastic tool to set the DIP switches.
- Unpack the AEC3012-4001 kit on the bench next to the CDC to be upgraded.

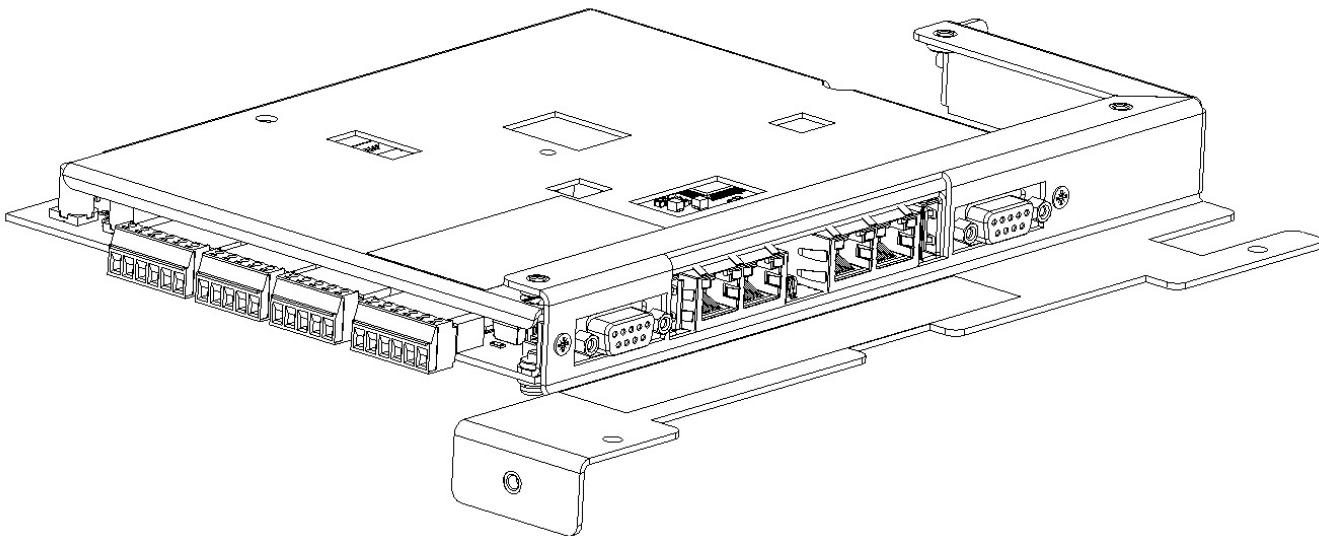


**NOTE: Use caution when handling static sensitive devices. A wrist-strap is provided to connect yourself to the metal case of the CDC to be upgraded until this procedure is complete.**

### 4.1 Disassemble the Shipping Configuration

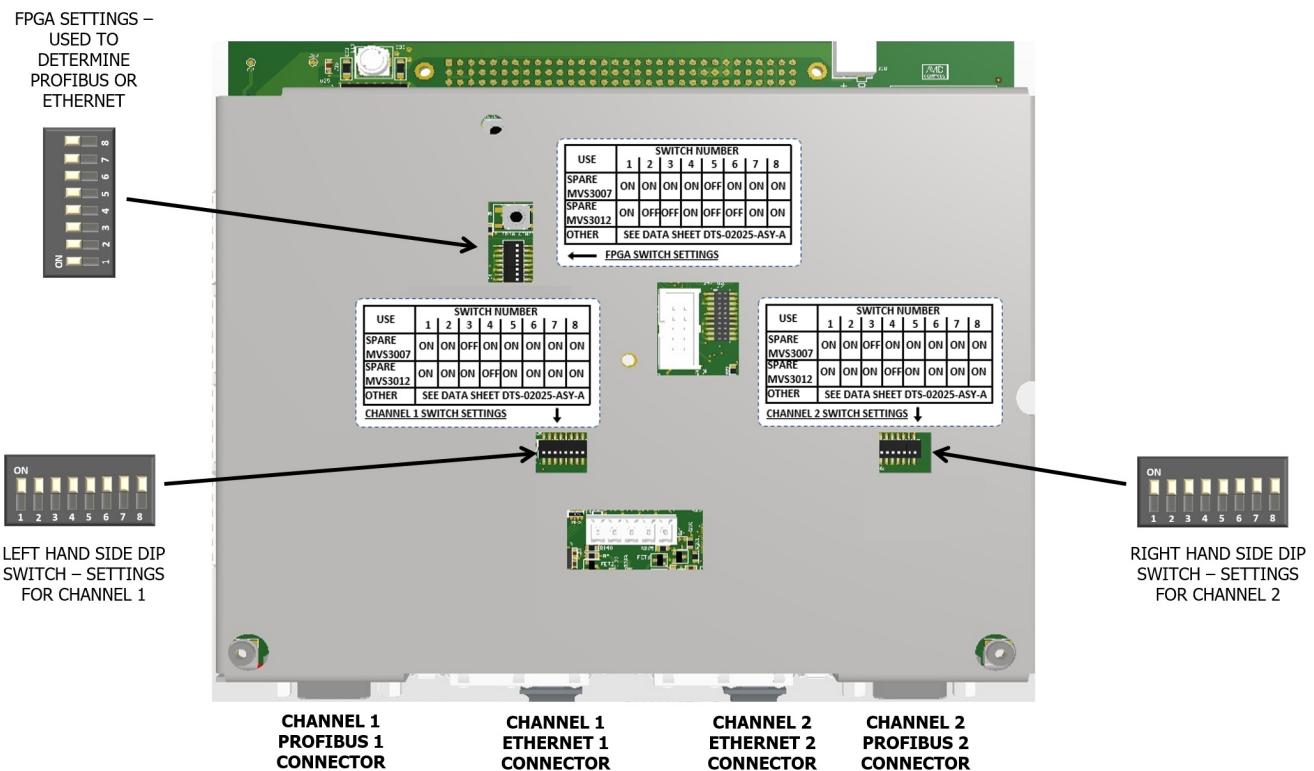
- For protection, the UCB assembly is shipped assembled. It is necessary to partially disassemble it before installing into the target CDC.
- This is illustrated in the following figures:



**UCB Ready for Installation:****4.2 Switch Settings**

- Configuration of the UCB is achieved by the use of DIP switches which are accessible via cut outs in the metal cover. These switches need to be set carefully using a suitable pointed plastic tool.
- There are three banks of 8-way DIP switches with functions as follows:
  - Uppermost switch – FPGA settings – use to determine Profibus or Ethernet.
  - Left Hand Side DIP switch – Settings for Channel 1.
  - Right Hand Side DIP switch – Settings for Channel 2.
- There is a 2-way switch located between the LED Channel 1 and 2 indicators on the front of the module (switches are labelled Ch1 & Ch2). These switches are used **only** to update firmware in the UCB assembly. **For normal operation these switches must be in the UP position.**

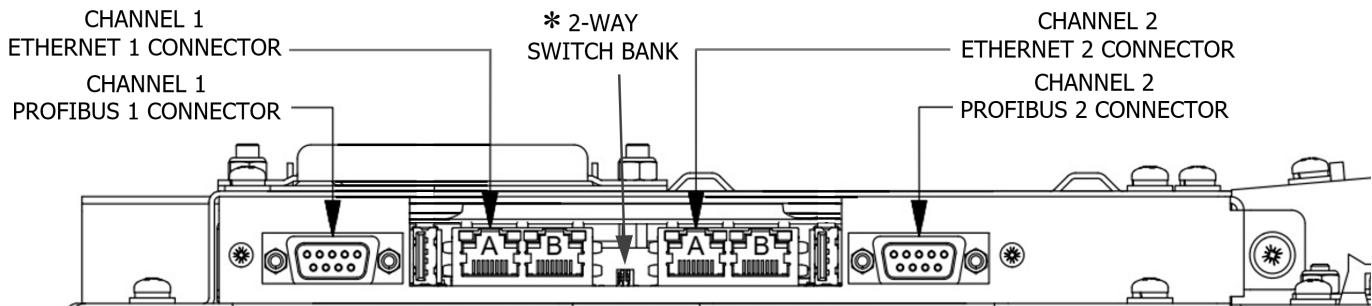
### UCB DIP Switch Settings:



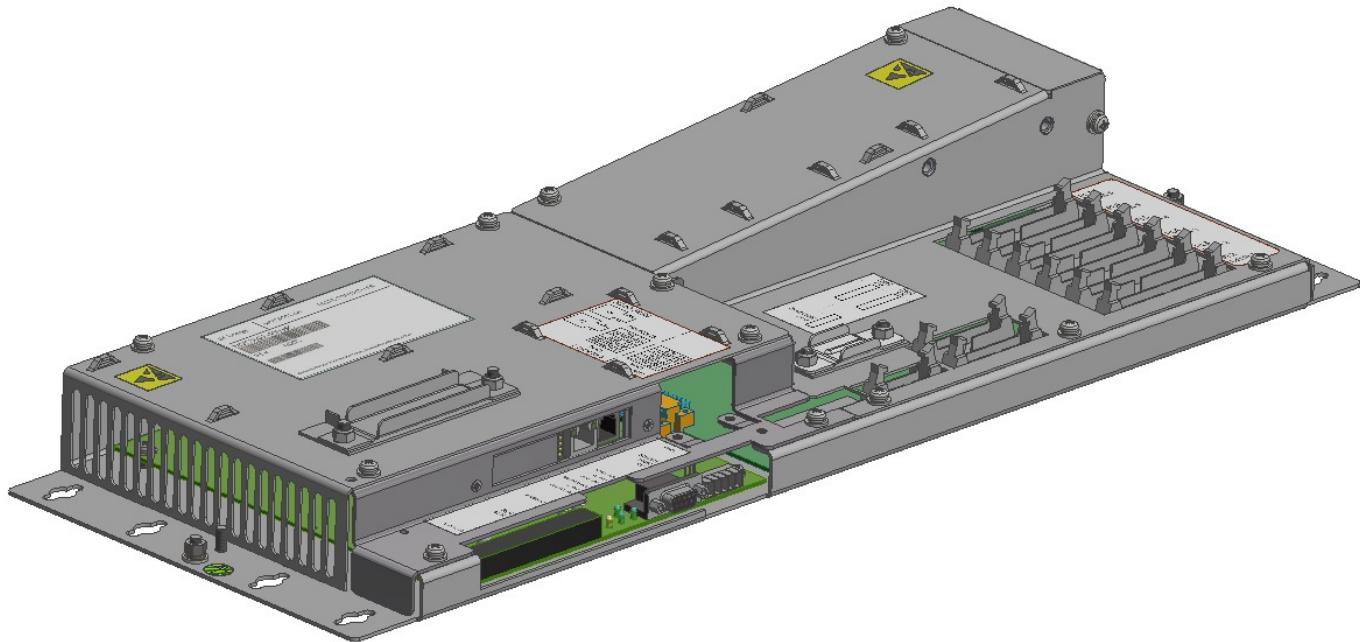
- For use as spares (or in new systems where complete compatibility is required):

DIP Switch	Compatible with MVS3007-400x (PROFIBUS)								Compatible with MVS3012-400x (ETHERNET)							
	Switch Number								Switch Number							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
FPGA	ON	ON	ON	ON	OFF	ON	ON	ON	ON	OFF	OFF	ON	OFF	OFF	ON	ON
Channel 1 & 2	ON	ON	OFF	ON	ON	ON	ON	ON	ON	ON	ON	OFF	ON	ON	ON	ON

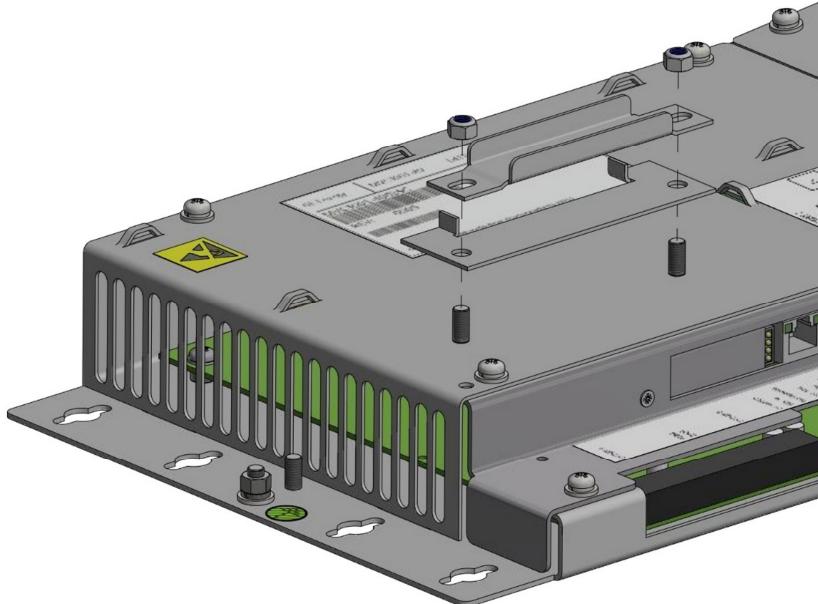
- For more detailed information on the function of the DIP switches, see section 6 of this Data Sheet.

**UCB 2-Way DIP and Channel 1 & 2 Connectors:**

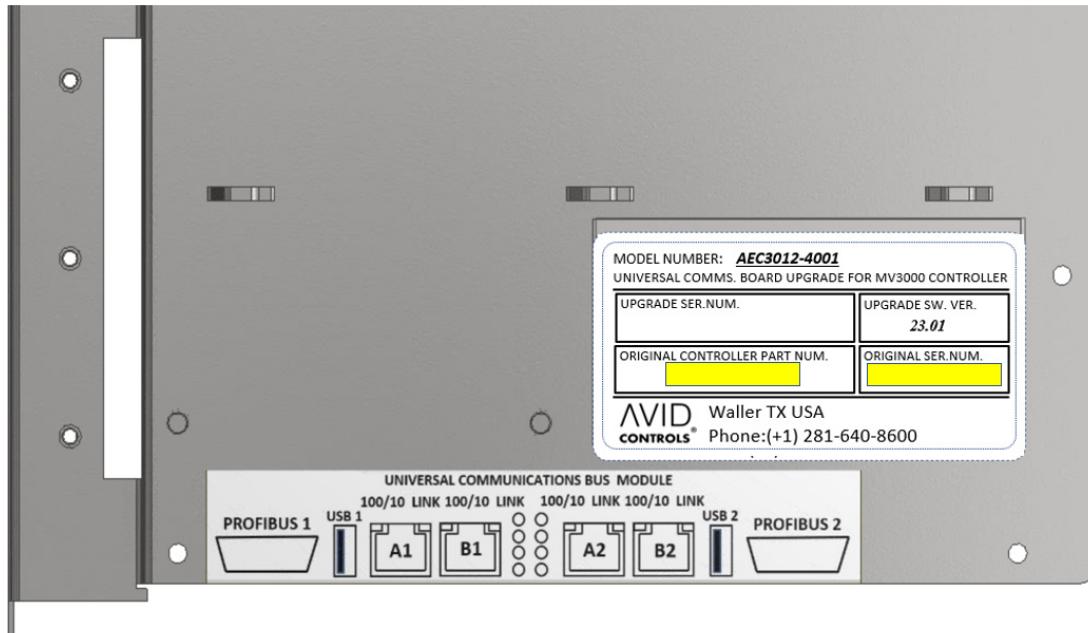
\* Must be in the UP position for normal operation.

**4.3 Disassemble the CDC****CDC Ready for Disassembly**

- Remove 2 x M5 nuts and remove ribbon clamp hardware.
- Retain all this hardware for re-fitting after upgrade.

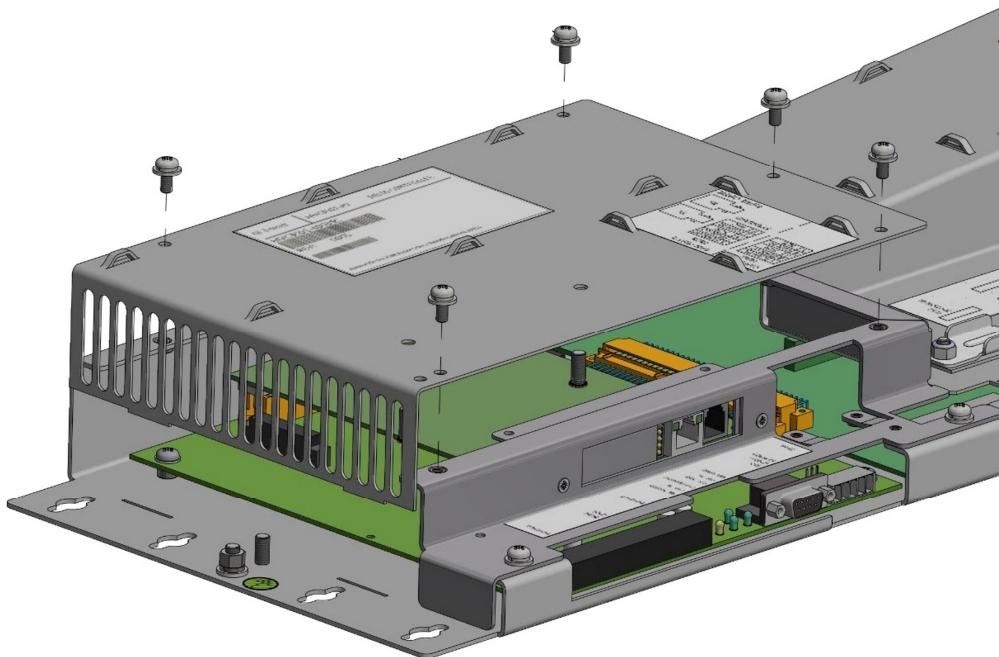


- Locate the Top Cover from the upgrade kit and use a fine permanent marker to transfer part number and serial number information from the CDC to be upgraded into the boxes provided on the new label:

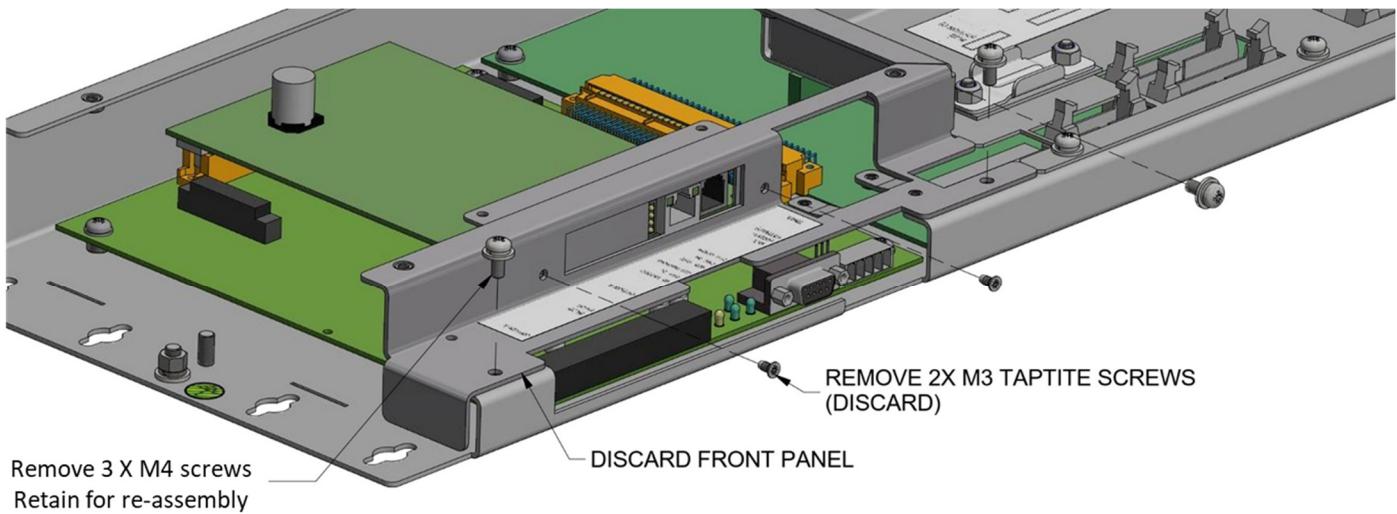


- Remove and discard the top cover from the CDC to be upgraded.

- Retain the M4 captive washer screws for re-assembly.



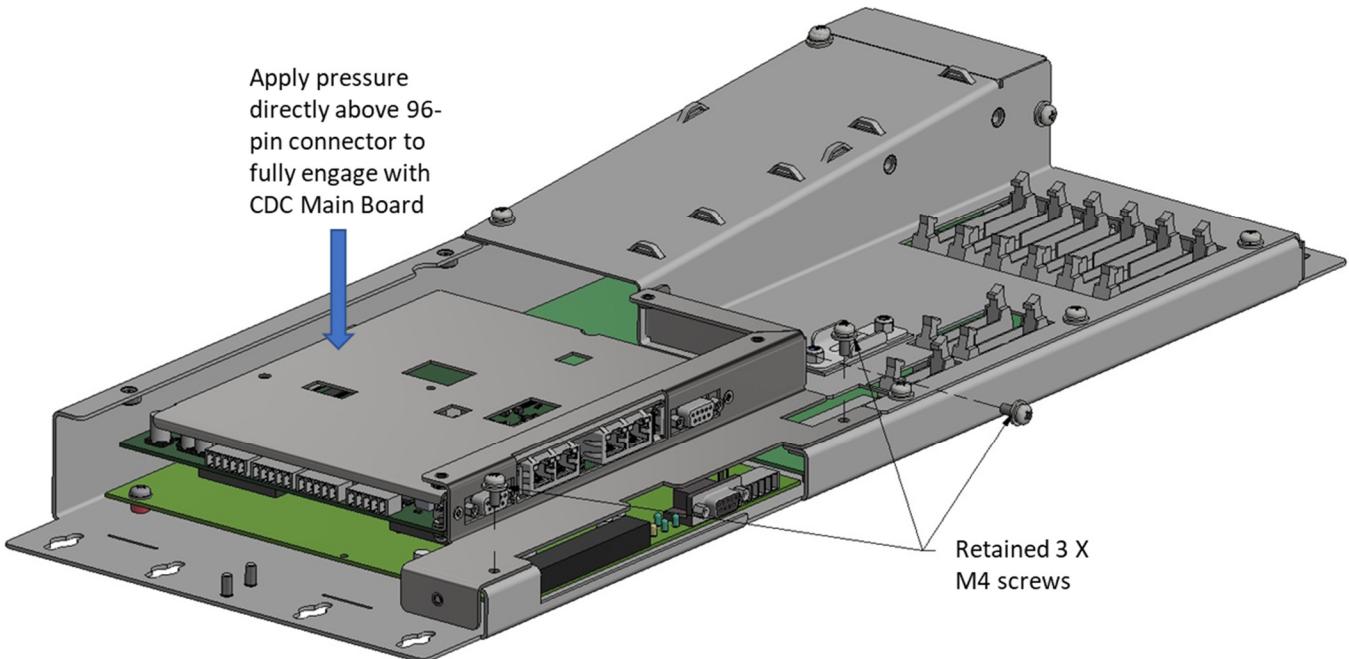
- Remove the front panel and old communication card (if installed).
- Retain the M4 captive-washer screws for re-assembly.



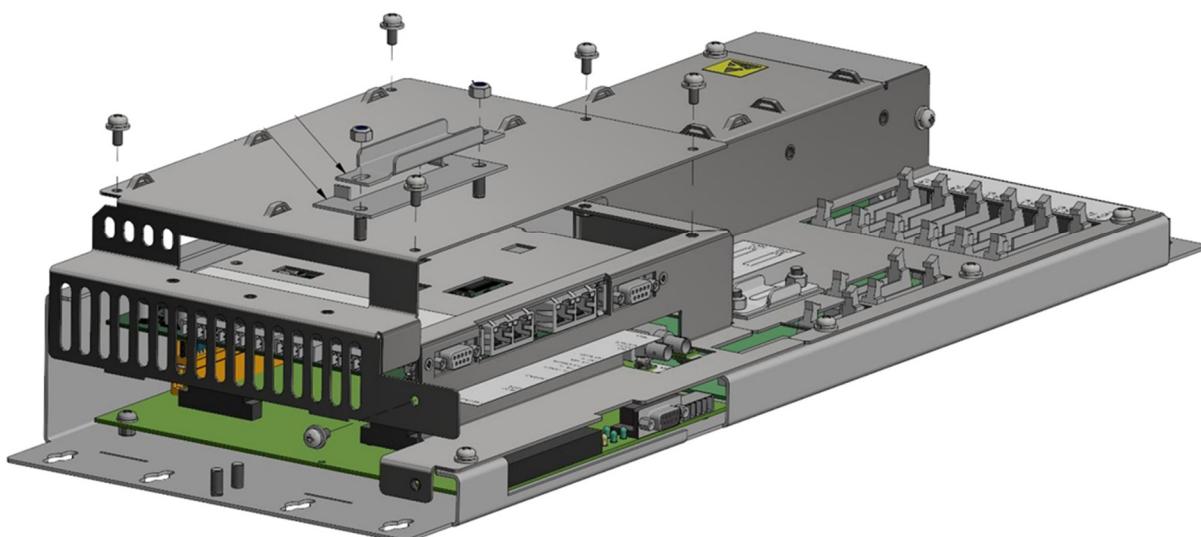
- If necessary, dispose of the removed printed circuit card in accordance with local regulations.

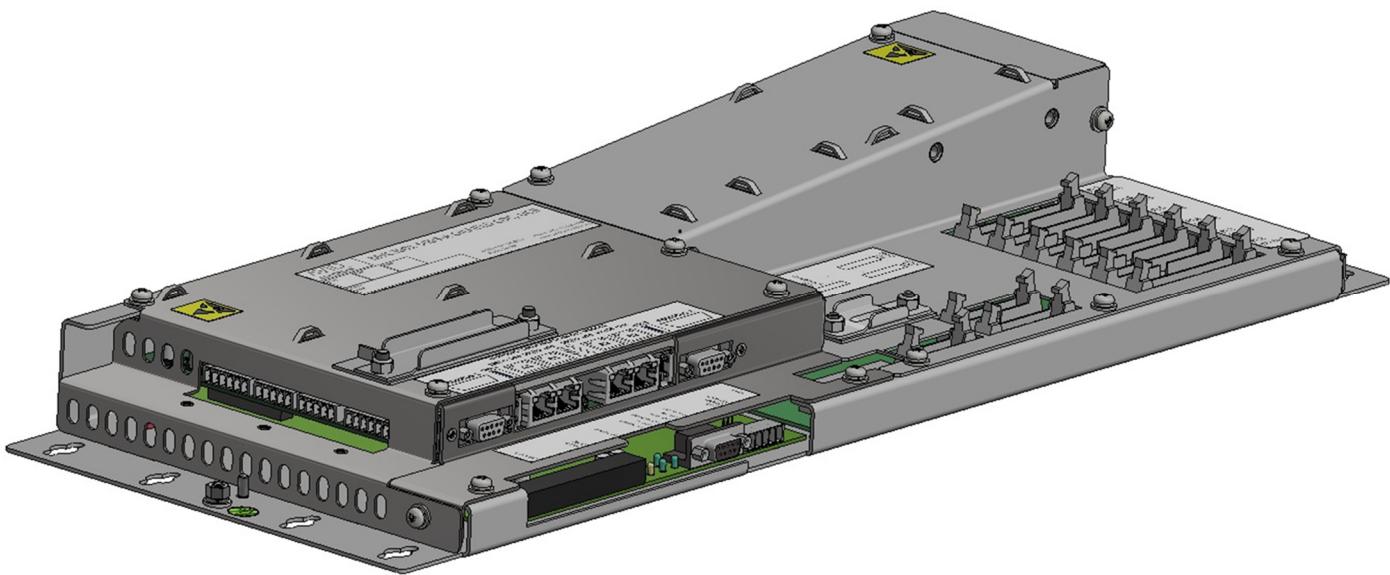
#### 4.4 Install UCB Assembly

- Carefully align the 96-pin DIN41612 connector on the back of the UCB assembly with the correct connector of the CDC main board and press until fully engaged.
- Then secure the front panel with the 3 M4 screws retained when it was initially removed.



- Fit the new Top Cover using the retained M4 screws.
- Replace the retained ribbon clamp hardware.





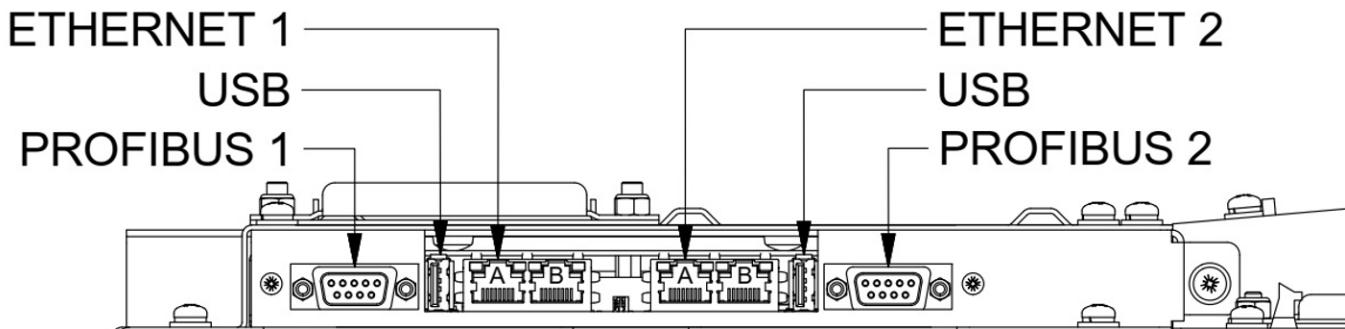
**Upgraded CDC Ready for Re-Installation**

- The UCB is now ready to operate.

## 5. Network Connections

### 5.1 General Layout

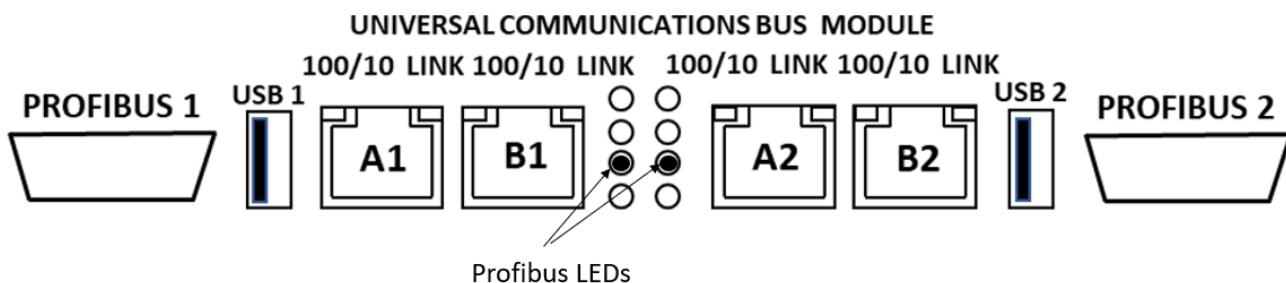
- The general layout of the connectors is shown below.



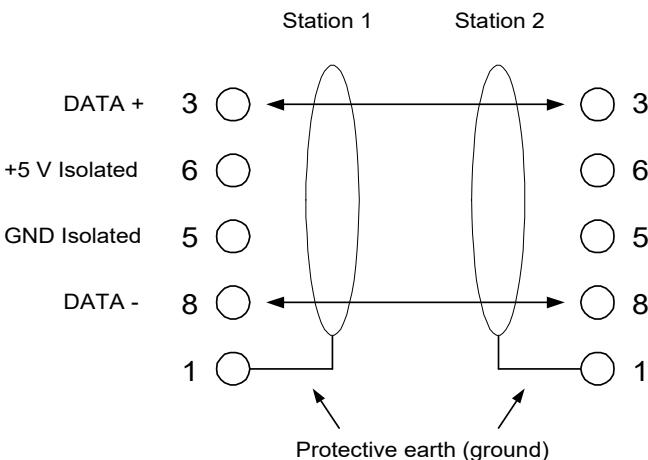
- Note that Ethernet "B" connectors are not used, and the USB connectors are for firmware update only.
- **Note that Channel 1 and Channel 2 are positionally swapped compared to the MVS3012-400x modules**

## 5.2 PROFIBUS Connectors and LEDs

- The PROFIBUS board contains two external connections, via 9-way D-type female connectors that are used to connect to the PROFIBUS network cables and are visible on the UCB front panel as below:

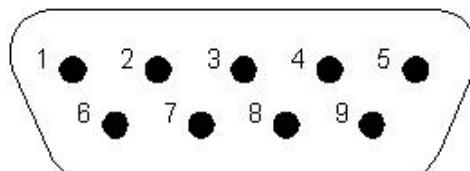


- Connectors conforming to the PROFIBUS standard are recommended, e.g. DIN 41652.
- Note that the making of a 'T' in the PROFIBUS network is not allowed, the cable must always be daisy-chained, as shown below.



Interconnecting two PROFIBUS Stations

## 5.3 Pin-out of the PROFIBUS 9 Pin D-Type Connector



View Looking into the Mating Face of the Connector

The PROFIBUS connections are as follows:

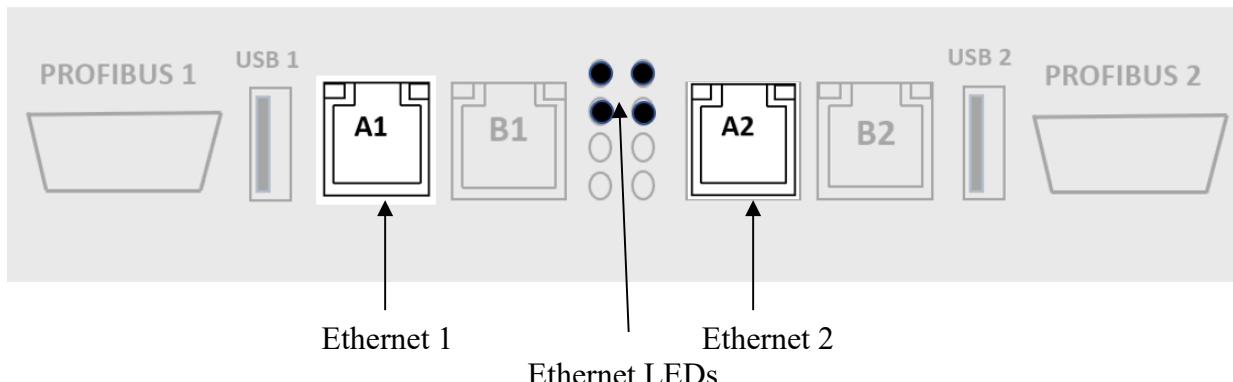
- Pin 1 = Protective earth (PE) or screen.
- Pin 3 = DATA+
- Pin 5 = GND (isolated)
- Pin 6 = +5V (isolated)
- Pin 8 = DATA-

## 5.4 PROFIBUS Cable

- It is important to use the correct cable as below:
  - Twisted pair shielded cable equivalent to Belden 8227 is recommended.
  - Two core cable screened and twisted.
  - Resistance 100 to 120 ohm at  $f > 100$  kHz.
  - Capacitance  $< 60$  pF per meter.
  - Minimum cross section of  $0.22$  mm $^2$  (24 AWG).

## 5.5 Ethernet Connections and LEDs

- The Ethernet connection is achieved by connecting to the 8-pin RJ45 connectors using a standard Ethernet STP connector.
- The Ethernet connector socket has integral LEDs to display the network connection status.
- The lower of the two Ethernet LEDs, when ON alone is used to show that the software is running on that channel. When the upper of these two LEDs is ON the channel has successfully been configured for one of the Ethernet protocols. When both the two Ethernet LEDs are ON, it means that the Ethernet channel is successfully communicating.



- Of the eight pins of the RJ45, only 4 pins are used, these are:
  - Pin 1 = Tx+
  - Pin 2 = Tx-
  - Pin 3 = Rx+
  - Pin 6 = Rx-
- The TX (transmitter) pins are connected to corresponding RX (receiver) pins, '+' to '+' and '-' to '-'.

## 6. Additional Technical Details

### 6.1 DIP Switch Functions – Summary

- The FPGA switches control how the UCB is accessed by the CDC firmware. These switches do not act independently of each other and must be set into one of the exact configurations defined in this Data Sheet.
- The Channel switches control various implementation options for the different communication protocols supported by the UCB. Each Channel switch affects the operation of the corresponding communication channel.
- Channel Switch Functions:

Switch Number	Function When OFF	Function When ON	Notes
1	Avid Profibus ID is used	Legacy Profibus ID is used	This switch has no effect on Ethernet operation
2	PPO 4 is used for MVS3007-4001 legacy mode	PPO 2 is used for MVS3007-4001 legacy mode	This switch has no effect on Ethernet operation
3	Low-byte, high-byte swap in Profibus is enabled. This is the legacy compatible mode.	Low byte, high-byte swap in Profibus is disabled. This is for systems that do not require byte-swap.	This switch has no effect on Ethernet operation
4	Modbus/TCP Fieldbus Coupler emulation is disabled	Modbus/TCP Fieldbus Coupler emulation is enabled	This switch has no effect on Profibus operation Enable for full compatibility with MVS3012-400x.
5	Not Used		
6	Not Used		
7	Not Used		
8	Internal Avid use only	Normal Operation	

## 6.2 MVS3007-4001 (MK1) & MVS3007-4002 (MK2) Profibus Versions and GSD Files

- The MV3000 Profibus menus support the old Profibus MK1 board and the newer MK2 board.
- The MK1 board is compatible with the *mv3\_2002.gsd* file and the MK2 with the *alst2002.gsd* file.
- The *mv3\_2002.gsd* file can be used with the MK2 board, but the additional PPO types offered by the MK2 board will not be available to the Profibus master PLC.
- Menu 75 was written before the MK2 board was produced, but MK2 boards can be used with Menu 75 but they are best used with Menu 74.
- Menu 74 (and 76 and 77) supports the additional capability of the MK2 board but can be used with the MK1 board. MK1 boards select the PPO type by DIP switch.
- The UCB emulates the MK2 board.
- To support systems based on MK1 Profibus boards, the PPO type selection in Menu 74 (and 76 and 77) is set to zero.
- If this is configured, the UCB uses Channel SW2 to select the PPO type. ON is PPO type 2 and OFF is PPO type 4.
- If a UCB is used with Menu 75, which has no PPO type selection parameter, then the PPO type 4 is always selected.
- For new installations, the UCB may be configured to use the Avid Profibus ID rather than the legacy ID. A new GSD file is provided for this purpose. The *avid1126.gsd* file may be downloaded from the **Documentation** page of [www.avidcontrolsinc.com](http://www.avidcontrolsinc.com).
- Channel DIP switch SW1 is used to select between AVID ID and legacy ID, it interacts with the chosen GSD as specified in the following table:

Channel SW1 Setting	General Station Description GSD File	Operating Mode	PPO Types
ON	<i>mv3_2002.gsd</i>	GE Profibus Identity for legacy MK1 boards (MVS3007-4001)	PPO2 and PPO4
	<i>alst2002.gsd</i>	GE Profibus Identity for legacy MK2 boards (MVS3007-4002)	PPO1 to PPO5
OFF	<i>avid1126.gsd</i>	Avid Profibus identity for new installations	PPO1 to PPO5

## 6.3 Byte Swapping Function

- Byte endianness is the ordering or sequencing of bytes of a word of digital data during transmission. Position 3 of each Channel Switch allows bytes to be swapped which may be required depending upon the make of PLC or other device in your system. The default mode emulated the original Profibus module.

Position 3 Setting	Profibus Data Word Mode
OFF	Low Byte and Hi Byte Swap Enabled (Default)
ON	Low Byte and Hi Byte Swap Disabled

## 6.4 Advanced FPGA Switch Settings

- The table below gives other operational modes:

FPGA SWITCH SETTINGS								Channel 1 Profibus Menu	Channel 2 Profibus Menu	Mode	
SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8				
ON	ON	ON	ON	OFF	ON	ON	ON	MENU 75	MENU 74	Dual Profibus Option	
ON	ON	ON	ON	ON	ON	ON	OFF	MENU 74	MENU 75	Channel swapped Dual Profibus Option	
ON	OFF	OFF	ON	OFF	OFF	ON	ON	Menu 75 for Profibus and first half of Menu 86	Menu 74 for Profibus and second half of Menu 86	Dual Ethernet and Profibus Option †	
ON	OFF	OFF	ON	ON	OFF	ON	OFF	Menu 74 for Profibus and second half of Menu 86	Menu 75 for Profibus and first half of Menu 86	Channel swapped Dual Ethernet and Profibus Option †	

† Simultaneous operation of Profibus and Ethernet communications is not guaranteed with existing CDC implementations. It is provided for future support. Contact Avid Controls for more information.

## 6.5 Assignment of Protocol to Shared Menus 74 & 75

- If Ethernet and Profibus are enabled, Channel Switch position 4 provides the following assignments:

Position 4 Setting	Menu 74 & 75 Assignment
OFF	Modbus TCP (Ethernet)
ON	Profibus (Default)

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## 8. Document Revision History

Rev.	Date	Author	Changes
00	28 <sup>th</sup> Feb 2020	Mark Woods	Document created Software Version 12.01 Profibus functionality only
01	23 <sup>rd</sup> March 2020	Mark Woods	Additional clarity on switch settings
02	6 <sup>th</sup> April 2020	Gary Pace	Instructions to disassemble shipping configuration included
03	15th May 2020	Mark Woods	Ethernet Function added and additional clarity on LEDs and other details
04	12 <sup>th</sup> Aug 2020	Mark Woods	Format changes Information for spares/compatibility with MVS3007 and MVS3012 modules clarified Software Version 25.01 release
05	30 <sup>th</sup> July 2025	Mark Woods	Clarified DIP switch settings, changes to diagrams and format changes.