mTB006 (with AdaptaNet) Field Interconnect Technical Manual

Document No. 10825, Revision F00

January 2016

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1. Overview

The mTB006 Field Interconnect Box (FIB) is part of the CMCIEL industrial facilities monitoring system. The unit provides a means of terminating the sensor bus cables in a NEMA4X rated enclosure. The kit can be used with unshielded, shielded or direct burial CAT5 cable for the sensor bus. The interconnection has 6 RJ-11 plugs. The FIB can be upgraded to intelligent FIB by installing special card called AdaptaNet. Description of functionality of FIB with AdaptaNet installed is described below.

The mTB006 has branch-disconnect switches to assist in network diagnostics. In addition, power and data LED's display if the data the current status of the network. With AdaptaNet card installed the LED's display exact type of issue which can be in present on the sensors plugged into the particular FIB.

The kit includes all hardware required for the installation, including drill templates for the sensor and main bus entries. A grounding plate is provided to provide an electrical grounding path if a metallic conduit system is used for the bus cabling.

The enclosure kit is part of a complete facilities monitoring system. The entire system has been specified by CMCIEL. Components of the system include:

- A complete range of sensors, including temperature, rotation, digital input, analog input, vibration, relative humidity, current, infrared temperature and thermocouple cables
- mBC081/mBC082/mBC083 Bus Converters
- mTB006 Field Wiring Interconnect
- mOI215 Browser Based Operator Interface
- EZSentinel128 HMI

The field sensor bus system is rated Intrinsically Safe when used with the mBC081/83 Bus Converter.

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2. Planning Your Network

If your network is to be Intrinsically Safe you must observe the following:

1. You must route all network and sensor cables in separate cable trays and raceways from all other cables. The wiring system must be designed to prevent any possibility of energy from a secondary source from entering the network cabling.
2. Only use the mBC081/83 Bus Converter and components and cabling specified by CMCIEL in an Intrinsically Safe system. You must follow the installation instructions in the component Technical Manuals and the notes included on the drawings provided by CMCIEL. No exceptions can be made to the requirements outlined in this documentation.
3. Wiring for the Modbus RTU RS485 network connecting the mBC081/83s is not Intrinsically Safe and must be wired in accordance with the local electrical code for the classification of the installation. You must observe the wire placements shown on drawing 10416/11752 when connecting the Modbus RTU RS485 cables. The mBC081/83 enclosure cannot be used for any other cables than the two Modbus RTU RS485 cables.
4. No other cables can exit the hub designated for the Intrinsically Safe sensor bus cable on the mBC081/83. This hub must be connected to the first junction point using a rated conduit system such as metallic liquid tight conduit. Install an EYS fitting in the conduit if required by code for your area classification. Do not modify the bus cable from the mBC081/83 or remove the attached connector.
5. Do not modify the mBC081/83 housing in any way by drilling holes or attaching brackets. Use u-bolts around the hubs to secure the unit. Do not attempt to service or repair the PCB assembly. Return the assembly to the factory for repair.

Before starting the planning process, obtain and read the Technical Manuals for all of the components to be used in the system. Refer to drawings 11751 for an overview of a typical network. The following are critical issues in planning your network:

1. Each of the mTB006 Field Interconnects has three 110 punch-down connectors for bus cables. One connector is marked INCOMING and is for the cable connected to a preceding mTB006. The INCOMING connector is not used on the mTB006 connected directly to the mBC081/82/83. The other 2 connectors, marked BRANCH A and BRANCH B are for outbound cables to other mTB006's.
2. The network has been tested with 1000 feet (333m) of cable and up to 5 tees. A tee is where both the A and B outbound connectors are used. Good network planning will create a network with the fewest possible tees.
3. Mount the mTB006's as close to the sensors as possible. The enclosures must be less than 6 feet (1.9m) from each sensor. A maximum of six sensors can be connected to a mTB006, five if the mBC081 is connected. Do not modify the sensor cables and use a strain relief to enter the enclosure.
4. The mBC081/82/83 is to be connected to the mTB006 using the supplied cable.
5. Any CAT5 cable is acceptable for the sensor network backbone. Use a suitable strain relief fitting for the CAT 5 cable you employ. For rugged industrial use, we recommend a metallic conduit system with unshielded CAT5 cable. An alternative is a nonmetallic

conduit system with shielded CAT5 cable.

CAT5 direct burial cable (Superior Essex Type BBDN part no. 04-001-34) can also be used. This cable has a tough outer jacket, a rodent resistant aluminum layer and a wax filled conductor cavity. The cable is quite stiff and requires few clamps during installation. It is fully weatherproof and can be immersed in water.

Standard jacket CAT5 cable can be used for indoor applications where physical protection is not required. You can use either shielded or unshielded cable. Use shielded cable if there is a possibility of excessive electrical noise. The drain wires of shielded cable should be connected using the ground clamps provided.

6. If metallic conduit is used for the distribution network, the supplied grounding plate must be installed. The plate ensures the integrity of the conduit grounding system. In the first enclosure where the mBC081/83 is connected, connect the ground plate to the cable shielding system if shielded cable is used. This is accomplished using the “EARTH CONNECTION” standoff provided.
7. Route cabling wherever possible away from higher voltage electrical cables. Do not place cables in the same tray or conduits as cable from VFDs or other electrically noisy equipment.
8. If this is an Intrinsically Safe installation, observe all requirements of your local electrical code for the installation of IS systems. Failure to observe all of the requirements of the electrical code may result in an explosion or fire.
9. Make sure you allow for serviceability. Mount all components where they can be accessed for service. Mount the sensors using double nut systems so they can be replaced without disassembling the machine. Mount the mTB006 kits so the doors can be easily opened and the diagnostic lamps observed.
10. Provide a network layout drawing showing the cable routing to facilitate service.
11. Use only an approved 110 punch down tool to connect the CAT5 cable. Observe the cable stripping templates included with the drawings.
12. Make sure all cables are securely clamped and are protected from physical damage.
13. Protect the components from weather during installation. Make sure all enclosure covers are closed when not being serviced. Do not attach the sensors to the machine until the mTB006 is mounted and the sensors connected. Do not leave connectors and components exposed to weather during installation.

3. AdaptaNet Description

AdaptaNet is a device which was especially designed for CMC sensor bus system to upgrade the regular FIBs to intelligent FIBs. The CMC sensors network works on 1-Wire bus system. The main disadvantage of this system is that when such a fault as a short between two wires on the network is presented it affects the whole network regardless on a location of this issue. This is inconvenient problem because of difficult way to locate the issue and also because of the fact that when one fault occurs, the whole system will be affected.

For those described reasons was designed AdaptaNet card.

The AdaptaNet card divides the 6 RJ11 plugs in the FIB into two groups, Group 1 and Group 2, see Figure 1.

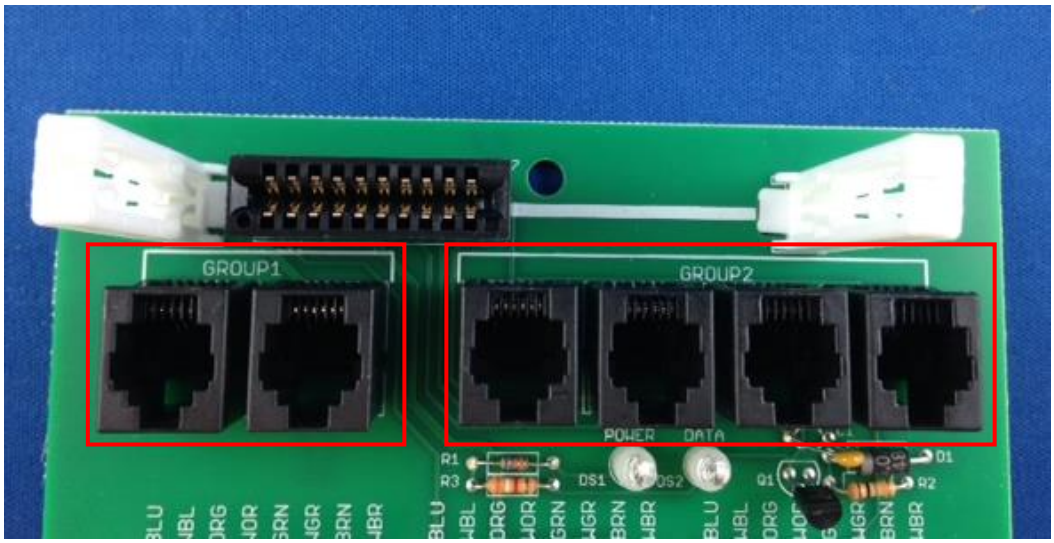

Figure 1: Groups of sensors for AdaptaNet

The basic functionality of AdaptaNet is to disconnect faulty sensors from the rest of the network. Means that if there is a faulty sensor in Group 1, the whole group will be disconnected from the network. The rest of the network won't be affected. The same rule is applied for Group 2. Locate the issue is then really easy. The faulty sensor is always within that disconnected group.

The Group 1 has only two plugs and Group 2 has 4 plugs. The reason behind this is that the Group 1 is dedicated for higher consumption sensors as is Rotation, Vibration, Capacitive and Inductive sensors. The Group 2 was designed to take higher volume of Temperature sensors which have lower consumption. To each group can be plugged any sensor but in the Group 2 should be carefully considered the volume of high consumption sensors plugged in it.

The AdaptaNet is not simple electronic board as the FIB. It is still highly unlikely that there will be any problem with the board, but higher possibility definitely exists. For this reason was the AdaptaNet board designed the way that the Adaptanet can be bypassed. If there will be any issue with the AdaptaNet board, the board can be easily flipped by 180° and be plugged back to the connector. By doing this the whole assembly will be downgraded to the regular FIB till the faulty AdaptaNet is replaced. Both options of installation can be seen on following picture. On the Figure 2 is the board installed in Active Mode when the AdaptaNet is working. On the Figure 3 is the board installed in Passive Mode when the AdaptaNet is bypassed.

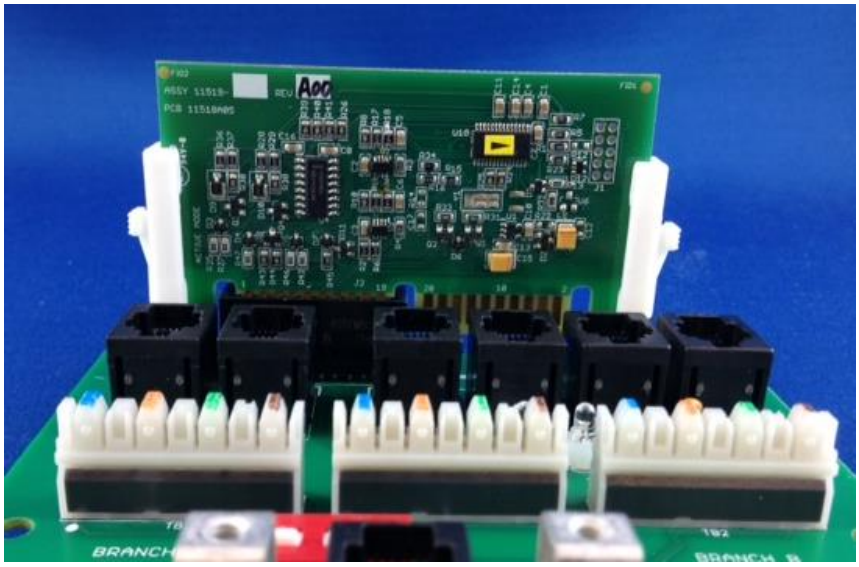

Figure 2: AdaptaNet installed in Active Mode

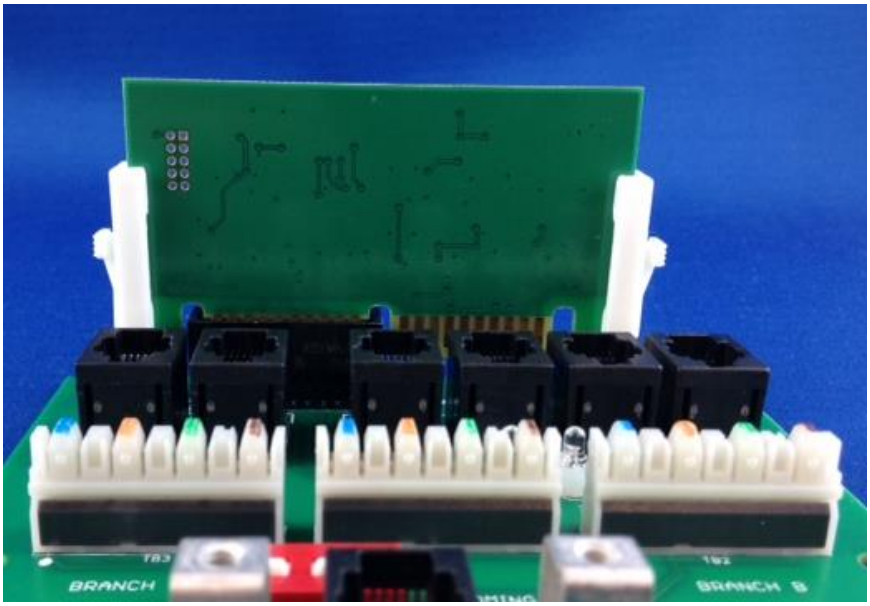

Figure 3: AdaptaNet installed in Passive Mode

4. Description of Indicator

1. Red LED blink shows Power fault, and Green LED blink shows Data fault.
2. One blink shows the fault on the sensors connected to Group 1, and two blinks show the fault on the sensors connected to Group 2.

Indication		Fault	
RED LED	**GREEN LED**	**Group 1**	**Group 2**
		No Fault	No Fault
	X	Power Fault	No Fault
	X	No Fault	Power Fault
	X	Power Fault	Power Fault
		Data Fault	No Fault
		No Fault	Data Fault
		Data Fault	Data Fault

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5. Installation Instructions for mTB006 Board

The following steps are required for installation:

1. Drill the required strain relief entry holes using the supplied drill templates. Remove the templates immediately after drilling the holes. Do not drill holes without the templates. The templates ensure that the correct cable entry locations are used for the grounding plate. Drill holes only for the required number of cable entries. Do not drill unused holes. Use the sides of the enclosure for sensor cables only. Use the bottom of the enclosure for the network cables. Do not use the top, back or front door of the enclosure to ensure the system remains weather tight.
2. Mount the enclosure in a readily accessible location using the provided stainless steel hardware. Ensure that the door can be easily opened and that the diagnostic LED's can be easily viewed. Use stainless or plated screws for mounting.
3. If you are using CAT5 direct burial cable, prepare the main sensor bus cables using the template on drawing 10826, page 2. Use strain relief fittings that securely clamp the cable and insure a weatherproof entry. Use the supplied grounding clamps to ground the solid aluminum shield in the cable as shown on the drawing. If you are using armored CAT5 use the correct weatherproof fitting for the cable and ground the armored layer using a grounding kit as shown in the drawing. If you are using shielded CAT5 cable, connect the drain wires to the supplied pan grounding screw.
4. Use only an approved 110 tool to punch down the CAT5 cables.
5. Attach each sensor using a strain relief or nonmetallic conduit system if physical protection of the sensor wiring is required. Coil excess cable inside the enclosure. Plug the sensor into the mTB006 using the supplied connector.
6. Ensure that the disconnect switches for the outbound network cables are turned on.
7. Close the enclosure cover, verifying the integrity of the o-ring seal, and fasten the locking clamps.

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6. Safety Warning for Intrinsically Safe Systems

IMPORTANT NOTICE

This product is Intrinsically Safe when used with the mBC081/83 Bus Converter. Do not modify the cable from the mBC081/83 or any of the system components in any way. Install the system using the drawings provided with the mBC081/83 Bus Converter Technical Manual. Do not install sensors or components other than those specified by the manual. Follow the field wiring instructions provided. Only use the wiring components and cabling specified in the manual.

Intrinsically Safe wiring must be fully segregated from all other wiring systems. Use separate cable trays, conduits and raceways for Intrinsically Safe cabling. Follow the requirements of the local electrical code for all elements of the installation.

Do not attempt to service or repair individual components. Return defective components to the factory for repair.

Failure to follow the installation instructions provided in the mBC081/83 Technical Manual and the requirements of the local electrical code could result in an explosion or fire.

7. Specifications

Description	Characteristic
Sensor Bus Voltage Current	 5 VDC 3.0mA max, 800µA avg.
Environment Temperature	 -40°C to +85°C (-40°F to 176°F)
Overall Capacitance	3µF
Overall Inductance	1µH

Revision History

First Release – May 15, 2006

Revision A – June 8, 2007
- Update drawings 10826 and 10827

Revision B – April 7, 2010
- Add drawing 11218

Revision C – May 6, 2011
- Remove reference to 4 port and EK

Revision D – April 24, 2014 (Not Released)
- Added fault detection and bus isolation features (AdaptaNet)

Revision E – June 16, 2015 (Not Released)
- Changed ADC pin assignment, power fault recovery circuit
- Modified LED's display

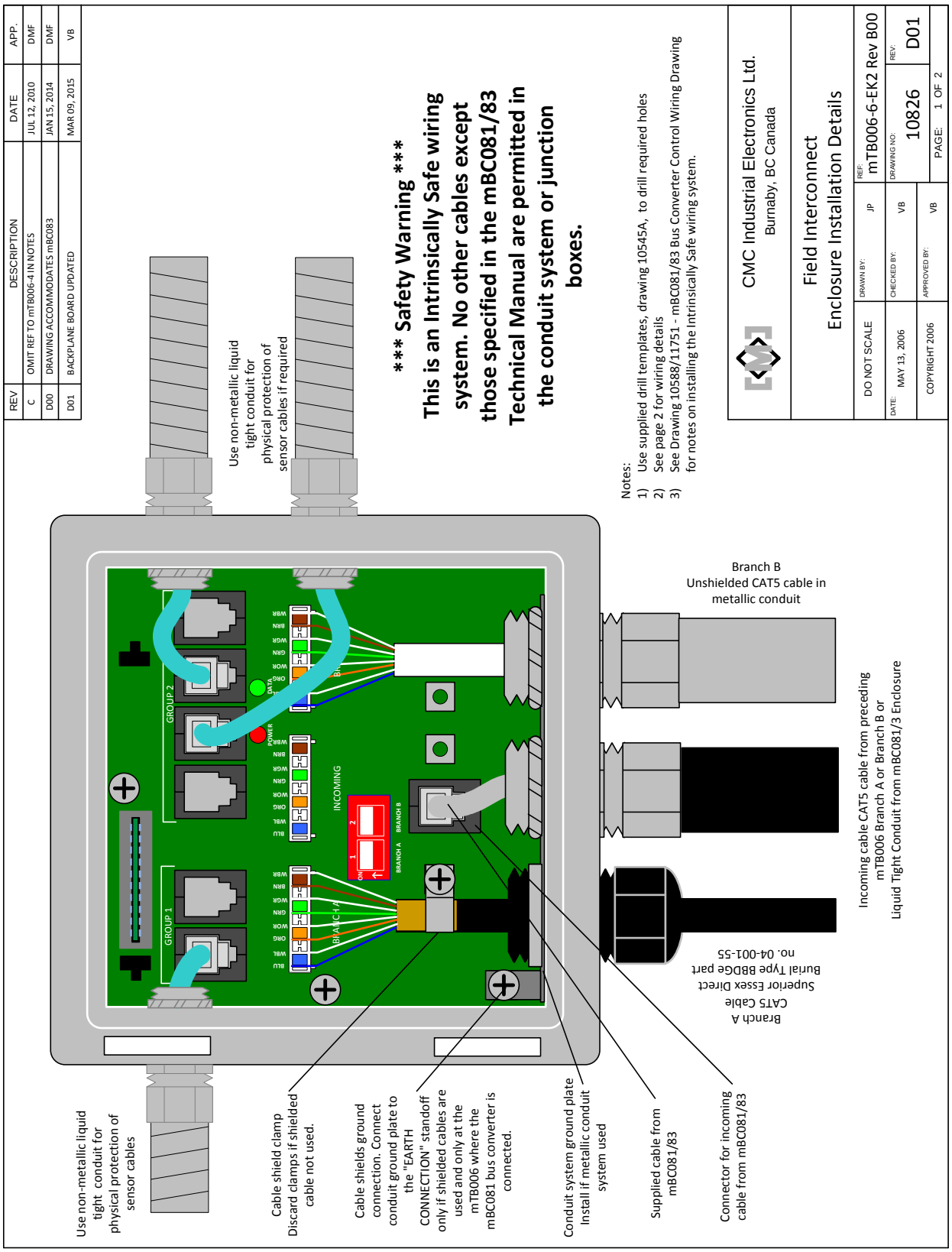
Revision F00 – January 21, 2016

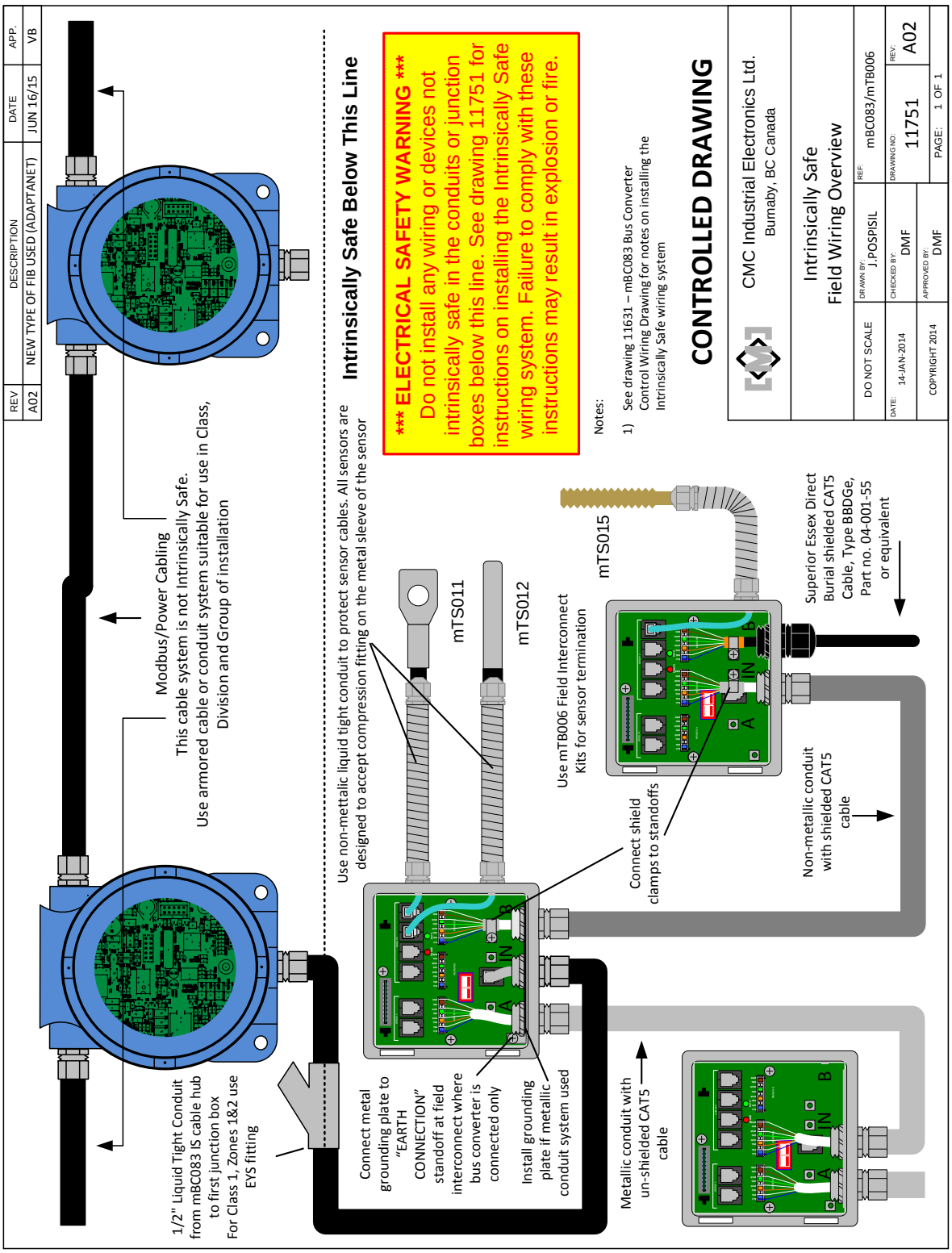
- AdaptaNet Added
- Drawings updated

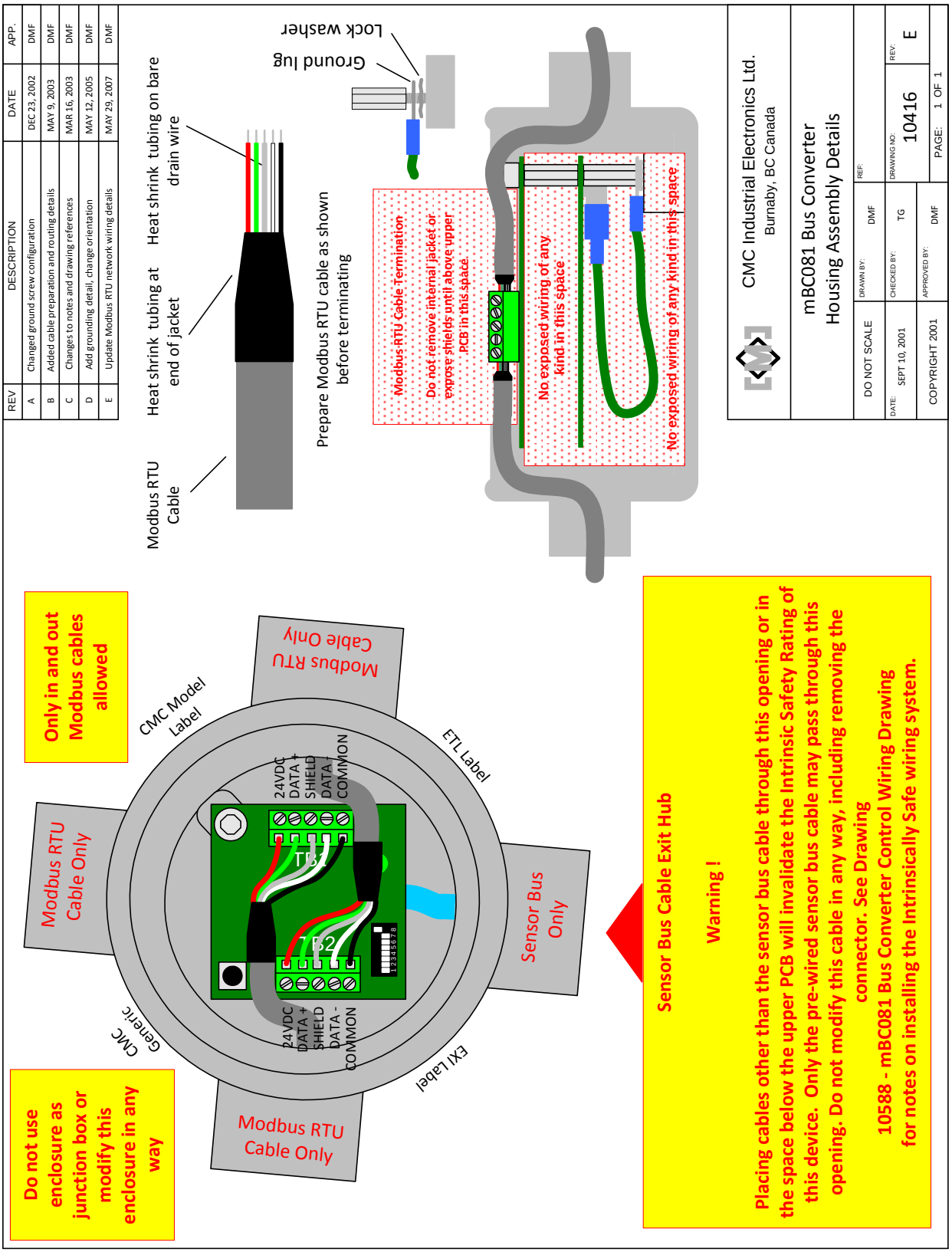
Appendix 1 – Installation Drawings

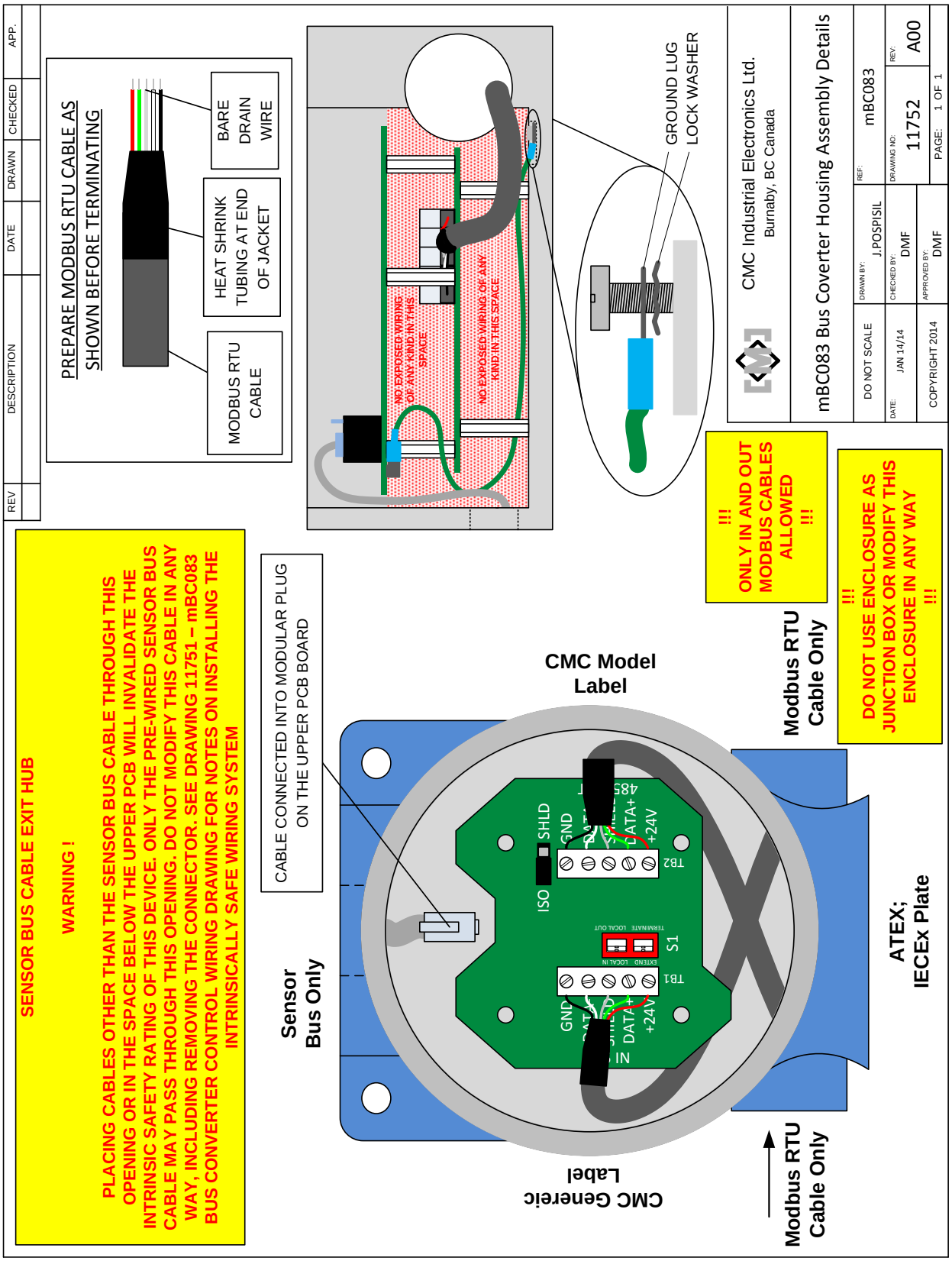
The following is a list of the installation drawing in this appendix:

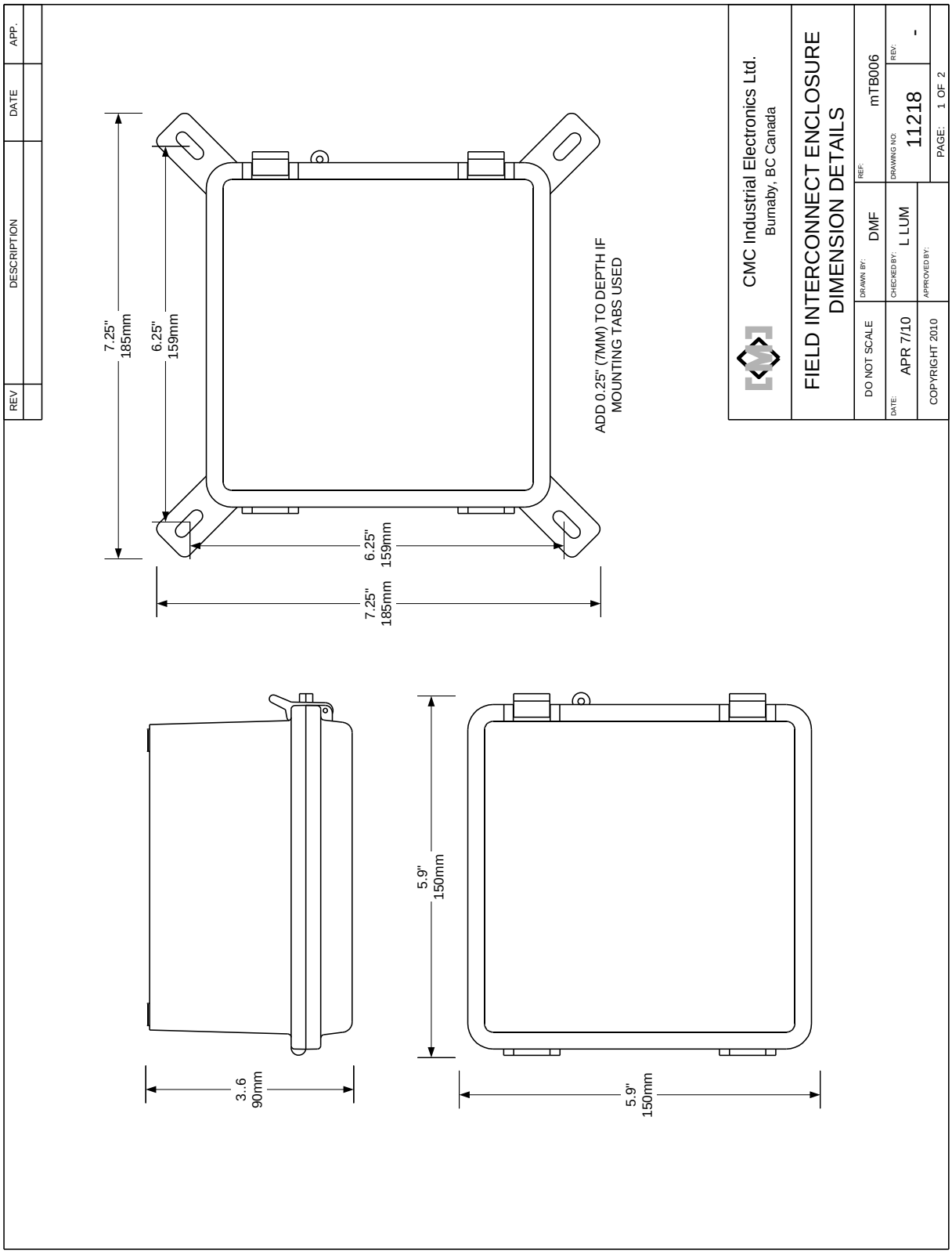
10826	Field Interconnect Enclosure Installation Details
10827	Intrinsically Safe Field Wiring Overview
11218	Field Interconnect Enclosure Dimension Details


REV | DESCRIPTION | DATE | APP.
C | OMIT REF TO mTB006-4 IN NOTES | JUL 12, 2010 | DMF
D00 | DRAWING ACCOMMODATES mBC083 | JAN 15, 2014 | DMF
D01 | BACKPLANE BOARD UPDATED | MAR 09, 2015 | VB
*** Safety Warning ***
This is an Intrinsically Safe wiring system. No other cables except those specified in the mBC081/83 Technical Manual are permitted in the conduit system or junction boxes.
Notes:
1) Use supplied drill templates, drawing 10545A, to drill required holes
2) See page 2 for wiring details
3) See Drawing 10588/11751 - mBC081/83 Bus Converter Control Wiring Drawing for notes on installing the Intrinsically Safe wiring system.
CMC Industrial Electronics Ltd.
Burnaby, BC Canada
Field Interconnect
Enclosure Installation Details
DO NOT SCALE
DRAWN BY: JP
CHECKED BY: VB
APPROVED BY: VB
REF: mTB006-6-EK2 Rev B00
DRAWING NO: 10826
REV: D01
DATE: MAY 13, 2006
COPYRIGHT 2006
PAGE: 1 OF 2
Use non-metallic liquid tight conduit for physical protection of sensor cables if required
Use non-metallic liquid tight conduit for physical protection of sensor cables
Cable shield clamp Discard clamps if shielded cable not used.
Cable shields ground connection. Connect conduit ground plate to the "EARTH CONNECTION" standoff only if shielded cables are used and only at the mTB006 where the mBC081 bus converter is connected.
Conduit system ground plate Install if metallic conduit system used
Supplied cable from mBC081/83
Connector for incoming cable from mBC081/83
Branch A
CAT5 Cable
Superior Essex Direct
Burial Type BBDGe part
no. 04-001-55
Branch B
Unshielded CAT5 cable in metallic conduit
Incoming cable CAT5 cable from preceding mTB006 Branch A or Branch B or Liquid Tight Conduit from mBC081/3 Enclosure
GROUP 1
GROUP 2
INCOMING
BRANCH A
BRANCH B
POWER
DATA

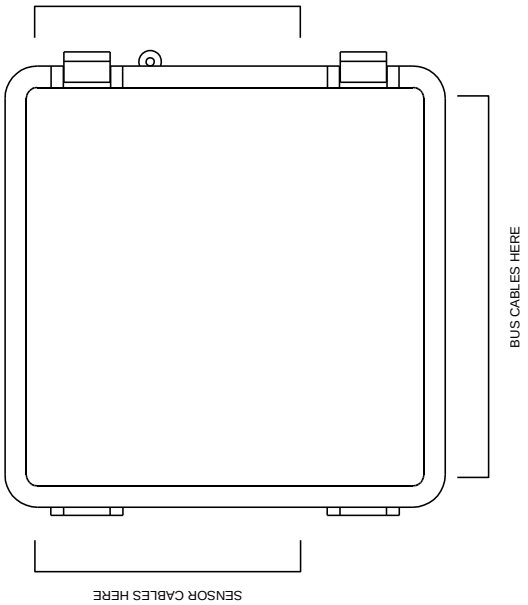

REV
DESCRIPTION
DATE
APP.
A02
NEW TYPE OF FIB USED (ADAPTANET)
JUN 16/15
VB
Intrinsically Safe Below This Line
*** ELECTRICAL SAFETY WARNING ***
Do not install any wiring or devices not intrinsically safe in the conduits or junction boxes below this line. See drawing 11751 for instructions on installing the Intrinsically Safe wiring system. Failure to comply with these instructions may result in explosion or fire.
Notes:
1) See drawing 11631 – mBC083 Bus Converter Control Wiring Drawing for notes on installing the Intrinsically Safe wiring system
CONTROLLED DRAWING
CMC Industrial Electronics Ltd.
Burnaby, BC Canada
Intrinsically Safe
Field Wiring Overview
DO NOT SCALE
DRAWN BY: J.POSPISIL
REF: mBC083/mTB006
DATE: 14-JAN-2014
CHECKED BY: DMF
DRAWING NO: 11751
REV: A02
COPYRIGHT 2014
APPROVED BY: DMF
PAGE: 1 OF 1
Modbus/Power Cabling
This cable system is not Intrinsically Safe.
Use armored cable or conduit system suitable for use in Class, Division and Group of installation
1/2" Liquid Tight Conduit from mBC083 IS cable hub to first junction box For Class 1, Zones 1&2 use EYS fitting
Use non-mettalic liquid tight conduit to protect sensor cables. All sensors are designed to accept compression fitting on the metal sleeve of the sensor
mTS011
mTS012
mTS015
Use mTB006 Field Interconnect Kits for sensor termination
Superior Essex Direct Burial shielded CAT5 Cable, Type BBDGe, Part no. 04-001-55 or equivalent
Connect shield clamps to standoffs
Non-metallic conduit with shielded CAT5 cable
Connect metal grounding plate to "EARTH CONNECTION" standoff at field interconnect where bus converter is connected only
Install grounding plate if metallic conduit system used
Metallic conduit with un-shielded CAT5 cable
A
B
IN


REV
DESCRIPTION
DATE
APP.
A Changed ground screw configuration DEC 23, 2002 DMF
B Added cable preparation and routing details MAY 9, 2003 DMF
C Changes to notes and drawing references MAR 16, 2003 DMF
D Add grounding detail, change orientation MAY 12, 2005 DMF
E Update Modbus RTU network wiring details MAY 29, 2007 DMF
Heat shrink tubing at end of jacket
Heat shrink tubing on bare drain wire
Modbus RTU Cable
Prepare Modbus RTU cable as shown before terminating
Ground lug
Lock washer
Modbus RTU Cable Termination
Do not remove internal jacket or expose shields until above upper PCB in this space.
No exposed wiring of any kind in this space
No exposed wiring of any kind in this space
CMC Industrial Electronics Ltd.
Burnaby, BC Canada
mBC081 Bus Converter
Housing Assembly Details
DO NOT SCALE
DRAWN BY: DMF
CHECKED BY: TG
APPROVED BY: DMF
DATE: SEPT 10, 2001
COPYRIGHT 2001
DRAWING NO: 10416
REV: E
PAGE: 1 OF 1
Only in and out Modbus cables allowed
Modbus RTU Cable Only
CMC Model Label
ETL Label
Sensor Bus Only
CMC Generic
EXI Label
Modbus RTU Cable Only
24VDC
DATA +
SHIELD
DATA -
COMMON
TB1
TB2
Do not use enclosure as junction box or modify this enclosure in any way
Sensor Bus Cable Exit Hub
Warning !
Placing cables other than the sensor bus cable through this opening or in the space below the upper PCB will invalidate the Intrinsic Safety Rating of this device. Only the pre-wired sensor bus cable may pass through this opening. Do not modify this cable in any way, including removing the connector. See Drawing
10588 - mBC081 Bus Converter Control Wiring Drawing
for notes on installing the Intrinsically Safe wiring system.


REV
DESCRIPTION
DATE
DRAWN
CHECKED
APP.
PREPARE MODBUS RTU CABLE AS SHOWN BEFORE TERMINATING
BARE DRAIN WIRE
HEAT SHRINK TUBING AT END OF JACKET
MODBUS RTU CABLE
NO EXPOSED WIRING OF ANY KIND IN THIS SPACE
NO EXPOSED WIRING OF ANY KIND IN THIS SPACE
GROUND LUG
LOCK WASHER
CMC Industrial Electronics Ltd.
Burnaby, BC Canada
mBC083 Bus Coverter Housing Assembly Details
DO NOT SCALE
DRAWN BY: J.POSPISIL
REF: mBC083
DATE: JAN 14/14
CHECKED BY: DMF
DRAWING NO: 11752
REV: A00
COPYRIGHT 2014
APPROVED BY: DMF
PAGE: 1 OF 1
SENSOR BUS CABLE EXIT HUB
WARNING !
PLACING CABLES OTHER THAN THE SENSOR BUS CABLE THROUGH THIS OPENING OR IN THE SPACE BELOW THE UPPER PCB WILL INVALIDATE THE INTRINSIC SAFETY RATING OF THIS DEVICE. ONLY THE PRE-WIRED SENSOR BUS CABLE MAY PASS THROUGH THIS OPENING. DO NOT MODIFY THIS CABLE IN ANY WAY, INCLUDING REMOVING THE CONNECTOR. SEE DRAWING 11751 – mBC083 BUS CONVERTER CONTROL WIRING DRAWING FOR NOTES ON INSTALLING THE INTRINSICALLY SAFE WIRING SYSTEM
CABLE CONNECTED INTO MODULAR PLUG ON THE UPPER PCB BOARD
!!! ONLY IN AND OUT MODBUS CABLES ALLOWED !!!
!!! DO NOT USE ENCLOSURE AS JUNCTION BOX OR MODIFY THIS ENCLOSURE IN any WAY !!!
CMC Model Label
Modbus RTU Cable Only
Sensor Bus Only
ATEX; IECEx Plate
CMC Generic Label
Modbus RTU Cable Only
ISO
SHLD
GND
DATA+
+24V
TB2
TB1
S1
TERMINATE
EXTEND
LOCAL IN
LOCAL OUT


REV
DESCRIPTION
DATE
APP:
7.25"
185mm
6.25"
159mm
ADD 0.25" (7MM) TO DEPTH IF
MOUNTING TABS USED
6.25"
159mm
7.25"
185mm
3.6
90mm
5.9"
150mm
5.9"
150mm
CMC Industrial Electronics Ltd.
Burnaby, BC Canada
FIELD INTERCONNECT ENCLOSURE
DIMENSION DETAILS
DO NOT SCALE
DATE: APR 7/10
DRAWN BY: DMF
CHECKED BY: L LUM
APPROVED BY:
REF: mTB006
DRAWING NO: 11218
REV: -
PAGE: 1 OF 2
COPYRIGHT 2010

REV:	-
DRAWING NO:	11218
PAGE:	2 OF 2



NOTES:

1) USE SUPPLIED TEMPLATES TO DRILL CABLE ENTRY HOLES
2) ALLOW SPACE FOR LID LATCHES AND LID TO OPEN
3) SEE DRAWING 10826 FOR WIRING DETAILS