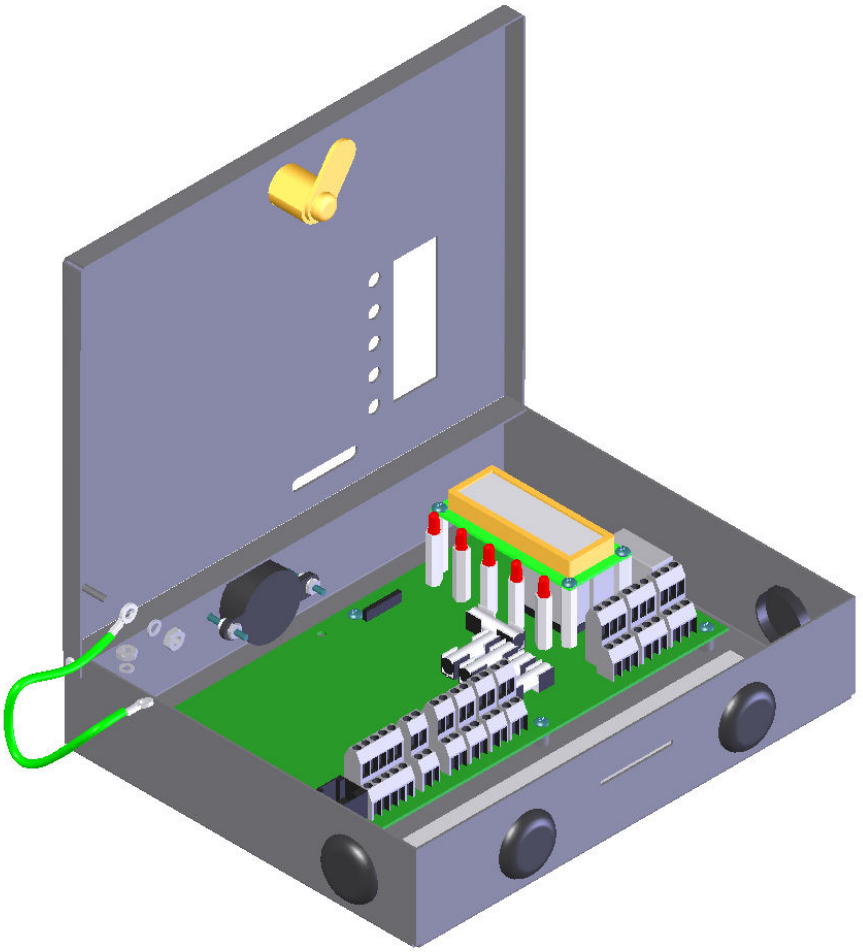
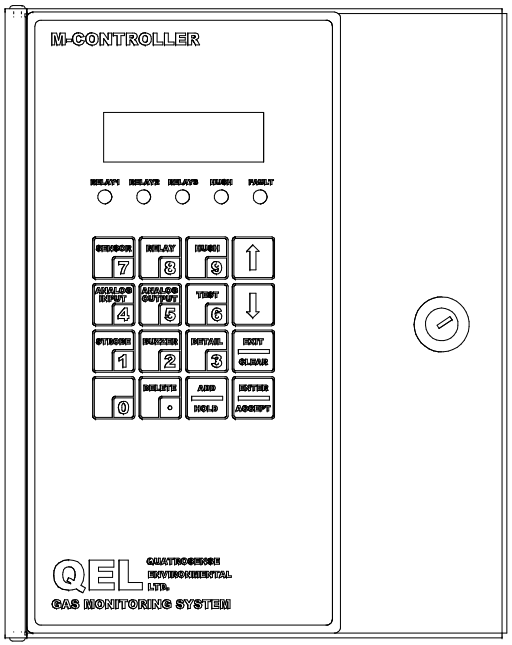
REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
886	C	UPDATE FUSE AND CONNECTION	2008/12/02	XY





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APPLICATION	

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DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL

FINISH

DO NOT SCALE DRAWING

	NAME	DATE
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ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

QUATROSENSE ENVIRONMENTAL LTD.

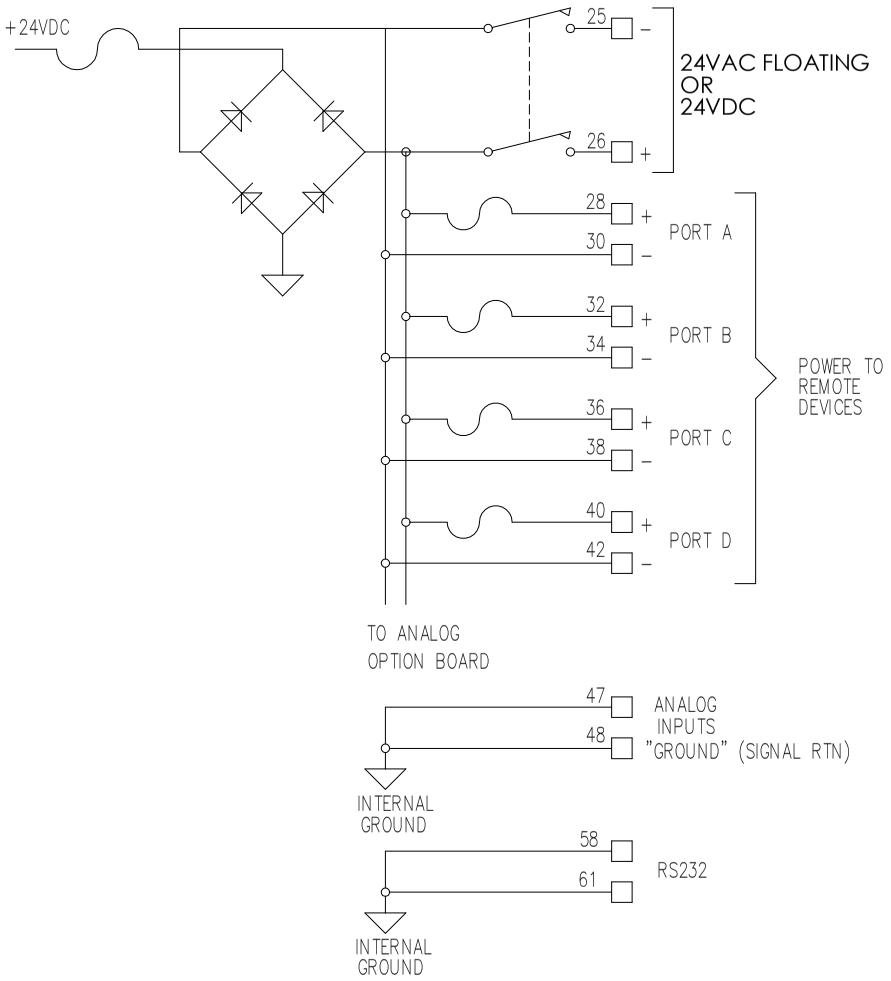
TITLE:
M-CONTROLLER GUIDELINES FOR SYSTEM DESIGN

SIZE	DWG. NO.	REV
B	84350-005-000	C

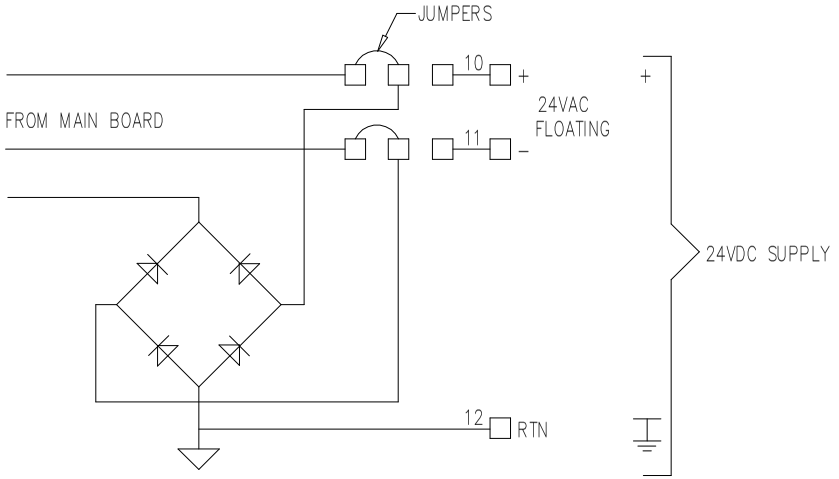
SCALE: 1:4	WEIGHT:	SHEET 1 OF 13

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
		SEE SHEET ONE		

MAIN CIRCUIT CARD



ANALOG OUTPUT OPTIONAL CIRCUIT CARD



NOTE:
ANALOG OUTPUT OPTION
Jumpers allow choice of power supplied from the main circuit card or from some separate power supply.

REFERENCE
POWER SUPPLY ARCHITECTURE
FLOATING AC SUPPLIES

		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±	DRAWN	Y.DUBE	03-07-16
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		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL	COMMENTS:		
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APPLICATION		DO NOT SCALE DRAWING			

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TITLE: M-CONTROLLER GUIDELINES FOR SYSTEM DESIGN

SIZE	DWG. NO.	REV
B	84350-005-000	C

SCALE: 1:4 | 1 | SHEET 2 OF 13

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
		SEE SHEET ONE		

NOTE 1 : Power Supply Limitations

-AC Power supplies to the M-Controller must be floating.
-DC Power supplies to the M-Controller may have the negative terminal grounded.
-Power supplies to remote digital (RS-485) sensors may be supplied separately,
in which case QEL M-Series sensors can accept AC-Grounded, as per relevant drawings.
-AC Power supplies to the remote M-Relay Modules MUST NOT be AC grounded
-AC Power supplies to the Analog Output card must be floating.
-DC Power supplies to the Analog Output card may be floating or grounded
but the connections differ.

NOTE 2 : RS-232 Limitations
RS-232 ports are ground referenced. Therefore it is best to always
use some form of isolated RS-232 connection.
-Laptops running on battery are isolated.
-Do NOT use Laptop power adapters, these will typically have negative (on secondary side)
connected to safety ground (on primary side).

NOTE 3 : RS-485 Limitations
RS-485 connections between devices with separate floating power supplies
(and this includes QEL's M-17 which is internally isolated)
may have some difficulty due to lack of a positive signal return path.

RS-485 connections operate between devices at different ground potentials.
Grounds may differ by up to 5 volts

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH
DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	Y.DUBE	03-07-16
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ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

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TITLE: M-CONTROLLER GUIDELINES FOR SYSTEM DESIGN

SIZE	DWG. NO.	REV
B	84350-005-000	C

SCALE: 1:4 | 1 | SHEET 3 OF 13

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
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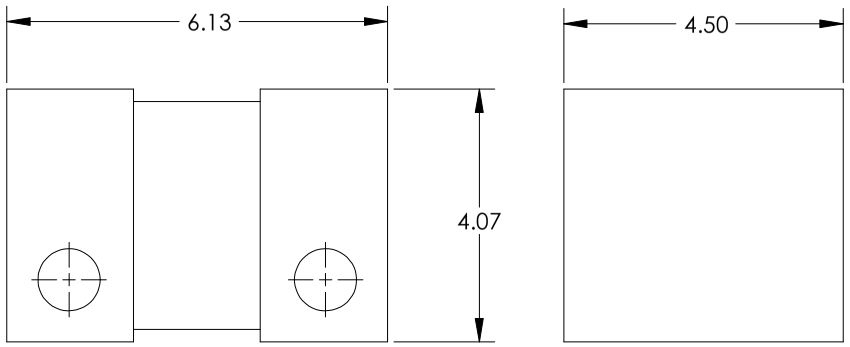
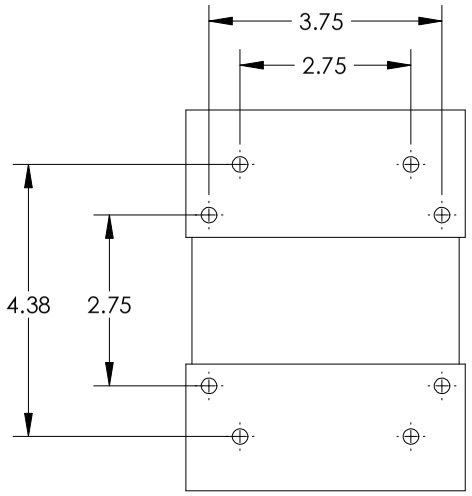
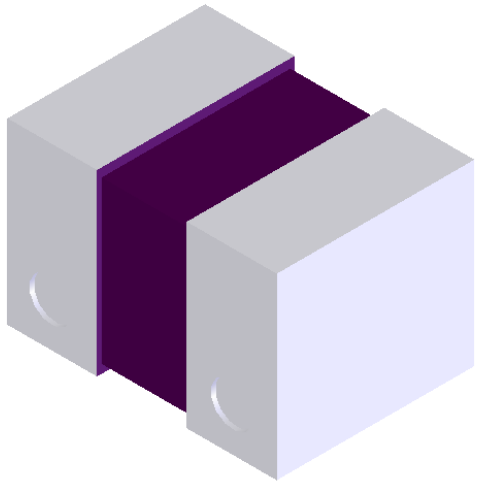




BOTTOM VIEW
MOUNTING HOLES



QEL M-TRANSFORMER
DIMENSIONS AND SPECIFICATIONS

NOTE;
INDOOR TYPE ENCLOSED TRANSFORMER

PRIMARY	120VAC 60Hz
SECONDARY	24VAC
POWER	250VA

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH
DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	Y.DUBE	03-07-17
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MFG APPR.		
Q.A.		

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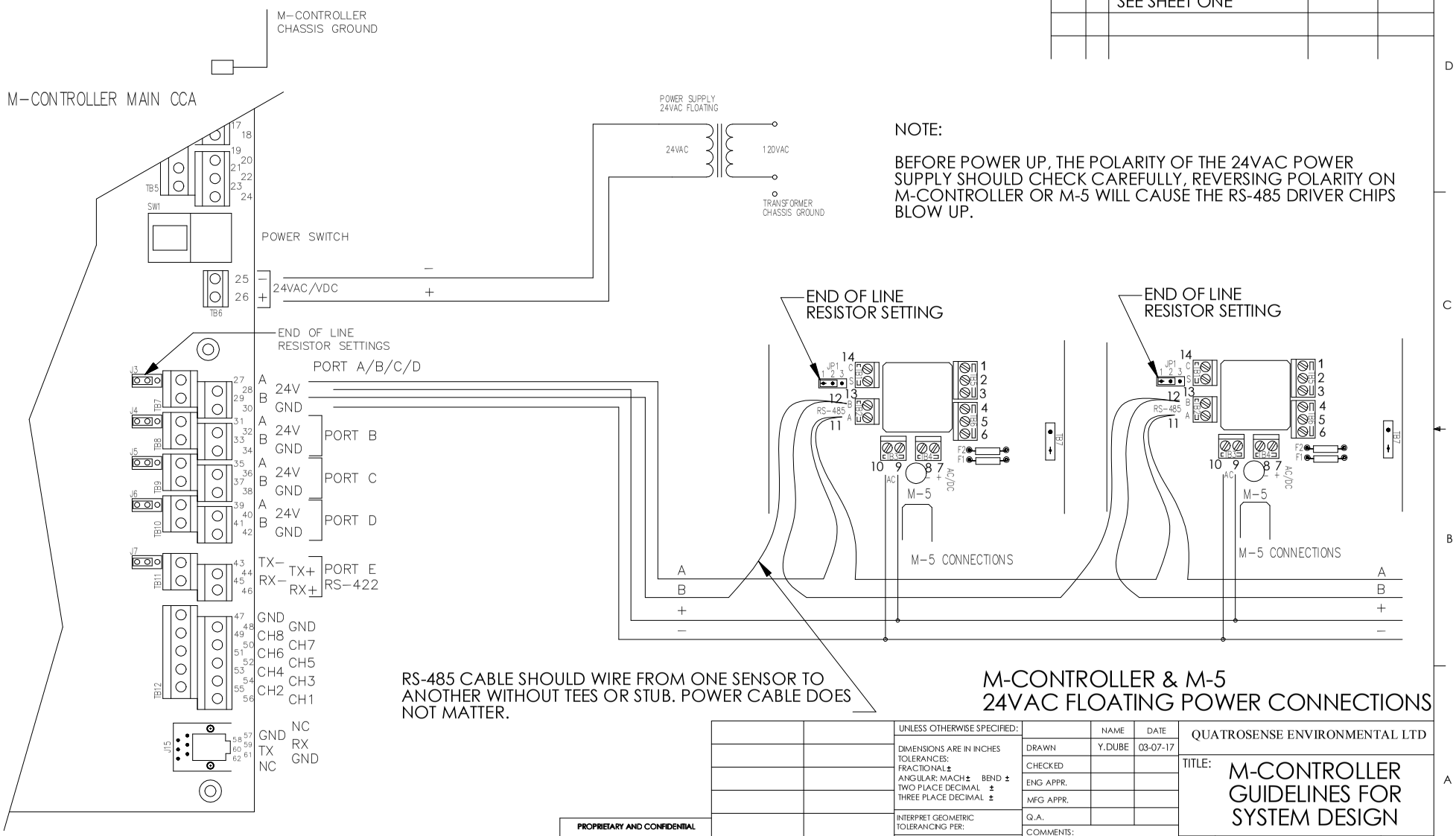
TITLE: M-CONTROLLER GUIDELINES FOR SYSTEM DESIGN

SIZE	DWG. NO.	REV
B	84350-005-000	C

SCALE: 1:1 | 1 | SHEET 4 OF 13

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
		SEE SHEET ONE		



NOTE:

BEFORE POWER UP, THE POLARITY OF THE 24VAC POWER SUPPLY SHOULD CHECK CAREFULLY, REVERSING POLARITY ON M-CONTROLLER OR M-5 WILL CAUSE THE RS-485 DRIVER CHIPS BLOW UP.

RS-485 CABLE SHOULD WIRE FROM ONE SENSOR TO ANOTHER WITHOUT TEES OR STUB. POWER CABLE DOES NOT MATTER.

M-CONTROLLER & M-5 24VAC FLOATING POWER CONNECTIONS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL

FINISH

DO NOT SCALE DRAWING

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ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

QUATROSENSE ENVIRONMENTAL LTD

TITLE: M-CONTROLLER GUIDELINES FOR SYSTEM DESIGN

SIZE	DWG. NO.	REV
B	84350-005-000	C

SCALE: 1:4 | 1 | SHEET 5 OF 13

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
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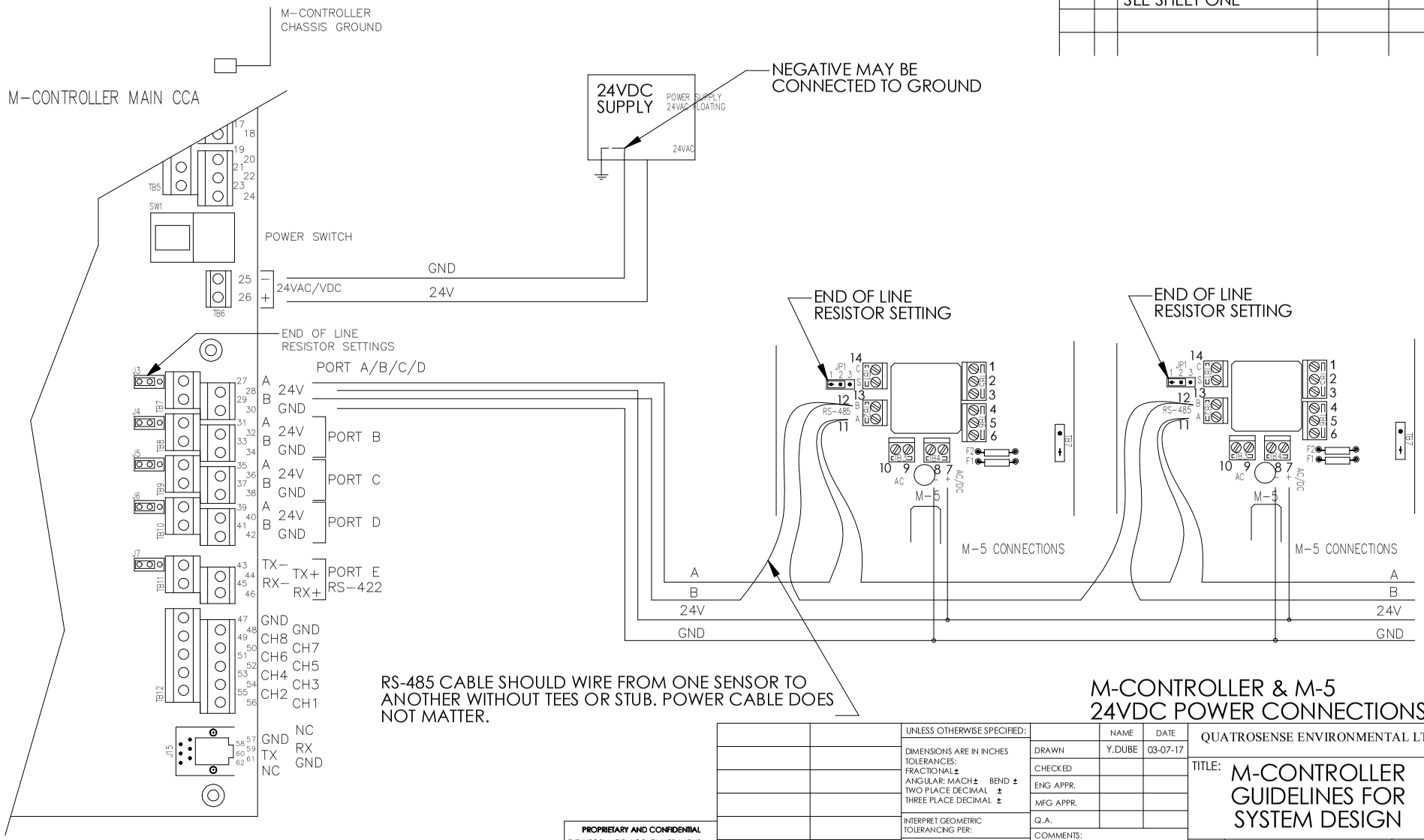

M-CONTROLLER & M-5
24VDC POWER CONNECTIONS

NEXT ASSY	USED ON	
APPLICATION	DO NOT SCALE DRAWING	

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL

FINISH

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B	84350-005-000	C

SCALE: 1:4 | 1 | SHEET 6 OF 13

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
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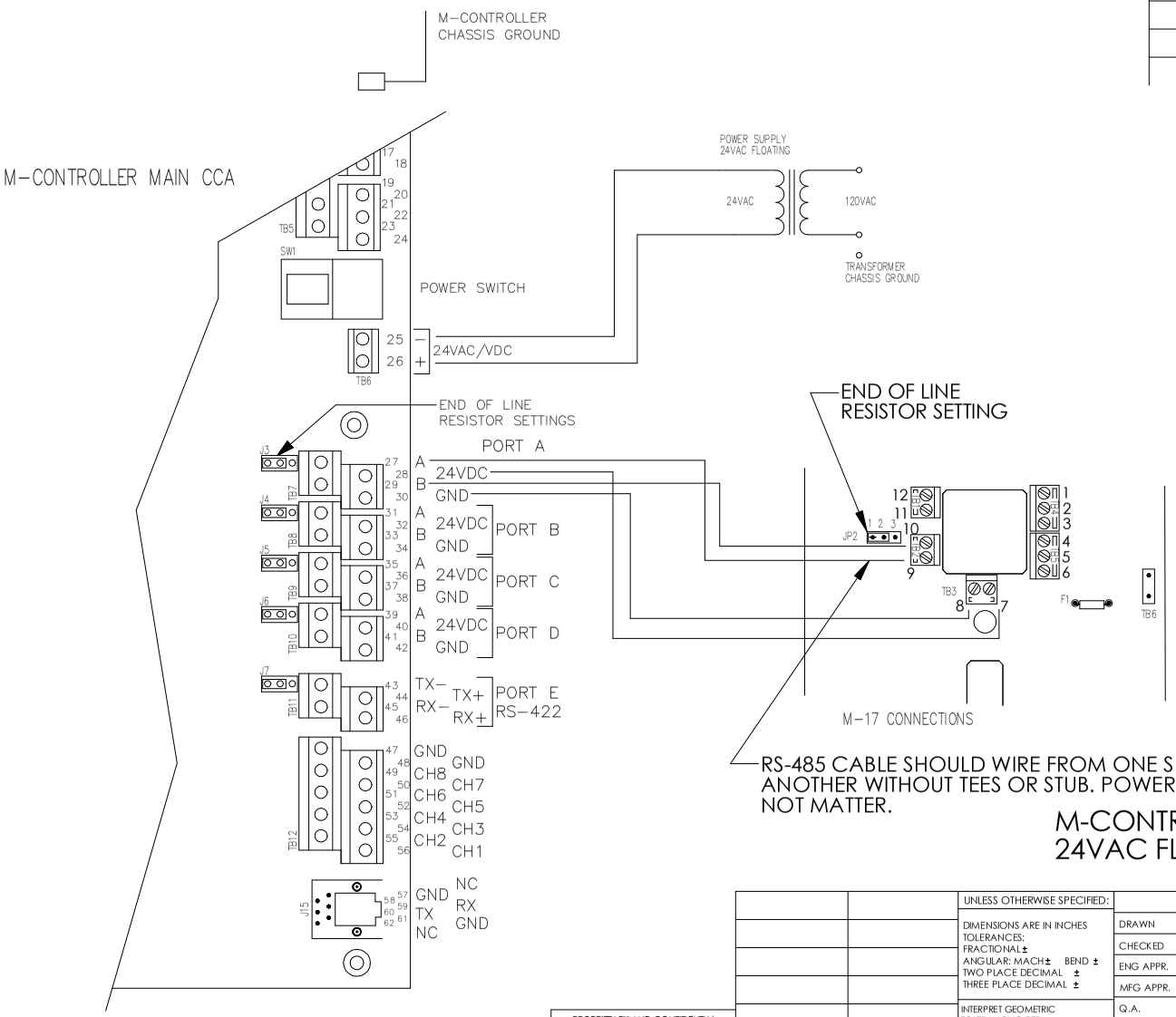

M-CONTROLLER & M-17
24VAC FLOATING POWER CONNECTIONS

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APPLICATION	DO NOT SCALE DRAWING	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH

	NAME	DATE
DRAWN	Y.DUBE	03-07-17
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ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

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SIZE	DWG. NO.	REV
B	84350-005-000	C

SCALE: 1:4 | 1 | SHEET 7 OF 13

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
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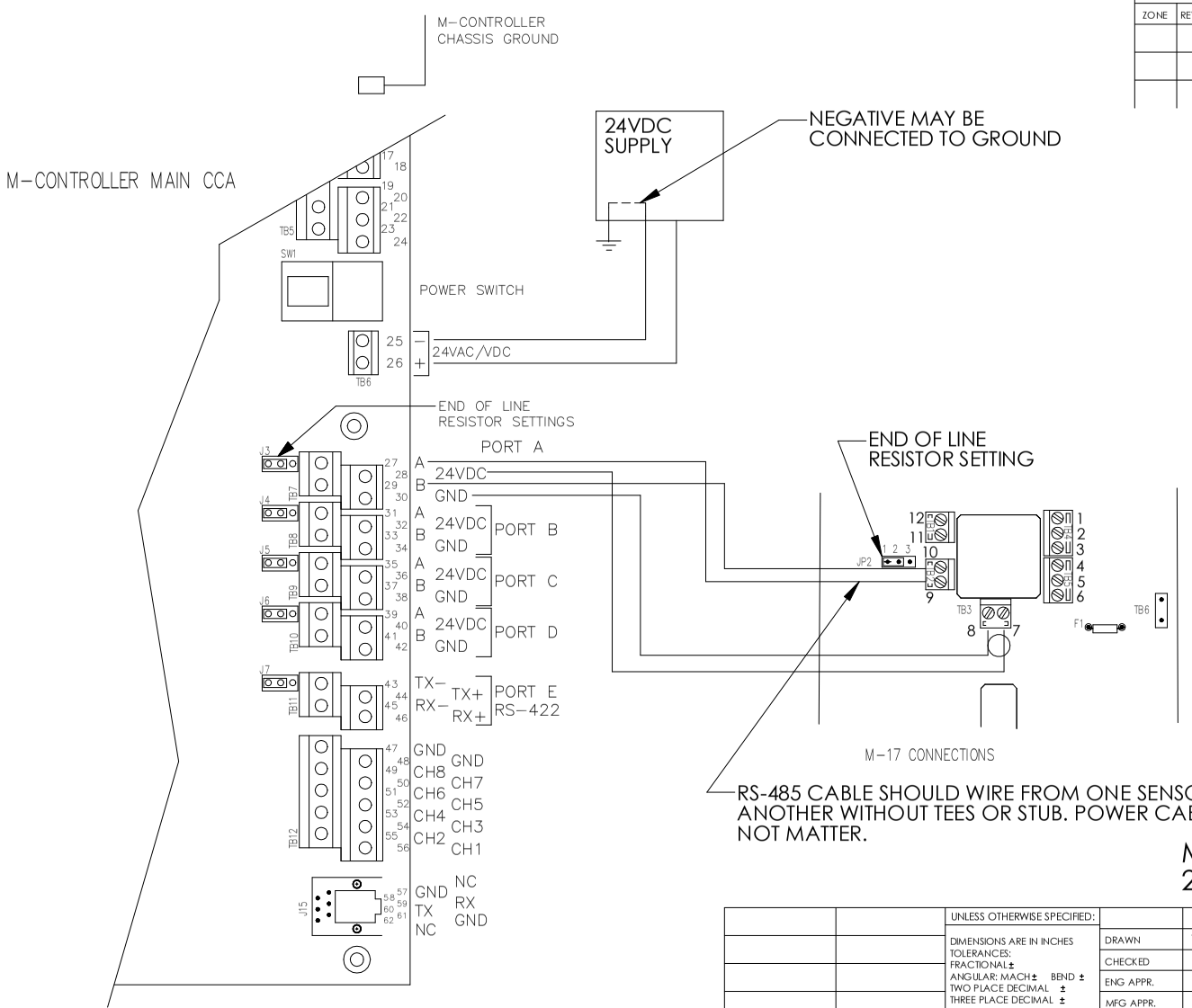

M-CONTROLLER & M-17 24VDC POWER CONNECTIONS

NEXT ASSY	USED ON	
APPLICATION	DO NOT SCALE DRAWING	

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL

FINISH

	NAME	DATE
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COMMENTS:

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TITLE: M-CONTROLLER GUIDELINES FOR SYSTEM DESIGN

SIZE	DWG. NO.	REV
B	84350-005-000	C

SCALE: 1:4 | 1 | SHEET 8 OF 13

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
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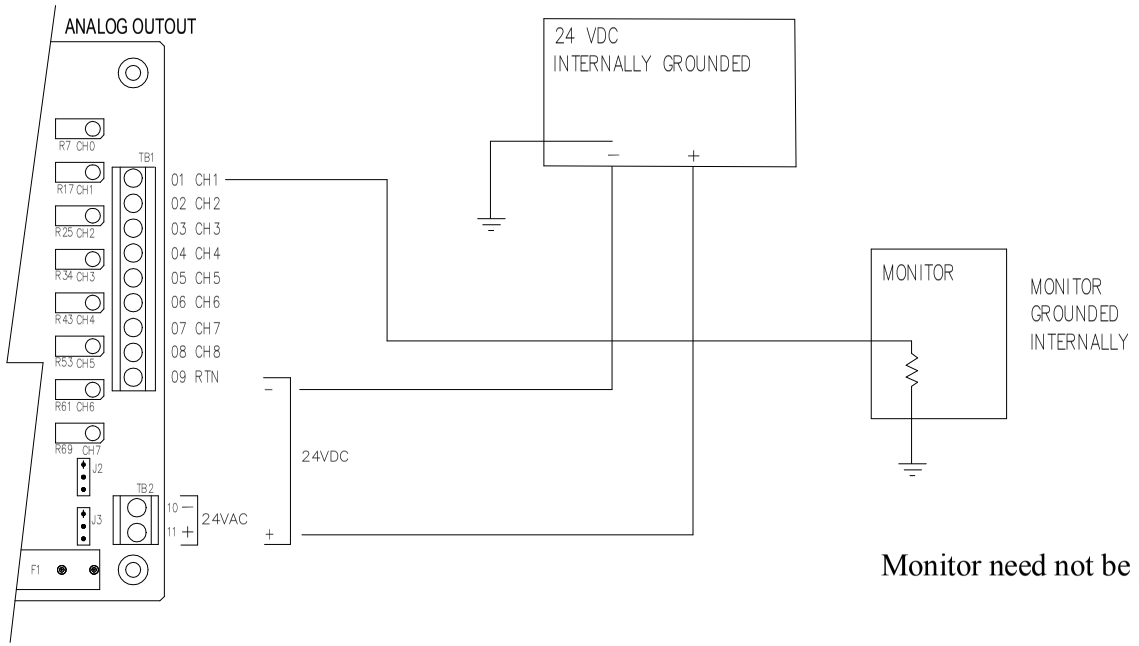

Monitor need not be grounded.

ISOLATED ANALOG OUTPUT
24VDC AND MONITOR COMMON GROUND

NEXT ASSY	USED ON	
APPLICATION	DO NOT SCALE DRAWING	

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL

FINISH

	NAME	DATE
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SIZE	DWG. NO.	REV
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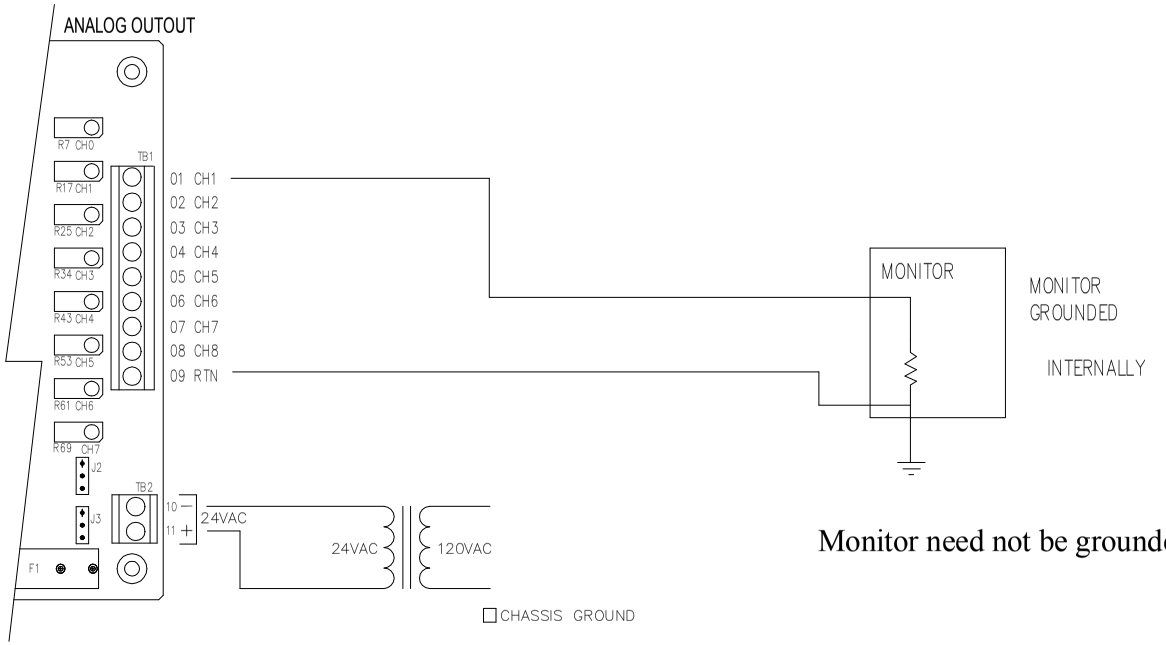
SCALE: 1:4 | 1 | SHEET 9 OF 13

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
		SEE SHEET ONE		



Monitor need not be grounded

ISOLATED ANALOG OUTPUT FLOATING 24VAC AND GROUNDED MONITOR

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL

FINISH

DO NOT SCALE DRAWING

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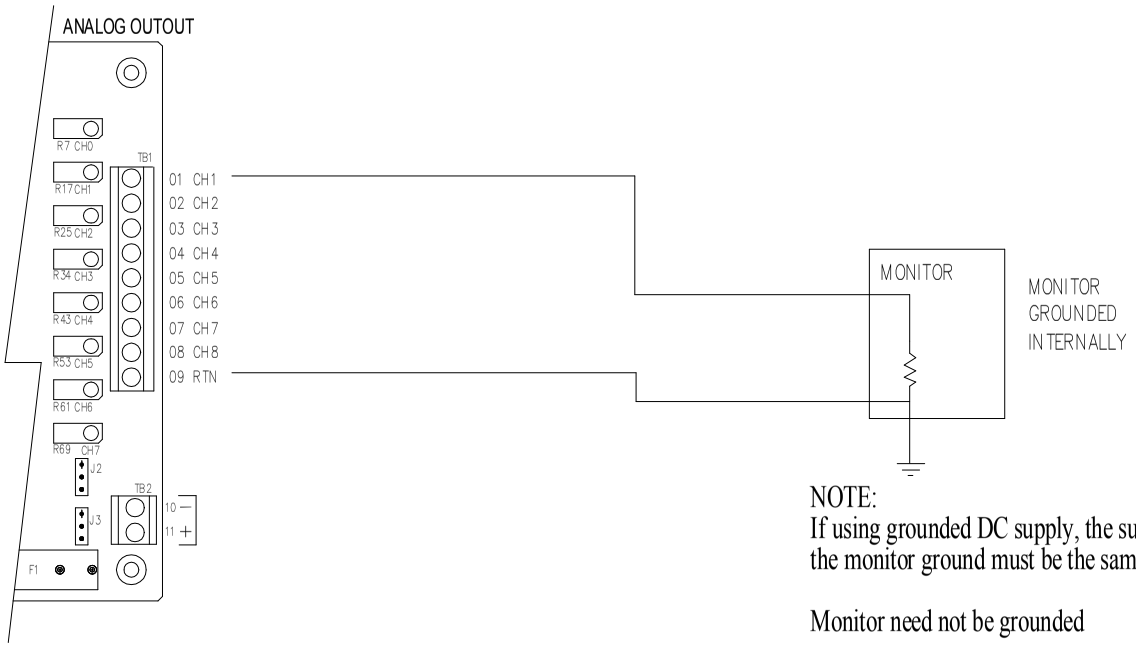
SIZE	DWG. NO.	REV
B	84350-005-000	C

SCALE: 1:4 | 1 | SHEET 10 OF 13

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
		SEE SHEET ONE		



NOTE:
If using grounded DC supply, the supply ground and the monitor ground must be the same.

Monitor need not be grounded

NON-ISOLATED ANALOG OUTPUT
INTERNALLY POWERED ANALOG OUTPUT

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH
DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	Y.DUBE	03-07-17
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ENG APPR.		
MFG APPR.		
Q.A.		

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TITLE: M-CONTROLLER GUIDELINES FOR SYSTEM DESIGN

SIZE	DWG. NO.	REV
B	84350-005-000	C

SCALE: 1:4 | SHEET 11 OF 13

M-CONTROLLER GUIDLEINES FOR SYSTEM DESIGN:

A) Power Supply and wiring Considerations

** IMPORTANT***
Mis-wiring the M-System, and/or failing to follow the instructions in the relevant Operation Manuals (supplied with your equipment) can lead to damage to the equipment. It is therefore strongly recommended that you read and understand the relevant product's Operation Manual prior to starting to work with QEL equipment. You must also study the relevant Installation Drawings.

- 24 VAC Power supplies to the M-Controller must be floating.
- **DO NOT USE GROUNDED AC on the M-CONTROLLER or the M-RELAY!**
- If in doubt, measure that there is no continuity between either side of the transformer and ground, or that there is roughly 12 VAC between either side of the transformer and ground.
- If your system design requires a grounded supply, then use an isolating transformer to isolate the M-Controller from ground, or use a DC supply. DC Power supplies to the M-Controller may have the negative terminal grounded.
- The 24 VAC transformer should be dedicated to the M-System, in order to avoid grounding issues. Make sure that a floating transformer is not being grounded out through another device, such as a contactor, damper motor, etc.
- **Use a sufficient wire gauge to supply power to a chain of transmitters.** Consider the length of the wiring runs involved, as well as the maximum current expected on a given line. Insufficient wire gauge on the 24 volt power lines results in inadequate voltage being delivered to the transmitters. The transmitters which are furthest down the line will have the biggest voltage drops. See the table on page 40 of the M-Controller's Operation Manual for details on how to calculate the total current draw down each individual wire run from the M-Controller. Compare this to a wiring table and ensure that the voltage drop is no greater than one or two volts. If in doubt, go with a heavier gauge for power.
- When wiring the system initially, start only by powering-up only the M-controller, then attach the first transmitter: if the M-Controller and the first transmitter appear to be operating properly, communicating and not drawing down the power supply with excessive current, continue wiring to the next transmitter, and so on.
- **Use the recommended wiring for the RS-485 data transmission line, Belden 9841:** It is designed specifically for RS-485 communications, in that it has the proper characteristic impedance of 120 ohms, and is twisted, shielded, and balanced.
- **Use the termination resistor to improve communications quality:** move the appropriate jumper on the last transmitter, as well as on the M-Controller's RS-485 port, on each data line to enable the 120 ohm termination resistor. Consult the relevant manual for jumper location.
- If you connect a laptop to the M-Controller via the RS-232 port, it is best to always use some form of isolated RS-232 connection. Laptops running on battery are isolated. Avoid using the laptop's power adapter when connected to the M-Controller, as these will typically have negative (on secondary side) connected to safety ground (on primary side).

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
-	-	See Sheet1	-	-

B) Overview: Programming the M-Controller and M-series transmitters

Follow the instructions in the M-Controller's Operation Manual for specific programming details. Here are some general guidelines on programming an M-Controller.

- **There are two ways to program the controller**: using the keypad and using QEL's M-view software. Both are acceptable.
- Once the M-Controller and transmitters have been wired together, powered up, the MController will be in it's default condition, reading '**No Sensor', ' No output**'.
  - '**No sensor**' indicates that the controller has not been programmed to with any digital (RS-485) or analog (4-20 mA) inputs.
  - '**No output**' means that no relays, strobe, buzzer, horn or triggers have been programmed, and are therefore not active.
- When you program the M-Controller, you will be determining:
  - how many and which transmitters (by address) are on the input ports
  - the gas type of each of the transmitters
  - which output devices (i.e. Relays, buzzers, strobes etc.) are active
  - set-points at which the various transmitters will activate specific output devices
  - in the case of an analog input, it is also necessary to program the controller with
  - the appropriate 4-20 mA span
- You also need to tell the controller what outputs (the three on-board relays are the most commonly used outputs) need to be active.
- **Make sure that each transmitter has a unique address**: The address will need to be programmed into the transmitter itself ¡V this is done via the transmitter¡ ¦s menu once the system has power.
- The default baud rate (communication speed) for the M-System is 4800 bps, which is ideal for most applications.
- Be sure to note the physical location of each address on the site plan ¡V this is critical when programming the M-Controller and assigning the outputs.

NEXT ASSY | USED ON
APPLICATION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH
DO NOT SCALE DRAWING

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DRAWN	XY	2008/12
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MFG APPR.		
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TITLE: M-CONTROLLER GUIDELINES FOR SYSTEM DESIGN

SIZE	DWG. NO.	REV
B	84350-005-000	C

SCALE: 1:4 | SHEET 12 OF 13

C) Typical Scenario – Programming a digital system in 4 steps:

1. Programming the addresses of the transmitters:

- On all M-series transmitters, there are a series of three push buttons: the top is an 'up' button, the middle is a 'down' button, and the bottom is a 'select' or 'enter' button.
- Push and hold the top push button. release at password prompt.
- Push the top (up) button, and scroll to '0017', If you go past '0017' use the middle (down) button to move down, then press the bottom button (enter).
- Use the 'up' or 'down' button to scroll through the menu, stop at 'ADDRESS.
- Push the bottom (select) button. An asterisk will appear by the displayed value. The asterisk tells you this is a variable you can change.
- Use the 'up' button to select your desired address, If you go past the number you want use the middle (down) button to move down, then press the bottom button (enter).
- Use the 'up' or 'down' button to scroll through the menu, stop at 'EXIT SAVE'. press 'enter' button twice.
- Continue until all the sensors on the network all have a unique digital address.
- Ensure that you record the location of each address.

2. Programming the transmitters into the controller:

At this stage we enter the transmitters, their addresses and their gas type at the controller.

- Press the '7' hotkey for 'sensors'. 'Sensor Database' will be displayed, press 'enter/accept'.
- You are then prompted for an 'address' number - enter your first sensor address number and press 'enter/accept'.
- 'gas type' will be displayed. Use the up 'arrow' or down 'arrow' to select your gas type and press 'enter/accept'.
- 'units' will be displayed. Use the up 'arrow' or down 'arrow' to select your unit of measure and press 'enter/accept'.
- Continue until all your sensor addresses are entered. When prompted for a 'sensor no' and you have no more sensors to enter, press 'exit/clear' once. We have now told the controller you have sensors and what they are.

3. Programming the relays into the controller:

This step determines which on-board or remote relays are active, as well as their mode of operation.

- Press the '8' hotkey for 'relay'. ' Relay Database' will be displayed, press 'enter/accept'.
- Press '8' key for 'r=style'.
- You are prompted for a 'relay' number, enter your first relay number and press 'enter/accept'.
- You are prompted for the relay to be 'not normally energized', press 'add/hold' key to accept.
- You are prompted for the relay to be 'non-latching', press 'add/hold' key to accept.
- You are prompted for the relay to be 'voting', press 'add/hold', then press '1' key then 'enter/accept' key to accept.
- You are prompted for the relay to have an 'on delay', press 'add/hold' key for a time delay, and enter your desired delay, or the 'delete' key for no delay to accept.
- You are prompted for the relay to have an 'off delay', press 'add/hold' key for a time delay, and enter your desired delay, or the 'delete' key for no delay to accept.

Continue until all the relays your using are entered. When prompted for a 'relay no' and you have no more relays to enter, press 'exit/clear' once. We have now told the controller you have relays and how they will operate. You should still be in the 'relay database'.

4. Assigning transmitters to the relays:

- Press the '7' key for 's=sensor'.
- Enter the first relay number you want to assign to one, some, or all of the sensors, press 'enter/accept'.
- Input the sensor address number for the relay selected above.
- Enter your 'alarm on' value, ie. press '2', '5' for 25ppm, press the 'enter/accept' key.
- Enter your 'alarm off' value, ie. press '5', '0' for 50ppm, press the 'enter/accept' key.
- Use the up 'arrow' or down 'arrow' if you want the relay to activate on 'fault', press 'enter/accept'.
- Enter the next sensor address associated with this relay as above.
- Once you've entered all the sensors associated with a particular relay, press, 'exit/clear' once. This allow you to enter your next relay to be assigned to sensors as programmed above. You have now told the controller how the sensors and relays will work together.
- Press the 'exit/clear' key repeatedly until 'exit <y/n>' appears on the display, press 'enter/accept'. You have now finished the programming.

The process is the same for the buzzer and strobe databases.

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
-	-	See Sheet1	-	-

NEXT ASSY	USED ON	
APPLICATION		DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH

	NAME	DATE
DRAWN	XY	2008/12
CHECKED	ROB	2008/12
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

QUATROSENSE ENVIRONMENTAL LTD

TITLE: M-CONTROLLER GUIDELINES FOR SYSTEM DESIGN

SIZE	DWG. NO.	REV
B	84350-005-000	C

SCALE: 1:4 SHEET 13 OF 13