



MastMinder[®]
Site Installation Guide
M400a Generic
(dual generator)

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Warranty

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This document should be read in conjunction with the MastMinder M400A User Guide.

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1. MastMinder Site Installation Kit – Inventory of components

The following components are provided in the MastMinder M400A Site Installation kit for dual generators.

- 1 x M400A Master Control Unit
- 1 x 300 Amp Current Sensor
- 1 x Temperature sensor
- 2 x M400A IO Unit
- 2 x Generator Alarm Status capture module
- 2 x Generator cranking – voltage stabiliser capacitor
- 1 x Fuel Level Sensor and cable
- 1 x Vented Fuel Level Sensor cable connector block
- 3 x MB-4 Surge Arrestor
- 3 x Inline Fuse Holder and Fuse
- 30 metres of Alpha 24awg 2 pair overall screened data cable
- 1 x M400A / RS232 Console cable and USB converter
- 1 x 2.5mm flat screwdriver

Note that the 30 metres of Alpha 24awg 2 pair overall screened data cable must be used on the MBUS interconnection between the M400A and the IO Units, including on both sides of the Surge Arrestors. Any remaining cable may be preferably used on extending the fuel sensor cable and any further remaining used on any of the other connections for power or current or temperature sensor extension. If any further cable is required for power connections or temperature or current sensor then ordinary 1.5 mm 2 core or 3 core local cable may be obtained.

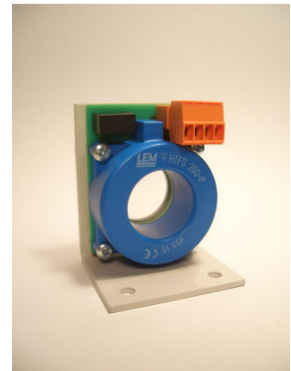
Please check all these components are supplied in the kit and familiarise with the equipment, a picture of each of the major components is provided below.



M400A Master Control Unit



M400A IO Unit



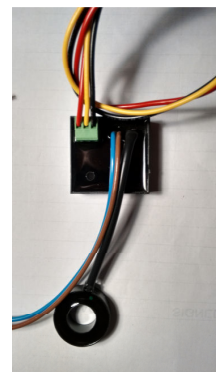
300 Amp Current Sensor



Fuel Level Sensor and cable



MB-4 Surge Arrestor



Status capture module

2. Tools required to perform the installation

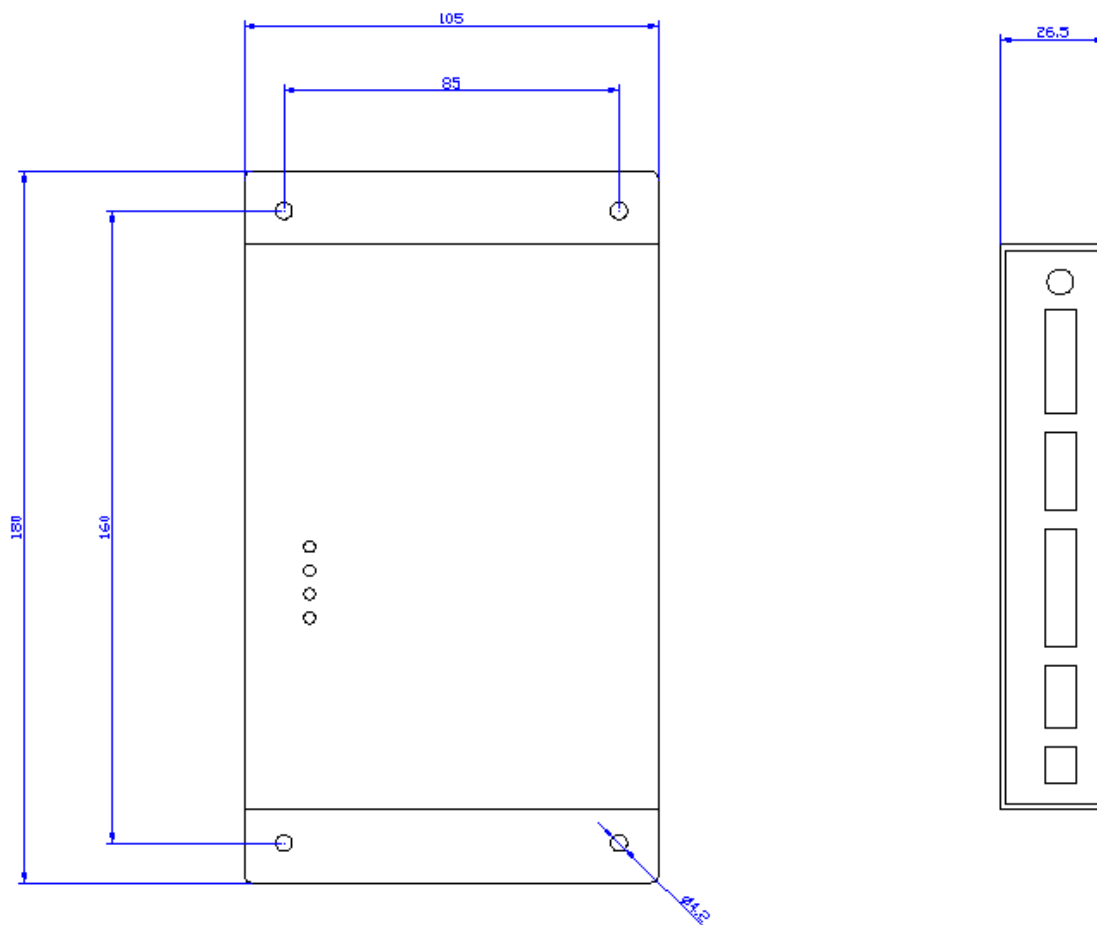
- Laptop with GPRS Web connection for Skype & TeamViewer for remote support, with good batteries and/or spares.
- MastMinder MFlash application loaded on lap-top, plus HyperTerminal or Putty for serial port access via the provided USB / RS232 converter and cable to M400A unit.
- Mobile phone with good battery
- Flashlight with good battery
- Tape measure to measure tank dimensions and depth of fuel.
- Accurate Voltmeter (preferably with DC current clamp on top)
- Basic electric installation toolkit:
 - Wire cutters
 - Screw drivers of various heads
 - Crimping tool to crimp 6mm or 10mm cable (lugs are provided in kit)
 - Etc.
- This Installation Manual
- Enough good quality 6mm copper or 10mm aluminium grounding cable to connect the 3 Surge Arrestors to local grounding points. (Note that the Surge Arrestors should be physically sited just inside the shelter to protect the M400A unit and just inside each generator to protect the IO Unit in each generator).
- Enough flexible plastic conduit pipe, if required, to protect any external cables running between the shelter and the generators and also the generator to the fuel tank.
- Selection of cable-ties.
- 4 small self-tapping screws to secure the M400A unit to internal wall of cabin.
- Small power drill and bit to make holes for self-tapping screws above.

3. M400A Master Unit Positioning

The M400A Master Unit is usually installed inside the shelter where available or inside the Power cabinet in the case of Outdoor type sites. In any case a dry area not exposed to water or weather. Typically wall mounted in the shelter with minimum cable runs to main site batteries, position of temperature sensor in shelter and cable run to generators, bearing in mind that the cable run to the generators will be via a MB-4 Surge Arrestor which must be installed near a good earth point. Also with easy access for viewing status LED's and for maintenance.

The base unit is contained in a robust aluminium enclosure provided with four mounting screw positions. The unit can be mounted in any orientation but must be installed in a dry area. *The MastMinder M400A unit is not designed to be installed in any outside location where it could be exposed to weather or water.*

An outline drawing showing the mounting details is shown below.



4. M400A Master Unit Connections - General

All power and IO signal connections to the master unit are made via 3.5mm plug-in terminal blocks positioned on the right hand side of the unit.

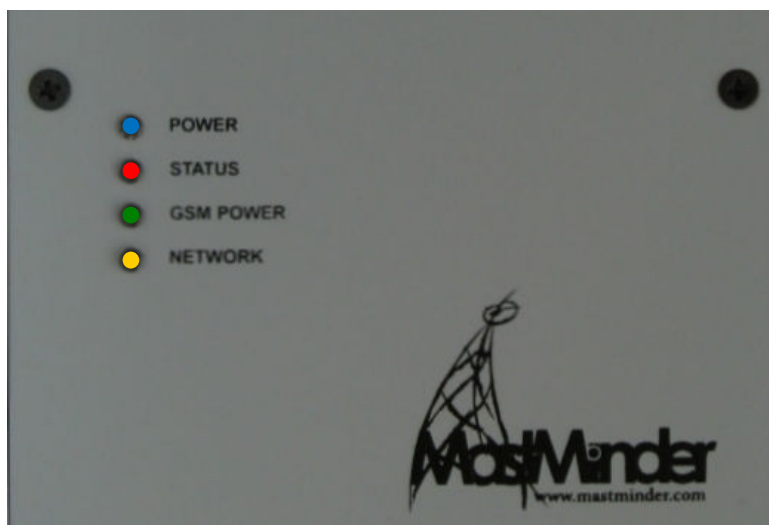


The table below shows all the IO connection allocations.

M400A Term.	Dir.	Description	Dest.	Wire Col.	Destination Signal
1	In	10-60VDC Power, Positive	BTS1		24/48 BTS1 Batt+
2	In	10-60VDC Power, Neg.	BTS1		24/48 BTS1 Batt-
3	Out	M400A Mbus, CLKb	IO Mod		Mbus CLKb
4	Out	M400A Mbus, CLKa	IO Mod		Mbus CLKa
5	In/Out	M400A Mbus, DATAb	IO Mod		Mbus DATAb
6	In/Out	M400A Mbus, DATAa	IO Mod		Mbus DATAa
7	In	Digital Input 1			Optional digital sensor
8	In	Digital Input 2			Optional digital sensor
9	In	Digital Input 3			Optional digital sensor
10	In	Digital Input 4			Optional digital sensor
11	-	Ground	GND		GND
12	-	Output 0, NC Relay Contact			Free Cooling Fan control
13	-	Output 0, COMMON			Free Cooling Fan control
14	-	Output 0, NO Relay Contact			Free Cooling Fan control
15	Out	PT1000 Temp probe 1	BTS1		PT1000 Temp probe 1
16	In	PT1000 Temp probe 1	BTS1		PT1000 Temp probe 1
17	Out	Current Sensor 1 Supply	BTS1	Term 1	Current Sensor 1 Supply
18	In	Current Sensor 1 Input	BTS1	Term 3	Current Sensor 1 Input
19	-	Current Sensor 1 GND	BTS1	Term 2&4	Current Sensor 1 GND
20	Out	PT1000 Temp probe 2	BTS2		PT1000 Temp probe 2
21	In	PT1000 Temp probe 2	BTS2		PT1000 Temp probe 2
22	Out	Current Sensor 2 Supply	BTS2	Term 1	Current Sensor 2 Supply
23	In	Current Sensor 2 Input	BTS2	Term 3	Current Sensor 2 Input
24	-	Current Sensor 2 GND	BTS2	Term 2&4	Current Sensor 2 GND
25	In	10-60V BST 2 Batt, Positive	BTS2		24/48 BTS2 Batt+
26	In	10-60V BST 2 Batt, Neg.	BTS2		24/48 BTS2 Batt-

5. M400A Master Unit LED Indicators

The Unit has four LED indicators; blue, red, green and yellow located on the front of the unit.



The LED indications have multiple meanings as shown in the table below.

BLUE (Power)	RED (Status)	GREEN (GSM Power)	YELLOW (Network)	Meaning
○	○	○	○	Unit not powered up
●	*	○	○	Normal Start up
●	*○*○...	○	○	Self test fail
●	** (10 sec)	⊗	⊗	System active
●	⊗	●	*○*○...	GSM modem on, searching for network or no SIM
●	⊗	●	* (3 sec)	Registered to GSM network (Normal operation)
●	*	●	* (3 sec)	SMS Received
●	*****	●	* (3 sec)	SMS Sent
●	*****	⊗	⊗	Rule Syntax Error
●	*****	⊗	⊗	SMS Sending Failed
●	* (10 sec)	⊗	⊗	Low supply
●	* (1 sec)	○	○	Low Backup battery (GSM modem shut down)

LED symbol key

- - LED On
- - LED Off
- * - LED Flash
- * (1 sec) - LED repeating flash (repetition rate)
- ⊗ - Don't care

6. Fitting the SIM Card

Before the MastMinder M400A unit can be used it must be fitted with a SIM card.

Insert the SIM into the SIM slot on the front of the unit. Use a small flat screwdriver or another SIM to fully insert the card until it “clicks” into place.

To remove the SIM use a small flat screwdriver or another SIM and gently push the SIM until it “clicks”. The SIM will then protrude from the front panel and can be removed.



Note that to the right of the SIM Slot is a small hole, this may be accessed with a paper clip to turn off the unit. The unit contains a small back-up battery so that even with all its external cables disconnected it will still send one last message to the server to say it has had its power supply disconnected. In the event of removing the power, to save the back-up battery insert a paper clip gently and straight into the hole to press a small switch to turn off the device.

7. System Console Port

A system console is provided to allow management of the remote site unit via a locally connected RS232 serial terminal (e.g. PC running HyperTerminal) or via a GSM CSD or GPRS dial-in connection.

8. Local terminal connection

A local serial terminal may be connected to the RS232 port 1. The communications format is fixed to 9600bps, no parity and 1 stop bit.



9. Remote connection

The console port can be accessed remotely via a “dial-in” GSM or GPRS connection. The remote dial-in connection is functionally the same as the local console connection with the exception of the “sms” command.

10. Console Port Commands

Once connected, the system console will respond with the prompt:

Enter Password:

(if an admin password has been set)

<Site ID> <Version> :

(if no password has been set, or when the correct password has been entered)

e.g.

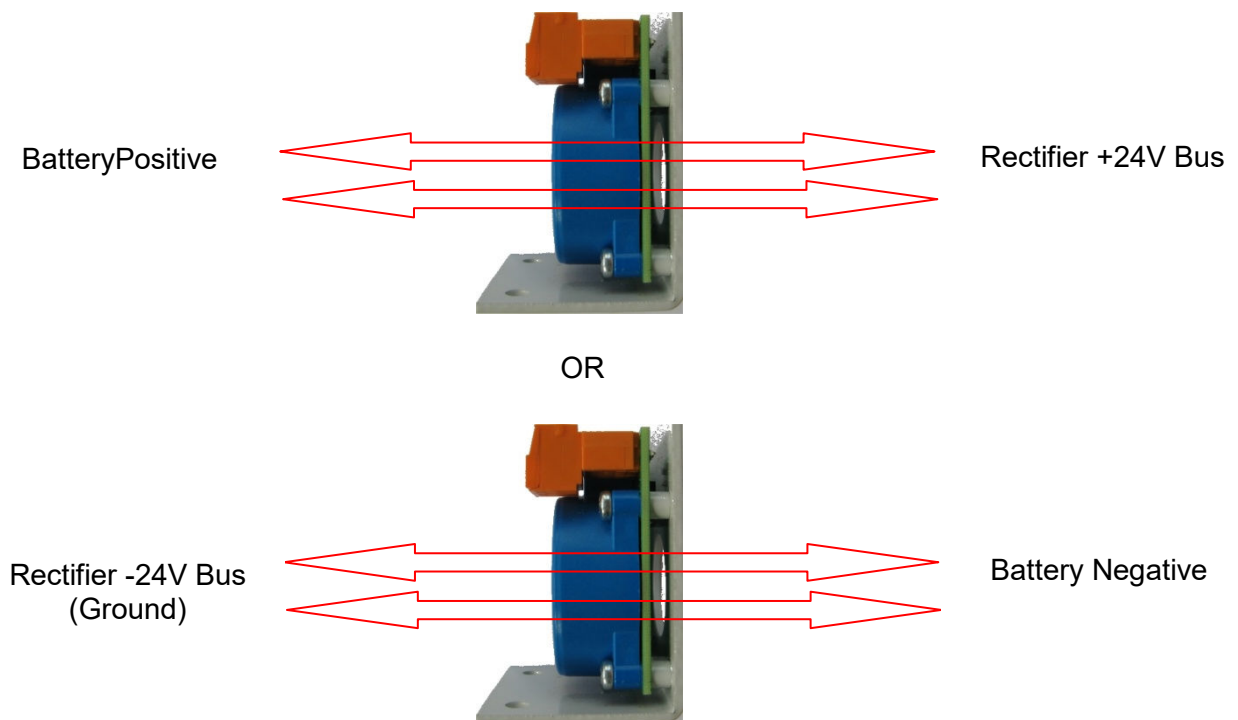
sitename 2.14 :

Note: See Console Command Reference in User Manual for more detailed information on specific commands.

11. Current Sensor Connections - General

The current sensor may be installed on either side of the main battery bank but must be in a way to capture the total current both into and out of the entire battery bank.

It is preferred that the current sensor is installed in the correct orientation as shown below, however if it is discovered later that it is the wrong way around then rather than performing the procedure again it is possible to reverse the polarity in the software configuration.



Note that the current sensor is now supplied without the grey metal bracket and must be secured to the cable with a convenient sized cable-tie.

In order not to bring the site down, it is suggested that this procedure is made with the generator running so the generator is meeting the entire site load and one side of the batteries may be disconnected from the rectifier system to allow the cable to be passed through the Current Sensor and then re-connected.

Note: Only attempt this if the generator is running in a stable condition and not low on fuel.

Connections to the current sensor are via a 4 way plug-in terminal block.

The signal allocations are as shown:



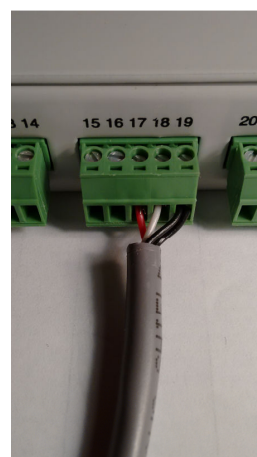
Note that the connection numbers run right to left as you face the plug as above.
Note also that there are 4 connections on the current sensor and 3 on the M400A, the Ground connections 2 & 4 on the current sensor are common on the M400A.

Terminal	Signal	Description	M400A terminal
1	POWER	+5V Power supply Connection	17
2	GND	GND Connection	19
3	OUTPUT	Measurement signal output	18
4	GND	GND Connection	19

For example below –



Sensor connections



M400A connections

12. M400A IO Unit Connections – General

The M400A IO module is a DIN rail mounting unit which is usually housed within the generator enclosure.

The purpose of the IO module is to manage the various electrical interfaces within the generator enclosure and thereby eliminating the need to separately wire generator monitor and control interfaces back to the master M400A unit.

The IO module communicates with the M400A master unit via a simple 4 wire twisted pair interface cable.

Up to four IO modules can be connected to each master unit giving the capability to monitor and control up to two generating sets and additional I/O such as Power monitoring either AC or additional DC such as solar or wind or other hybrid solutions.

The MastMinder IO module is not designed to be installed in any outside location where it could be exposed to weather or water.



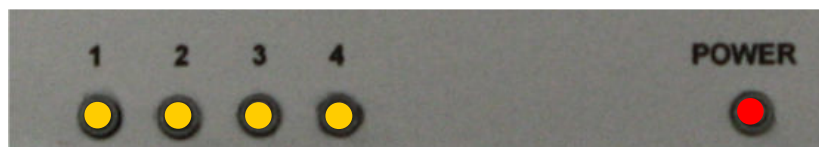
The M400A IO Module

The table below shows the IO connection allocations.

IO Module Term.	Dir.	Description	Dest.	Wire Col.	Destination Signal
1	In	Digital Input 1	AMF		Generator running signal
2	In	Digital Input 2	AMF		Gen On-Load signal
3	In	Digital Input 3	AMF		Mains On-Load signal
4	In	Digital Input 4	AMF		Gen Common Alarm signal
5	In	Digital Input 5	AMF		Configurable
6	In	Digital Input 6	AMF		Configurable
7	In	Digital Input 7	AMF		Configurable
8	In	Digital Input 8	AMF		Configurable
9	Out	RS232 Serial Port TX	AMF		AMF Panel Serial Port
10	In	RS232 Serial Port RX	AMF		AMF Panel Serial Port
11	-	Ground			AMF Panel Serial Port
12	In/Out	RS485 Serial Port TX/RXb	LEVEL		Optional RS485 Comms
13	In/Out	RS485 Serial Port TX/RXa	LEVEL		Optional RS485 Comms
14	In	4-20mA Current Loop Analogue Input	LEVEL	White	Level Sensor 4-20mA O/P
15	In/Out	Mbus, DATAb			Mbus, DATAb
16	In/Out	Mbus, DATAa			Mbus, DATAa
17	In	Mbus, CLKb			Mbus, CLKb
18	In	Mbus, CLKa			Mbus, CLKa
19	-	Output 1, NC Relay Contact			Gen Stop when open
20	-	Output 1, COMMON			GND
21	-	Output 1, NO Relay Contact	AMF		Gen Stop when closed
22	-	Output 2, NC Relay Contact			Reset AMF when open
23	-	Output 2, COMMON			GND
24	-	Output 2, NO Relay Contact	AMF		Reset AMF when closed
25	-	Output 3, NC Relay Contact			Gen Test when open
26	-	Output 3, COMMON			GND
27	-	Output 3, NO Relay Contact			Gen Test when closed
28	-	Output 4, COMMON			Spare control
29	-	Output 4, NO Relay Contact			Spare control
30	-				
31	Out	PT1000 Temperature Probe			Optional temperature
32	In	PT1000 Temperature Probe			Optional temperature
33	Out	8-16VDC Filtered Output	LEVEL	Brown	Level Sensor Power +12V
34	-	Power Ground	LEVEL	Green	Level Sensor GND
35	-	Power Ground	GND		Power Ground
36	In	8-16VDC Power, Positive	+12V		Generator Battery +

13. M400A IO Unit LED Indicators

The Unit has four Amber LEDs to indicate the state of the four outputs and one RED status LED labelled POWER as shown.



The LED indications have multiple meanings as shown in the table below.

RED LED (POWER)	Meaning
○	Unit not powered up
● (3 sec)	Normal Start up
●○●○... (slow)	Self test fail
** (every 10 sec)	System active (Normal operation)
●○●○... (fast)	No Communications with master unit
*	Packet received from master unit
●○●○... (1 Hz)	Inhibit Mode
* (every 4 sec)	Address set mode – address 1
** (every 4 sec)	Address set mode – address 2
*** (every 4 sec)	Address set mode – address 3
**** (every 4 sec)	Address set mode – address 4

LED symbol key

- - On
- - Off
- * - Short Single Flash

14. Setting the IO module address

Up to four IO modules can be connected to a master unit. If more than one IO module is in use each module *must* be set to a unique address. IO modules are factory set for address 1 unless marked on the packaging as pre-configured to Gen 1 or Gen 2.

To set the address press the inhibit button and hold for a least 15 seconds.

The unit will then enter address set mode and the red LED will flash the current address every 4 seconds, 1 flash for address 1, 2 flashes for address 2 etc.

To change the address briefly press the inhibit button. Each time the inhibit button is pressed the address will change in the sequence 1-2-3-4-1-2-3 etc.

When the LED is indicating the required address do not press the inhibit button again. After 20 seconds with no button pushes the unit will return to operational mode with the new address programmed.

15. Setting the IO module Inhibit Mode

A single quick press of the inhibit button will temporarily inhibit any outputs currently on. A second press on the inhibit button will re enable any outputs programmed to be on.

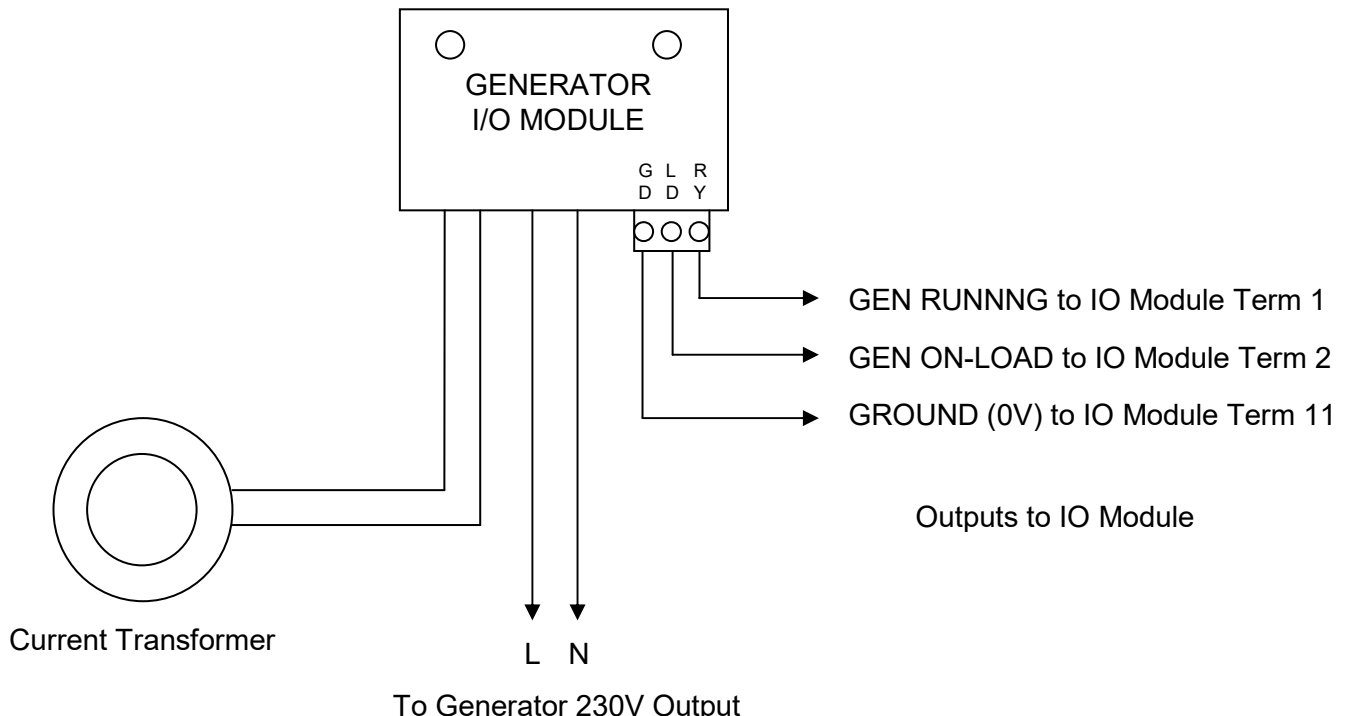
The Inhibit button is usually configured to be automatically reset immediately by the internal software therefore resulting in only a momentary dropping and then resetting of any set output relays.

This feature is customer specific and rarely used.

16. Generator Interface Module (Alarm status capture module) - General

In order to provide compatibility to many different generator and AMF Panel equipment types the MastMinder Generator Interface Module can be used.

The generator interface module senses the generator mains and load current and provides the “Generator Running” and “Generator On-Load” signals to the M400A IO module.



17. Generator Interface Module (Alarm status capture module) - Installation

First ensure generator is stopped, turned off and Emergency Stop is activated.

If there is no other generator running then ensure there is adequate reserve in the site main batteries whilst performing this task.

Locate main generator output circuit breaker.

Disconnect the neutral cable from the load side or supply side of the circuit breaker and pass through the current transformer and re-connect. (to detect current - generator on load).

Connect the interface module L and N connections to the phase 1 output and neutral connections respectively on the supply side of the circuit breaker, so the voltage is detected even if the circuit breaker trips. (to detect voltage - generator running).

Connect the three output signals from the plug-in connector to the IO module as shown above.

Secure the interface module in a convenient location using self tapping screws, 4mm bolts or cable ties.

Restart the generator if required.

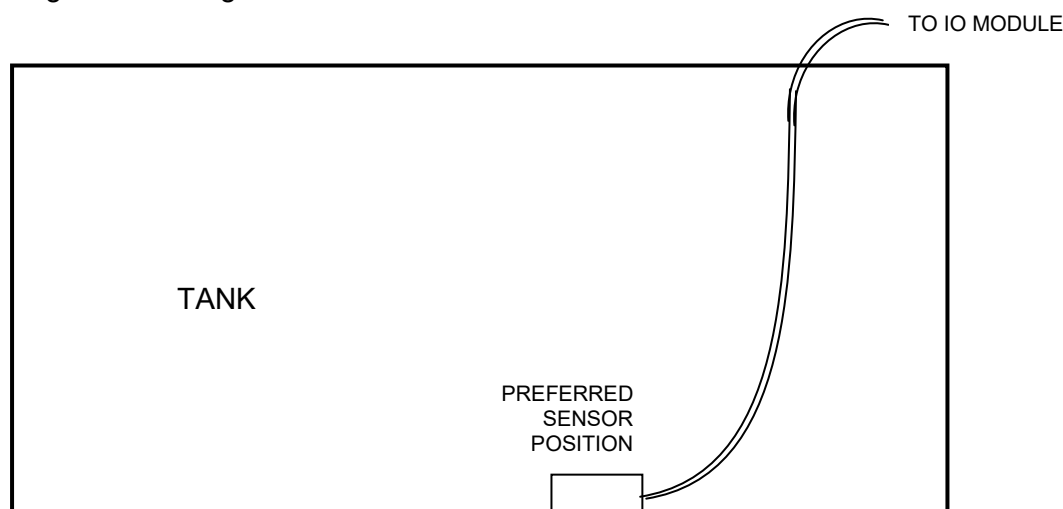
18. Fuel Level Sensor Installation

The level sensor is designed to be situated on the bottom of the inside of the fuel tank. As standard the level sensor is supplied with 3 or 6 Metres of special vented cable.

The fuel tank must be examined to find a suitable way of inserting the sensor so it lies flat on the bottom of the tank and the cable is fed back out of a suitable hole or breather pipe. Sometimes this may involve removing an inspection plate or feeding the sensor in through the main filler hole and then feeding the cable back out through a suitable breather pipe.

There is no general rule here as all fuel tanks come in different shapes and sizes and sometimes a little ingenuity is required in order to install the sensor.

The general arrangement is shown below:



Typical installation:

Terminate the level sensor cable in the IO module according to the connection table below:

IO Module Term.	Dir.	Description	Dest.	Wire Col.	Destination Signal
14	In	4-20mA Current Loop Analogue Input	LEVEL	White	Level Sensor 4-20mA O/P
33	Out	8-16VDC Filtered Output	LEVEL	Brown	Level Sensor Power +12V
34	-	Power Ground	LEVEL	Green	Level Sensor GND

Important Note:

There is a black protective plug on the connector end of the vent tube to stop debris from entering during transport and storage, remove the black cap during installation for proper functioning.

The level sensor cable contains a vent tube. To ensure proper operation of the vent tube there must be no “kinks” or sharp bends in the cable run. **The minimum bend radius is 60mm.**

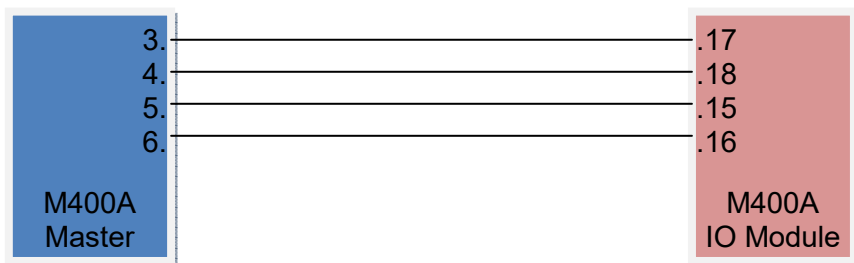


19. M400A and IO Unit Module interconnection

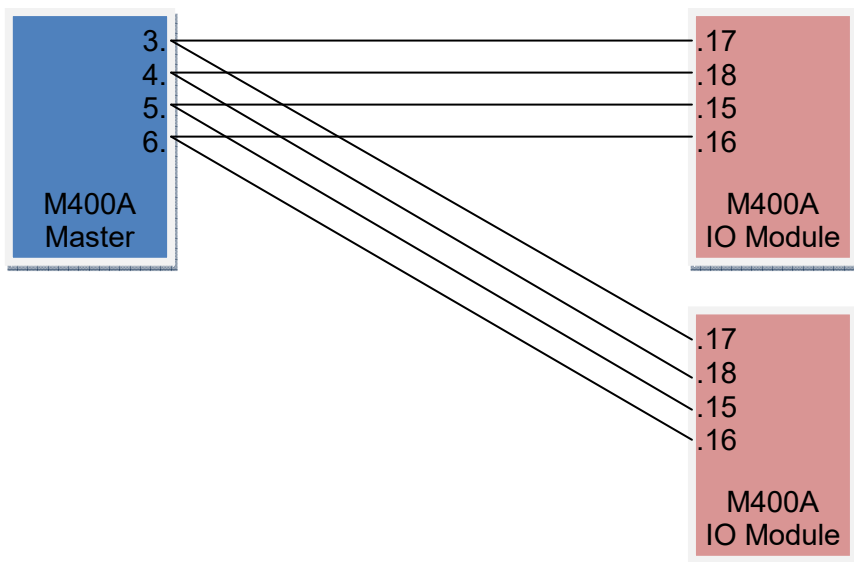
The M400A master unit and IO modules are interconnected using a 4 wire, 2 twisted pair interconnection cable.

The cable interconnection of a master unit and IO module is shown below:

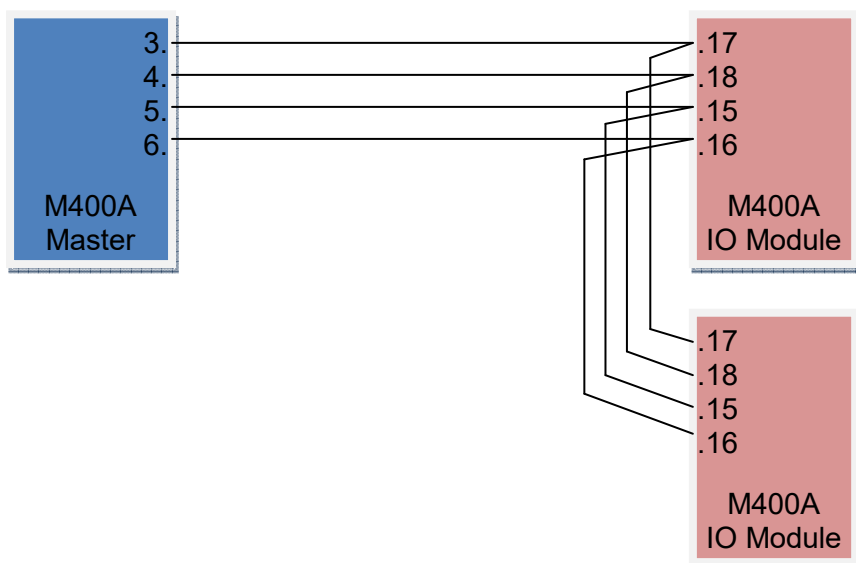
Note that the connections on the IO Unit crossover and run as 17, 18, then 15, 16.



The Interconnection of two IO modules and one master unit is show below:



Option 1 (Star Connected)



Option 2 (Daisy Chain)

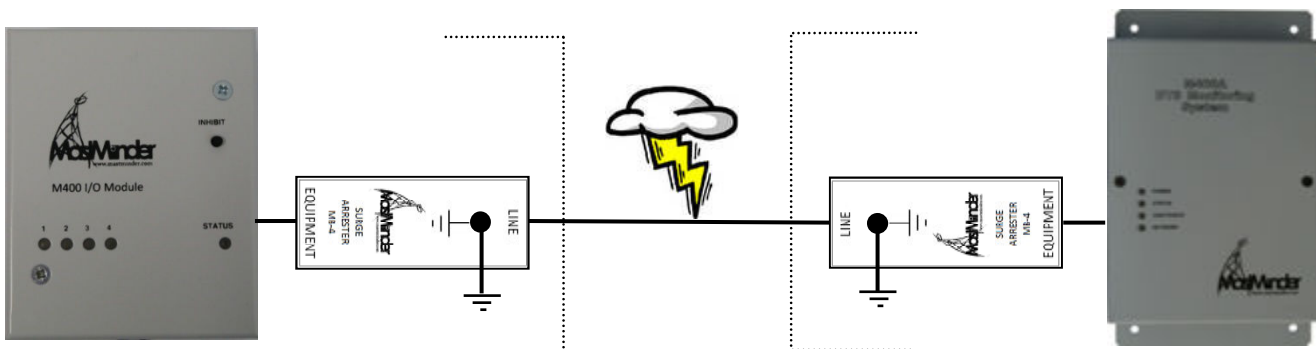
20. MB-4 Surge Arrestor installations in the interconnection

The **MastMinder® MB-4** lightning surge arrester is designed to protect MastMinder equipment installed in locations where there is a high risk of equipment damage due to lightning induced surges.



The **MastMinder® MB-4** is typically installed in series with the 4-wire Mbus connection at a point close to where the external Mbus cable enters the building or enclosure. Combining both ultra-fast transient suppression semiconductors and ultra high current gas discharge technology the unit offers a high degree of protection from high voltage and high current surges induced into the external cables by nearby lightning strikes.

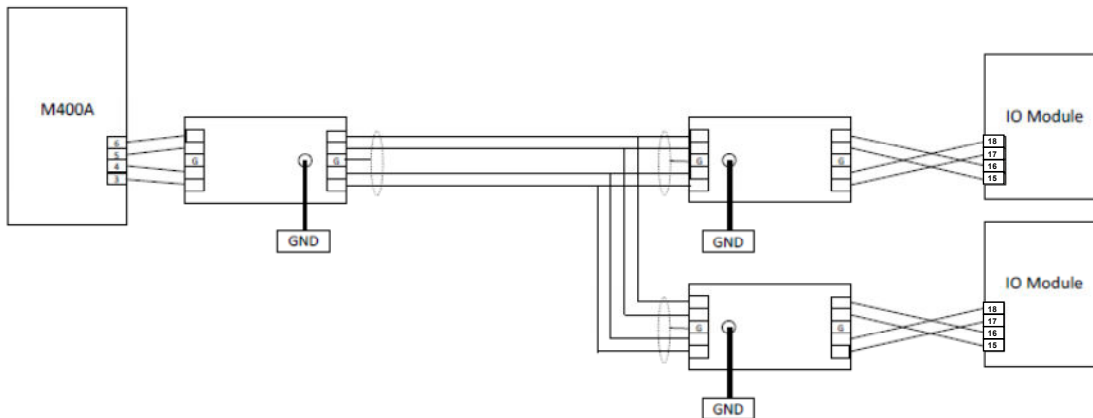
- Provides repeated protection in lightning intense environments
- Self resetting design
- Low let-through voltage between all lines
- Low in-line resistance
- 35mm DIN rail or bulkhead mounting
- 4 signal wires protected (2 x twisted pair)
- Screen terminal
- Substantial earth stud enables effective earthing



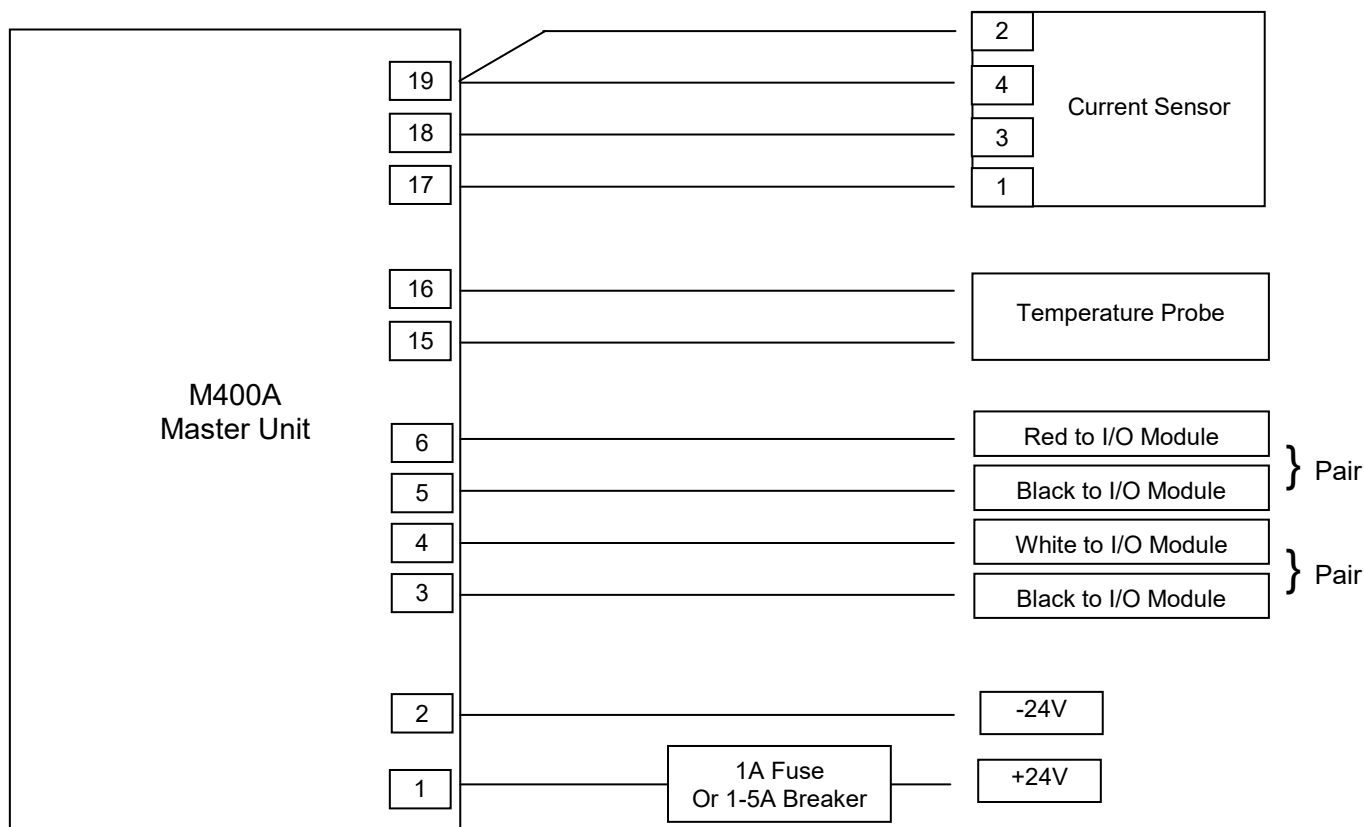
Typical Installation

21. MB-4 Surge Arrestor – Install instructions

- Install the Surge Arrestors as shown below.
- Note that the screen (earth) in the cable is not used at each equipment end and is to be disconnected from Ground on the M400.
- The screen (earth) in the cable is connected into the centre terminal at each end of the line.
- Please look carefully at the diagram below.
- Ensure Earth cable is very good ground using minimum of 6mm Copper cable or 10mm Aluminium if copper not available.



22. M400A Master Unit Connections – Generic

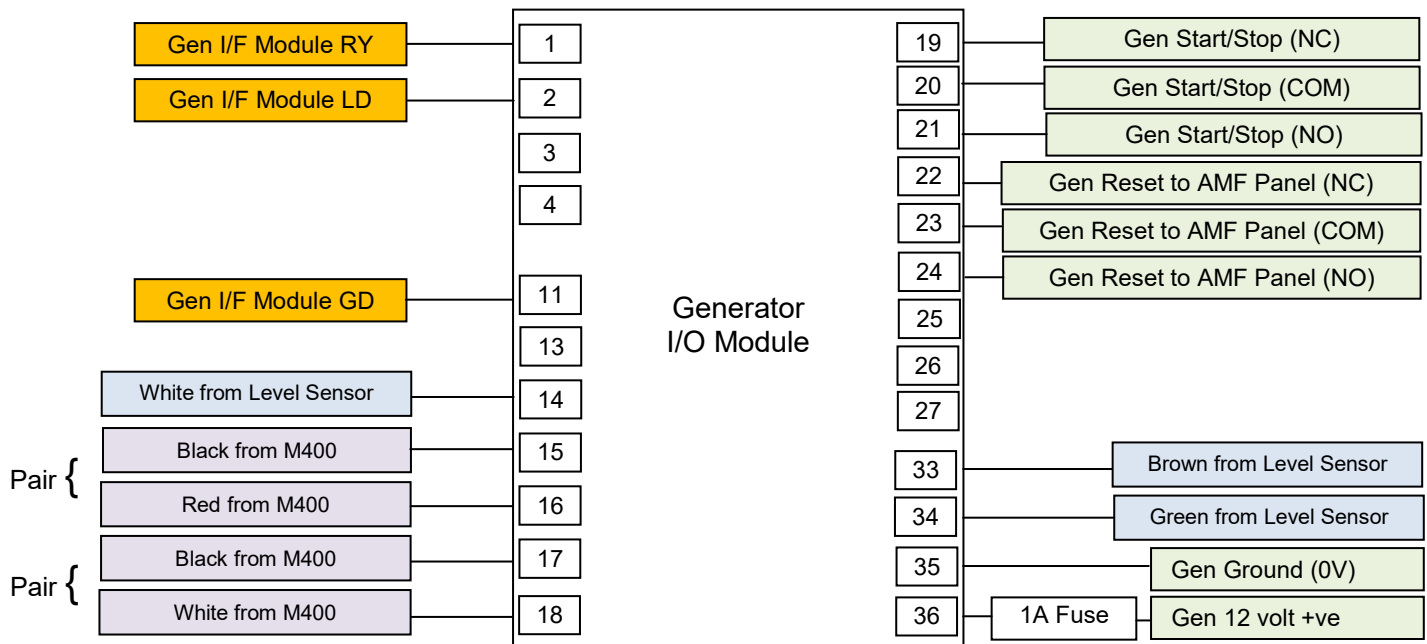


23. M400A Master Unit Connection Schedule – Generic

M400A Terminal	Description	Destination	Destination Terminal	Wire Colour
1	+24V Power	+24V Bus		Red/Black pair
2	0V	-24V Bus		White/Black pair
3	Mbus Clkb	I/O Module 1&2	17	Black } Pair
4	Mbus Clka	I/O Module 1&2	18	White
5	Mbus Datab	I/O Module 1&2	15	Black } Pair
6	Mbus Dataa	I/O Module 1&2	16	Red
15	Temperature probe	Temp. probe		White
16	Temperature probe	Temp. probe		Black
17	Current Sensor Supply	Current Sensor	1	Red
18	Current Sensor Input	Current Sensor	3	White
19	Current Sensor 0V	Current Sensor	2 & 4	Black & Black

24. M400A IO Unit Connections – Generic

The diagram below shows the connections to the I/O Module installed in the Generator.



Note that in order to eliminate the temporary effects on battery voltage of the generator cranking a capacitor supplied in the kit is to be applied across terminals 33 & 34.

The capacitor is polarity sensitive and should be connected –ve to term 34 and +ve to term 33.

Note also that the Output generator controlling terminals 19 to 29 are generic and depend on the type of generator AMF panel or ATS panel installed and the interconnecting wiring and Contactor control.

25. M400A IO Unit Connection Schedule – Generic

I/O Module	Description	Destination	Destination Terminal	Wire
1	Generator Running Signal	Gen I/F Module	RY	
2	Generator On Load Signal	Gen I/F Module	LD	
4				
11	Generator Interface Module Ground	Gen I/F Module	GD	
13				
14	Level Sensor 4-20mA Input	Level Sensor		White
15	Mbus Clkb	M400A Master	5	Black
16	Mbus Clka	M400A Master	6	Red
17	Mbus Datab	M400A Master	3	Black
18	Mbus Dataa	M400A Master	4	White
19	Generator Control	Gen	Gen Start/Stop (NC)	
20	Generator Control	Gen	Gen Start/Stop (COM)	
21	Generator Control	Gen	Gen Start/Stop (NO)	
22	Generator Fault Reset	Gen	Gen Reset to AMF Panel (NC)	
23	Generator Fault Reset	Gen	Gen Reset to AMF Panel (COM)	
26	Generator Fault Reset	Gen	Gen Reset to AMF Panel (NO)	
27				
33	Level Sensor +12V Supply	Level Sensor		Brown
34	Level Sensor 0V	Level Sensor		Green
35	I/O Module 0V	Gen1	Ground	
36	I/O Module +12V Supply	Gen1	Fuse	

Note that in order to eliminate the temporary effects on battery voltage of the generator cranking a capacitor supplied in the kit is to be applied across terminals 33 & 34.
The capacitor is polarity sensitive and should be connected –ve to term 34 and +ve to term 33.

Note also that the Output generator controlling terminals 19 to 29 are generic and depend on the type of generator AMF panel or ATS panel installed and the interconnecting wiring and Contactor control.

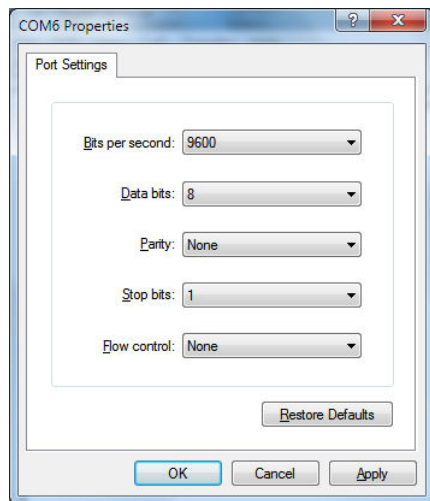
26. M400A Complete System Installation Procedure – Generic

1. Please note that for the first few installations it is a good idea to have the MastMinder remote consultant constantly online, preferably via TeamViewer and Skype or at least by mobile phone, to assist in progress.
2. Position and fix the M400A Unit using self-tapping screws into the wall of the cabin near to the rectifier & batteries and in a position which gives good access to the terminals on both sides of the unit. Ensure that the LEDs are clearly visible and there is adequate room to insert the SIM card on the left hand side of the unit. (consult page 6 above).
3. Attach antenna and insert SIM card. (consult page 9 above).
4. As a general rule always unplug the relevant connector from the M400A or IO Unit whilst making connections, in case of accidental damage caused by wrong connections. Only insert the plug after double-checking all connections are correct.
5. Make the connections to the fuse and +/- 24V (or 48V) supply [Do not plug into M400 at this stage].

Note that the inline fuse should be as close as possible to the power source to protect the cable from short circuit in addition to protecting the equipment.

The inline fuse or circuit breaker must be used, this will blow in the case of reverse polarity connected to the unit, with no fuse then reverse polarity will damage the unit and the warranty will be void (if no fuse used). (consult page 21 above).

6. Plug in the + and - 24V (or 48V) connector and power up M400A, check LEDs are OK. (Blue light on permanently, Green light on permanently after a few seconds, Yellow light flashing every one second while it searches for network and then changes to flashing every 3 seconds after it successfully logs onto the network, Red light flashing every 10 seconds although maybe more due to other activity). (consult page 8 above).
7. Connect laptop to M400A local console connection using the M400A / RS232 Console cable and USB converter provided. (consult page 9 above).
8. On the laptop Start HyperTerminal or Putty using the Com Port for the RS232 serial port configured to the USB. The serial port settings should be set to –



If you are not sure what the Com Port is then go to Control Panel / System and Security / System / Device Manager and expand Ports. Unplugging and re-plugging the USB converter will automatically remove or add the Com Port number to the displayed list.

9. When connected to the M400A then simply tap enter and it will either bring up a command prompt or ask for a password if password is already set. Enter password and press enter if password requested.
10. The voltage of the connected power supply may be checked by entering -
11. **get 9V3** [press enter]
12. It should show about 24.0 volts, probably nearer 27.2 if on charge or 48.0 (54.4) if a 48 volt system.
13. From a mobile phone, preferably on the same network, not necessarily but only for speed and reliability, send the following message to the SMS number of the SIM in the M400A, **#ADMIN,?9V3**
After a minute or two then the mobile phone should receive a reply saying **9V3=27.2** or a similar voltage to that shown on the laptop query.
14. On successful operation of the above then this has proved that the M400A is functioning correctly and is communicating with the network correctly.
15. Determine the position to install the Temperature Sensor in the shelter, typically about 1 or 2 feet down from the roof and out of direct draft of air-conditioners or fan units to determine a good average room temperature.
16. Install the Temperature sensor (consult page 21 above).and connect to the M400A unit and test for correct operation using the lap-top connected to the M400A by entering –
17. **get 9V7** [press enter]
18. It should show the shelter temperature in degrees centigrade
19. If it shows “---“ (dashes) then the temperature sensor is not correctly connected.
20. Install and make the connections to the current sensor (consult page 10 above), take care to observe correct polarity.

21. Connect the current sensor to the M400A unit and test for correct operation using the laptop connected to the M400A by entering –
22. **get 9V9** [press enter]
23. It should show the charge or discharge current in Amps.
24. If the polarity of the charge / discharge is the incorrect way around because the sensor was installed the wrong way around then to reverse the charge (+) / discharge (-) showing in 9V9 enter –
25. **set 9A9=1** to reverse the charge / discharge setting
26. If it shows “----“ (dashes) then the current sensor is not correctly connected.
27. The M400A Unit is now installed and we move to Generator 1.
28. Before commencing any work on the generator ensure the generator is stopped and turned off and the Emergency Stop button is engaged. It may be necessary to run the other generator if the site main batteries are not good enough to keep the site functioning with both generators stopped.
29. Position and fix the M400A IO Unit in the generator, this would usually be in the electronics compartment housing the AMF (ATS) panel or thereabouts.
30. Make the connections to the fuse and +/- 12V supply [Do not plug into IO Unit at this stage]. Note that the inline fuse should be as close as possible to the power source to protect the cable from short circuit in addition to protecting the equipment. The power supply should also be connected as close as possible to the generator battery to minimise voltage reduction when cranking, also direct and not via any other switches.
The inline fuse or circuit breaker must be used, this will blow in the case of reverse polarity connected to the unit, with no fuse then reverse polarity will damage the unit and the warranty will be void (if no fuse used). (consult page 22 above).
31. Install and connect the Generator Interface Module to the IO Unit. (consult page 16 above).
32. Install and connect the Fuel Sensor to the IO Unit. (consult page 17 above).
33. Use the vented connector block supplied to extend the fuel sensor cable from the tank to the IO Unit.
34. Whilst connecting the Brown & Green wires from the fuel sensor to terminals 33 & 34 note that the “Generator cranking – voltage stabiliser capacitor” is to be connected across the same two terminals in parallel with the fuel sensor wires. Note also that the polarity must be observed on the capacitor with +ve to 33 & -ve to 34.
35. The fuel sensor will be tested and calibrated later.
36. Connect all the plugs into the IO Unit including the power supply, the Status LED should flash and after a few seconds will flash rapidly signifying it cannot find the network cable to the M400A Unit.

37. Disconnect the power supply from the IO Unit and proceed to generator 2 and perform exactly the same tasks for generator 2 as we have just done for generator 1, except there will be no fuel sensor on generator 2. However, it is still necessary to install the “Generator cranking – voltage stabiliser capacitor” across terminals 33 & 34.
38. After completing both generators then let the generators run as required.
39. Physically install the MB-4 Surge Arrestor unit in the cabin, including connecting the 6mm or 10mm Ground Cable to the site Ground. (consult page 17 above).
40. Connect the Surge Arrestor to the M400A. (consult page 17 & 21 above).
41. Physically install the MB-4 Surge Arrestor unit in each of the 2 generators, including connecting the 6mm or 10mm Ground Cable to the site Ground. (consult page 17 above).
42. Connect the network cable from the M400A Surge Arrestor to the IO Unit Generator 1 Surge Arrestor and the on to the IO Unit Generator 2 Surge Arrestor. (consult pages 18 & 20 above).
43. After double-checking all the wiring is correct then plug in all the plugs on the M400A Unit, including the power and do the same for both IO Units.
44. Within one minute the LED's on the M400A should be Blue on continuously, Green on continuously, Yellow flashing every 3 seconds and the Red flashing at least once per 10 seconds.
45. Similarly the Red LED on each IO Unit should be flashing at least once per 10 seconds, similar to the M400A Red LED. However, if it is flashing very fast then this would signify a problem with the network connection.
46. Connect the Lap-Top to the M400A and logon to the system as previously above.
47. Re-check the following by entering –
48. **get 9V3** should show the Main site battery voltage as before
49. **get 9V7** should show the cabin temperature as before
50. **get 9V9** should show the Main site battery charge / discharge current as before
51. **get 1V1** should show the generator 1 starter battery voltage
52. **get 2V1** should show the generator 2 starter battery voltage
53. **get 1I1** should show if generator 1 is running or not (1=run, 0=not).
54. **get 1I2** should show if generator 1 is On Load or not (1=On Load, 0=not).
55. **get 2I1** should show if generator 2 is running or not (1=run, 0=not).
56. **get 2I2** should show if generator 2 is On Load or not (1=On Load, 0=not).
57. If any of these return a dash or dashes then there is a problem with the wiring connections.
58. **get 1L7** should show the physical depth of the fuel in mm.
59. Find a stick or rod to put into the tank to physically measure the depth of fuel in the tank, ensuring the stick is entered perpendicular to and to the bottom of the tank.

60. At this stage the system will be checked remotely by the MastMinder consultant and any necessary calibrations or adjustments applied.
61. For this first installation, the MastMinder consultant will then set the site for monitoring only for a period of say 1 week before we return to the site and install the connections in the generators to allow for automatic stopping and starting by the system.

27. M400A Master Local Diagnostic Command Reference

“Hyperterm” can be used as follows:

Once connected, the system console will respond with the prompt:

Enter Password:

Enter the password

The unit will then respond with the command prompt:

<Site ID> <Version> :

Frequently Used Commands:

Get Analogue Values

Command: *getm 9V1*

Response:	Description
9V1=nn.n	Generator 1 Starting Battery Volts
9V2=nn.n	Generator 2 Starting Battery Volts
9V3=nn.n	Main Battery Volts
9V5=nnn	Generator 1 Fuel Level (0-255)
9V7=+nnn	BTS Container Internal Temperature
9V9=+/-nnn	BTS 1 Battery Charge/Discharge Current (Amps)
....	

Get Digital Values

Command: *get 9I1*

Response:	Description
9I1=n	1 = Generator 1 Running
9I2=n	1 = Generator 2 Running
9I3=n	1 = Generator 1 Contactor In
9I4=n	1 = Generator 2 Contactor In
....	