Documentation

MastMinder®

M400A
BTS Monitoring System
Remote Site Master Unit
and Generator IO module

User Documentation

UM(PP8020-V01)
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Applicable to M400A V3.00 +

MastMinder Ltd
Alphamstone
Bures
Suffolk
CO8 5HH
United Kingdom

Tel: +44 (0) 1787 269018
info@MastMinder.com

Warranty

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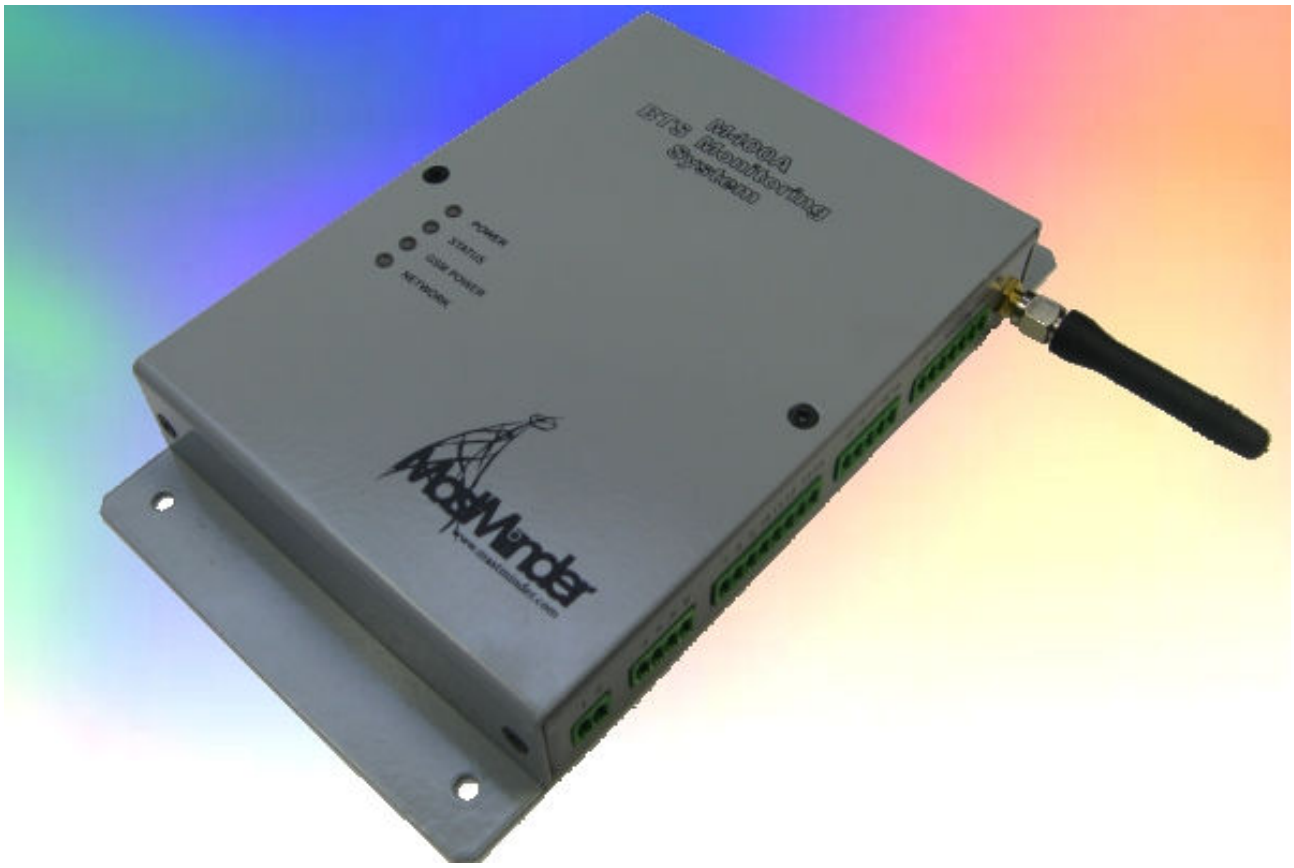
1. Introduction

The **MastMinder® M400A** is an intelligent Power Management Module which forms the remote (BTS) part of the MastMinder® BTS power and fuel management system. Designed and built to meet the needs of Mobile Telco operators in developing countries with poor infrastructure, especially where the remote BTS sites have poor commercial power supply and often sites are distant and at certain times unreachable.



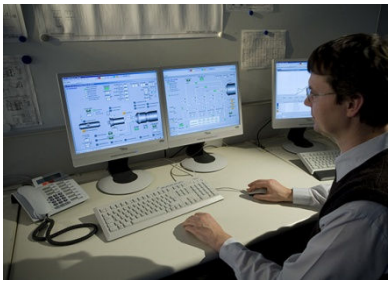
The **MastMinder® M400A** continuously monitors key base station parameters including mains power, temperature, battery voltages, rectifiers, generator function, fuel levels and fuel consumption for up to two BTS and two generator installations per site.

Generator running is optimised according to the needs of the site taking into account such factors as current battery state, temperature, mains power and optionally, local noise control requirements, resulting in a significant reduction in generator running time and fuel used.

All key base station measurements are reported back to the MastMinder Network Management System which can then generate operator alerts and detailed reports for every BTS site in the network. In addition the MastMinder® M400A is able to accept commands from the NMS allowing generator operation and other functions to be directly controlled from the central system.

Communication with the MastMinder Network Management system is by SMS messaging using the built-in quad-band GSM cellular engine.

2. System Overview



MastMinder NMS

SMS

BTS 1

Generator 1

MastMinder
M400A Unit

BTS 2

Generator 2

The MastMinder M400A system can interface with up to two BTS units and two Generating sets per site.

2.1. Network Compatibility

The internal GSM mobile module is a quad-band unit and is fully compatible with any 850/900/1800/1900Mhz GSM network.

2.2. MastMinder M400A I/O interfaces

The M400A master unit can interface with up to two BST units.
In addition up to two generating sets are supported via the M400A I/O modules.

The following physical I/O interfaces are supported:

M400A Master Unit

- 2 x 0-60VDC analogue inputs for BTS battery monitoring
- 2 x 0-300Amp DC current transducer inputs
- 2 x Temperature probe inputs
- 4 x Digital inputs
- 1 x Digital Output (change-over relay)
- 1 x M400A IO module bus
- 1 x RS232 local management port

M400A IO Module (up to four per site)

- 1 x 0-20VDC analogue input for generator battery monitoring
- 1 x 4-20mA fuel level sensor input
- 8 x Digital inputs
- 1 x Temperature sensor input
- 4 x 10A relay outputs
- 1 x RS485 level sensor management interface
- 1 x RS232 AMF panel management interface
- 1 x 12VDC fuel level sensor supply output
- 1 x M400A IO module bus
- Filtered supply output for level sensor

3. Security Features

3.1. Incoming Number Filtering

With this option enabled all incoming messages will be totally ignored by MastMinder M400A if they do not originate from a mobile number which appears on the list of 16 numbers to which alert messages are sent.

3.2. Password Protection

With password protection all received command messages must contain a valid password for the command to be accepted by MastMinder M400A.

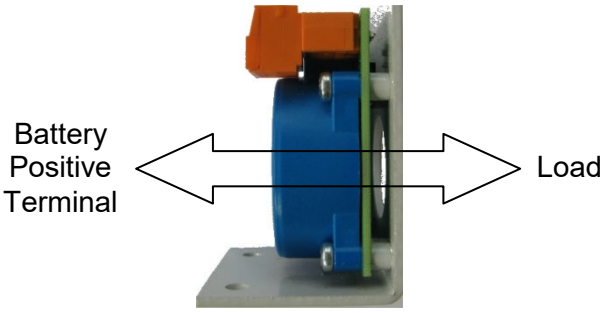
Two levels of password access are provided; “Admin” and “User”. Use of the admin password allows full read/write access to all parameters whereas the user password will only allow read only access.

Passwords can be from 1 to 6 characters long and ARE case sensitive.

4. Current Sensor

The M400A is designed to be used with the PP8022-V01 current sensor module.
This module provides non-intrusive (hall effect) sensing for currents up to +/- 300 Amps.

To read correctly the module must be installed as shown:



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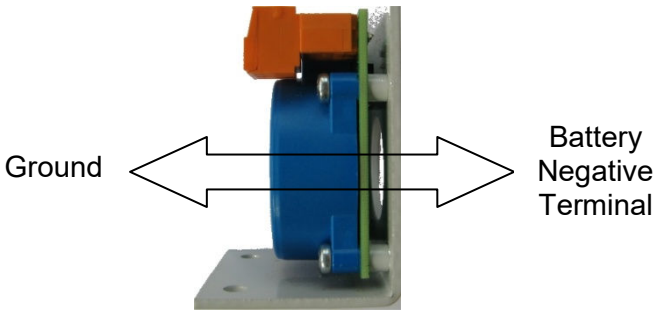
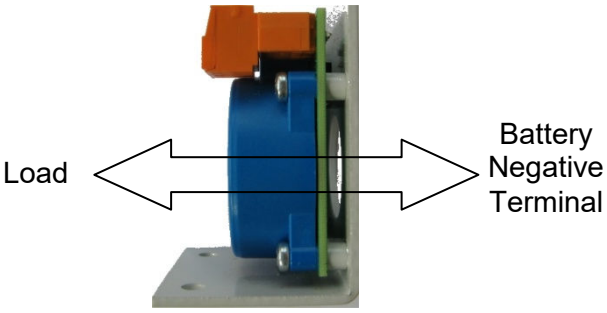


Negative Ground Systems



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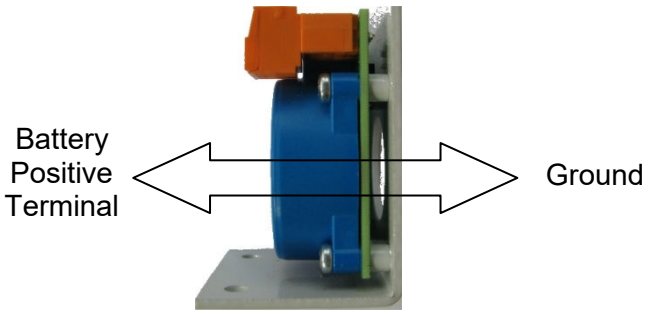


Positive Ground Systems

4.1. Current Sensor Connections

Connections to the current sensor are via a 4 way plug-in terminal block.
The signal allocations are as shown:

Terminal	Signal	Description
1	POWER	+5V Power supply Connection
2	GND	GND Connection
3	OUTPUT	Measurement signal output
4	GND	GND Connection

5. The IO Module

The M400A IO module is a DIN rail mounting unit which is 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.

A simple 4 wire twisted pair interface cable is all that is required to connect the IO module with the M400A master unit.

Up to four IO modules can be connected to each master unit giving the capability to monitor and control four generating sets on each site.

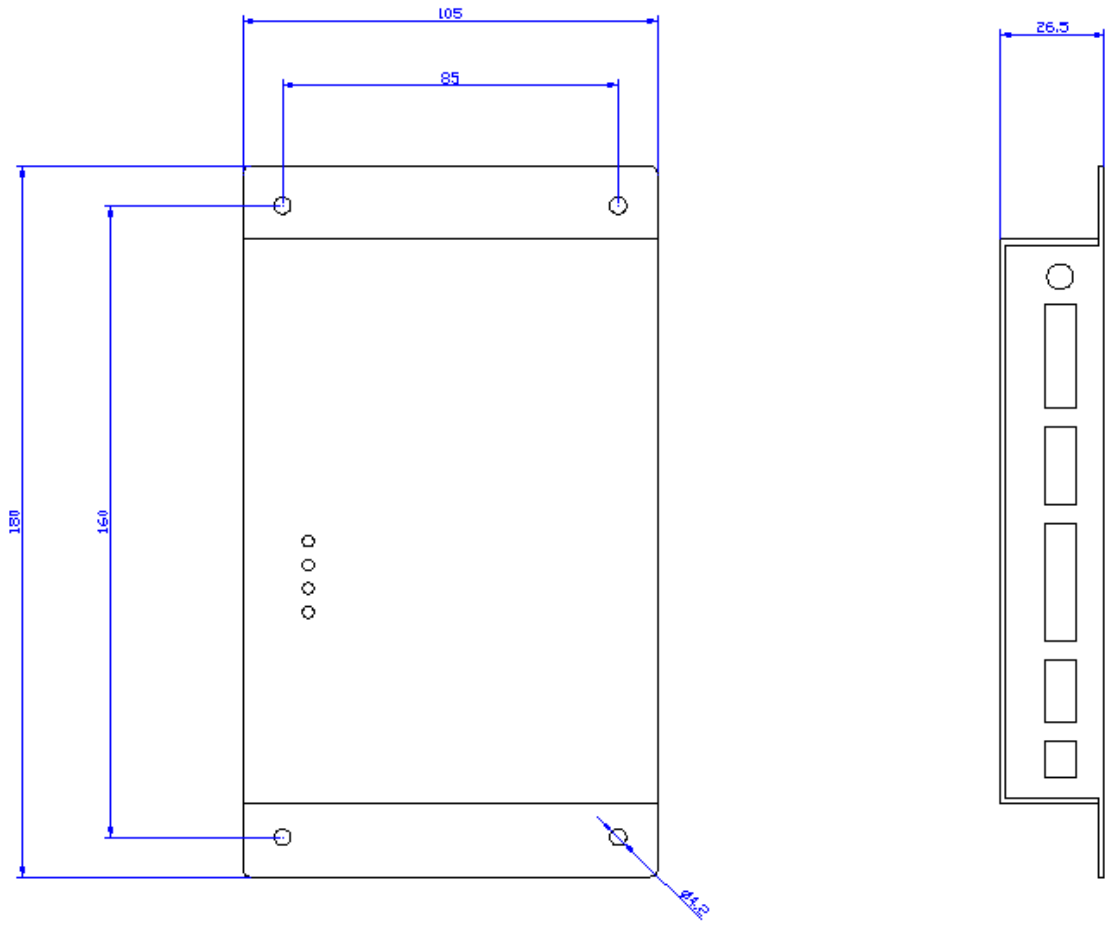
The M400A IO Module

6. Installation

6.1. Positioning the Master Unit

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.



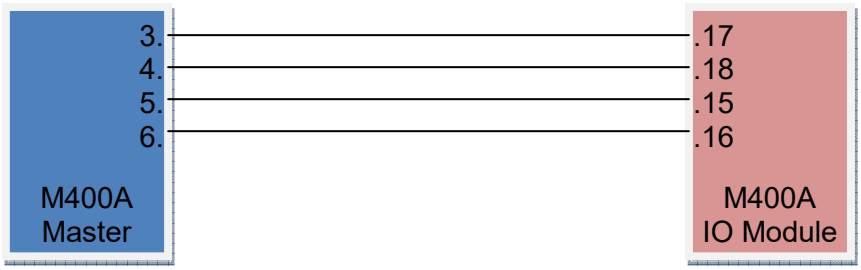
6.2. Positioning the IO Module

The IO module is a DIN rail mounting unit and installed inside the generator enclosure in the wiring frame.
The MastMinder IO module is not designed to be installed in any outside location where it could be exposed to weather or water.

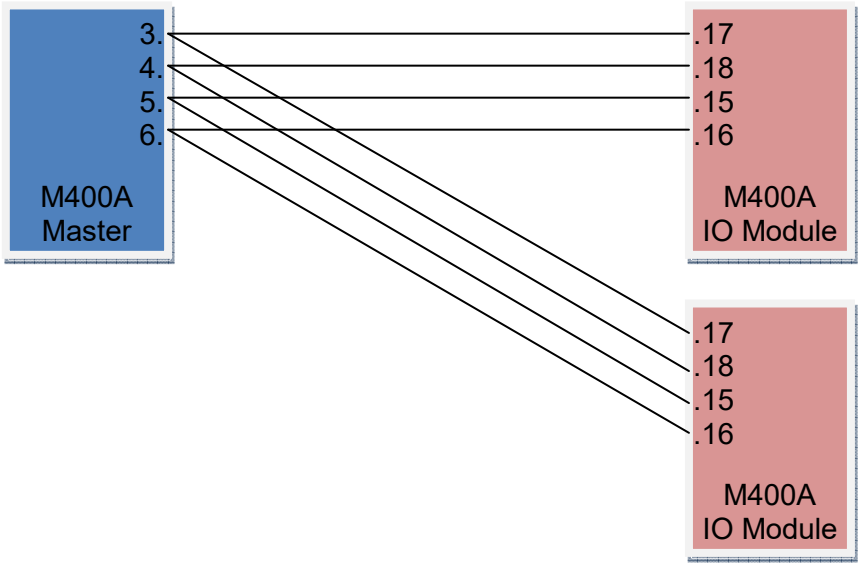
6.3. Module interconnection

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

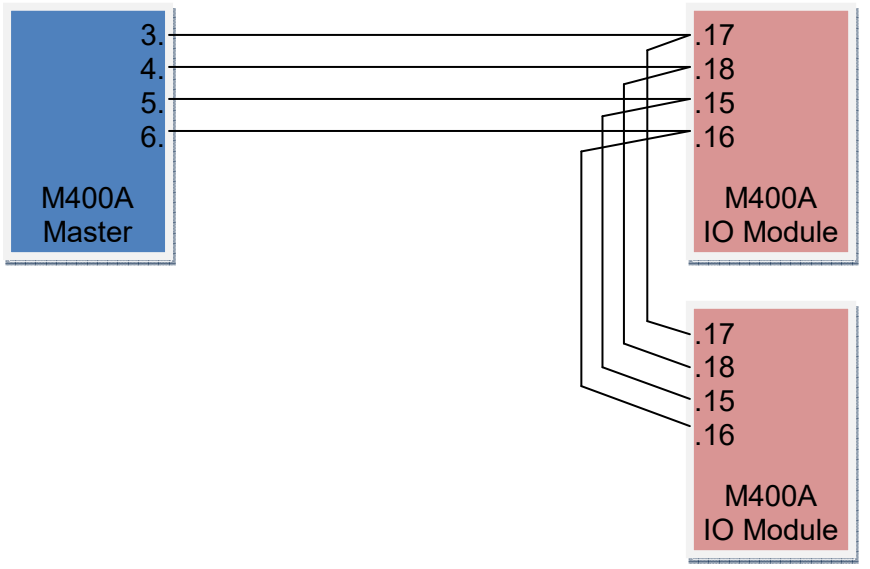
The interconnection of a master unit and IO module is shown below:



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



Option 1 (Star Connected)



Option 2 (Daisy Chain)

6.4. Fitting the SIM Card

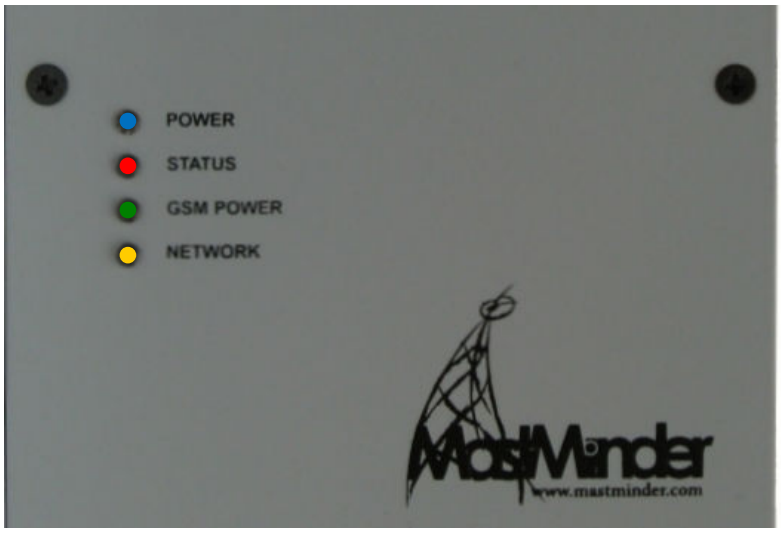
Before the MastMinder M400A unit can be used it must be fitted with a SIM card.

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 is “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.

7. 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

8. Power and I/O Signal Connections

8.1. Master Unit

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 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 (Dig. input 5)
6	In/Out	M400A Mbus, DATAa	IO Mod		Mbus DATAa (Dig. input 6)
7	In	Digital Input 1			
8	In	Digital Input 2			
9	In	Digital Input 3			
10	In	Digital Input 4			
11	-	Ground	GND		GND
12	-	Output 0, NC Relay Contact			
13	-	Output 0, COMMON			
14	-	Output 0, NO Relay Contact			
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-

8.2. 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 Contactor 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	Red	AMF Panel Serial Port
10	In	RS232 Serial Port RX	AMF	Green	AMF Panel Serial Port
11	-	Ground		Black	AMF Panel Serial Port
12	In/Out	RS485 Serial Port TX/RXb	LEVEL	Blk(3) (SSI)	Level Sensor Serial Port
13	In/Out	RS485 Serial Port TX/RXa	LEVEL	Grn/Yel (SSI)	Level Sensor Serial Port
14	In	4-20mA Current Loop Analogue Input	LEVEL	Blk(4) (SSI) Green (L400) Yell (L400-V2)	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			Phase Monitor In
26	-	Output 3, COMMON			Phase Monitor Out
27	-	Output 3, NO Relay Contact			
28	-	Output 4, COMMON			
29	-	Output 4, NO Relay Contact			
30	-				
31	Out	PT1000 Temperature Probe			Optional
32	In	PT1000 Temperature Probe			Optional
33	Out	8-16VDC Filtered Output	LEVEL	Blk(2) (SSI) Red (L400) Brown (L400-V2)	Level Sensor Power +12V
34	-	Power Ground	LEVEL	Blk(1) (SSI) White (L400) White (L400-V2)	Level Sensor GND
35	-	Power Ground	GND		Power Ground
36	In	8-16VDC Power, Positive	+12V		Generator Battery +

9. I/O Module Set up and Operation

9.1. 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.

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.

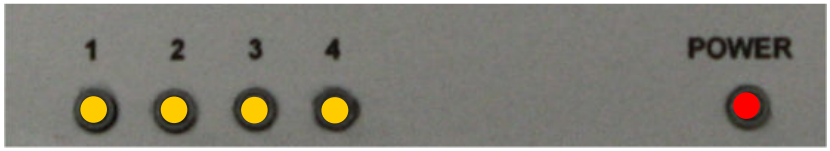
When the LED is indicating the required address do not press the inhibit button again. After 20 seconds with no button pushes the unit will return to operational mode with the new address programmed.

9.2. IO Module Inhibit Mode

A single 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.
If inhibit mode is not deactivated by operation of the inhibit button, the outputs will automatically revert to normal operation after 1 hour.
Inhibit mode is for use by a generator service engineer wishing to perform testing or maintenance of the generator.
On pressing the Inhibit button the MastMinder system will deactivate all its output control to the AMF panel, therefore leaving the technician to perform testing of the generator without any MastMinder intervention.
When the technician has completed testing then by pressing the Inhibit button again then MastMinder will take control again.
If the technician forgets to press the Inhibit button a second time then MastMinder will automatically take control again after 1 hour.

9.3. IO Module 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.

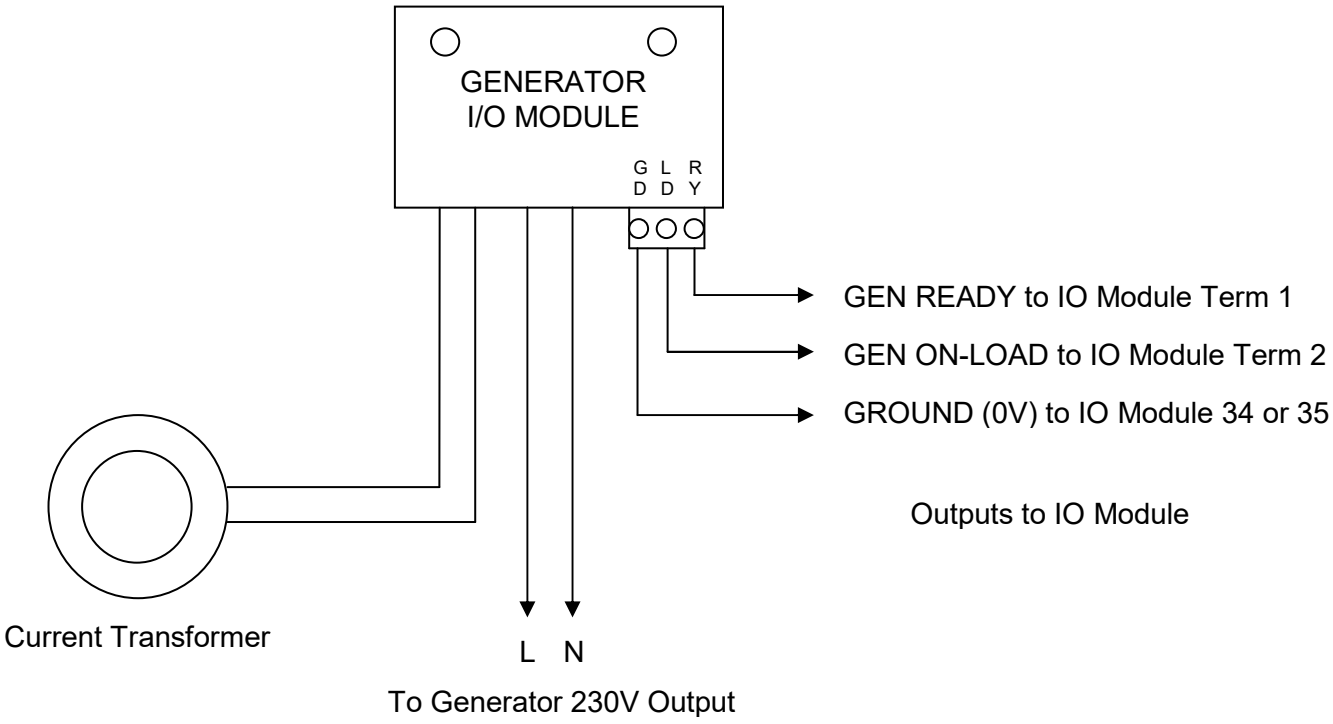
RED LED (POWER)	Meaning
○	Unit not powered up
● (3 sec)	Normal Start up
●○●○… (slow)	Self test fail
✳✳ (every 10 sec)	**System active (Normal operation)**
●○●○… (fast)	No Communications with master unit
✳	Packet received from master unit
●○●○… (1 Hz)	Inhibit Mode
✳ (every 4 sec)	Address set mode – address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

10. Generator Interface Module

In order to provide compatibility to many different generator and AMP 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 Ready" and "Generator On-Load" signals to the M400A IO module.



10.1. Generator Interface Module Installation

1. Locate main generator output circuit breaker.

2. Disconnect the neutral cable from the load side of the circuit breaker and pass through the current transformer.

3. Connect the interface module L and N connections to the phase 1 output and neutral connections respectively on the load side of the circuit breaker

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

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

11. Fuel Level and Consumption Monitoring

The M400A IO Module is able to monitor both fuel level and fuel consumption.

The fuel monitoring behaviour differs depending on whether the engine is running or stopped, and is explained below.

Engine Not Running

Level Alarm

If the fuel drops from the initial level, i.e. the level when the engine lasted stopped, by more than the margin set then the fuel level drop alarm will be set.

If the “shared tank” option parameter is set, then the fuel level will be allowed to fall slowly (as it is consumed by another generator) but a sudden fuel level drop, i.e. by more than the margin set in any 15 minute period, then the fuel level drop alarm will be set.

The alarm will remain active until it is manually cleared.

The fuel level at which the alarm was triggered then becomes the new reference level and a new alarm will be set if the level again drops below this by more than the programmed margin.

The fuel level is sampled every 15 minutes.

Fuel Added Alarm

A fuel added alarm will be set if the fuel level rises above the reference level by more than the programmed margin during the 15 minute sample period. If the level rises, the reference level is set to the new level.

Engine Running

Fuel Consumption Alarm

If at any time the current fuel consumption is greater than 5 units/hour plus the programmed margin a fuel consumption alarm will be set.

If the current fuel consumption exceeds the 32 hour average consumption by the programmed margin a fuel consumption alarm will be set.

The alarm will remain active until it is manually cleared.

Consumption figures are updated every 15 minutes.

Fuel Added Alarm

Behaves in the same way as for the engine not running condition.

12. Reading and Setting I/O Values and Parameters

All system input measured variables and conditions, output states and system control variables are accessed through system “parameters”
Each parameter has a unique 3 character ID and are detailed in the section “System Parameter Reference”

System parameters may be read or updated as a result of incoming SMS messages.

12.1. Requesting Parameter Values

Individual system parameters (e.g. IO values) my be read by sending an SMS message of the form “?ppp”, where ppp is the parameter code. The reply will be in the form ppp=<parameter value>, with the exception that a request for a message parameter value (9M0 to 9MZ) will result in only the parameter value, without the “ppp=” header.

Example:
Message: ?918
Reply: 918=nn

It is also possible to request multiple parameter values in the same message:

Example:
Message: ?918?901?909
Reply: 918=21,901=London,909=07712345678

12.2. Setting Parameter Values

Individual system parameters (e.g. IO values) my be set or updated by sending an SMS message of the form “!ppp=ddd”, where ppp is the parameter code and ddd is the new value to set.

Example:
Message: !9N0=07711223344
Reply: none

Multiple parameters may be set in the same message by separating each parameter by a comma, e.g. !9X0=1,!9X1=0,!9X2=1

It is also possible to combine updates and requests in the same message. This method can be used if a response to a parameter update message is required.

Example:
Message: !9N0=07711223344,!9X2=1,?9X2
Reply: 9X2=1

Parameter values can also be uploaded in bulk to the unit by sending a simple text parameter configuration file either through the local RS232 port or a GSM CSD connection. See the section entitled “System Console Port”.

13. User Messages

Up to 32 different user messages can be programmed into the unit. Each message can be up to 160 characters long and can contain “tags” to insert variable data into the outgoing message.
Bear in mind that since messages can contain ‘tags’, the resulting message length could be longer than 160 characters (the SMS maximum) once the tag values have been inserted into the outgoing message. In this case outgoing messages are truncated to 160 characters.

To insert a parameter (variable) into the outgoing message the “%” (percent) character is placed in the message at the point where the variable data is required followed by the parameter ID where the data is stored.

Note that parameter tags cannot be nested. For example if a message contains a tag which refers to another programmed message, which in turn contains parameter tags, then the tags in the inserted message will not be substituted but displayed “as is”.

Example:

A user message which shows the current temperature value might look like this:-

The current temperature is %9V7 degrees

The message received on the GSM mobile phone would look like this:-

The current temperature is +27 degrees

The tag has been substituted for the current value stored in parameter 9V7.

The 32 user messages are stored in the M400A parameters 9M0 to 9MV and can be programmed using SMS messages or a serial terminal as described in the section above “Setting Parameter Values”

14. Input Monitoring and Actions

14.1. Rules

A powerful feature of the system is the ability to perform actions based on the value of any of the system parameters.

A set of 36 “rules” are available (themselves parameters) which specify actions to be taken as a result of individual or logical combinations of system parameter values.

Each rule can be individually enabled or disabled either manually or by actions of other rules.

A simple example would be to send an SMS message if a digital input was low.

A complex example would be to send 3 different messages to 5 different numbers & turn on an output if the measured temperature was below a certain value, digital input 2 was low, and the time was between 0300 and 0400.

Each of the 36 rules has 5 associated parameters as follows:

Enable
Enables/disables the rule. ‘Y’ = enabled, ‘N’ = Disabled

Qualify Time
Qualification time in seconds between a matching condition and the rule being triggered. 0-9999. This is useful for discounting momentary conditions or “nusense” alarms

Rearm Time
Time in minutes to re-enable a triggered rule. 0-9999. This parameter is useful for limiting the number of messages sent if a rule is repeatedly triggered.

Body
A string of up to 160 characters which specify the rule conditions and actions.

Status
This is a read only parameter showing the current rule status:-

Value	Meaning
Off	Not enabled
Active	Rule enabled, not triggered (no trigger condition met)
PreTrig	Unqualified Trigger Condition
Trig	Rule triggered, programmed action performed
PreUTrig	Unqualified Un-Trigger Condition
Trig,R	Re-armed (trigger condition still met)
Rearmed	Re-armed (no trigger condition met)

14.2. Rule Syntax

Each rule consists of a free format text string of up to 160 characters which specify the conditions for triggering the rule and then the actions that result if the rule is triggered.

The general format is:

If <paramID><operator><value> [**and**] [**or**] [<paramID><operator><value>]
then [**set** <paramID=value>] [**set** <paramID=value+value>] [**send** <Mn> **to** <Nn>]

Where: Words in **bold** are key words
<….> is a mandatory part
[….] is an optional part

"paramID" is the system parameter ID to be tested (or changed) in the form %ppp

"operator" is the logical operator as described below.

"value" is the operand and can be a literal value in the form "dddd" or a parameter ID in the form %ppp

The "+" operator sets a parameter with the result of the numerical addition of two parameter values e.g. %PPP=%PPP+"1" or %PPP=%PPP+%PPP. Both values must equate to a numeric value.

Multiple parameters may be evaluated in a single rule by using the logical operators "**or**" and "**and**". The expressions are evaluated in the order they are written.

"**then**" separates the rule conditions part from the rule actions part, everything after the "then" statement is a list of actions to be performed if the rule is triggered.

"**set**" is an action which sets a parameter value e.g. switches on an output

"**send**" and "**to**" are actions which send the specified message (Mn) to the specified number (Nn). If required "Gn" can be used instead of "Nn" to send the messages to a number group or "NR" to send the message to the CLI of the last received message.

Example 1:

If %9I1=="0" then send 9M0 to 9N0

The above rule would send message M0 to number N0 if digital input 1 went inactive.

Example 2:

If %9I1==%9I2 then set %9X1=%9X2

The above rule would set output 1 = output 2 if inputs 1 and 2 were equal.

Example 3:

If %9I1=="0" or %9I2=="0" and %9V1<<"10.5" then set %9X1="1" send 9M1 to 9N0

The above rule would set output 1 on and send message M1 to number N0 if digital input 1 or 2 was low and the supply was less than 10.5V

Example 4:

If %9V7<<"18" then set %9X1="1" set %9T1="60" send M1 to N0

This rule would turn on output 1 for 60 mins. And send message M1 to number N0 if temperature 1 was less than 18 degrees.

The M1 message parameter might be programmed as follows:

%901,%901 Temperature low (%9V7 Deg.), Heater activated for %9T0 minutes.

The above message also shows how variable information (real time data) can be embedded in the message.

14.3. Rule Logical Operators

The following expression operators can be used in the rule body:

"==", "!=",">=","=<",">>" , "<<","=$" or "!$"

The following table describes the condition parameters.

Condition	Comparison Type	Meaning
==	Numeric	The rule is triggered if the current value of the parameter specified in the rule "Parameter" *equals* the number in the rule "value"
!=	Numeric	The rule is triggered if the current value of the parameter specified in the rule "Parameter" *is not equal to* the number in the rule "value" .
=>	Numeric	The rule is triggered if the current value of the parameter specified in the rule "Parameter" is *equal to or greater than* the number in the rule "value" .
=<	Numeric	The rule is triggered if the current value of the parameter specified in the rule "Parameter" is *equal to or less than* the number in the rule "value" .
>>	Numeric	The rule is triggered if the current value of the parameter specified in the rule "Parameter" is *greater than* the number in the rule "value" .
<<	Numeric	The rule is triggered if the current value of the parameter specified in the rule "Parameter" is less *than* the number in the rule "value" .
=$	String	The rule is triggered if the string specified in the rule "value" parameter (up to 16 bytes) is found anywhere within the contents of the parameter specified in the rule "Parameter"
!$	String	The rule is triggered if the string specified in the rule "value" is not found anywhere within the contents of the parameter specified in the rule "Parameter"

14.4. Rule trigger operation

Once a rule has been triggered and the actions performed, no further actions will be performed until the rule has returned to a "not triggered" condition and then subsequently returns to a "triggered" condition. Additionally the rule will only be allowed to "re-trigger" provided that the rule re-arm time has expired.

15. System Parameter Reference

The following table lists all of the system parameters. The table columns are as follows:-

Parameter ID	The parameter access code used to reference the parameter.
Type	Either ROM, EROM or RAM dependent on whether the parameter is based in flash ROM or EEPROM and therefore persistent or RAM based and therefore not preserved across a power reset. For the non-volatile ROM/EROM parameters the EROM parameters are rated for a higher number of write cycles compared to the ROM parameters. Therefore use EROM parameters for parameters likely to change often and ROM parameters for those likely to change less often. For fast changing parameters use the RAM type. Additionally, EROM parameters are not changed after performing a flash firmware upgrade, whereas all ROM parameters will revert to factory defaults after a flash firmware upgrade.
Attributes	Parameters can posses one of three attributes; read/write (RW), read only (RO) or write only (WO)
Length	Specifies the maximum length for the parameter; parameter values can be less than the maximum length.

15.1. Master Unit Parameters

Param ID	Type	Attributes	Length	Description	
-- System Parameters --					
901	ROM	RW	20	**Site ID**	20 character string for system identification *Default = Site Name*
902	ROM	RO	4	**Firmware Rev.**	Format n.nn
903	ROM	RO	20	**Module Type**	'9009-V01 M400A'
913	ROM	RW	6	**Admin Password**	Up to 6 character full access password. The password is disabled when the string is empty. *Default = None*
914	ROM	RW	1	**Number Authorisation**	If set to "Y" incoming messages will only be accepted from GSM mobile numbers which appear in the mobile number list (N0 – NF) *Default = N*
930	EROM	RW	4	**Sent SMS Message Counter**	Keeps a count of the number of SMS messages successfully sent.
931	EROM	RW	4	**SMS Message Number**	SMS Message serial number
950	RAM	RW	2	**RTC Hours**	Real-time clock hour
951	RAM	RW	2	**RTC Minutes**	Real-time clock Minute
952	RAM	RW	2	**RTC Seconds**	Real-time clock Second
953	RAM	RW	2	**RTC Years**	Real-time clock day
954	RAM	RW	2	**RTC Months**	Real-time clock month
955	RAM	RW	2	**RTC Days**	Real-time clock year
956	RAM	RW	12	**RTC Time & Date**	Real-time clock hhmmssddmmyy
9XN	EROM	RO	5	**Unit Serial Number**	nnnnn Unit serial number
9U0	RAM	WO	1	**System Reboot**	Writing any value to this parameter will cause the system to reboot
9u0	RAM	WO	1	**Soft System Reboot**	Writing any value to this parameter will cause the system to reboot but preserve RAM parameter values.
9Y1	EROM	RW	1	**Max Slaves**	Maximum number of slave modules in system, 0-8. Default = 2
9H0	EROM	RW	8	**Hours Counter 0**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time Param 9U9=9 (system active, rule processing on)
9H7	EROM	RW	8	**Network Down Time**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time the GSM network is unavailable.
-- GPRS Parameters --					
9GA	ROM	RW	24	**APN**	GPRS Network APN
9GB	ROM	RW	16	**GPRS Username**	GPRS Network Username
9GC	ROM	RW	16	**GPRS Password**	GPRS Network Password
9GD	ROM	RW	16	**FTP Server IP Address**	FTP Server IP Address
9GE	ROM	RW	16	**FTP Username**	FTP Login Username
9GF	ROM	RW	16	**FTP Password**	FTP Login Password
9GG	ROM	RW	24	**Download Filename**	Filename for download
9GZ	ROM	RW	1	**Start GPRS Download**	Set to any value to start GPRS connection and download

Param ID	Type	Attributes	Length	Description	
-- GSM Parameters --					
-- 16 user defined GSM numbers --					
9N0 – 9NF	ROM	RW	16	**Mobile Numbers**	User defined mobile numbers.
-- 4 user defined GSM number groups --					
G0 – G3	ROM	RW	32	**Send Groups**	Number group. Contains a list of up to 16 user numbers, e.g. 'N1N2N9NBNC'
-- 32 user defined SMS messages --					
9M0-9MV	ROM	RW	160	**User Messages**	User defined 'canned' SMS Message. Message can contain parameter 'tags' allowing dynamic data to be included in the SMS message. Messages can consist entirely of Parameter tags.
909	RAM	RO	16	**Subscriber Number**	GSM subscriber number read from SIM
908	ROM	RW	16	**Service Centre No.**	The SMSC Service centre number to use for outgoing SMS messages. If left empty the default service centre number programmed into the SIM will be used. *Default = None*
915	RAM	RO	10	**GSM Modem Status**	Status of connection to GSM modem. "No Modem" "OK" "No Network"
918	RAM	RO	2	**GSM Signal**	The signal level reported by the GSM modem, usually 0-32. 99=Unknown
919	RAM	RO	4	**Battery Level**	The Battery level reported by the GSM modem, 0-100%.
920	RAM	RO	16	**Operator**	The current network operator.
924	RAM	RO	16	**Received SC Number**	The Service Centre number received with the last delivered message.
925	RAM	RO	16	**Received MT Number**	The mobile number of the message sender of the last received message.
926	RAM	RO	160	**Received Message**	The last received message.
932	ROM	RW	5	**Required Operator**	The required operator network in international numeric form, i.e. "23415". If left blank the unit will attach to any network according to those allowed by the inserted SIM. If a network ID is programmed the unit will only attach to the specified network.
-- DC Energy Parameters --					
9K1	RAM	RO	9	**DC1 Charge Energy**	Total Battery 1 Charge Energy in KWh
9K2	RAM	RO	9	**DC1 Discharge Energy**	Total Battery 1 Discharge Energy in KWh
9K3	RAM	RO	6	**DC1 Power**	Current Battery 1 Charge/Discharge Power in W
9K4	RAM	RO	9	**DC2 Charge Energy**	Total Battery 1 Charge Energy in KWh
9K5	RAM	RO	9	**DC2 Discharge Energy**	Total Battery 1 Discharge Energy in KWh
9K6	RAM	RO	6	**DC2 Power**	Current Battery 1 Charge/Discharge Power in W

Param ID	Type	Attributes	Length	Description	
-- Rule Processing Parameters --					
9U9	ROM	RW	1	**Rule Processing Enable**	Set to “9” to enable rule processing, all other values disable rule processing. Default: “0”
-- 36 Rule Enable Parameters --					
9E0 – 9EZ	ROM	RW	1	**Rule Enable**	Enables/disables processing rule. ‘Y’ = enabled, ‘N’ = Disabled *Default = N (disabled)*
-- 36 user defined processing rules --					
9P0 – 9PZ	ROM	RW	160	**Rule Body**	String containing the rule directives *Default = none*
-- 36 rule qualify times --					
9Q0 – 9QZ	ROM	RW	4	**Rule Qualify Time**	Qualification time in seconds between a matching condition and the rule being triggered. 0-9999 *Default = 0*
-- 36 rule rearm times --					
9R0 - 9RZ	ROM	RW	4	**Rule Rearm Time**	Time in minutes to re-enable a triggered rule. 0-9999 *Default = 0*
-- 36 current rule status --					
9S0 – 9SZ	RAM	RO	8	**Rule Status**	Current Rule status. Off - Not enabled Active - Rule enabled, not triggered (no condition active) PreTrig - Unqualified Trigger Condition Trig - Rule triggered PreUTrig - Unqualified Un-Trig. Condition Rearmed - Rule triggered, re-armed (no condition active) Trig,R - Rearmed, still triggered
9IR	RAM	RW	1	**Invalid Rule**	Null if no rule syntax errors. Will contain rule number 0-9 or A-Z if invalid rule found
960	RAM	RO	1	**Queued Msg. Source**	Contains the rule number responsible for queuing message if message sent by a rule action
9WW	ROM	RW	16	**Parameter File Version**	Current Parameter File Version

Param ID	Type	Attributes	Length	Description	
				-- I/O Parameters --	
9ID	RAM	RO	1	**Digital Input 1**	Logical value of digital input 1, ‘0’ or ‘1’
9IE	RAM	RO	1	**Digital Input 2**	Logical value of digital input 2, ‘0’ or ‘1’
9IF	RAM	RO	1	**Digital Input 3**	Logical value of digital input 3, ‘0’ or ‘1’
9IG	RAM	RO	1	**Digital Input 4**	Logical value of digital input 4, ‘0’ or ‘1’
9IH	RAM	RO	1	**Digital Input 5***	Logical value of digital input 5, ‘0’ or ‘1’
9II	RAM	RO	1	**Digital Input 6***	Logical value of digital input 6, ‘0’ or ‘1’
9JD	ROM	RW	1	**Digital Input Level 1**	Active level of digital input 1 (0,1 or -)
9JE	ROM	RW	1	**Digital Input Level 2**	Active level of digital input 2 (0,1 or -)
9JF	ROM	RW	1	**Digital Input Level 3**	Active level of digital input 3 (0,1 or -)
9JG	ROM	RW	1	**Digital Input Level 4**	Active level of digital input 4 (0,1 or -)
9JH	ROM	RW	1	**Digital Input Level 5**	Active level of digital input 4 (0,1 or -)
9JI	ROM	RW	1	**Digital Input Level 6**	Active level of digital input 4 (0,1 or -)
9mE	ROM	RW	1	**Mbus Enable**	Mbus Enable (Y or N) If set to “N” Mbus IODatab & IODataa Become digital inputs 9IH & 9II Respectively*
9V3	RAM	RO	4	**Main Supply Value**	Measured value of external supply, nn.nV
9V4	RAM	RO	4	**External 0-60V 2**	Measured value of external 0-60V input 2, nn.n Volts
9V7	RAM	RO	3	**Temperature 1**	Measured value of temperature probe connected to temperature input 1, +/-nn ^{o}C
9V8	RAM	RO	3	**Temperature 2**	Measured value of temperature probe connected to temperature input 2, +/-nn ^{o}C
9V9	RAM	RO	4	**Current Monitor 1**	Measured value of current transducer, +/-0-300 A
9VA	RAM	RO	4	**Current Monitor 2**	Measured value of current transducer, +/-0-300 A
9VB	RAM	RO	4	**5V Supply Value**	Measured value of 5V battery supply, n.n V
9U2	RAM	RW	1	**Digital Input Change**	Set to “1” if any digital input changes state. Remains set until cleared by user.
9U3	RAM	RW	1	**Analogue Input Status Change**	Set to “1” if any analogue input changes state. Remains set until cleared by user.
9X9	ROM	RW	1	**Digital Output Value**	Value of digital output , ‘0’ or ‘1’ This output controls a C/O relay.
9T9	ROM	RW	4	**Digital Output 0 Timer**	Optional time in minutes for output to remain in current state before automatically returning to previous state. 0-9999 minutes. A value of ‘0’ disables the timer function and the output remains unchanged.
9WM	RAM	RW	4	**User Seconds Timer 1**	User Programmable 4 digit seconds counter 0000-9999 seconds. Counts down from set value and stops at 0000
9WN	RAM	RW	4	**User Seconds Timer 2**	User Programmable 4 digit seconds counter 2
9U4	RAM	RW	4	**User Minute Timer 1**	User Programmable 4 digit minutes counter 0000-9999 minutes. Counts down from set value and stops at 0000
9U5	RAM	RW	4	**User Minute Timer 2**	User Programmable 4 digit minutes counter 2

* Use of digital inputs 9IH & 9II also requires a hardware modification

Param ID	Type	Attributes	Length	Description
-- 58 User Parameters --				
9U1	RAM	RW	1	**User Parameter**
9WA	RAM	RW	4	**User Parameter**
9WB	RAM	RW	8	**User Parameter**
9WC	RAM	RW	6	**User Parameter**
9WD	RAM	RW	6	**User Parameter**
9WE	RAM	RW	6	**User Parameter**
9WF	RAM	RW	6	**User Parameter**
9WG	RAM	RW	8	**User Parameter**
9WH	RAM	RW	8	**User Parameter**
9WI	RAM	RW	8	**User Parameter**
9WJ	RAM	RW	8	**User Parameter**
9WK	RAM	RW	8	**User Parameter**
9WL	RAM	RW	8	**User Parameter**
9WO	RAM	RW	8	**User Parameter**
9WP	RAM	RW	12	**User Parameter**
9WU	EROM	RW	2	**User Parameter**
9WV	EROM	RW	2	**User Parameter**
9W1	EROM	RW	8	**User Parameter**
9W2	EROM	RW	8	**User Parameter**
9W3	EROM	RW	8	**User Parameter**
9W4	EROM	RW	8	**User Parameter**
9W5	EROM	RW	8	**User Parameter**
9W6	EROM	RW	8	**User Parameter**
9KA	EROM	RW	2	**User Parameter**
9W8	EROM	RW	16	**User Parameter**
9WX	EROM	RW	16	**User Parameter**
9U6	ROM	RW	1	**User Parameter**
9U7	ROM	RW	1	**User Parameter**
9UA	ROM	RW	4	**User Parameter**
9UB	ROM	RW	4	**User Parameter**
9UC	ROM	RW	4	**User Parameter**
9UD	ROM	RW	4	**User Parameter**
9UE	ROM	RW	4	**User Parameter**
9UF	ROM	RW	4	**User Parameter**
9UG	ROM	RW	4	**User Parameter**
9UH	ROM	RW	4	**User Parameter**
9UI	ROM	RW	4	**User Parameter**
9UJ	ROM	RW	4	**User Parameter**
9UK	ROM	RW	4	**User Parameter**
9UL	ROM	RW	2	**User Parameter**
9UM	ROM	RW	2	**User Parameter**
9WQ	ROM	RW	32	**User Parameter**
9WR	ROM	RW	10	**User Parameter**
9WS	ROM	RW	8	**User Parameter**
9WT	ROM	RW	4	**User Parameter**
9UO	ROM	RW	4	**User Parameter**
9UP	ROM	RW	4	**User Parameter**
9UQ	ROM	RW	4	**User Parameter**
9UR	ROM	RW	4	**User Parameter**
9US	ROM	RW	4	**User Parameter**
9UT	ROM	RW	4	**User Parameter**
9UU	ROM	RW	4	**User Parameter**
9UV	ROM	RW	4	**User Parameter**
9UW	ROM	RW	4	**User Parameter**
9UX	ROM	RW	6	**User Parameter**
9UY	ROM	RW	4	**User Parameter**
9UZ	ROM	RW	4	**User Parameter**

15.2. IO Module Parameters

* 1st character of parameter ID must correspond to IO module address.

Param ID*	Type	Attributes	Length	Description	
-- System Parameters --					
A02	ROM	RO	4	**Firmware Rev.**	Format n.nn
A03	ROM	RO	20	**Module Type**	'M400A I/O'
A04	EROM	RO	6	**Serial Port 1 Baud Rate**	2400,4800,9600,19200,38400
A40	EROM	RO	6	**Serial Port 2 Baud Rate**	2400,4800,9600,19200,38400
A05	ROM	RO	6	**Firmware Type**	Format nnnnnn
AAD	EROM	RW	1	**Unit Address**	Single character unit address A-D Default: A
AU0	RAM	WO	1	**System Reboot**	Writing any value to this parameter will cause the module to reboot
AUN	EROM	RW	4	**Supply Disc. Threshold**	12V supply disconnect threshold, nn.n
AGI	EROM	RW	1	**Generator I/F Module**	Set to "1" if the "Generator Ready" and "Generator on-load" signals are provided by the MastMinder Generator Interface Module
9WW	ROM	RW	16	**Parameter File Version**	Current Parameter File Version
-- I/O Parameters --					
AI1	RAM	RO	1	**Digital Input 1**	Logical value of digital input 1, '0' or '1'
AI2	RAM	RO	1	**Digital Input 2**	Logical value of digital input 2, '0' or '1'
AI3	RAM	RO	1	**Digital Input 3**	Logical value of digital input 3, '0' or '1'
AI4	RAM	RO	1	**Digital Input 4**	Logical value of digital input 4, '0' or '1'
AI5	RAM	RO	1	**Digital Input 5**	Logical value of digital input 1, '0' or '1'
AI6	RAM	RO	1	**Digital Input 6**	Logical value of digital input 2, '0' or '1'
AI7	RAM	RO	1	**Digital Input 7**	Logical value of digital input 3, '0' or '1'
AI8	RAM	RO	1	**Digital Input 8**	Logical value of digital input 4, '0' or '1'
AJ1	EROM	RW	1	**Digital Input Level 1**	Active level of digital input 1 (0 or 1)
AJ2	EROM	RW	1	**Digital Input Level 2**	Active level of digital input 2 (0 or 1)
AJ3	EROM	RW	1	**Digital Input Level 3**	Active level of digital input 3 (0 or 1)
AJ4	EROM	RW	1	**Digital Input Level 4**	Active level of digital input 4 (0 or 1)
AJ5	EROM	RW	1	**Digital Input Level 5**	Active level of digital input 1 (0 or 1)
AJ6	EROM	RW	1	**Digital Input Level 6**	Active level of digital input 2 (0 or 1)
AJ7	EROM	RW	1	**Digital Input Level 7**	Active level of digital input 3 (0 or 1)
AJ8	EROM	RW	1	**Digital Input Level 8**	Active level of digital input 4 (0 or 1)
AH1	EROM	RW	8	**Hours Counter 1**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time digital input 1 is active.
AH2	EROM	RW	8	**Hours Counter 2**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time digital input 2 is active.
AH3	EROM	RW	8	**Hours Counter 3**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time digital input 3 is active.
AH4	EROM	RW	8	**Hours Counter 4**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time digital input 4 is active.
AH5	EROM	RW	8	**Hours Counter 5**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time digital input 5 is active.
AH6	EROM	RW	8	**Hours Counter 6**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time digital input 6 is active.
AH7	EROM	RW	8	**Hours Counter 7**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time digital input 7 is active.
AH8	EROM	RW	8	**Hours Counter 8**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time digital in 8 act.

Param ID*	Type	Attributes	Length	Description	
AV1	RAM	RO	4	**Main 12V Supply Value**	Measured value of external supply, nn.nV
AV5	RAM	RO	3	**External 4-20mA**	Measured value of external 4-20mA input , 0-255
AV7	RAM	RO	3	**Temperature 1**	Measured value of temperature probe connected to temperature input 1, +/-nn ^{o}C
AU2	RAM	RW	1	**Input State Change**	Set to “1” if any digital or analogue input changes state. Remains set until cleared by user.
AX1	EROM	RW	1	**Digital Output 1 Value**	Value of digital output 1, ‘0’ or ‘1’ This output controls a C/O relay.
AX2	EROM	RW	1	**Digital Output 2 Value**	Value of digital output 2, ‘0’ or ‘1’ This output controls a C/O relay.
AX3	EROM	RW	1	**Digital Output 3 Value**	Value of digital output 3, ‘0’ or ‘1’ This output controls a C/O relay.
AX4	EROM	RW	1	**Digital Output 4 Value**	Value of digital output 4, ‘0’ or ‘1’ This output controls a NO relay.
AT1	ROM	RW	4	**Digital Output 1 Timer**	Optional time in minutes for output to remain in current state before automatically returning to previous state. 0-9999 minutes. A value of ‘0’ disables the timer function and the output remains unchanged.
AT2	ROM	RW	4	**Digital Output 2 Timer**	As for Output timer 1
AT3	ROM	RW	4	**Digital Output 3 Timer**	As for Output timer 1
AT4	ROM	RW	4	**Digital Output 4 Timer**	As for Output timer 1
AOI	RAM	RW	1	**Inhibit Mode**	Displays or sets IO module inhibit state “0”=Not inhibited, “1”=Inhibited

Param ID*	Type	Attributes	Length	Description	
-- Fuel Monitoring Parameters --					
AL1	EROM	RW	1	**Level Sensor Type**	Level Sensor Type: 0=Ultrasonic Sensor 1=L400 2M 2=L400 4M 3=L400 10M
AL2	EROM	RW	4	**Fuel Specific Gravity**	Specific gravity of fuel. Usually between 0820 and 0950 for diesel. Default = 0880
AL3	EROM	RW	1	**Tank Type**	Type of Tank: 1=Linear (cuboid or cylinder on end) 2=Cylinder on it's side 3=User defined tank profile
AL4	EROM	RW	4	**Tank Diameter**	Diameter of tank in mm, 4 digits long. (only needed for tank type 2)
AL5	EROM	RW	4	**Maximum Useable Level**	Maximum useable level in mm, 4 digits.
AL6	EROM	RW	4	**Minimum Useable Level**	Minimum useable level in mm, 4 digits.
AL7	RAM	RO	4	**Measured Level**	Current measured level in mm
ALA-ALP	EROM	RW	4	**User Level Entries**	16 user defined level entries. Only used for tank type 3. As few (min 0) or as many (max 16) can be used in order to define tank level capacity characteristics. Entries are in mm and must be 4 digits long (leading 0's required)
ACA-ACP	EROM	RW	2	**User Capacity Entries**	16 user defined capacity entries. Only used for tank type 3. As few (min 0) or as many (max 16) can be used in order to define tank level capacity characteristics. Each entry is paired with corresponding level entry. Entries are in % of full capacity and must be 2 digits long (leading 0's required)
AF1	RAM	RO	5	**Fuel Consumption**	Fuel consumption in units/hour. Only updated while engine is running (digital input 1 is active). Format nn.nn
AF2	RAM	RO	5	**Average Fuel Cons.**	Average fuel consumption in units/hour over last 32 hours of engine running Format nn.nn
AF3	RAM	RO	1	**Consumption Alarm**	Value "0" = no alarm, "1" = alarm, "2" = fuel Added ***Engine Running:*** Alarm is active if current fuel consumption exceeds average fuel consumption by more than the margin set in parameter 9F4. *Or* If fuel consumption is > 5 units/hour more than the margin set in parameter 9F4 ***Engine Stopped:*** Alarm is active if fuel level decreases by more than the margin set in parameter 9F4
AF4	ROM	RW	5	**Fuel Margin**	Fuel consumption/level alarm margin in units. nn.nn
AF5	EROM	RW	1	**Shared Fuel Tank**	Set to "1" if another generator is able to use the monitored fuel tank.

15.3. M400 Compatibility

In order to allow the M400A to be backwards compatible with existing M400 systems a number of parameter IDs are “remapped” so that a referenced M400 parameter will transparently point to the equivalent parameter in an M400A master and IO module system as tabled below:

15.3.1. M400/M400A parameter re-mapping reference table

Referenced Parameter ID	Remapped Destination Parameter ID	Description
9I1	1I1	gen1 sol
9I2	2I1	gen2 sol
9I3	1I2	gen1 cont
9I4	2I2	gen2 cont
9I5	1I3	gen1 mains
9I6	1I4	gen1 abnormal
9I7	2I4	gen2 abnormal
9I8	1I5	gen1 low fuel
9I9	2I5	gen2 low fuel
9IA	2I6	gen2 hi temp
9IB	1I7	gen1 low water
9IC	1I6	gen1 hi temp
9J1	1J1	gen1 sol
9J2	2J1	gen2 sol
9J3	1J2	gen1 cont
9J4	2J2	gen2 cont
9J5	1J3	gen1 mains
9J6	1J4	gen1 abnormal
9J7	2J4	gen2 abnormal
9J8	1J5	gen1 low fuel
9J9	2J5	gen2 low fuel
9JA	2J6	gen2 hi temp
9JB	1J7	gen1 low water
9JC	1J6	gen1 hi temp
9T1	1T1	Output timer
9T2	2T1	Output timer
9T3	1T4	Output timer
9T4	1T3	Output timer
9V1	1V1	12V supply 1 value
9V2	2V1	12V supply 2 value
9V5	1V5	4-20mA 1 value (0-255)
9V6	2V5	4-20mA 2 value (0-255)
9H1	1H1	gen1 sol
9H2	2H1	gen2 sol
9H3	1H2	gen1 cont
9H4	2H2	gen2 cont
9H5	1H3	gen1 mains
9H6	2H3	gen2 mains
9F1	1F1	Fuel Consumption 1 counts/hour
9F2	1F2	Fuel Consumption 1 32h Average counts/hour
9F3	1F3	Fuel consumption 1 alarm, 1 (alarm), 2 (fuel added)
9F4	1F4	Fuel Consumption 1 alarm threshold, hourly consumption counts above average
9F6	2F1	Fuel Consumption 2 counts/hour
9F7	2F2	Fuel Consumption 2 32h Average counts/hour
9F8	2F3	Fuel consumption 2 alarm, 1 (alarm), 2 (fuel added)
9F9	2F4	Fuel Consumption 2 alarm threshold, hourly consumption counts above average
9X1	1X1	Gen 1 inhibit
9X2	2X1	Gen 2 inhibit
9X3	1X4	Gen 1 Fault Reset
9X4	1X3	Mains monitor phase drop

16. 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 dial-in connection.

16.1. Local terminal connection

A local serial terminal may be connected to the RS232 port 1.

Serial port 1 is available for use as a local console port at any time a GSM CSD call is not active or

The communications format is fixed to 9600bps, no parity and 1 stop bit.

16.2. Remote Connection

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

16.3. 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.

```
Compulogic 1.14 :
```

16.3.1. Console Command Reference

The following commands are available through the console port.

Command get
Description Displays the value of one or more system parameters
Syntax get ppp,[ppp],[ppp]

Response
```
<parameter value>
[<parameter value>]
```

Where ppp = parameter ID

Command getm
Description Displays the value of 20 consecutive system parameters
Syntax getm ppp

Response
```
ppp=<parameter value>
ppp=<parameter value>
ppp=<parameter value>
…
ppp=<parameter value>
```

Where ppp = parameter ID

Command set
Description sets the value of a system parameter
Syntax set ppp=ddd

Response `None (prompt)`

Where ppp = parameter ID and ddd = new parameter data to set.

Command sms
Description Sends an “SMS” message directly to the unit. Used for testing.
Syntax sms message

Response `None (prompt)`

Where message = SMS message to send.

If the SMS message received by the unit results in a reply SMS this will be sent to the console port in the following format:

```
SMS: message
```

Automated SMS messages can also be sent to the console port, e.g. messages generated from rules, by setting “00000000002” as the receiving number.

Note: the sms command is *NOT* available when using a remote, dial-in connection. It is only available to a locally connected terminal.

Command logout
Description Logs the current user off
Syntax logout

Response `Enter Password:`

An automatic logout will occur if no console commands are received for more than 30 minutes.

16.3.2. Setting Multiple Parameters

Multiple parameters can be uploaded to the M400A by sending a simple text file to the console port or remote dial-in connection.

Parameters are set one per line using the same syntax as for the console port.
Comment lines can be added by starting the line with "*/"
Comments can be added to the ends of lines by preceding with a horizontal tab (HT)

Example parameter file:

```
set 9N1=0787650500
set 914=Y
set 901=SiteName
*/
*/ Messages
*/
set 9M0=%901    Test Message
set 9M1=%901    Another Test Message
*/
*/ Rules
*/
set 9P1=if %9I1="1" and %9V2>>"27.5" then send M1 to N0
set 9E1=Y
```

If sending a parameter file using the Hyperterm program it is recommended that a line pacing value of 170mSec is set.

17. Specifications

Interfaces

M400A Master Unit

Digital Inputs	4 x Switch, Relay Contact or DC voltage up to 30V, threshold 2V
Relay Output	1 x Single pole change-over, 200VDC, 1A
DC Voltage Inputs	2 x 3-60VDC measurement inputs, one connected to supply input.
Temperature Probe	2 x Temperature probe inputs. Range -100 to +100°C, resolution 1°C.
Current Sensor	2 x +/- 300A current sensor inputs
RS232 Serial Ports	1 x RS232 serial port used for local console connection.
Format:	9600bps, 8 data bits, 1 stop bit, no parity
Signals:	TXD, RXD, GND
M400A IO Bus	1 x M400A IO bus for connection to IO modules

M400A IO Module (up to four per system)

Digital Inputs	8 x Switch, Relay Contact or DC voltage up to 30V, threshold 2V
Relay Outputs	4 , 3x Single pole change-over, 250VAC, 10A, 1 x NO contact, 250VAC, 10A
4-20mA Current Loop	1 x 4-20mA current loop input with 8 bit accuracy (0-255) and loop disconnection indication.
DC Voltage Inputs	1 x 0-20VDC measurement input. For generator battery monitoring
RS232 Serial Port	1 x RS232 serial ports for AMF panel management
RS485 Serial Port	1 x RS485 serial port for Fuel sensor management
M400A IO Bus	1 x M400A IO bus for connection to IO modules
+12V Output	1 x 12V filtered supply output for fuel sensor

Functions

Programmable Rules	36 x 160 character user programmable rules which specify actions to be taken as a result of individual or logical combinations of input and output states and system parameter values.
Messages	32 x 160 character user programmable messages. Messages can contain variable (system parameter) data.
Numbers	16 x programmable GSM numbers.
Number Groups	4 x programmable number groups of up to 16 numbers each.
Real-time clock	Can be used in rules to perform time related functions.
Output Timers	All outputs can be set on or off indefinitely or for a user programmed pulse time in minutes.
Timers	2 x User programmable minute timers, 2 x User programmable second timers

Mobile Networks

Band	Quad-band 850Mhz, 900Mhz, 1800Mhz or 1900Mhz
RF Power	Class 4 (2W) 900Mhz, Class 1 (1W) 1800Mhz, Class 1 (1W) 1900Mhz.
Antenna	external (fitted) via SMA connector
Compatibility	Fully compatible with all GSM networks.

Electrical

Power (Master)	18-72 VDC, 65mA average.
Power (IO Module)	8-16VDC, 50mA average
Battery Backup	Internal 0.5 Hour battery backup

Environmental

Operating Temperature	-20 - +55oC
Storage Temperature	-40 - +85 oC
Humidity	0-95% non-condensing

Enclosure

Type	Wall mounted powder coated aluminium enclosure
Dimensions	180mm x 105mm x 27mm