Documentation

MastMinder®

F400g

Site Management System
(GPRS and/or Ethernet backhaul)

User Documentation

UM(PP8055-V01)
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Applicable to F400g V5.10 +

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Warranty

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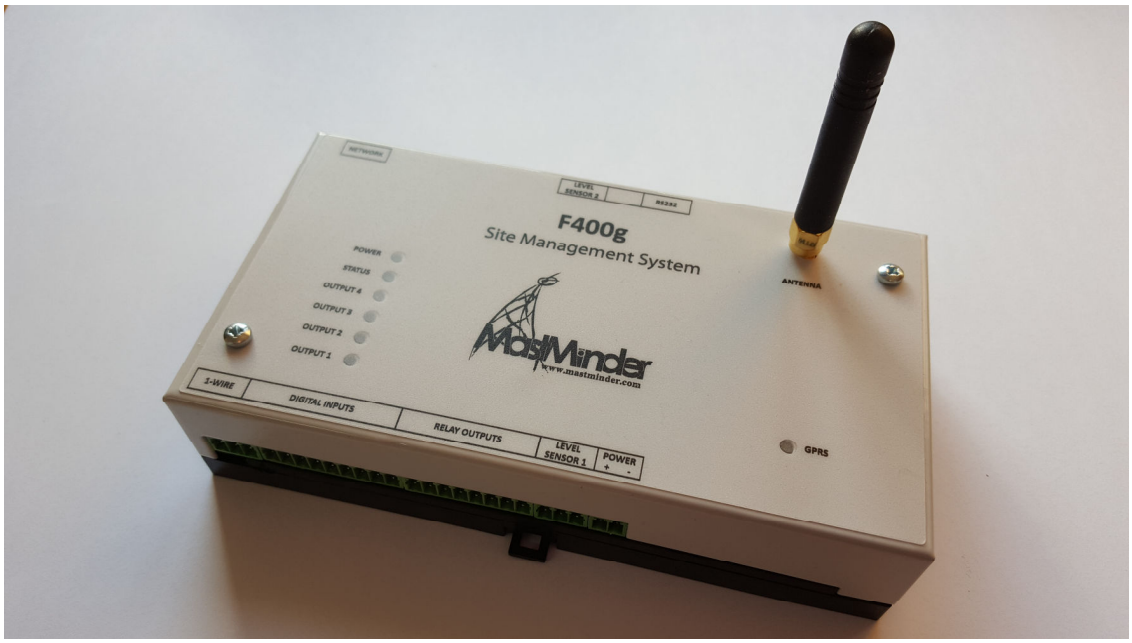
contents

1. Introduction

The **MastMinder® F400g** is an intelligent generator and fuel Management Module which forms the remote (cell site) 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.

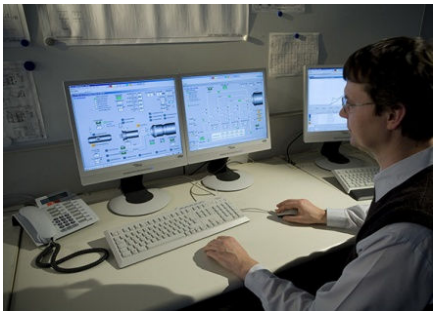


The **MastMinder® F400g** continuously monitors key parameters including mains power, battery voltages, generator function, fuel levels and fuel consumption.

All key measurements are reported back to the MastMinder Network Management System which can then generate operator alerts by email, standard SMS and Android App plus detailed reports for every BTS site in the network. In addition the MastMinder® F400g is able to accept commands from the NMS allowing generator operation and other functions to be directly controlled from the central system and / or mobile phone Android App.

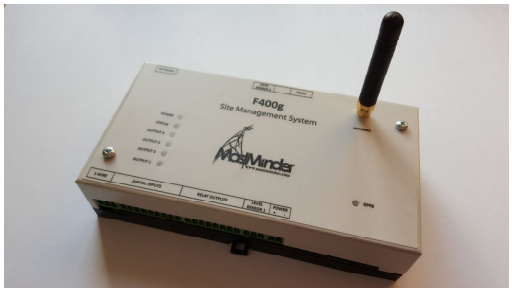
Communication with the MastMinder Network Management system for the F400g model can be configured to use GSM/GPRS or an Ethernet/IP network.

2. System Overview



MastMinder NMS

IP Network



Generator

MastMinder
F400g Unit

Fuel Tank

The MastMinder F400g system monitors generator and fuel system

2.1. Network Compatibility

Ethernet 10baseT or 100baseTX auto negotiation.

2.2. MastMinder F400g I/O interfaces

The F400g unit provides the following interfaces.

- DC supply monitor
- DC power over Ethernet supply monitor
- 2 x 4-20mA fuel level sensor inputs
- 2 x Filtered supply outputs for level sensors
- 8 x Digital inputs
- 1 x 3A Digital Relay Output (change-over relay)
- 3 x 3A Digital relay outputs (Normally open contacts)
- 1 x RS232 local management port
- 1 x 1-Wire compatible interface port
- Ethernet 10/100baseT port
- GPRS Cellular modem

3. Security Features

3.1. Password Protection

With password protection all received command messages must contain a valid password for the command to be accepted by MastMinder F400g.

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.

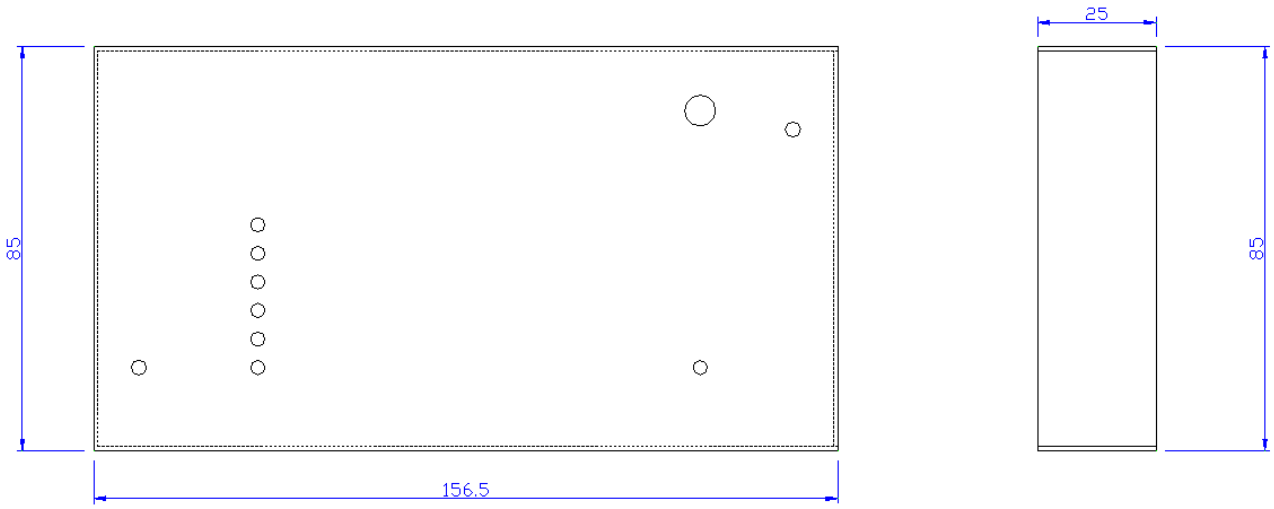
Passwords can be from 1 to 6 characters long and ARE case sensitive.

4. Installation

4.1. Positioning the Unit

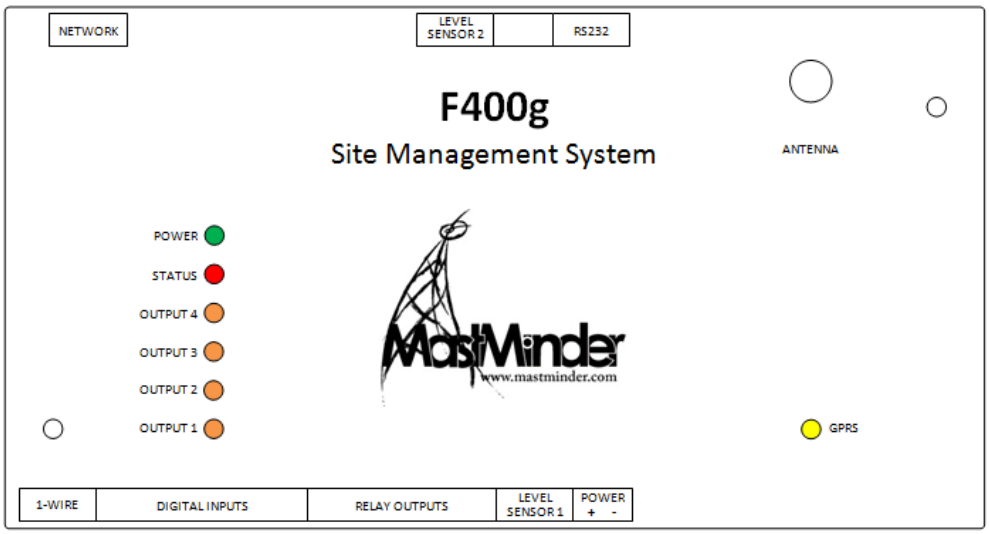
The base unit is housed in a DIN rail mountable enclosure. The unit can be mounted in any orientation but must be installed in a dry area. *The MastMinder F400g unit is not designed to be installed in any outside location where it could be exposed to weather or water.*

4.2. F400g Outline Drawing



5. LED Indicators

The Unit has seven LED indicators located on the front of the unit:



The LED functions are shown in the table below.

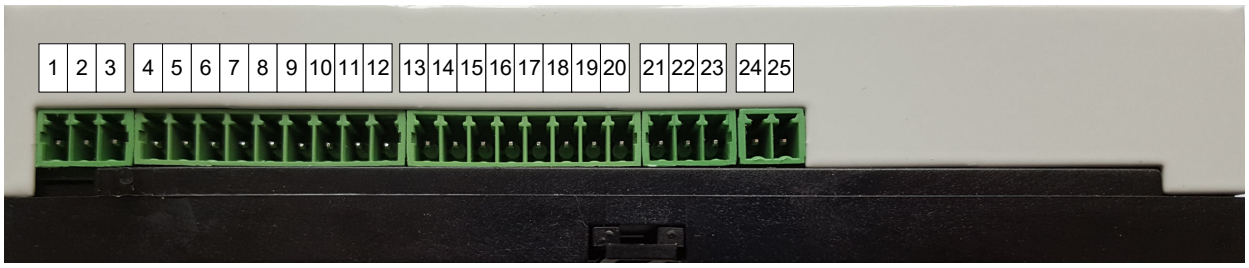
GREEN (Power)	RED (Status)	Orange (Outputs)	YELLOW (GPRS)	Meaning
○	○	⊗	⊗	Unit not powered up
●	✳	⊗	⊗	Normal Start up
●	✳○✳○…	⊗	⊗	Self test fail
●	✳✳ (10 sec)	⊗	⊗	System active
●	⊗	○	⊗	Output Not Active
●	⊗	●	⊗	Output Active
⊗	⊗	⊗	○	GSM Not Powered On
⊗	⊗	⊗	✳ (1 sec)	GSM Trying to Attach
⊗	⊗	⊗	✳ (3 sec)	GSM Attached
⊗	⊗	⊗	✳ ✳ (0.5 sec)	GPRS Connected

LED symbol key

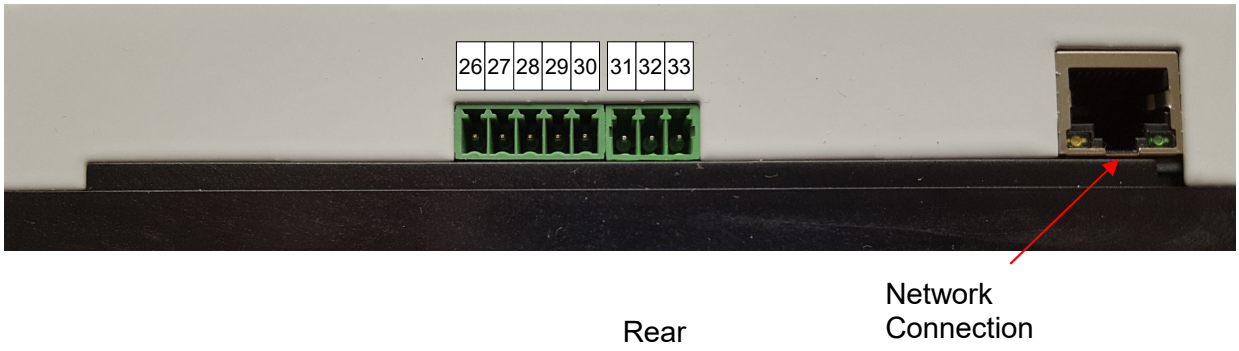
● - LED On
○ - LED Off
✳ - LED Single Flash
✳ (1 sec) - LED repeating flash (repetition rate)
⊗ - Don't care

Power and I/O Signal Connections

All power and IO signal connections to the master unit are made via 3.5mm plug-in terminal blocks.



Front



Rear

Network Connection

The table below shows the IO connection allocations.

F400g Term.	Direction	Description
1	-	Ground (0V)
2	In/Out	1-Wire Interface
3	Out	1-Wire 5.0V Power Supply
4	In	Digital Input 1
5	In	Digital Input 2
6	In	Digital Input 3
7	In	Digital Input 4
8	In	Digital Input 5
9	In	Digital Input 6
10	In	Digital Input 7
11	In	Digital Input 8
12	-	Ground (0V)
13	-	Output 4, NO Relay Contact
14	-	Output 3, NO Relay Contact
15	-	Output 2, NO Relay Contact

16	-	Output 1, NO Relay Contact
17	-	Output 1, NC Relay Contact
18	-	Output 1, Common Relay Contact
19		Outputs 2,3,4 Common Relay Contact
20	-	Ground (0V)
21	-	Ground (0V)
22	In	4-20mA Level Sensor Input 1
23	Out	Level Sensor Filtered Supply Output
24	In	18-75VDC Power Input
25	-	Ground (0V)
26	In	RS232 Serial Terminal Rx
27	Out	RS232 Serial Terminal Tx
28	-	RS232 Serial Ground
29	-	Not Used
30	-	Not Used
31	-	Ground (0V)
32	In	4-20mA Level Sensor Input 2
33	Out	Level Sensor Filtered Supply Output

6. Network Connection

The F400g can be connected to an Ethernet 10baseT or 100baseTX Ethernet network via the standard RJ45 network connector located in the top of the unit.

6.1. Network LED indicators

There are two LED indicators provided on the network connector.

The Yellow LED is lit if the unit is connected to a 100baseTX network.

The Green LED is lit if the network connection is active and will flash when network data is sent or received.

7. GSM Connection

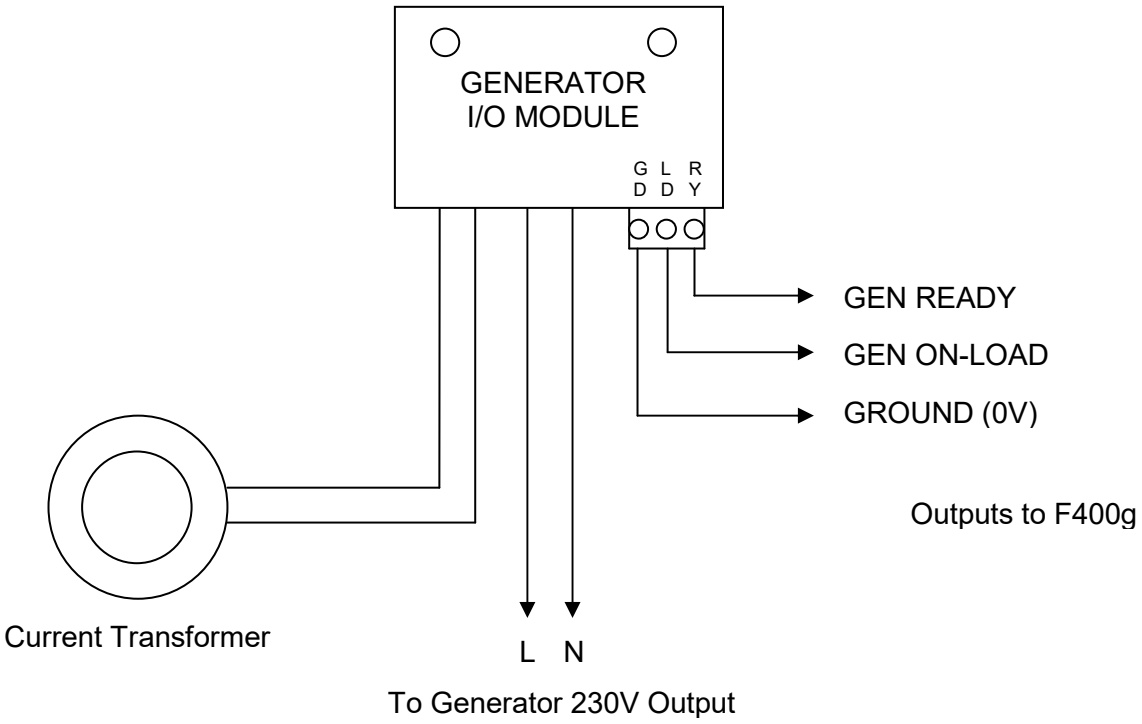
The F400g can use a GSM/GPRS connection to the MastMinder server instead of a hard wired Ethernet connection if required.

The unit is supplied with a quad band antenna. An SMA antenna connector is provided to allow the use of an external antenna if required.

The SIM card is located under the top cover and uses the "micro SIM" format

8. Generator Interface Module

In order to provide compatibility to many different generator and AMF 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 F400g unit.



8.1. Generator Interface Module Installation

1. Locate main generator output circuit breaker.

2. Disconnect the neutral cable from the supply or 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 **supply** side of the circuit breaker

4. Connect the three output signals from the plug-in connector to the F400g digital inputs.

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

9. Fuel Level and Consumption Monitoring

The F400g 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.

10. 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.

10.1. Requesting Parameter Values

Individual system parameters (e.g. IO values) my be read by sending a 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

10.2. Setting Parameter Values

Individual system parameters (e.g. IO values) my be set or updated by sending a 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 IP connection. See the section entitled “System Console Port”.

11. 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 message 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 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 F400g parameters 9M0 to 9MV and can be programmed using a serial terminal as described in the section above “Setting Parameter Values”

12. Input Monitoring and Actions

12.1. 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 a message if a digital input was low.

A complex example would be to send 3 different messages to 5 different recipients & 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)

12.2. 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.

12.3. 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"

12.4. 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.

13. 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.

13.1. F400g 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**	'9045-V01 F400g'
913	ROM	RW	6	**Admin Password**	Up to 6 character full access password. The password is disabled when the string is empty. *Default = None*
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**	000D0640nnn Unit serial number
9U0	RAM	WO	1	**System Reboot**	Writing any value to this parameter will cause the system to reboot
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)
9H1	EROM	RW	8	**Hours Counter 1**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time input 1 is active.
9H2	EROM	RW	8	**Hours Counter 2**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time input 2 is active.
9H3	EROM	RW	8	**Hours Counter 3**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time input 3 is active.
9H4	EROM	RW	8	**Hours Counter 4**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time input 4 is active.
9H5	EROM	RW	8	**Hours Counter 5**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time input 5 is active.
9H6	EROM	RW	8	**Hours Counter 6**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time input 6 is active.
9H7	EROM	RW	8	**Hours Counter 7**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time input 7 is active.
9H8	EROM	RW	8	**Hours Counter 8**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time input 8 is active.
9H9	EROM	RW	8	**Network Down Time**	Non-volatile total hours counter of the form HHHHH:MM. Counts total time the GSM network is unavailable.

Param ID	Type	Attributes	Length	Description	
--Network Parameters --					
9e1	EROM	RW	16	**Unit IP Address (Ethernet)**	nnn.nnn.nnn.nnn
9e2	EROM	RW	16	**Unit IP Subnet Mask (Ethernet)**	nnn.nnn.nnn.nnn
9e3	EROM	RW	16	**Unit IP Gateway Address (Ethernet)**	nnn.nnn.nnn.nnn
9e4	EROM	RW	16	**Message Gateway Server IP Address**	nnn.nnn.nnn.nnn
9e5	EROM	RW	5	**Unit HTTP Port Number**	nnnnn (default 00080)
9e6	EROM	RW	16	**Unit HTTP Username**	
9e7	EROM	RW	16	**Unit HTTP Password**	
9e8	EROM	RW	5	**Message Gateway Server Port Number**	nnnnn (default 30303)
9e9	EROM	RW	16	**Public IP Address**	nnn.nnn.nnn.nnn
9eA	EROM	RW	1	**Use Public IP Address (es)**	Y or N
9eB	EROM	RW	1	**Static or Dynamic IP Address**	S or D
9eC	EROM	RW	5	**TFTP Port Number**	nnnnn (leading 0s req.)
9eD	EROM	RW	1	**Gateway via Ethernet or GPRS**	E or G
9eE	EROM	RW	1	**File Download via Ethernet or GPRS**	E or G
9eF	EROM	RW	16	**Alternate Public IP Address 1**	nnn.nnn.nnn.nnn
9eG	EROM	RW	16	**Alternate Public IP Address 2**	nnn.nnn.nnn.nnn
9eH	EROM	RW	16	**Alternate Public IP Address 3**	nnn.nnn.nnn.nnn
9eI	EROM	RW	16	**Alternate Public IP Address 4**	nnn.nnn.nnn.nnn
9eJ	EROM	RW	1	**Enable GSM/GPRS Modem**	Y or N
9GA	ROM	RW	24	**GPRS APN**	
9GB	ROM	RW	16	**GPRS Username**	
9GC	ROM	RW	16	**GPRS Password**	
9GD	ROM	RW	16	**FTP Server IP Address**	nnn.nnn.nnn.nnn
9GE	ROM	RW	16	**FTP Username**	
9GF	ROM	RW	16	**FTP Password**	
9GG	ROM	RW	64	**Download Filename**	(must have .cff, .cpf or cwf extension)
9GS	ROM	RW	10	**GPRS Status**	GPRS UP, GPRS DOWN, IP/UDP UP
9GI	ROM	RW	16	**GPRS IP Address**	nnn.nnn.nnn.nnn
9GZ	ROM	RW	1	**Start File Download**	Set to any value to start download
915	RAM	RO	4	**IP Network Status**	Status of IP Gateway Connection “UP” or “DOWN”
918	RAM	RO	2	**GSM Signal Strength**	0-20
919	RAM	RO	10	**GSM Modem Status**	No Modem, No Network, Register, OK
91A	RAM	RO	16	**GSM Operator ID**	nnnnn
91B	RAM	RO	16	**GSM Subscriber Number**	nnnnnnnnnn

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** Off - Not enabled Activ - 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
9WW	ROM	RW	16	**Parameter File Version** Current Parameter File Version
9M0-9M5	ROM	RW	160	**User Messages** User defined 'canned' Message. Message can contain parameter 'tags' allowing dynamic data to be included in the message. Messages can consist entirely of Parameter tags.

Param ID	Type	Attributes	Length	Description	
-- I/O Parameters --					
9I1	RAM	RO	1	**Digital Input 1**	Logical value of digital input 1, '0' or '1'
9I2	RAM	RO	1	**Digital Input 2**	Logical value of digital input 2, '0' or '1'
9I3	RAM	RO	1	**Digital Input 3**	Logical value of digital input 3, '0' or '1'
9I4	RAM	RO	1	**Digital Input 4**	Logical value of digital input 4, '0' or '1'
9I5	RAM	RO	1	**Digital Input 5**	Logical value of digital input 5, '0' or '1'
9I6	RAM	RO	1	**Digital Input 6**	Logical value of digital input 6, '0' or '1'
9I7	RAM	RO	1	**Digital Input 7**	Logical value of digital input 7, '0' or '1'
9I8	RAM	RO	1	**Digital Input 8**	Logical value of digital input 8, '0' or '1'
9J1	ROM	RW	1	**Digital Input Level 1**	Active level of digital input 1 (0,1 or -)
9J2	ROM	RW	1	**Digital Input Level 2**	Active level of digital input 2 (0,1 or -)
9J3	ROM	RW	1	**Digital Input Level 3**	Active level of digital input 3 (0,1 or -)
9J4	ROM	RW	1	**Digital Input Level 4**	Active level of digital input 4 (0,1 or -)
9J5	ROM	RW	1	**Digital Input Level 5**	Active level of digital input 5 (0,1 or -)
9J6	ROM	RW	1	**Digital Input Level 6**	Active level of digital input 6 (0,1 or -)
9J7	ROM	RW	1	**Digital Input Level 7**	Active level of digital input 7 (0,1 or -)
9J8	ROM	RW	1	**Digital Input Level 8**	Active level of digital input 8 (0,1 or -)
9V1	RAM	RO	4	**Main Supply Value**	Measured value of external supply, nn.n Volts
9V2	RAM	RO	4	**POE Supply Value**	Measured value of Power over Ethernet supply, nn.n Volts
9V5	RAM	RO	3	**4-20mA (Level Sensor) 1**	Measured value of external 4-20mA input , 255
9V6	RAM	RO	3	**4-20mA (Level Sensor) 2**	Measured value of external 4-20mA input , 0-255
9VB	RAM	RO	4	**4V Supply Value**	Measured value of 4V internal 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.
9X1	ROM	RW	1	**Digital Output Value**	Value of digital output , '0' or '1' This output controls a C/O relay.
9X2	ROM	RW	1	**Digital Output Value**	Value of digital output , '0' or '1' This output controls a N/O relay.
9X3	ROM	RW	1	**Digital Output Value**	Value of digital output , '0' or '1' This output controls a N/O relay.
9X4	ROM	RW	1	**Digital Output Value**	Value of digital output , '0' or '1' This output controls a N/O relay.
9T1	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.
9T2	ROM	RW	4	**Digital Output 2 Timer**	As for 9T1
9T3	ROM	RW	4	**Digital Output 3 Timer**	As for 9T1
9T4	ROM	RW	4	**Digital Output 4 Timer**	As for 9T1
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

Param ID*	Type	Attributes	Length	Description	
-- Fuel Monitoring Parameters Sensor 1 --					
9L1	EROM	RW	1	**Level Sensor Type**	Level Sensor Type: 0=Ultrasonic Sensor 1=L400 2M 2=L400 4M 3=L400 10M
9L2	EROM	RW	4	**Fuel Specific Gravity**	Specific gravity of fuel. Usually between 0820 and 0950 for diesel. Default = 0880
9L3	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
9L4	EROM	RW	4	**Tank Diameter**	Diameter of tank in mm, 4 digits long. (only needed for tank type 2)
9L5	EROM	RW	4	**Maximum Useable Level**	Maximum useable level in mm, 4 digits.
9L6	EROM	RW	4	**Minimum Useable Level**	Minimum useable level in mm, 4 digits.
9L7	RAM	RO	4	**Measured Level**	Current measured level in mm
9L8	ROM	RO	4	**Fuel Height @ 20ma**	Fuel height @ 20mA sensor output nnnn
9LA-9LP	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)
9CA-9CP	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)
9F1	RAM	RO	5	**Fuel Consumption**	Fuel consumption in units/hour. Only updated while engine is running (digital input 1 is active). Format nn.nn
9F2	RAM	RO	5	**Average Fuel Cons.**	Average fuel consumption in units/hour over last 32 hours of engine running Format nn.nn
9F3	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
9F4	ROM	RW	5	**Fuel Margin**	Fuel consumption/level alarm margin in units. nn.nn
9F5	EROM	RW	1	**Shared Fuel Tank**	Set to "1" if another generator is able to use the monitored fuel tank.

Param ID*	Type	Attributes	Length	Description	
-- Fuel Monitoring Parameters Sensor 2 --					
9I1	EROM	RW	1	**Level Sensor Type**	Level Sensor Type: 0=Ultrasonic Sensor 1=L400 2M 2=L400 4M 3=L400 10M
9I2	EROM	RW	4	**Fuel Specific Gravity**	Specific gravity of fuel. Usually between 0820 and 0950 for diesel. Default = 0880
9I3	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
9I4	EROM	RW	4	**Tank Diameter**	Diameter of tank in mm, 4 digits long. (only needed for tank type 2)
9I5	EROM	RW	4	**Maximum Useable Level**	Maximum useable level in mm, 4 digits.
9I6	EROM	RW	4	**Minimum Useable Level**	Minimum useable level in mm, 4 digits.
9I7	RAM	RO	4	**Measured Level**	Current measured level in mm
9I8	ROM	RO	4	**Fuel Height @ 20mA**	Fuel height @ 20mA sensor output nnnn
-- 1-Wire Parameters --					
9a1-9aA	RAM	RO	8	**1-Wire Results**	1-8 digits according to device type
9b1-9bA	ROM	RW	1	**1-Wire Device Type**	1 - T-Sense temperature sensor 2 - MS-TH Temperature measurement 3 - MS-TV Voltage measurement 4- MS-TH Humidity measurement 5 - MastMinder 300A Current sensor 6- MastMinder 100V Voltage sensor 7 - Mastminder Solar Irradiance sensor 9 - MS-TC 20 Amp AC Current Sensor A- Mastminder Temperature sensor
9c1-9cA	ROM	RW	16	**1-Wire Device Address**	nnnnnnnnnnnnnnn

1-Wire Device Type Recommended Slot Usage			
Type (9bn)	**Description**	**Slot**	**Alternate Slot**
1	T-Sense temperature sensor device based on maxim MAX1820PAR	7	8
2	MS-TV / MS-TH device measuring temperature based on DS2438	7	8
3	MS-TV device measuring voltage (0-10V) based on DS2438	1	2
4	MS-TH device measuring Humidity (0-100%) based on DS2438	6	6
5	MastMinder 1-wire +/- 300 Amp DC Current Sensor	9 (main bat)	A (aux or load)
6	MastMinder 1-wire isolated DC 0-100 voltage sensor	3 (main bat)	4 (aux or load)
A	MAX DS18S20 Based temperature sensor	7	8

The above 1-wire slots are only the recommended values and any slot may be used, however type 5 must be entered into the recommended slots if the F400G is to automatically derive additional power information such as Ah, Watts and kWh.
There are also specialist 1-wire commands which may be issued from the Console.
Note that all these commands require only the one device on the 1-wire network at the time of issuing the command. (It is advised only qualified personnel should use these).

Command	Function
1wid	returns the ID of the unit connected on the 1-wire interface
1wzc	calibrate to zero
1wgp	calibrate to a positive gain
1wgn	calibrate to a negative gain

Param ID*	Type	Attributes	Length	Description	
-- DC Energy Parameters --					
9K1	RAM	RO	9	**DC1 Charge Energy**	Total Battery 1 Charge Energy in KWh (see below for calculation details)
9K2	RAM	RO	9	**DC1 Discharge Energy**	Total Battery 1 Discharge Energy in KWh (see below for calculation details)
9K3	RAM	RO	6	**DC1 Power**	Current Battery 1 Charge/Discharge (see below for calculation details)
9K7	RAM	RO	9	**DC1 Charge Ah**	Total Battery 1 Charge Ah (see below for calculation details)
9K8	RAM	RO	9	**DC1 Discharge Ah**	Total Battery 1 Discharge Ah (see below for calculation details)
9K4	RAM	RO	9	**DC2 Charge Energy**	Total Load 1 Charge Energy in KWh (see below for calculation details)
9K5	RAM	RO	9	**DC2 Discharge Energy**	Total Load 1 Discharge Energy in KWh (see below for calculation details)
9K6	RAM	RO	6	**DC2 Power**	Current Load 1 Charge/Discharge Power in W (see below for calculation details)
9K9	RAM	RO	9	**DC3 Charge Energy**	Total Load 2 Charge Energy in KWh (see below for calculation details)
9KA	RAM	RO	9	**DC3 Discharge Energy**	Total Load 2 Discharge Energy in KWh (see below for calculation details)
9KB	RAM	RO	6	**DC3 Power**	Current Load 2 Charge/Discharge Power in W (see below for calculation details)
9KC	RAM	RO	9	**DC4 Charge Energy**	Total Load 3 Charge Energy in KWh (see below for calculation details)
9KD	RAM	RO	9	**DC4 Discharge Energy**	Total Load 3 Discharge Energy in KWh (see below for calculation details)
9KE	RAM	RO	6	**DC4 Power**	Current Load 3 Charge/Discharge Power in W (see below for calculation details)
9KF	RAM	RO	9	**DC5 Charge Energy**	Total Load 4 Charge Energy in KWh (see below for calculation details)
9KG	RAM	RO	9	**DC5 Discharge Energy**	Total Load 4 Discharge Energy in KWh (see below for calculation details)
9KH	RAM	RO	6	**DC5 Power**	Current Load 4 Charge/Discharge Power in W (see below for calculation details)
9KI	RAM	RO	9	**Total Charge Energy**	Total all Loads Charge Energy in KWh (see below for calculation details)
9KJ	RAM	RO	9	**Total Discharge Energy**	Total all Loads Discharge Energy in KWh (see below for calculation details)
9KK	RAM	RO	6	**Total Power**	Current all Loads Charge/Discharge Power in W (see below for calculation details)

14. Battery Power Calculations

kWh IN - 9K1, kWh Out - 9K2, Watts - 9K3, Ah IN - 9K7 & Ah Out - 9K8

If SNMP is used (973 not null & 979 not null) then these are used to make the calculations, else if 1-wire is used (9a9 not null) then 9V1 & 9a9 are used to make the calculations, else no calculations are made.

973 or 9V1	Site Battery voltage 24 or 48 volts
979 or 9a9	Site Battery (973 or 9V1) Current

Resulting Power parameters –

9K1	Total Battery Charge Energy in KWh (973 &979) or (9V1 &9a9)
9K2	Total Battery Discharge Energy in KWh (973 &979) or (9V1 &9a9)
9K3	Current Battery Charge/Discharge Power in W (973 &979) or (9V1 &9a9)
9K7	Total Battery Charge (973 &979) or (9V1 &9a9)
9K8	Total Battery Discharge (973 &979) or (9V1 &9a9)

Load 1 Power Calculations kWh IN - 9K4, kWh Out - 9K5, Watts - 9K6.

If SNMP is used (974 not null & 97A not null) then these are used to make the calculations, else if 1-wire is used (9aA not null) then 9V1 & 9aA are used to make the calculations, else no calculations are made.

974 or 9V1	Load 1 Voltage.
97A or 9aA	Load 1 (974 or 9V1) Current

Resulting Power parameters –

9K4	Total Battery Charge Energy in KWh (974 &97A) or (9V1 &9aA)
9K5	Total Battery Discharge Energy in KWh (974 &97A) or (9V1 &9aA)
9K6	Current Battery Charge/Discharge Power in W (974 &97A) or (9V1 &9aA)

Up to 3 additional Loads (SNMP2 to SNMP4) scenario (SNMP only, not relevant for 1-wire).

These optional extra 3 Load calculations are only relevant to SNMP and not applicable to any 1-wire inputs.
Further to this the F400G (and soon F400E) have the ability to monitor 3 more Load currents in addition to the single load scenario above.

The up to 3 additional Load currents are processed as follows –

Load 2 Power Calculations kWh IN - 9K9, kWh Out - 9KA, Watts - 9KB.

If SNMP is being used to access Load Battery volts & Load Current (9p4 & 9pA not null) then 9K9, 9KA, 9KB can be calculated.

9p4	Is an additional monitored voltage input.
9pA	Is an additional Power (9p4) Current

Resulting Power parameters –

9K9	SNMP 2 Charge Energy	Total SNMP 2 Charge Energy in KWh (9p4 &9pA)
9KA	SNMP 2 Discharge Energy	Total SNMP 2 Discharge Energy in KWh (9p4 &9pA)
9KB	SNMP 2 Power	Current SNMP 2 Charge/Discharge Power in W (9p4 &9pA)

Load 3 Power Calculations kWh IN - 9KC, kWh Out - 9KD, Watts - 9KE.

If SNMP is being used to access Load Battery volts & Load Current (9t4 & 9tA not null) then 9KC, 9KD, 9KE can be calculated.

9t4 Is an additional monitored voltage input.
9tA Is an additional Power (9t4) Current

Resulting Power parameters –

9KC	SNMP 3 Charge Energy	Total SNMP 3 Charge Energy in KWh (9t4 &9tA)
9KD	SNMP 3 Discharge Energy	Total SNMP 3 Discharge Energy in KWh (9t4 &9tA)
9KE	SNMP 3 Power	Current SNMP 3 Charge/Discharge Power in W (9t4 &9tA)

Load 4 Power Calculations kWh IN - 9KF, kWh Out - 9KG, Watts - 9KH.

If SNMP is being used to access Load Battery volts & Load Current (9x4 & 9xA not null) then 9KF, 9KG, 9KH can be calculated.

9x4 Is an additional monitored voltage input.
9xA Is an additional Power (9x4) Current

Resulting Power parameters –

9KF	SNMP 4 Charge Energy	Total SNMP 4 Charge Energy in KWh (9x4 &9xA)
9KG	SNMP 4 Discharge Energy	Total SNMP 4 Discharge Energy in KWh (9x4 &9xA)
9KH	SNMP 4 Power	Current SNMP 4 Charge/Discharge Power in W (9x4 &9xA)

Total Load Power Calculations kWh IN - 9KI, kWh Out - 9KJ, Watts - 9KK.

Resulting Power parameters –

9KI Total Charge Energy - Total Charge Energy in KWh (9K4 + 9K9 + 9KC + 9KF)
9KJ Total Discharge Energy - Total Discharge Energy in KWh (9K5 + 9KA + 9KD + 9KG)
9KK Total Power - Current Charge/Discharge Power in W (9K6 + 9KB + 9KE + 9KH)

The resulting scenario allows us to monitor the following –

Ah IN (Main Batteries)	-	SNMP or 1-wire	(9K7)
Ah OUT (Main Batteries)	-	SNMP or 1-wire	(9K8)
Total Charge Energy (Main Batteries)	-	SNMP or 1-wire	(9K1)
Total Discharge Energy (Main Batteries)	-	SNMP or 1-wire	(9K2)
Current Charge/Discharge Power (Main Batteries)	-	SNMP or 1-wire	(9K3)
Total Charge Energy (Load 1)	-	SNMP or 1-wire	(9K4)
Total Discharge Energy (Load 1)	-	SNMP or 1-wire	(9K5)
Current Charge/Discharge Power (Load 1)	-	SNMP or 1-wire	(9K6)
Total Charge Energy (Load 2)	-	SNMP only	(9K9)
Total Discharge Energy (Load 2)	-	SNMP only	(9KA)
Current Charge/Discharge Power (Load 2)	-	SNMP only	(9KB)
Total Charge Energy (Load 3)	-	SNMP only	(9KC)
Total Discharge Energy (Load 3)	-	SNMP only	(9KD)

Current Charge/Discharge Power (Load 3)	-	SNMP only	(9KE)
Total Charge Energy (Load 4)	-	SNMP only	(9KF)
Total Discharge Energy (Load 4)	-	SNMP only	(9KG)
Current Charge/Discharge Power (Load 4)	-	SNMP only	(9KH)
Total Charge Energy (All above loads)	-	SNMP only	(9KI)
Total Discharge Energy (All above loads)	-	SNMP only	(9KJ)
Current Charge/Discharge Power (All above loads)	-	SNMP only	(9KK)

The design also gives lots of flexibility to have up to 4 independent loads monitored from the same main battery or 4 independent loads on independent batteries or 4 totally independent power systems with their own batteries.

Param ID*	Type	Attributes	Length	Description
-- SNMP Parameters --				
960	ROM	RW	16	**SNMP 1 Community String**
961	ROM	RW	16	**SNMP 1 Agent IP Address** nnn.nnn.nnn.nnn
962	ROM	RW	5	**SNMP 1 Agent Port** nnnn (leading 0s required)
963	ROM	RW	5	**SNMP 1 Enterprise ID** nnnn (leading 0s required)
964	ROM	RW	16	**SNMP 1 TRAP Community String**
970-97F	ROM	RW	16	**SNMP 1 Parameter OIDs** n.n.n. etc.
97G-97N	ROM	RW	16	**SNMP 1 Trap Active Specific IDs** nnnn (leading 0s required)
98G-98N	ROM	RW	16	**SNMP 1 Trap Inactive Specific IDs** nnnn (leading 0s required)
9d1	RAM	RW	1	**SNMP 1 Trap Result Changed Flag**
980-98F	ROM	RW	16	**SNMP 1 Input / Output Format** Digit 1 = SNMP object format: Digit 2 = F400 Output Format: 0 - Integer max 32 bit, units 0 - nnnnn.n (No Leading 0s)) 1 - Integer max 32 bit, deci units 1 - nnnnnnnn (No Leading 0s) 2 - Integer max 32 bit, mili units 2 - +/-nn (No Leading 0s) 3 - Octet (string) 3 - +/-nnn (Space Replaced L0s) 4 - Nul 5 - Integer max 32 bit, 10^-4 units
990-99F	RAM	RO	8	**SNMP 1 Object Result** Format depends on I/O format above
99G-99N	RAM	RO	1	**SNMP 1 Trap Result** 1 or 0
9m0	ROM	RW	16	**SNMP 2 Community String**
9m1	ROM	RW	16	**SNMP 2 Agent IP Address** nnn.nnn.nnn.nnn
9m2	ROM	RW	5	**SNMP 2 Agent Port** nnnn (leading 0s required)
9m3	ROM	RW	5	**SNMP 2 Enterprise ID** nnnn (leading 0s required)
9m4	ROM	RW	16	**SNMP 2 TRAP Community String**
9n0-9nF	ROM	RW	16	**SNMP 2 Parameter OIDs** n.n.n. etc.
9nG-9nN	ROM	RW	16	**SNMP 2 Trap Active Specific IDs** nnnn (leading 0s required)
9oG-9oN	ROM	RW	16	**SNMP 2 Trap Inactive Specific IDs** nnnn (leading 0s required)
9o0-9oF	ROM	RW	16	**SNMP 2 Input / Output Format** Format as for SNMP 1
9p0-9pF	RAM	RO	8	**SNMP 2 Object Result** Format depends on I/O format above
9pG-9pN	RAM	RO	1	**SNMP 2 Trap Result** **1 or 0**
9d2	RAM	RW	1	**SNMP 2 Trap Result Changed Flag**
9q0	ROM	RW	16	**SNMP 3 Community String**
9q1	ROM	RW	16	**SNMP 3 Agent IP Address** nnn.nnn.nnn.nnn
9q2	ROM	RW	5	**SNMP 3 Agent Port** nnnn (leading 0s required)
9q3	ROM	RW	5	**SNMP 3 Enterprise ID** nnnn (leading 0s required)
9q4	ROM	RW	16	**SNMP 3 TRAP Community String**
9r0-9rF	ROM	RW	16	**SNMP 3 Parameter OIDs** n.n.n. etc.
9rG-9rN	ROM	RW	16	**SNMP 3 Trap Active Specific IDs** nnnn (leading 0s required)
9sG-9sN	ROM	RW	16	**SNMP 3 Trap Inactive Specific IDs** nnnn (leading 0s required)
9s0-9sF	ROM	RW	16	**SNMP 3 Input / Output Format** Format as for SNMP 1
9t0-9tF	RAM	RO	8	**SNMP 3 Object Result** Format depends on I/O format above
9pG-9pN	RAM	RO	1	**SNMP 2 Trap Result** **1 or 0**
9d3	RAM	RW	1	**SNMP 3 Trap Result Changed Flag**
9u0	ROM	RW	16	**SNMP 4 Community String**
9u1	ROM	RW	16	**SNMP 4 Agent IP Address** nnn.nnn.nnn.nnn
9u2	ROM	RW	5	**SNMP 4 Agent Port** nnnn (leading 0s required)
9u3	ROM	RW	5	**SNMP 4 Enterprise ID** nnnn (leading 0s required)
9u4	ROM	RW	16	**SNMP 4 TRAP Community String**
9v0-9vF	ROM	RW	16	**SNMP 4 Parameter OIDs** n.n.n. etc.
9vG-9vN	ROM	RW	16	**SNMP 4 Trap Active Specific IDs** nnnn (leading 0s required)
9wG-9wN	ROM	RW	16	**SNMP 4 Trap Inactive Specific IDs** nnnn (leading 0s required)
9w0-9wF	ROM	RW	16	**SNMP 4 Input / Output Format** Format as for SNMP 1
9x0-9xF	RAM	RO	8	**SNMP 4 Object Result** Format depends on I/O format above
9pG-9pN	RAM	RO	1	**SNMP 2 Trap Result** **1 or 0**
9d4	RAM	RW	1	**SNMP 4 Trap Result Changed Flag**

Param ID	Type	Attributes	Length	Description
-- User Parameters --				
9U1	RAM	RW	1	User Parameter
9WC	RAM	RW	8	User Parameter
9WD	RAM	RW	8	User Parameter
9WE	RAM	RW	8	User Parameter
9WF	RAM	RW	8	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
9WO	RAM	RW	8	User Parameter
9WP	RAM	RW	12	User Parameter
9WU	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
9U6	ROM	RW	6	User Parameter
9U7	ROM	RW	6	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
9WW	ROM	RW	16	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. Remote WEB Access

The F400g has an onboard web server which can be accessed via the Ethernet interface (not GPRS) and gives access to a number of the major parameters and interfaces on the F400g.

Web access is from a web browser.

Three pages are available through this interface as follows:

Main home page:

MastMinder F400g

Site Name: SiteName

Type		9055-V01 F400g		Firmware Revision				5.11			
Ethernet Address		000D06500000		Parameter File Version							
				Reboot				Download			
Site Name		SiteName									
IP Address		192.168.0.100		GPRS APN				mobile.o2.co.uk			
Subnet Mask		255.255.255.0		GPRS Username				mobileweb			
Gateway IP Address		192.168.0.1		GPRS Password				password			
Message Server IP Address		81.149.241.183		Download Server IP Address				81.149.241.183			
Download Filename		FW9055-V01-R510.cff									
Date/Time		01 - 01 - 01	00 : 01 : 27					Submit			
Supply	48.2V	Input Qual Time 5		1	2	3	4	5	6	7	8
PoE Supply	----V	Input Config Submit		0	0	0	0	0	0	0	0
Internal Volts	4.1V	Input Value		0	0	0	0	0	0	0	0
4-20mA Input-1	47	Outputs Submit		0	0	0	0				
4-20mA Input-2	81										
Fuel Level	mm	Consumption c/h		00.00	Ave Consumption c/h		00.00				
Sensor Type	0	Tank Height		2039	Fuel Alarm		0				
Tank Type	1	Max Fill Level		2039	Threshold		05.00				
Fuel Sg	0880	Min Fill Level		0000							
Shared Tank	0	Height@20mA		2039				Submit			
System Active	0	Invalid Rule						Submit			
				Console				Rule Settings			

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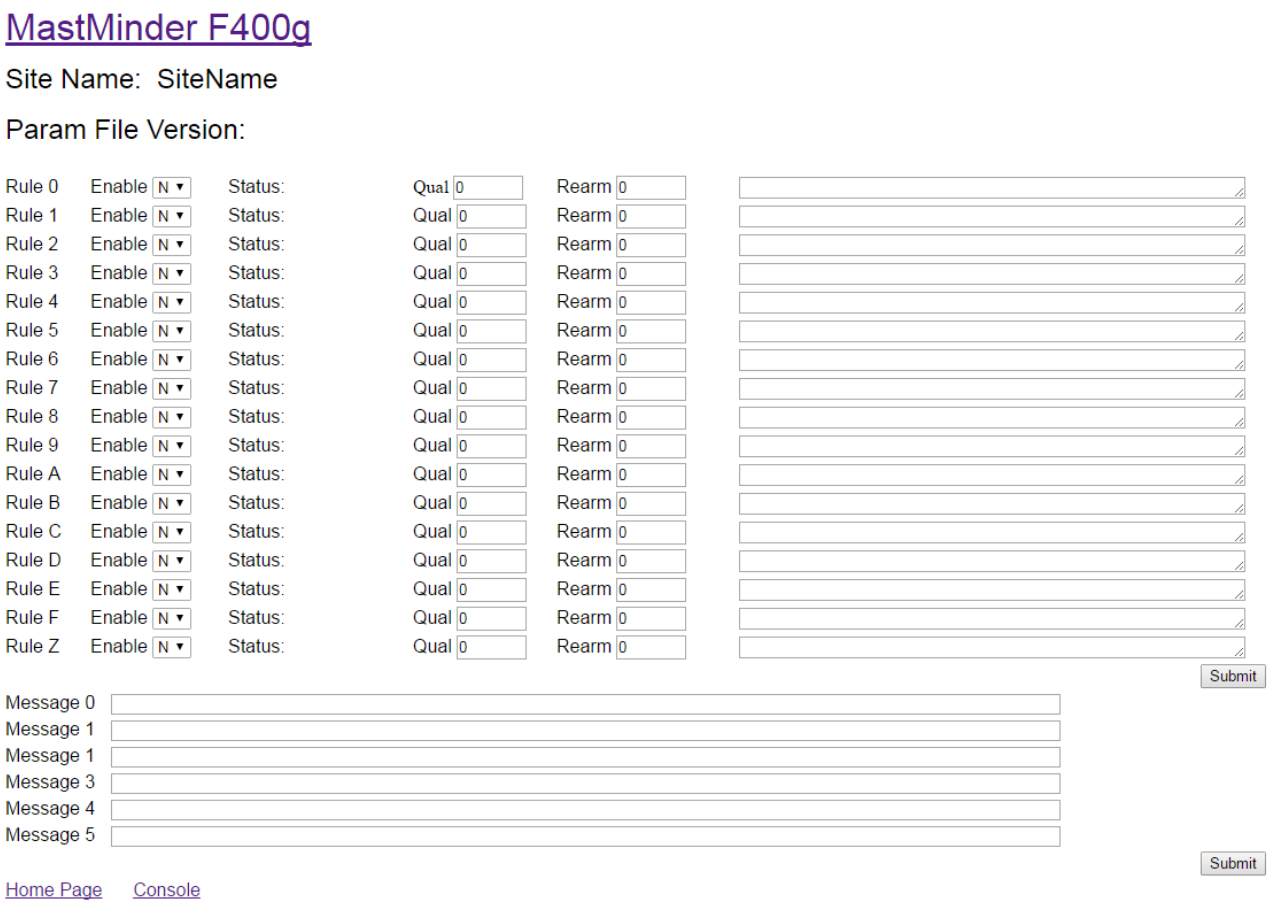
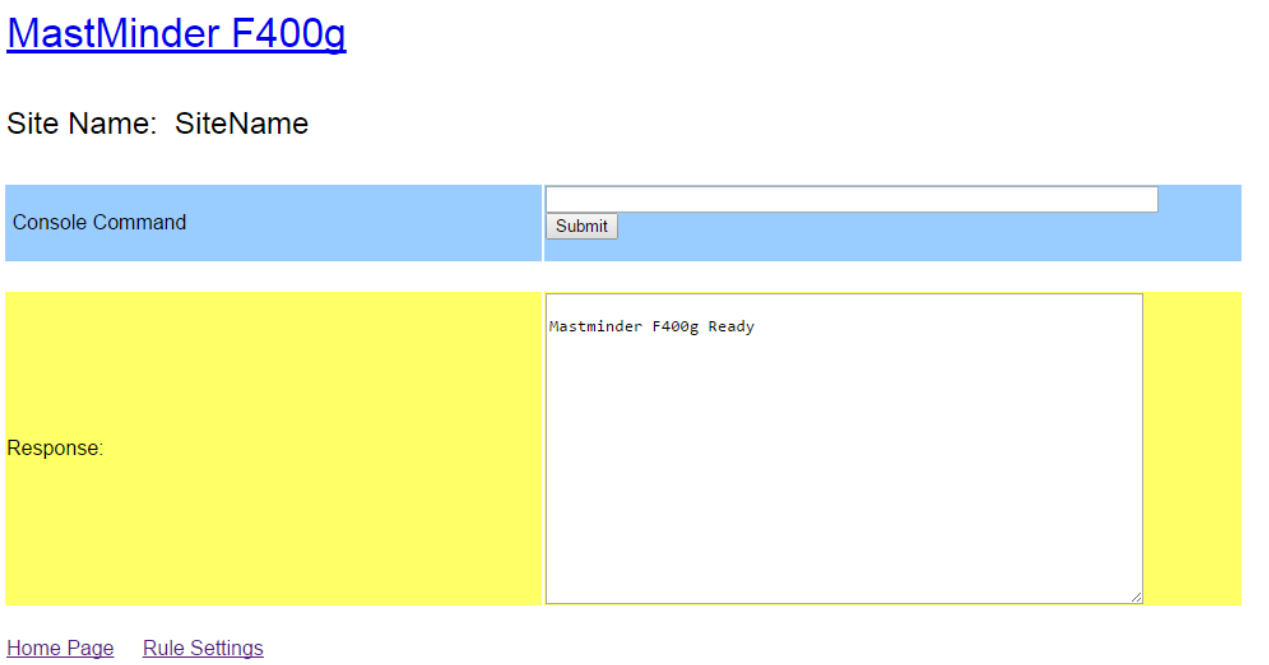
Rule & Message Page:



Console Command Page:



The Console command page can be used to issue F400g local console commands to set or read any parameters not displayed in the other two web pages.

16. System Console Port

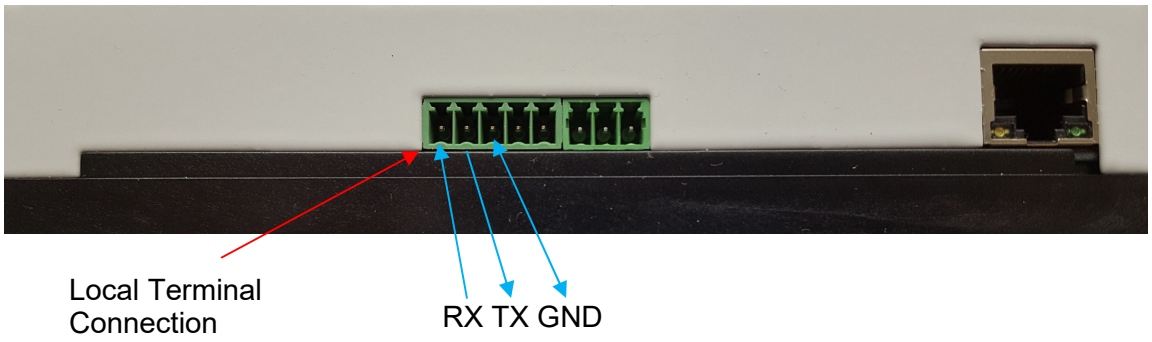
A system console is provided to allow management of the remote site unit via a locally connected RS232 serial terminal (e.g. PC running HyperTerminal)

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.

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



16.2. 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.

```
Mastminder 5.11 :
```

16.2.1. 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 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.

17. Specifications

Interfaces

Digital Inputs	8 x Switch, Relay Contact or DC voltage up to 30V, threshold 2V
Relay Output	1 x Single pole change-over, 200VDC, 1A 3 x Single pole N/O, 200VDC, 1A
4-20mA Current Loop	2 x 4-20mA current loop input with 8 bit accuracy (0-255) and loop disconnection indication.
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
Ethernet IP	10baseT or 100baseTX Ethernet fir IP network communications
GSM/GPRS	Quad band GSM / GPRS / EGDE cellular modem
1-Wire I/O Port	1-Wire compatible interface for sensor connection with +5V device supply capability
+12V Output	2 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	6 x 160 character user programmable messages. Messages can contain variable (system parameter) data.
Real-time clock	Battery backed real time clock
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

Electrical

Primary Power	18-75 VDC, Positive or Negative Ground 150mA average.
POE Power	8-60 VDC, Negative ground 150mA average
Battery Backup	Internal 30 second battery backup

Environmental

Operating Temperature	-20 - +55^{o}C
Storage Temperature	-40 - +85 ^{o}C
Humidity	0-95% non-condensing

Enclosure

Type	DIN rail mounting enclosure
Dimensions	157mm x 85mm x 30mm