# MERLIN
# Commands
# V29

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## 2. INTRODUCTION

### 2.1 Firmware Compatibility

This document is valid for MERLIN firmware V6.00 onwards. Earlier firmware will have some similarities but not all commands will be supported or the syntax may be slightly different.

### 2.2 Important Note on Sending Commands to MERLIN Units

You must use the international format for all mobile communications including the initial '+'.

**Example**

+44 for UK, then the area code without a leading zero, e.g. +447890123456

### 2.3 Text Message Casing

MERLIN text message commands are not case sensitive and can be sent in UPPER, lower or MiXeD casing.

### 2.4 Valid Characters

The MERLIN system will accept the following characters:

! " # % & ' ( ) * + , - . / : ; < = > ?
0 1 2 3 4 5 6 7 8 9
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m n o p q r s t u v w x y z

### 2.5 Invalid Characters

The MERLIN system will not recognise the following characters:

@ £ $ _ ^ { } \ [ ~ ] | € ¡ ¿

### 2.6 Commands to Units

Must always start with "CMD:".

### 2.7 Responses from Units

Text messages will start with "CPM:XXX UNIT:12345678" where XXX is the message type and 12345678 is the unique 8 digit MERLIN serial number.

### 2.8 Message Validity

You will need to set the phone's SMS message validity to 1 hour to prevent an SMS message getting stuck. For example, if an install message gets stuck in the network and arrives 3 days late, the unit clock will be set 3 days slow. Setting the message validity to 1 hour stops this happening. Please refer to your mobile phone user manual for information about this setting.

## 3. QUICK REFERENCE GUIDE TO COMMANDS

The following sections detail the commands used to control MERLIN units. For more information on specific commands, please see the full command descriptions further in this document.

### 3.1 General Commands

The following commands apply to all MERLIN Transformer Rectifier Monitors and MERLIN CP Monitors.

| Command | Description |
|---|---|
| CMD:READ | Take a reading now |
| CMD:CONFIG | Set configuration information |
| CMD:INSTALL | Installs the unit with the given Pipe and Location names |
| CMD:SYNCTIME | Sets the unit clock and/or time zone |
| CMD:GETTIME | Reads the units current clock and date information |
| CMD:REPLACE | Replace unit - i.e. new unit at an existing location |
| CMD:REPORT | Send an additional data report to the HQ(s) |
| CMD:STATUS | Get unit status |
| CMD:TEST | Self-test used for diagnostics |
| CMD:UNITOFF | Turns the unit off - unit advises HQ(s) |
| CMD:GSMSIG | Measure the GSM signal strength over a short period of time - default is 5 minutes |
| CMD:GETLOC | Reports the units PIPE: and LOC: names |
| CMD:RENAME | Changes PIPE: and LOC: names |

### 3.2 MERLIN Transformer Rectifier Monitor Commands

The following commands only apply to MERLIN Super and Excel Transformer Rectifier Monitors with an external relay or a MERLIN Interrupter.

| Command | Description |
|---|---|
| CMD:INTERRUPT | Sets the unit into interrupt mode |
| CMD:GPSINFO | Gets the GPS information |
| CMD:CPOFF | Turns the CP off for a set number of hours* |
| CMD:CPON | Restores CP |

**Note**

*The maximum period of time you can set CP OFF is governed by the MERLIN Transformer Rectifier Monitors firmware version:

V2.07 and earlier versions = 12 hours maximum

V2.08 and later revisions = 672 hours (4 weeks)

On all firmware versions, once the CP OFF period has expired, CP is automatically restored.

### 3.3 MERLIN Transformer Rectifier Monitor Pipeline Locate Commands

The following command only applies to a MERLIN Excel Transformer Rectifier Monitor with a MERLIN Interrupter or DC SSR.

| Command | Description |
|---|---|
| CMD:LOCATE | Sets the unit into Pipeline Locate mode |

## 4. FULL COMMAND DESCRIPTIONS

The following sections describe each command in full.

### 4.1 CMD:READ

Takes a full set of channel readings. Calibration is applied and the results are scaled. The result is sent back to the sender in text format. Different responses are sent by the MERLIN Transformer Rectifier Monitor and MERLIN CP Monitor depending on the model in use.

**Examples**

**MERLIN Transformer Rectifier Monitor (5 Channel)**

| | |
|---|---|
| Message Sent | CMD:READ |
| Response | CPM:020 UNIT:10000001 TR VOLTS:18.00V SHUNT:20.00mV ON:0mV OFF:0mV |

**MERLIN CP Monitor (1 Channel)**

| | |
|---|---|
| Message Sent | CMD:READ |
| Response | CPM:020 UNIT:20000001 POST 1DC:-1000mV 1AC:300mV |

**MERLIN CP Monitor (4 Channel)**

| | |
|---|---|
| Message Sent | CMD:READ |
| Response | CPM:020 UNIT:20000001 POST 1DC:-1000mV 1AC:300mV 1DC(OFF):-900mV 2DC:200mV 3DC:90.00mV 3AC:0.40mV |

From firmware V4.12 onwards the CMD:READ has been extended to have 2 optional parameters OFF: and CH:

OFF: defines a period in seconds, it can be between 2 seconds and 120 seconds e.g. OFF:2
CH: can be CH:1 or CH:2

Together these parameters allow a suitably wired Test Post (with 4 channels) to analyse the depolarisation of a coupon over the period specified by the OFF value. The internal relay is opened for the specified period and the time divided into 10 slots. At the end of each time slot a reading is taken. So a CMD:READ OFF:10 CH:1 will take 10 readings over a period of 10 seconds. The instant off delay is not applied during CMD:READ OFF:

**Example**

**MERLIN CP Monitor (4 Channel)**

| | |
|---|---|
| Message Sent | CMD:READ OFF:10 CH:1 |
| Response | CPM:020 UNIT:20000001 POST OFF:10s CH1 DC mV -900 -800 -700 -600 -500 -400 -300 -100 +0 |

### 4.2 CMD:CONFIG

Command used to (re)configure unit settings such as HQ numbers, measurement times and reports.

The parameters shown below are always returned irrespective of which parameter is changed. One or more parameter(s) may be changed with a single text message. If the command is sent without any parameters, the reply still contains all current configuration settings.

<table>
<tr><th>Parameter</th><th>Description</th><th>Values</th></tr>
<tr><td>UNIT:</td><td>Serial number of unit (cannot be changed)</td><td>8 digits</td></tr>
<tr><td>MTIME:</td><td>Daily measurement time HH:MM (default is 18:00). A measurement time (MTIME) of 18:00 is suggested for two reasons:<br>1) Abriox have observed that this is a peak time for AC interference from national power lines<br>2) If CIPS or DCVG surveys are conducted during the working day the MERLIN CP Monitor measurements will be unaffected</td><td>2 digits for hour<br>2 digits for mins<br>Separated by ‘:’</td></tr>
<tr><td>RDAY:</td><td>Reporting day of week</td><td>3 characters</td></tr>
<tr><td>RTIME:</td><td>Reporting time of day HH:MM</td><td>2 digits for hour<br>2 digits for mins<br>Separated by ‘:’</td></tr>
<tr><td>RETRY:</td><td>Number of report retries: 0, 1 or 2.<br>This is over and above the built-in automatic retries.<br>Default of 0 unless there is a problem.</td><td>Single digit</td></tr>
<tr><td>RETRY-HRS:</td><td>Interval between report retries. Default of 8, and 8 recommended.</td><td>1 digit (max 8 hours)</td></tr>
<tr><td>ACK:</td><td>The type of acknowledgement the unit should request: SMS message (MSG) or a Delivery Report (REP).<br><br>If there are missing messages the following setting combinations are recommended to minimise power consumption and communication costs whilst getting the best results:<br><br>
<table>
<tr><th>Unit Type</th><th>RETRY:</th><th>ACK:</th></tr>
<tr><td>TR</td><td>1</td><td>REP</td></tr>
<tr><td></td><td>2</td><td>MSG</td></tr>
<tr><td>CP or Hemi</td><td>1</td><td>MSG</td></tr>
<tr><td></td><td>2</td><td>MSG</td></tr>
</table>
</td><td>3 characters</td></tr>
</table>

**Table continues on next page**

| | | |
|---|---|---|
| LED: | **OFF**, **DIS** or **ON** (DIS stands for DISCREET).<br><br>The LED settings work as follows:<br><br>**OFF** - in OFF mode, the green LED will flash when the unit is swiped to indicate a reset but at all other times the LEDs will remain off. Note that after using this command the unit will appear to be dead!<br><br>**DIS** - in DISCREET mode (only applicable to the MERLIN CP Monitor) the LEDs will be active after a reset and during the 20 minute installation period. From that point onwards the LEDs are switched off<br><br>**ON** - in ON mode, the status LED flashes briefly at 2 second intervals whilst the unit is awake and able to respond to messages and at 10 second intervals at all other times | 2 or 3 characters |
| INT: | **12V** or **0V**<br>Whether the interrupter output drives 12V or 0V for the interruption (OFF) period.<br>This is the INT output. The FS output is unchanged.<br>This option should be set by text message only at the time of installation because only when physically at the location can the relay type be confirmed.<br>*Note that only MERLIN 6 TR units support this option. Other units will ignore this setting.* | 2 or 3 characters |
| HQ1: | Phone number of HQ1 | Max 16 digits (including '+') |
| HQ2: | Phone number of HQ2 or OFF | Max 16 digits (including '+') |

**Examples**

**Setting the HQ numbers (Single HQ)**

Message Sent CMD:CONFIG HQ1:+447799123456 HQ2:OFF

Response CPM:009 UNIT:20000001 MTIME:18:00 RDAY:MON RTIME:18:00 RETRY:1 RETRY-HRS:6 ACK:MSG LED:ON HQ1:+447799123456 HQ2:OFF

**Changing the Reporting Day and Time**

Message Sent CMD:CONFIG RDAY:TUE RTIME:12:30

Response CPM:009 UNIT:20000001 MTIME:18:00 RDAY:TUE RTIME:12:30 RETRY:1 RETRY-HRS:6 ACK:MSG LED:ON HQ1:+447799123456 HQ2:OFF

**Note**

If a CMD:CONFIG message is sent with no parameters changed, the reply is only sent to the sender. If a CMD:CONFIG is sent changing any parameters, a reply is sent to the sender and the HQ(s).

### 4.3 CMD:INSTALL

This command installs the unit in the HQ(s) database. Before this command is used, a CMD:CONFIG command must be sent to setup the HQ number(s), so that the unit knows where to send its install message.

| Parameter | Description | Values |
|---|---|---|
| PIPE: | Description of area or pipeline | Up to 30 characters |
| LOC: | Description of unit location | Up to 50 characters |

**Example**

Message Sent CMD:INSTALL PIPE:PIPELINE NORTH LOC:MAIN TR FENTON

Response PIPELINE NORTH/MAIN TR FENTON INSTALLED SUCCESSFULLY

The PIPE: and LOC: text are not case sensitive and will be converted to uppercase by the system, the descriptions can include spaces, punctuation and numbers but not "PIPE:" or "LOC:".

For a new install a new unique location reference should be supplied (the term 'location reference' is the combination of 'pipe' and 'location'). To resurrect a unit that has previously been installed at this location, but turned off, no location reference is required, just the 'install' command. When the unit receives the message it sends install messages to the HQ(s). A confirmation is then sent to the sender from the HQ(s) not the unit, in this way the full system integrity is verified.

**Possible Error Messages**

Response INSTALLATION FAILED. THE UNIT SERIAL NUMBER (SERIAL_NUMBER) IS ALREADY ACTIVE IN THE DATABASE

Cause: This unit has been installed previously on the same database. First send unit CMD:UNITOFF then reset before attempting installation again.

Response INSTALLATION FAILED. (PIPELINE_NAME/LOCATION_NAME) IS ACTIVE IN THE DATABASE

Cause: The name you have given the unit already exists in the database. Try again with a different name.

Response INSTALLATION FAILED. THE UNIT'S ADDRESS (TELEPHONE_NUMBER) IS ALREADY ACTIVE IN THE DATABASE

Cause: A unit is already installed (and active) on the database with this telephone number.

**Note**

An install command will always clear all the alarm thresholds. An install command will also set the time and time zone (UK only), it will do this based on the timestamp of the CMD:INSTALL message it receives.

### 4.4 CMD:SYNCTIME

Without an additional parameter, this command sets the unit's clock to the network timestamp decoded from the command message. Any message delay through the network will be apparent in the clock setting.

**The timestamp is the time the message is received by the network from the sender, not the time the message is delivered.** The unit sets its clock then returns what it believes the current time to be.

**Example**

| | |
|---|---|
| Message Sent | CMD:SYNCTIME |
| Response | CPM:001 UNIT:00000001 09:24:00 MON 24 JUN 2011 (TIME ZONE GMT+01:00) |

There is an optional additional parameter of 'TIMEZONE'. This must be in the form of +/-HH:MM. This tells the unit the time zone it is working within; in the example below, 1 hour behind GMT.

**Example**

| | |
|---|---|
| Message Sent | CMD:SYNCTIME TIMEZONE:-01:00 |
| Response | CPM:001 UNIT:00000001 09:24:00 MON 24 JUN 2011 (TIME ZONE GMT-01:00) |

For this SYNCTIME command, and from now on each time a CMD:SYNCTIME is received, the unit will work out what GMT is, then set its clock according to the time zone it is in.

The TIMEZONE parameter only needs to be included in the command when the time zone needs to be set. When a unit is fitted with GPS it is important to set the time zone or the unit will work to GMT, however, this will be done automatically by the CMD:INSTALL command (in the UK).

**Note**
The CMD:INSTALL or CMD:REPLACE commands will also set the time zone (if available in the SMS message, which typically is only in the UK).

### 4.5 CMD:GETTIME

This command reads the units clock and date information and reports back to the sender.

**Example**

| | |
|---|---|
| Message Sent | CMD:GETTIME |
| Response | CPM:002 UNIT:10000001 09:24:30 MON 24 JUN 2011 (TIME ZONE GMT+01:00) |

### 4.6 CMD:REPLACE

This command must be used when a new unit is replacing an existing unit. It allows the HQ software to associate the new unit's data with an existing location.

The new unit must first be configured to set the HQ(s) it needs to report to (i.e. CMD:CONFIG HQ1: +447890123456 HQ2:OFF).

| Parameter | Description | Values |
|---|---|---|
| PIPE: | Exact description of existing area or pipeline | Up to 30 characters |
| LOC: | Exact description of existing unit location | Up to 50 characters |

**Example**

Message Sent CMD:REPLACE PIPE:PIPELINE NORTH LOC:MAIN TR FENTON

Response UNIT (10000002) HAS BEEN INSTALLED AT LOCATION (MAIN TR FENTON)

The PIPE: and LOC: text must be an exact match of the original PIPE: and LOC: text of the unit it is replacing.

To view the existing PIPE: and LOC: information, send a CMD:GETLOC command to the old unit.

**Note**

A CMD:REPLACE command will clear any existing alarm thresholds. A CMD:REPLACE command will also set the time and time zone, it will do this based on the timestamp of the CMD:REPLACE message it receives.

If the replaced unit continues to send in data it will be ignored. To prevent confusion, the new unit to be used for the replacement must either be new to iCPSM or be tagged as 'UNITOFF' (i.e. replacement unit has had HQ numbers programmed and has been sent a CMD:UNITOFF command).

**MERLIN V6.00 firmware and the replace command**

MERLIN firmware V6.00 (and onwards) extends the CMD:REPLACE command. The original method is still available but alternatives have been added.

The format is — CMD:REPLACE UNIT:20000008

In the above example, 20000008 is the currently installed unit at that location on iCPSM

### 4.7 CMD:REPORT

This command makes the unit send an up-to-date report to the HQ(s). This has no effect on the normal reporting cycle of the unit.

**Example**

Message Sent CMD:REPORT

Response No response is returned from this command

### 4.8 CMD:STATUS

This command is used to get the status of a unit. The following parameters are returned:

**Example**

Message Sent CMD:STATUS

Response CPM:007 UNIT:00000001 TYPE:POST CHANS:3 FW:001-V4.06 PWR:N GSM:12
BAT:7200mV MODE:DAILY ALARMS:Y STATUS:00 IN:3 OUT:127
RST:1 CAL:Y

The full explanation of the response is below

<table>
<tr><th>Parameter</th><th>Description</th><th>Values</th></tr>
<tr><td>TYPE:</td><td>Shows whether the unit is a MERLIN Transformer Rectifier Monitor (TR) or MERLIN CP Monitor (POST)</td><td>TR or POST</td></tr>
<tr><td>CHANS:</td><td>Shows the number of channels the unit has</td><td>1, 2, 3, 4 or 5</td></tr>
<tr><td>FW:</td><td>Shows the current version of firmware the unit is running</td><td>Dependant on version</td></tr>
<tr><td>PWR:</td><td>Shows whether the unit is being supplied external power</td><td>Y = Yes or N = No</td></tr>
<tr><td>GSM:</td><td>Shows the unit’s current signal level</td><td>0 - 31 (31 = max signal)</td></tr>
<tr><td>BAT:</td><td>Shows the status of the unit’s battery (in mV). A good battery is usually between 7000mV and 7200mV but this is affected by temperature</td><td>Dependant on battery level</td></tr>
<tr><td>MODE:</td><td>Shows the unit’s operating mode<br>TR Monitor:
<table>
<tr><th>Mode</th><th>Reading Interval</th><th>Daily Report</th><th>Weekly Report</th><th>SMS Send/Receive*<br>* If no (or limited capacity) external 12V then Send/Receive SMS only when reporting</th></tr>
<tr><td>DAILY</td><td>Daily</td><td>No</td><td rowspan="4">Min/Max/ Av</td><td rowspan="3">Always</td></tr>
<tr><td>HOURLY</td><td>Hourly</td><td>All Hourly readings</td></tr>
<tr><td>NORMAL</td><td>Hourly</td><td>No</td></tr>
<tr><td>LOWPWR</td><td>Hourly</td><td>No</td><td>Once a day</td></tr>
</table>
CP Monitor:
<table>
<tr><th>Mode</th><th>Reading Interval</th><th>Daily Report</th><th>Weekly Report</th><th>SMS Send/Receive</th></tr>
<tr><td>DAILY</td><td>Daily</td><td>No</td><td rowspan="3">Min/Max/ Av</td><td>Once a week</td></tr>
<tr><td>HOURLY</td><td>Hourly</td><td>All Hourly readings</td><td>Once a day</td></tr>
<tr><td>DETAIL</td><td>Hourly</td><td>No</td><td>Once a week</td></tr>
</table></td><td>DAILY, NORMAL, HOURLY, DETAIL or LOWPWR</td></tr>
<tr><td>ALARMS:</td><td>Shows whether alarm reporting is enabled</td><td>Y = Yes or N = No</td></tr>
<tr><td>STATUS:</td><td>Factory use only</td><td>2 digits</td></tr>
<tr><td>IN:</td><td>Count of incoming SMS messages</td><td>Up to 5 digits</td></tr>
<tr><td>OUT:</td><td>Count of outgoing SMS messages</td><td>Up to 5 digits</td></tr>
</table>

### 4.9 CMD:TEST

This command initiates a self-test. When complete a status report is returned.

The self-test:

1) Exercises the LEDs and relays
2) Measures the 12V PSU voltage
3) Measures the battery voltages
4) Turns on the analogue circuitry and confirms it is functional

The fact that you can communicate with the unit proves that:

1) The processor is running
2) The GSM modem is operational
3) The processor can communicate with the modem

The self-test result is provided as two digits.

| | |
|---|---|
| Pass | RESULT:00 |
| No external 12V supply | RESULT:01 |
| Low battery | RESULT:02 |

**Note**

If you receive a self-test RESULT: other than 00, 01 or 02, please contact Abriox.

**Examples**

**MERLIN Transformer Rectifier Monitor**

| | |
|---|---|
| Message Sent | CMD:TEST |
| Response | CPM:008 UNIT:10000001 TT:00 RESULT:00 TYPE:TR CHANS:3 FW:001-V4.06 CAL:Y PWR:Y GSM:12 BAT:7159mV GPS:Y GPS ANTENNA OK:Y GPS SATS:10 |

**MERLIN CP Monitor**

| | |
|---|---|
| Message Sent | CMD:TEST |
| Response | CPM:008 UNIT:20000001 TT:00 RESULT:00 TYPE:POST CHANS:3 FW:001-V4.06 CAL:Y GSM:12 BAT:7197mV |

### 4.10 CMD:UNITOFF

This command instructs the unit to turn off permanently, once this command is sent, a site visit is the only way to awaken the unit. In this mode reports are not generated and the unit does not respond to SMS commands. The unit must be manually reset using the magnetic switch to return it to its normal operating state. No LED indication is present on the unit when in this state.

Before the unit turns off it also sends a message to the HQ(s) requesting that it be tagged as 'UNITOFF' in the database. The HQ(s) will no longer expect to see messages from that unit. If messages are received they will be filed as 'unrecognised messages'.

**Example**

| | |
|---|---|
| Message Sent | CMD:UNITOFF |

| | | |
|---|---|---|
| RST: | Shows the number of times the unit has been reset | Up to 5 digits |
| CAL: | Shows whether the unit is calibrated | Y = Yes or N = No |

Response CPM:012 UNIT:10000001 OK UNITOFF

**WARNING**

Once a CMD:UNITOFF command has been sent to a unit it will need a manual magnet swipe to wake it back up. It cannot be woken up remotely.

Be very careful with CMD:UNITOFF commands - always make sure the message validity on the sending phone is 1 hour and never send more than one command to a unit. If this is not done and two CMD:UNITOFF commands are sent, one will wait in the network and may get delivered at some point after the unit is woken up!

When waking up a MERLIN that has been installed but turned off, send a blank CMD:INSTALL after waking up the unit. This does two things: it tells CPSM/iCPSM the unit is back awake; it also sets the clock in the MERLIN. However, note that the alarm thresholds are cleared by this instruction and will then need to be reset.

### 4.11 CMD:GSMSIG

This command resets all parameters associated with the GSM signal measuring feature and starts a measuring period. The duration of the period may be specified in minutes (1 to 10), if omitted the default of 5 minutes is used.

**Example**

Message Sent CMD:GSMSIG MINS:3
Response 1 CPM:014 UNIT:10000001 GSM SIG REQUESTED, WAIT:3 MINS
Response 2 CPM:014 UNIT:10000001 NETWORK SIGNAL MIN:3 AV:6 MAX:10, OVER 3 MIN, (SIGNAL RANGE 0 to 31)

**Note**

The signal levels are in the range 0 to 31 with 31 being the strongest (0 to 31 is defined by the GSM network). This command is generally used for diagnosing GSM signal problems.

### 4.12 CMD:GETLOC

This command returns the unit PIPE: and LOC: details. This is useful when replacing the unit with another as you need to match the PIPE: and LOC: text exactly.

**Example**

Message Sent CMD:GETLOC
Response CPM:017 UNIT:10000001 PIPE:SOUTH LOC:TEST POST 57

### 4.13 CMD:RENAME

This command is used to change the pipeline name (PIPE:) and/or the location description (LOC:) text on an existing unit. Renaming a unit should ideally be sent from iCPSM as the system needs to verify the new name is valid, however, if you decide that the name of the unit needs to be changed in the field, you can use this command.

| Parameter | Description | Values |
|---|---|---|
| PIPE: | Description of existing area or pipeline | Up to 30 characters |
| LOC: | Description of existing unit location | Up to 50 characters |

**Example**

Message Sent CMD:RENAME PIPE:PIPELINE NORTH LOC:MAIN TR FARMHOUSE

Response No response is returned from this command

**Note**

It is highly recommended any name changes be carried out via iCPSM to make the process more manageable.

### 4.14 CMD:INTERRUPT

This command sets the MERLIN Transformer Rectifier Monitor into interruption mode.

| Parameter | Description | Values |
|---|---|---|
| ON:X.X OFF:X.X | ON and OFF patterns | See below for rules |
| START: | Whether the interruption cycle should start with the ON or the OFF.<br>*Note that only MERLIN 6 TR units support this option. Other units will ignore this setting.* | ON or OFF |
| END | Ends the current interrupt output pattern | |
| STATUS | Displays the current interrupt status | |

With this command you can:

1) Set interruption patterns for the Transformer Rectifier output relay
2) Close the Transformer Rectifier output relay (and end any pattern being output)
3) Ask what the current interruption status is

The patterns that are supported cater for both CIPS and DCVG surveys. CIPS surveys usually require the majority of the pattern to be ON to maintain the CP protection of the pipeline. DCVG surveys are the reverse and usually have a longer OFF than ON so that a short "blip" of ON can be seen by the survey tool. The interruption pattern setting can be given in seconds or seconds to 1 decimal place (the actual pattern precision is 1ms).

The following rules must be adhered to when selecting an interrupt pattern or the command will be refused:

MERLIN 6 units

- Cycles 10s and under can have the ON and OFF set to 1 decimal place
- Cycles longer than 10s need to be whole seconds, both the ON and the OFF
- Maximum ON or OFF of 120s
- Minimum complete cycle = 1 second

- Maximum complete cycle = 240 seconds
- Complete cycles must be whole seconds
- Multiples of cycles must fit exactly within 1 hour
- Cycles are synchronized from the top of the hour

MERLIN units older than MERLIN 6

- Minimum OFF = 0.1 seconds
- Maximum OFF = 4 seconds
- Minimum ON = 0.1 seconds
- Maximum ON = 59.9 seconds
- Minimum complete cycle = 1 second
- Maximum complete cycle = 60 seconds
- Complete cycles must be whole seconds
- 60 seconds must be divisible by the complete cycle time

**Examples**

**Start an Interruption**

| | |
|---|---|
| Message Sent | CMD:INTERRUPT ON:0.8 OFF:0.2 START:OFF |
| Response | CPM:026 UNIT:10000001 INTERRUPT OK, ON:0.8s OFF:0.2s, START:OFF, TR READS OFF, SATELLITES:5 |

**End an Interruption**

| | |
|---|---|
| Message Sent | CMD:INTERRUPT END |
| Response | CPM:026 UNIT:10000001 OK, CP IS ON, INTERRUPTING IS OFF |

**Note**

The unit will respond with a confirmation message. A MERLIN CP Monitor will ignore this command and respond with a bad command message. If an invalid interrupt cycle is requested or there are any problems, the unit will respond with an error message to advise why. Possible causes of error messages can be invalid cycles, no external power or no GPS synchronisation.

Where the ON period or OFF period is too short for the MERLIN Transformer Rectifier Monitor to take readings during interruption the MERLIN will automatically disable reads (whilst interrupting only). The response indicates whether the MERLIN is able to take readings or not.

The MERLIN Transformer Rectifier Monitor will still continue to check the AC power even if it cannot take the other readings. The omitted readings will not affect the weekly min/max/average report.

Anything other than an interrupt status request will result in a response not only to the sender but also to the HQ(s).

When interrupting the blue LED on the MERLIN Transformer Rectifier Monitor is lit during the OFF period. The OFF period is the start of the cycle and always starts at 00 seconds of each minute (UTC time).

All MERLIN units will automatically be synchronised in time with each other provided they have GPS lock. The syn-

chronisation error is less than 1ms. If interruption is started before the GPS has lock the cycle will be corrected and brought into synchronisation when GPS lock is acquired. At a new installation when power is first applied it can take 15 minutes for the GPS to fully lock.

### 4.15 CMD:GPSINFO

This command reports the unit's position, the number of satellites it can see and the status of the GPS and GPS antenna. The GPS position is reported as latitude, longitude in degrees. The latitude and longitude can be entered directly into Google Maps or Google Earth to show the position.

This command can only be used with MERLIN Transformer Rectifier Monitors with GPS. A MERLIN CP Monitor will respond with: CPM:031 UNIT:20000001 ERROR, BAD COMMAND.

**Example**

| | |
|---|---|
| Message Sent | CMD:GPSINFO |
| Response | CPM:031 UNIT:10000001 GPS VALID:Y LAT:51.4301 LONG:-2.6527 SATELLITES:4 ANTENNA OK:Y |

If the command is sent to a MERLIN Transformer Rectifier Monitor that does not have GPS fitted, the unit will respond with CPM:031 UNIT:10000001 NO GPS FITTED.

**Note**

GPS VALID can be Y or N and indicates valid time and position information being obtained. ANTENNA OK can be Y or N. Satellites can be 0 to perhaps 12. Lat and Long are given to 4 decimal places and can be positive or negative (4 decimal places gives the position to approximately 5 metres).

Ranges are:

+/- 90 for latitude (North/South from equator)
+/- 180 for longitude (from Greenwich Meridian line)

### 4.16 CMD:CPOFF

This command opens the relay for a specified number of hours, effectively turning the CP off. This command will end any other interrupt activity. This command can only be used with MERLIN Transformer Rectifier Monitors. A MERLIN CP Monitor will respond with CPM:032 UNIT:20000001 ERROR, BAD COMMAND.

**Example**

| | |
|---|---|
| Message Sent | CMD:CPOFF 2 |
| Response | CPM:032 UNIT:10000001 OK, CP OFF UNTIL 12:17:01 WED 4 MAY 2011 (TIME ZONE GMT+1:00) |

Possible responses prior to firmware V2.08 are:

CPM:032 UNIT:10000001 OK, CP OFF UNTIL 12:17
CPM:032 UNIT:10000001 ERROR, NO EXTERNAL POWER
CPM:032 UNIT:10000001 ERROR, INVALID NUMBER OF HOURS

From firmware V2.08 onwards the unit responds with the time and date the CP will be restored. Possible responses from are:

CPM:032 UNIT:10000001 OK, CP OFF UNTIL 12:17:01 MON 1 APR 2009 (TIME ZONE GMT+1:00)
CPM:032 UNIT:10000001 ERROR, NO EXTERNAL POWER
CPM:032 UNIT:10000001 ERROR, INVALID NUMBER OF HOURS

If the command is successful the result is a response not only to the sender but also to the HQ(s). When the CP is restored the standard CPON message is sent to the HQ(s) and the requester.

**Note**
Prior to firmware V2.08 a maximum of 12 hours can be selected. Firmware V2.08 or later will accept 1 to 672 hours (4 weeks).

### 4.17 CMD:CPON

This command will end both a CMD:CPOFF and a CMD:INTERRUPT command, effectively turning CP back on. This command can only be used with MERLIN Transformer Rectifier Monitors. A MERLIN CP Monitor will respond with CPM:033 UNIT:20000001 ERROR, BAD COMMAND.

**Example**
Message Sent CMD:CPON
Response CPM:033 UNIT:10000001 OK, CP IS ON, INTERRUPTING IS OFF

If the command is successful the result is a response not only to the sender but also to the HQ(s).

### 4.18 CMD:LOCATE

This command is to be used with a pipe locator to trace a pipeline route. Only the MERLIN Excel Transformer Rectifier Monitor installed with a MERLIN Interrupter or MERLIN DC SSR can use this feature.

| Parameter | Description | Values |
|---|---|---|
| FREQ: | Sets the frequency of the locate signal (in Hz). | 30Hz to 1024Hz |
| HOURS: | Number of hours to run the locate signal | 1 to 24 (default is 4) |
| END | Ends the current locate signal output | |

**Examples**
**Start a Locate Output**
Message Sent CMD:LOCATE FREQ:512 HOURS:12
Response CPM:041 UNIT:10000001 LOCATE OK, FREQ:512Hz (HIGH POWER) UNTIL 12:17:01 MON 1 APR 2009 (TIME ZONE GMT+1:00)

**End a Locate Output**
Message Sent CMD:LOCATE END
Response CPM:041 UNIT:10000001 OK, CP IS ON, INTERRUPTING IS OFF

If the requested hours are invalid, or omitted, then the default of 4 hours will be used.

Possible error responses are of the form:

CPM:041 UNIT:10000001 ERROR, NO EXTERNAL POWER
CPM:041 UNIT:10000001 ERROR, INVALID NUMBER OF HOURS
CPM:041 UNIT:10000001 ERROR, INVALID FREQUENCY (30Hz to 1024Hz allowed)
CPM:041 UNIT:10000001 ERROR, UNIT DOESN'T SUPPORT LOCATING

**Note**

To use this feature you must use a MERLIN Excel Transformer Rectifier Monitor installed with a MERLIN Interrupter or MERLIN DC SSR (AC SSRs will not work).

Whilst locate is active, the blue LED on the MERLIN Excel Transformer Rectifier Monitor will illuminate.

## 5. ADDITIONAL INFORMATION

The following section details further important information on the use, commands and features of MERLIN Transformer Rectifier Monitors and MERLIN CP Monitors.

### 5.1 Naming Conventions

When naming MERLIN units, it is important to give them a unique location reference. The term 'location reference' is the combination of the 'pipe' and 'location' (PIPE: and LOC:) details given to a MERLIN unit. All location references must be unique i.e. two separate geographical locations must not have the same location references.

**Example 1 - Correct Method** ✓
Location A = CMD:INSTALL PIPE:WEST LOC:UNIT A
Location B = CMD:INSTALL PIPE:WEST LOC:UNIT B

In example 1 above, both units have been installed on the same pipeline (PIPE:WEST) but have been given unique location ID's (LOC:UNIT A and LOC:UNIT B). This is the correct method of naming.

**Example 2 - Incorrect Method** ✗
Location A = CMD:INSTALL PIPE:EAST LOC:UNIT A
Location B = CMD:INSTALL PIPE:EAST LOC:UNIT A

In example 2 above, both units have been installed on the same pipeline (PIPE:EAST) but have been given the same location ID's (LOC:UNIT A), this will cause data confusion and the system will fail.

The only way you can ever use the same location ID is if the locations (units) reside on separate pipes:

**Example 3** ✓
Location A = CMD:INSTALL PIPE:NORTH LOC:UNIT D
Location B = CMD:INSTALL PIPE:SOUTH LOC:UNIT D

In example 3 above, the units have been installed on different pipelines (NORTH and SOUTH) but have been given the same location ID's (LOC:UNIT D). Even though the units have the same location ID (UNIT D), as they reside on separate pipes the location reference is unique for each unit.

### 5.2 Replacing Units

The command CMD:REPLACE must be used when a new unit is being installed at an existing location reference (i.e. a new unit replacing an existing unit). The HQ(s) will assign the new unit to the location reference. From this time forward, data from previous units assigned to this location reference will be ignored. The new unit to be used for the replacement must either be new to the system or be tagged as 'UNITOFF'.

**Note**
Sending a CMD:UNITOFF command to the old unit may not be possible if the unit is faulty, so this is not essential.

The new unit must first be configured to set the HQ(s) it needs to report to by using the CMD:CONFIG command.

### 5.3 MERLIN LEDs

The MERLIN Transformer Rectifier Monitor and the MERLIN CP Monitor incorporate LEDs that can help diagnose problems or notify the user of the current status. In general:

- Green - shows processor activity
- Red - indicates an error condition
- Blue - indicates an interrupt event

A MERLIN Transformer Rectifier Monitor with AC power will remain active most of the time (2 second LED flash). A MERLIN CP Monitor will stay active for 20 minutes after a reset (2 second LED flash) but after that will snooze (10 second LED flash) until it needs to report in. For further details on the MERLIN LEDs, please refer to the MERLIN LED Descriptions document (available from www.abriox.com).

## 6. NOTES

Feel free to use this section to write your own notes, tips and cheats to aid future installations.

# MERLIN
# Commands
# V29

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