



CMG- EAM-R

Quick-Start Guide

Part No. MSH-EAM-
0004

Designed and
manufactured by
Güralp Systems
Limited
3 Midas House,
Calleva Park
Aldermaston RG7
8EA
England

Proprietary Notice: The information in this manual is proprietary to Güralp Systems Limited and may not be copied or distributed outside the approved recipient's organisation without the approval of Güralp Systems Limited. Güralp Systems Limited shall not be liable for technical or editorial errors or omissions made herein, nor for incidental or consequential damages resulting from the

furnishing, performance, or usage of this material.

Issue A February 2012

Table of Contents

1 Introduction.....	3
2 Getting started.....	4
2.1 Configuring networking.....	4
2.1.1 DHCP.....	4
2.1.2 APIPA.....	4
2.1.3 Static addressing.....	4
2.1.4 Discovering dynamically allocated addresses.....	5
2.2 Hook-up diagrams.....	7
2.2.1 Multiple CD24-R8s with GPS synchronisation.....	7
2.2.2 Multiple CD24-R8s with GPS synchronisation.....	8
2.3 Operation.....	9
2.3.1 The LCD display.....	9
2.3.2 The FLUSH button.....	10
2.3.3 Connectors.....	10
3 Connector pin-outs.....	12
3.1 Front panel.....	12
3.1.1 Console.....	12
3.2 Rear panel.....	13
3.2.1 Power.....	13
3.2.2 Time.....	13
3.2.3 Data.....	14
3.2.4 Ethernet.....	14
3.2.5 USB.....	15
4 Revision history.....	16

1 Introduction

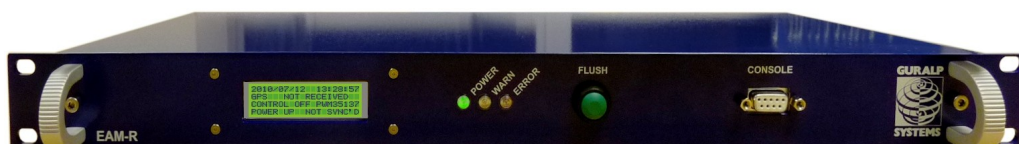
The CMG-EAM-R is a rack-mounted data acquisition, processing, storage and communications unit based on the CMG-EAM embedded acquisition module. The unit can be configured and controlled using a web-based interface. Security and fire-wall features support direct connection to the internet for remote operation.

The EAM-R is particularly well suited for use with multiple CMG-CD24-R8 rack-mounted digitiser but can be used in a wide variety of other applications.

The EAM-R houses an Intel PXA270 32-bit processor running at 312MHz with 64Mb of RAM and 512Mb of on-board flash. The unit is equipped with 100BASE-TX Ethernet, three serial ports and seven USB ports.

The EAM-R runs the open-source Linux operating system and Güralp Systems' Platinum firmware, providing:

- Data acquisition:
 - Data can be acquired in various formats via USB, Ethernet or serial ports;
- Recording:
 - Data can be recorded to a mass storage device or network-attached storage in a variety of standard formats;
- Data forwarding:
 - GCF output via serial port or Scream Server (TCP/UDP);
 - SEEDlink output over TCP/IP;
 - CD1.1 output;
 - Güralp Data Interconnect (GDI) can be used for interchanging data between CMG-EAM-Rs, CMG-EAMs and CMG-NAMs;
- Processing:
 - The EAM-R has sophisticated data-processing capabilities including triggering.



2 Getting started

The following steps will enable you to connect and start using your CMG-EAM-R.

2.1 Configuring networking

There are three ways in which your EAM-R can acquire a network address, DHCP, APIPA or static configuration.

2.1.1 DHCP

If the EAM-R is connected to a network which includes a DHCP (Dynamic Host Configuration Protocol) server, the EAM-R will automatically obtain an IP address from the server. You can either consult the DHCP server's log file to determine which address has been allocated or try one of the techniques described in section 2.1.4 on page 6.

2.1.2 APIPA

Many modern systems support Automatic Private IP Address (APIPA) allocation (also known as “link-local addressing”). On networks without a DHCP server, computers can negotiate addresses in the range 169.254.0.0 to 169.254.254.255 (or in the block `fe80::/64` for IPv6 systems). This scheme will, for example, allocate addresses to both systems if the EAM-R is connected directly to a laptop running Windows. To determine which address has been allocated, use one of the techniques described in section 2.1.4 on page 6.

2.1.3 Static addressing

You can configure your EAM-R to use a static IP address by connecting a PC running a terminal emulator (such as PuTTY, HyperTerm or minicom) to the console port on the front panel. Configure your emulator for a line speed of 38,400 with no hardware or software flow control.

Once connected, you will be presented with a login prompt. Enter the username `root` and the password `guralp3` when prompted. The password will not be displayed as you type it.

Once logged in, issue the following command:

```
eam999 ~ # ip addr add 192.168.0.1/24 dev eth0
```

replacing `192.168.0.1/24` with the desired IP address. It must be specified in CIDR format where the actual address is followed by the number of bits of the network mask. The above example uses `192.168.0.1` with a netmask of `255.255.255.0` (24 bits of network address). A PC connected to this

network could communicate with the acquisition module if it was configured to use an IP address of (for example) 192.168.0.2 with a matching netmask of 255.255.255.0.



Note: IP addresses assigned using this method will be lost if the unit is rebooted. To permanently assign an IP address, refer to the Platinum manual, MAN-EAM-0003, available from www.guralp.com

If you wish to connect to the EAM-R from a PC, they must either both be on the same subnet (usually the first three numbers of the IP address) or be able to connect to each other via routers.

In the latter case, you will need to tell the acquisition module the address of its default router. Please refer to the Platinum manual, MAN-EAM-0003, for more details.

2.1.4 Discovering dynamically allocated addresses

There are three ways to discover a dynamically allocated address. You can read it from the unit's LCD display, you can connect to the serial port and enquire or you can use a broadcast address in Scream.

2.1.4.1 Using the serial port

To use the serial port, connect a terminal emulator (as described in section 2.1.3 on page 5) and issue the command:

```
ip addr show dev eth0
```

You will see output like

```
eam999 ~ # ip addr show dev eth0
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc
pfifo_fast qlen 1000
    link/ether 00:50:c2:40:54:75 brd ff:ff:ff:ff:ff:ff
    inet 192.168.0.101/24 brd 192.168.1.255 scope global eth0

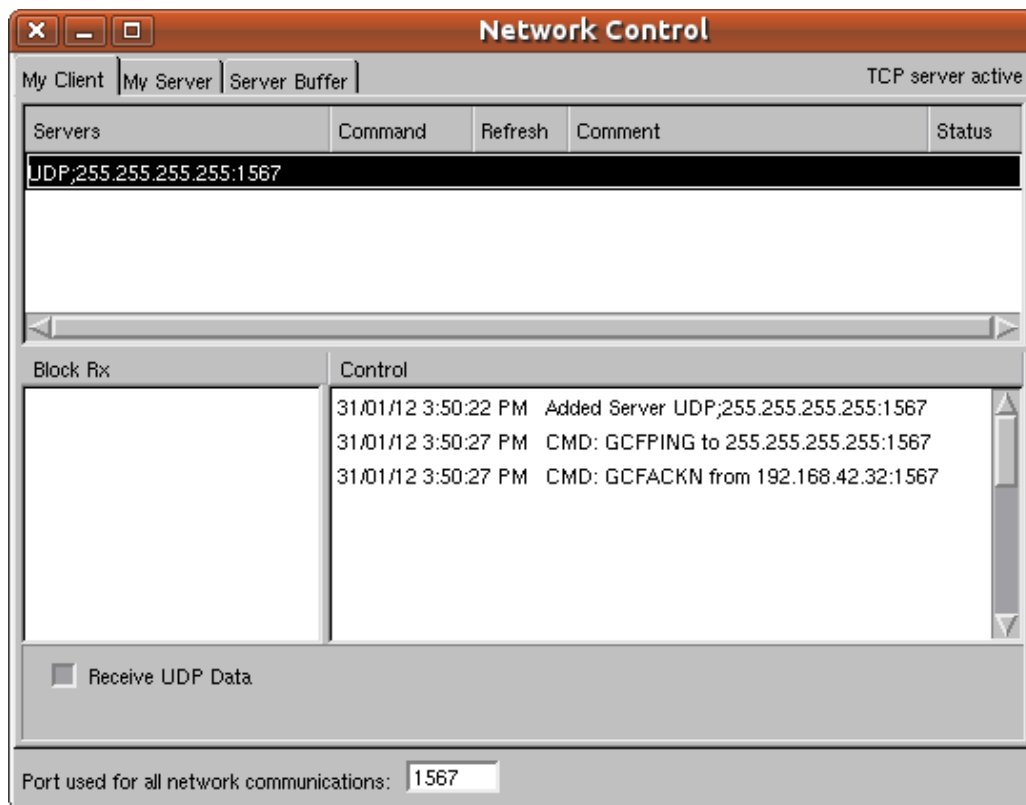
    inet6 fe80:250:c2ff:fe40:5475/64 scope link
    valid_lft forever preferred_lft forever
eam999 ~ #
```

The first line of the output should contain the word UP, confirming that the adaptor has been enabled. The IP address that has been assigned is shown on the line beginning `inet` - in this case, it is 192.168.0.101 (with a netmask of 24-bits indicated by /24).

2.1.4.2 Using Scream

Scream is a software package for **Seismometer Configuration, Real-time Acquisition and Monitoring**, developed by Guralp Systems. To obtain a free copy of Scream, please send an email to scream@guralp.com, describing briefly your equipment and the organisation for whom you are working. For more information, please see www.guralp.com/scream.

To determine the IP address of your EAM-R(s), start Scream and open the network control window (**Ctrl** + **N**). Key **Ins** to add a new UDP server and enter the address 255.255.255.255 – this is a broadcast address that will be recognised by all hosts on the network. The new server will appear in the Servers list: click on it once to highlight it and then key **Ctrl** + **P**. This sends a “GCFPING” packet to which all GCF servers will reply. The address of your EAM-R will appear in the control pane as shown below:



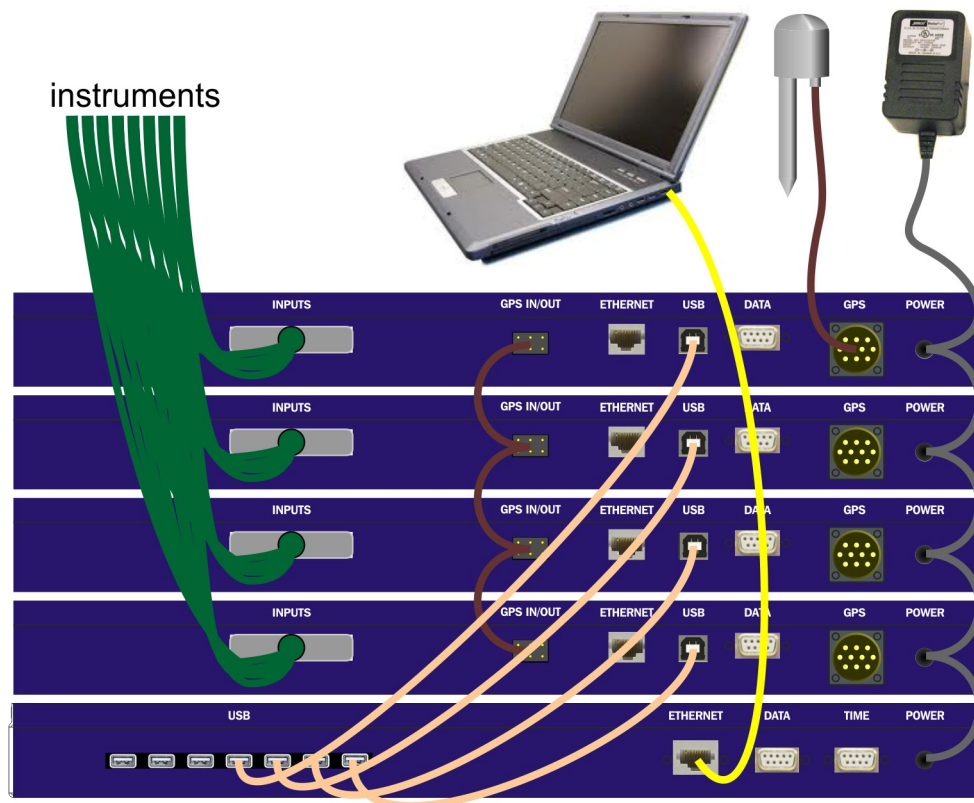
In this case, a single acknowledgement response (GCFACKN) was received and it came from the address 192.168.42.32 so this is the address of the EAM-R. If there are more than one EAM-R (or other GCF servers) on the network, multiple GCFACKN packets will be reported.

2.2 Hook-up diagrams

The hook-up diagrams on the following pages show the most common usage scenarios.

2.2.1 Multiple CD24-R8s with GPS synchronisation

The diagram below illustrates how to connect an EAM-R to a rack of CMG-CD24-R8 digitisers when using a GSL GPS receiver for synchronisation. The EAM-R needs only Power, Ethernet and input (USB) connections to start collecting and forwarding data.



The CMG-CD24-R8 is a rack-mounted, 8-channel digitiser designed for use with the EAM-R. For further information about the CD24-R8, please see its manual, MAN-C24-0004, which can be downloaded from www.guralp.com/documents/MAN-C24-0004.pdf.

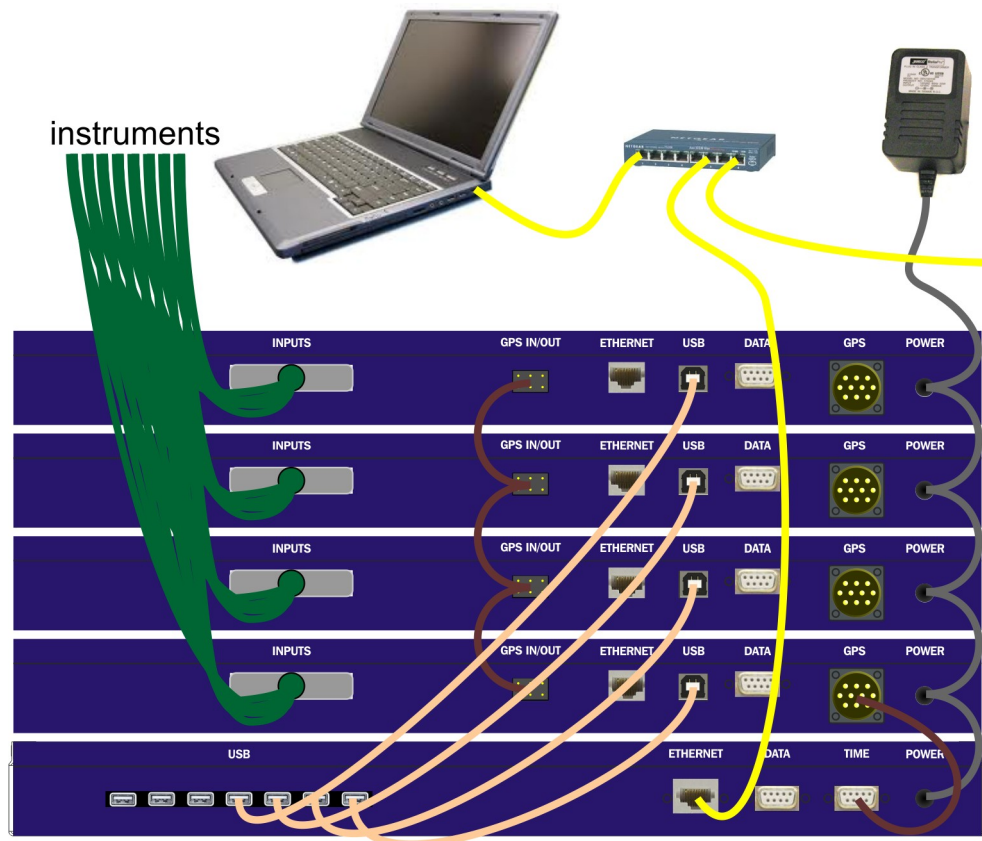
Multiple CD24-R8s can be connected to a single EAM-R using USB cables, as shown.

The GPS receiver should be connected to only one CD24-R8. A GPS “daisy-chain” cable is used to pass timing information to other units in the rack. The EAM-R is preconfigured to receive its timing information from the digitisers.

The EAM-R and CD24-R8s are supplied with separate power supplies but, if a suitable DC power source is available, a “daisy-chain” power supply cable can be made up to run all the units from a single supply.

2.2.2 Multiple CD24-R8s with GPS synchronisation

The diagram below illustrates how to connect an EAM-R to a rack of CMG-CD24-R8 digitisers when only NTP (internet Network Time Protocol) synchronisation is available. It must be stressed that GPS synchronisation is significantly more accurate than NTP.



In this arrangement, a special cable, CAS-DCM-0059, is used to connect the TIME output of the EAM-R to any one of the GPS inputs. NTP is received from the internet (or from a local NTP server) via the ETHERNET connector. All other connections are as described in the previous section.

The EAM-R needs to be configured to accept NTP synchronisation and to output NMEA (GPS timing signals) from the TIME connector. For further details, please see the “Digitiser synchronisation” chapter of the Platinum manual (MAN-EAM-0003), where the TIME connector is referred to as “Port C”. The Platinum manual is available for download from www.guralp.com/documents/MAN-EAM-0003.pdf.

2.3 Operation

The EAM-R runs Platinum firmware which has been developed specifically for the Guralp Systems range of data acquisition products, including the CMG-EAM and CMG-NAM. Platinum includes features for data collection,

processing, storage, forwarding and protocol conversion and well as digitiser and instrument configuration and control facilities.

Unless ordered otherwise, the EAM-R is supplied pre-configured to:

- acquire a DHCP or APIPA network address;
- collect GCF data from all seven USB connectors (this is, in fact, entirely automatic and not configurable);
- synchronise its own clock to connected digitisers; and
- provide a Scream server on the default network port (1567), forwarding all collected data;

In many situations, this means that you can start using your EAM-R immediately with no further configuration.

There are, however, many other features of Platinum firmware on the EAM-R which you may wish to explore and enable. Full details are provided in the Platinum manual, MAN-EAM-0003, which should be read in conjunction with this document and is available for download from www.guralp.com/documents/MAN-EAM-0003.pdf.

The rest of this section discusses features of the EAM-R which differ from or are not mentioned in the Platinum manual.

2.3.1 The LCD display

The front-panel LCD display is not mentioned in the Platinum manual: it scrolls through several pages of status information, showing the same content as the “System status” page of the web interface, as well as the current IP address.

2.3.2 The FLUSH button

The “FLUSH” button on the front panel is not mentioned in the Platinum manual. Pressing this button has exactly the same effect as clicking the “Flush to storage” button in the “Tools” → “Storage and recording” page of the web interface, causing recorded data to be flushed from the ring-buffers to the tertiary (or external) storage device. USB storage devices, such as USB “thumb drives” may be connected to any of the USB ports for this purpose: see the following section for more details.

2.3.3 Connectors

2.3.3.1 Console

The CONSOLE connector is not configurable via Platinum: it is permanently configured as a terminal running at 38,400 Baud. You can access the command line of the EAM-R by connecting a terminal emulator to this port.

Set your emulator to 8 data bits, 1 stop bit and no parity bits (8-N-1) and disable both hardware (XON/XOFF) and software (RTS/CTS) flow control.

2.3.3.2 Data

The DATA connector is referred to throughout the Platinum manual as “DATA OUT”. It is a general purpose serial port and is fully configurable within Platinum as PortDO.

2.3.3.3 USB

The USB connectors can be used to connect up to seven CD24-R8 digitisers and at most one external storage device, such as a USB thumb-drive.

CD24-R8 digitisers connected to these ports are automatically configured as GCF input sources. Entries will appear for each on the System Status page of the web interface and appropriate entries will appear in the instrument control and digitiser configuration menus. If the digitisers are connected and powered-up after the EAM-R has been started, you will have to refresh the web page in order to see these entries.



Note: In order for this feature to work correctly, the DATA OUT ports of the CD24-R8 digitisers must be configured to operate with a line speed of 115,200.

A USB storage device connected to any of the USB ports becomes available to Platinum as “External USB storage”. It can be selected as the recording device using the “Configuration” → “Storage and recording” page of the web interface. Please see the “Recording and Retrieving Data” chapter of the Platinum manual for more details.

3.2 Rear panel



3.2.1 Power

The power connector is a Switchcraft 712A 2.5mm barrel connector wired with the tip +ve and the shield -ve. A 7-28V DC regulated supply must be used. There is some variation amongst connectors labelled “ 2.5mm barrel” so it is recommended that mating connectors are purchased from GSL.

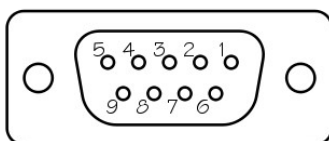


3.2.2 Time

This is a standard DE9F (TIA-574) sub-miniature (D-sub) plug, conforming to DIN 41652 and MIL-DTL-24308. They are very widely available, as are suitable mating connectors.



Pin	Function
1	<i>not connected</i>
2	NMEA data
3	<i>not connected</i>
4	<i>not connected</i>
5	Ground
6	<i>not connected</i>
7	<i>not connected</i>
8	One-pulse-per-second (PPS) timing signal
9	<i>not connected</i>



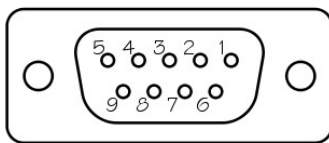
Wiring details for the compatible plug, DE9M, as seen from the cable end (i.e. during assembly).

3.2.3 Data

This is a standard DE9F (TIA-574) sub-miniature (D-sub) socket, conforming to DIN 41652 and MIL-DTL-24308. They are very widely available, as are suitable mating connectors.



Pin	Function
1	<i>not connected</i>
2	RS232 TxD
3	RS232 RxD
4	<i>not connected</i>
5	Ground
6	<i>not connected</i>
7	<i>not connected</i>
8	<i>not connected</i>
9	<i>not connected</i>



Wiring details for the compatible plug, DE9M, as seen from the cable end (i.e. during assembly).

3.2.4 Ethernet

The ETHERNET connector is a standard 8P8C modular socket, conforming to TIA/EIA-568-B. It is compatible with 10Base-T or 100Base-TX twisted-pair connectors.



Pin	Function
1	Tx+
2	Tx-
3	Rx+
4	<i>Not connected</i>
5	<i>Not connected</i>
6	Rx-
7	<i>Not connected</i>
8	<i>Not connected</i>

3.2.5 USB

The USB connectors are standard USB type A sockets with conventional wiring. Suitable mating connectors are widely available.



USB connections are very sensitive to wiring details so it is recommended that ready-made cables are used where possible. When used with a CD24-R8, Type A to Type B cables are required.

4 Revision history

2010-04-28 A New document