

C-Bus Application Messages & Behaviour

Chapter 28 – Measurement

Document Number: CBUS-APP/28

Issue: 1.2

Date: 13 February 2007

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C-Bus Measurement Application

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C-Bus Measurement Application

28 MEASUREMENT APPLICATION

28.1 Application ID

\$E4

28.2 Description

The Measurement Application is used to obtain information using basic units of voltage, current and resistance. This information is scaled as required to obtain units which can relate to real world quantities such as temperature, liquid level, light level, etc.

Measurement Application devices are typically categorised as:

- a. input units, which measure the quantities concerned; and
- b. output units, which are used to display or otherwise use the measured information.

28.3 Document Convention

Numbers are shown in decimal (base ten) with no other special prefixes or indications.

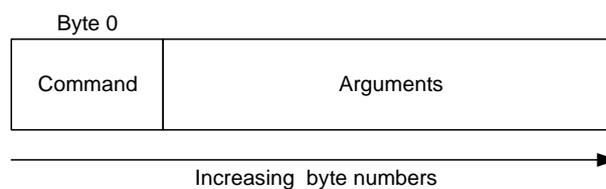
Binary numbers (base 2) are shown with the prefix %.

Hexadecimal numbers (base 16) are shown with the prefix \$.

Example: 157 = %10011101 = \$9D

28.4 Message Structure

C-Bus messages can be up to 64 bytes long¹, though in practice Measurement Application are no more than 5 bytes long. Measurement Application messages have the form:



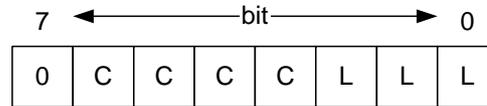
The number of arguments is variable, and is dependent on the command.

The command byte is broken into bit-fields to support encoding of a command and the number of bytes following as parameters.

¹ Due to a limitation in the C-Bus PC interface, a single message cannot be longer than 21 bytes.

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The short argument command form is:



Where “C” represents a bit of a command, and “L” represents a bit of the length.

The following commands are supported:

%0001 = MEASUREMENT EVENT

All others reserved.

The length field reflects the number of arguments.

28.5 Defined Messages

All messages listed are mandatory for C-Bus measurement systems, unless explicitly stated otherwise.

28.5.1 Measurement Data Messages

Measurement Data Messages are sent by a Measurement Device either:

- Based on an elapsed time interval between measurements;
- Based on a change in the measured value since the last transmission; or
- In response to a specific request for an update (using the Control Trigger Application).

28.5.1.1 Channel measurement data

Command: %0 0001 110

Arguments: <Device ID>, <Channel>, <Units>, <Multiplier>, <MSB>, <LSB>

Meaning: Measurement data for a channel.

Originator: Measurement device.

Notes: The 6 argument bytes have the following format:

<Device ID> Number identifying this measurement device,

<Channel> The input channel number of the measurement device

<Units> Number identifying measurement units,

<Multiplier> Power of ten unit multiplier, signed 2's complement,

<MSB>, <LSB> Most & least significant byte of scaled measurement, the two bytes forming a signed 2's complement number.

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28.5.1.2 Units definition

The units definition parameter, defines the base unit type (e.g. ohms, Celsius, volts, etc.).

Supported units are:

Unit Code	Units	Typical Use
\$00	°C	Temperature
\$01	Amps	Current
\$02	Angle (degrees)	Angular displacement
\$03	Coulomb	(Electric) charge
\$04	False = 0 True otherwise	Boolean stuff
\$05	Farads	Capacitance
\$06	Henrys	Inductance
\$07	Hertz	Frequency
\$08	Joules	Energy
\$09	Katal	Rate of catalytic activity
\$0A	Kg / m ³	Density
\$0B	Kilograms	Mass
\$0C	Litres	Volume
\$0D	Litres per hour	Very slow flow rates
\$0E	Litres per minute	Slow flow rate
\$0F	Litres per second	Flow rate
\$10	Lux	Light level
\$11	Metres	Distance
\$12	Metres per minute	Slow speed
\$13	Metres per second	Speed
\$14	Metres/s ²	Acceleration
\$15	Mole	Quantity of substance
\$16	Newton metre	Torque
\$17	Newtons	Force
\$18	Ohms	Resistance
\$19	Pascal	Pressure
\$1A	Percent	Humidity, generic percentages & linear ratios
\$1B	Decibels	Logarithmic ratio
\$1C	PPM	Concentrations
\$1D	RPM	Angular speed
\$1E	Second	Elapsed Time
\$1F	Minutes	Elapsed Time
\$20	Hours	Elapsed Time
\$21	Sieverts	Radiation
\$22	Steradian	Units of solid angle
\$23	Tesla	Magnetic field strength
\$24	Volts	Voltage
\$25	Watt hours	Power consumption
\$26	Watts	Power
\$27	Webers	Magnetic Flux

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Unit Code	Units	Typical Use
\$FE	No units	Unitless quantities
\$FF	Custom	User defined

28.6 Message Priority

C-Bus Measurement Application messages shall always be transmitted at Class 4 (lowest) priority.

28.7 Inter-network Routing

C-Bus Measurement Application Devices may receive Trigger Control Request messages that have been routed via one or more C-Bus bridges or gateway devices. Such messages will be received with a message type indicating point-multipoint, but will have a non-zero Network routing.

In this case, the measurements shall be transmitted into the network that originated the request. To ensure the response is directed back to the correct network, via the same bridges and message path, any request messages received with internetwork routing information shall:

- a. Always have the response generated as a point-point-multipoint message; and
- b. Use a routing stack derived from the request message, to deliver the response into the C-Bus network that originated the request.

28.8 Application Behaviour

28.8.1 Concatenated Commands

A Measurement Application device may receive and transmit messages containing more bytes than a single command. This permits a single C-Bus transmission to contain multiple commands for a single application.

Devices using C-Bus Measurement messages must process all received bytes. This can be achieved by placing the received bytes in a buffer, and using the following simple algorithm:

```
WHILE the buffer contains bytes LOOP
    The first byte defines the command type and argument
    count (refer section 28.4).
    Process the first (command) byte and its arguments
    Once processed, remove the command and argument bytes
    from the buffer
END LOOP
```

28.8.2 State

C-Bus Measurement devices are not expected to maintain measurement records through power failures of the measurement device.

28.9 Status Reporting

C-Bus measurement applications shall not respond to C-Bus status requests (MMI).

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28.10 Limitations

A single C-Bus network should not contain more than 10 measuring devices.