Group Four GLDU 69.1 Loadcell Digitizing Unit

PROGRAMMER'S MANUAL

Relating to Firmware 69.181 version 2.32

CONTENTS:

Group Four Transducers
22 Deer Park Drive | E. Longmeadow, MA 01028 | www.groupfourtransducers.com
Phone : (800) 419 1444 | Fax : (413) 525 -6182 | sales@group-4.com
Page 1 of 22

1. INTRODUCTION & SPECIFICATIONS

The Group Four GLDU 69.1 loadcell digitizing unit are a high performance device that can form the "front end" of weighing systems intended for either "approved" or industrial applications. The device feature full multi-drop communications capability and can be programmed via a straightforward ASCII command set.

The technical specifications of the unit are tabulated below:

Excitation Voltage	5V AC
Driving Capability	100 Ohm bridge
Load Cell Connection	Six-wire
Input Signal Range	2.2 mV/V nominal
Polarity	Bipolar
Input Overload	± 5V
Maximum read out	± 999999
Sample rate	170 samples / sec - 170 updates / sec
Internal Resolution	± 1000000 parts (± 20-bit)
Dead Load	Digitally compensated
Analogue Filter	3Hz 1.order (i.e. 6 dB/oct)
Digital Filter	0.2 - 3Hz 2.order (i.e. 12 dB/oct)
Calibration	Software calibration and set up
Communication	RS422 or RS485 full duplex
Baudrate	9k6, 19k2, 38k4, 57k6,115k2
Bus	Up to 32 devices on one bus (RS485)
Temperature Effect on Zero	< 2 ppm/°C
Temperature Effect on Span	< 5 ppm/°C
Temperature Range	-15°C to +50°C
Storage Temperature Range	-20°C to +60°C
Housing	Metal shield
Dimensions (L x W x H)	82 x 31 x 6 mm
Weight	Approx. 30g
Power Supply	12-24 V DC +10% -15%

2.   COMMUNICATIONS & GETTING STARTED

Communicating with the GLDU 69.1 digitiser is performed via the RS422/RS485 port. The data format is the familiar 8/N/1 structure (8 data bits, no parity, 1 stop bit)

Available data rates are:

Baud Rate
9600
19200
38400
57600
115200

Point-to-point or multi-drop connections are supported.

Protocol Summary

The GLDU 69.1 digitiser are intended for use with standard PC or PLC systems, and require no special interfacing hardware and no special software adapters. The command set is based on a simple ASCII format, as per the example below:

Master (PC or PLC) sends:	OP 1	(Open the device # 1)
Slave (LDU) sends:	OK	(acknowledging device #1 active)
Master sends:	GG	(Get the gross weight result)
Slave sends:	G+123.45	(the gross weight with sign and Decimal point information)

Note: The complete list of available commands is printed on the page 13 of this manual.

This protocol is standard across the whole range of Group four instrumentation, so it is possible to mix different types of Group four devices on the same bus.

Multi-Drop Support

A connection to the required device is opened by sending the OP xxx command, where xxx is the address of the relevant slave device, in decimal notation. The relevant device responds by acknowledging that it is active, and will then respond to any other command sent along the bus, until another OP xxx with a different address value is detected, or until a "Close Connection" command (CL) is detected.

Baudrate Settings

The GLDU 69.1 has a jumper SW3 for enabling a special configuration mode used for Altering the baudrate and the device address. When this jumper is closed the LDU will enter a special baudrate seach mode after power on – waiting for a space character (0x20) to be received. The time duration of this character will be meassured by the LDU and its baudrate timing will be set accordingly – i.e. the baudrate of the terminal used will be the baudrate used by the LDU subsequently. The default factory setting is 9600 baud.

Address Settings

It is possible to set the network address of the device using the AD command. (Address range between 0 and 255). Setting the device address to 0 will set the continuously active mode, where the device becomes permanently active, and will listen and respond to any command on the bus, without the need for an OP xxx command. The default factory setting is 0.
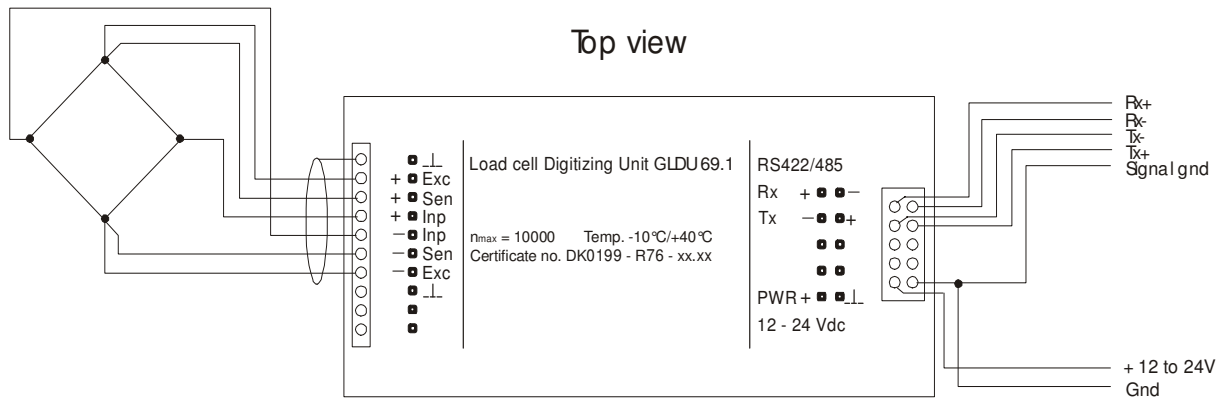
Getting Started

You will require a:

- PC or PLC with either a RS422 or RS485 communication port;

- RS232 to RS422/485 converter - necessary if it is intended to use communication driven from the master which has only a RS232 port available;

- Interconnecting cabling - confirm that all of the relevant pins are in use - check against the wiring diagram that follows this section;

- A load cell with test weights, OR a load cell simulator;

- A DC power supply capable of delivering 12-24 VDC. Current capacity dependent on the number of device and the number of load cells to be connected. (One device plus one load cell requires less than 100 mA) ;

- One or more GLDU 69.1;

- A suitable ASCII communication software (HyperTerminal etc)

Refer to the following wiring diagram

Group Four Transducers
22 Deer Park Drive | E. Longmeadow, MA 01028 | www.groupfourtransducers.com
Phone : (800) 419 1444 | Fax : (413) 525 -6182 | sales@group-4.com

Page 5 of 22

3.   HARDWARE & CONNECTIONS

Top view

Load cell Digitizing Unit GLDU 69.1

$n_{max} = 10000$ Temp. -10℃/+40℃
Certificate no. DK0199 - R76 - xx.xx

⊥
+ Exc
+ Sen
+ Inp
– Inp
– Sen
– Exc
⊥

RS422/485
Rx   + –
Tx   – +

PWR + ⊥
12 - 24 Vdc

Rx+
Rx-
Tx-
Tx+
Signal gnd

+ 12 to 24V
Gnd

Bottom view

Sw1
Sw2
Sw3
Sw4

Sw1 & Sw2 : Close for 4-wire loadcell
Sw3 : Close to enter configuration mode
Sw4 : Do NOT close - used for program download

Group Four Transducers
22 Deer Park Drive | E. Longmeadow, MA 01028 | www.groupfourtransducers.com
Phone : (800) 419 1444 | Fax : (413) 525 -6182 | sales@group-4.com
Page 6 of 22

4.   COMMAND PROTOCOL - LONG DESCRIPTIONS

For ease of interpretation, the commands have been grouped together and will be described in the following sequence:

4.1   System Diagnostics Commands

4.2   Calibration Commands

4.3   Motion Detection Commands

4.4   Filter Setting Command

4.5   Weigher Control Commands

4.6   Output Commands

4.7   Auto-Transmit Commands

4.8   Communication set-up commands

4.9   Save set-up Parameters Command

4.10   User defined information

4.11   Group commands

Group Four Transducers
22 Deer Park Drive | E. Longmeadow, MA 01028 | www.groupfourtransducers.com
Phone : (800) 419 1444 | Fax : (413) 525 -6182 | sales@group-4.com
Page 7 of 22

4.1   SYSTEM DIAGNOSTICS COMMANDS – ID, IV, IS

The following three commands provide a means of interrogating the device to confirm the type of device present, the software version of that device and the status. The commands require no parameters and are used as follows:

ID   Determine the device ID code - this is a code, which identifies the type of device, which is currently open for communications. Issuing the ID command, which has no parameters, will return the code **D:6910** This code is useful when mixed devices may be present on the bus.

IV   Determines the device software version - this identifies the release of software that is installed in the device. This is useful when determining the availability of special commands or features that may have been requested for special applications. Issuing the IV command, which has no parameters, will return the software identification code in the format **V:0200**

IS   Determine the device status - Issuing the ID command, which has no parameters, will return a result in the format **S:000000**. This result comprises two 3-digit decimal values, which can be decoded according to the table below:

Leftmost 3-digit value: Rightmost 3-digit value:

1	Signal stable		1	not used
2	Zero action performed		2	not used 4 Tare active
4				not used
8	not used		8	not used
16	not used		16	not used
32	not used		32	not used
64	not used		64	not used
128	not used		128	not used

Therefore, the example result **S:001000** decodes as signal stable (no-motion) no zero action and no tare.

The unsupported bits are reserved for use on other members of the Group four instrument family and in the case of the GLDU 69.1 are always set at zero.

SR   Software Reset – this command will respond with 'OK' and after maximum 400ms perform a complete reset of the LDU.

4.2   CALIBRATION COMMANDS – CE, CM, CI, MR, DS, DP, CZ, CG, ZT, ZR, FD, LC, LN, CS

CE   Set the calibration functions to the enabled state. This command must be issued PRIOR to any attempt to set the calibration parameters CM, CI, MR, DS, DP, CZ, CG, ZT, ZR, FD, LC, LN or CS. Issuing the command without any parameters results in the response **E+XXXXX** where **XXXXX** is the Traceable Access Code (TAC). This is an internal code that is used to record any changes in the calibration settings of the device. This is a critical feature that is required for "approved" applications, as it provides for the control of access to any command that has the potential of changing the weigher calibration value. For further information, please refer to section 7, "USE IN APPROVED APPLICATIONS".

CM n Set the maximum allowable output value in interval or range n ($1 <= n <= 3$). Lower limit 1, upper limit 999999. Issuing the command without any parameters returns the current CM value. This value will determine the point at which the output will change to **ooooooo**, signifying over-range or change to the next range or interval. To set a new value for CM, the command must be preceded by the **CE XXXXX** command, where **XXXXX** is the current TAC. The new CM value required is then input as a parameter of CM, in the format **CM 1 4010**. For further information, please refer to section 6, "CALIBRATION PROCEDURE". Factory default setting: Max 1 = 999999, Max 2 = 0, Max 3 = 0.

CI   Set the minimum allowable output value. Lower limit -999999, upper limit 0. Issuing the command without any parameters returns the current CI value. This value will determine the point at which the output will change to **uuuuuuu**, signifying under-range. To set a new value for CI, the command must be preceded by the **CE XXXXX** command, where **XXXXX** is the current TAC. The new CI value required is then input as a parameter of CI, in the format **CM -200**. For further information, please refer to section 6, "CALIBRATION PROCEDURE". Factory default setting: -9.

MR   Select multi range / multi interval. 0 = Multi interval, 1 = Multi range. Issuing the command without any parameters returns the current MR value. To set a new value for MR, the command must be preceded by the **CE XXXXX** command, where **XXXXX** is the current TAC. The new MR value required is then input as a parameter of MR, in the format **MR 1**. For further information, please refer to section 6, "CALIBRATION PROCEDURE". Factory default setting: 0.

DS   Set the display step size - this allows the output to step up or down by a unit other than 1. Permitted values are 1, 2, 5, 10, 20, 50, 100, 200 and 500. To set a new value for DS, the command must be preceded by the **CE XXXXX** command, where **XXXXX** is the

current TAC. The new DS value required is then input as a parameter of DS, in the format **DS 100**. In multi range / multi interval applications DS will define the step size in the lowest range / interval. The higher ranges / intervals will use the next step sizes from the list of allowable step sizes. For further information, please refer to section 6, "CALIBRATION PROCEDURE". Factory default setting: 1.

DP   Set the decimal point position - this allows the decimal point to be positioned anywhere between leftmost and rightmost digits of the 6-digit output result. Permitted values are 0 for the rightmost position, and 6 for the leftmost position. To set a new value for DP, the command must be preceded by the **CE XXXXX** command, where **XXXXX** is the current TAC. The new DP value required is then input as a parameter of DP, in the format **DP 2**. For further information, please refer to section 6, "CALIBRATION PROCEDURE". Factory default setting: 3.

CZ   Set the calibration zero point - this is the reference point for all weight calculations, and is subject to TAC control. The command returns **ERR** and has no action unless it is preceded by the **CE XXXXX** command, where **XXXXX** is the current TAC. Confirmation of action is provided by the return **OK**. For further information, please refer to section 6, "CALIBRATION PROCEDURE". Factory default setting: approx. 0mV/V input.

CG   Set the calibration gain (span) value - this is the reference point for the calibration under load, and is subject to TAC control. The lower limit for CG is 1, the upper limit is 999999. The weight signal used for calibration should be as close as possible to the maximum allowable display value (CM) so as to ensure optimum calibration accuracy. A feature provided is the ability to recall the value of the calibration weight used for the current calibration by the issue of a CG command without any parameters. This is useful information for future calibration purposes or for diagnostics. When calibrating the span, the actual value of the calibration weight must be entered as a parameter of the CG command, for example if the output 25000 is required for the weight placed on the load cell, then the calibration command becomes **CG 25000**. The command return "**ERR**" and has no updating action unless it is preceded by the **CE XXXXX** command, where **XXXXX** is the current TAC. **If the load applied to calibrate the span is less than 1% of full scale (2mV/V), the gain calibration will fail and 'ERR' will be returned.** For further information, please refer to section 6, "CALIBRATION PROCEDURE". Factory default setting: 200000 at approx. 2mV/V input.

ZT   Zero tracking - this command set the zero track band in divisions (d). Issuing the command without any parameters returns the current ZT value. The command returns **ERR** and has no updating action unless it is preceded by the **CE XXXXX** command, where **XXXXX** is the current TAC. Zerotracking will be performed only on results less than $+/-(0.5 * ZT)$ at a rate of 0.4 d/sec where d = display step size (see DS command). The zero can only be tracked to +/- ZR (see ZR command). A value of zero turns off the zero tracking. Factory default setting: 0.

Group Four Transducers
22 Deer Park Drive | E. Longmeadow, MA 01028 | www.groupfourtransducers.com
Phone : (800) 419 1444 | Fax : (413) 525 -6182 | sales@group-4.com

Page 10 of 22

ZR   Zero range - this command set the zero range in divisions (d). Issuing the command without any parameters returns the current ZR value. The command returns **ERR** and has no updating action unless it is preceded by the **CE XXXXX** command, where **XXXXX** is the current TAC.

FD   Factory default settings – this command put the LDU back to a known state. The data will be written to the EEPROM and the TAC will be incremented by 1.
NOTE: All calibration and setup information will be lost, by issuing this command. The command returns **ERR** and has no updating action unless it is preceded by the **CE XXXXX** command, where **XXXXX** is the current TAC.

LC   Linearize clear – this command put the LDU back to the initial factory calibration using two calibration points, zero at 0.0mV/V and 200000 increments at 2.0mV/V.

LN n Linearize – this command make it possible to inspect and correct more than the two normal calibration points set by the CZ and CG command – up to seven calibration points are allowed. Issuing the command with only one parameter (1-7) returns the calibration point in the format: Ln:XXXXXXX YYYYYYY where XXXXXXX is the input level in mV/V (without decimal point) and YYYYYYY is the displayed number of increments. Calibration can be done in the following way: LN1 0 0 define zero output at zero mV/V input. LN2 200000 100000 defines 100000 increments at +2mV/V input – at least two points must be given.
Changes in the linearization table require a preceding CE <TAC> command.
NOTE: Before a recalibration with fewer points than the previous one a LC command must be issued.

CS   Save the calibration values - this command results in the calibration values being saved to EEPROM, and causes the TAC to be incremented by 1. The CS command save all of the calibration group values, as set by CM, CI, MR, DS, DP, CZ, CG, ZT, ZR, LC and LN. The command returns **ERR** and has no updating action unless it is preceded by the **CE XXXXX** command, where **XXXXX** is the current TAC. For further information, please refer to section 6, "CALIBRATION PROCEDURE".

4.3   MOTION DETECTION COMMANDS – NR, NT

The Motion Detection facility provides a means of disabling certain functions whenever a condition of instability, or "motion", is detected. The "no-motion", or "stable" condition is achieved whenever the signal is steady for the period of time set by NT, during which it cannot fluctuate by more than NR increments. The stable condition activates the relevant bit of responses to "Info Status" (IS - see section 4.1, "SYSTEM DIAGNOSTICS COMMANDS")

The functions, which are disabled whenever motion is detected, are "Calibrate Zero" (CZ) "Calibrate Gain" (CG) "Set zero" (SZ) and "Set tare" (ST).

NR   Set the "no-motion" range - this is the range within which the weighing signal is allowed to fluctuate and still be considered as "stable". Issuing the NR command without any parameter will return the current value. Set a new value by issuing the NR command followed by the desired value, in the format **NR 5**. Permitted values are between the lower limit of 0 and the upper limit of 65535. Factory default setting: 1.

NT   Set the stabilisation time for the "in motion" band. This is the time parameter that defines the period during which the output must not fluctuate more than NR increments in order to be considered "stable". Set a new value by issuing the NT command followed by the desired value in milliseconds, in the format **NT 1000**. Permitted values are between the lower limit of 0 and the upper limit of 65535. Factory default setting: 1000.

4.4   FILTER SETTING COMMANDS – FL, UR

The facility exists for the setting of a digital filter via the command parameter FL, and this filter can be adjusted to eliminate most unwanted disturbances. Note that this filter is positioned immediately after the A/D Converter, and will therefore have an effect on all aspects of weigher operation.

FL   Set the filter - permitted values are between 0 and 17, see table below.
Issuing the FL command without any parameters will return the current filter value. Set a new value by issuing the FL command followed by the desired value, in the format **FL 4**. Factory default setting: 3.

	0.2Hz	0.5Hz	1Hz	1.5Hz	2Hz	3Hz
Gaussian	17	14	11	8	5	2
Bessel	16	13	10	7	4	1
Butterworth	15	12	9	6	3	0

The Gaussian filter will have the slowest step response and the Butterworth filter will have the fastest but with some overshoot.

UR   Set the update rate - this command defines the number of available updates per second, see table below. Issuing the UR command without any parameters will return the current update rate. Set a new value by issuing the UR command followed by the desired value, in the format **UR 2**. Factory default setting: 0.

0	1	2	3	4	5	6	7
172 u/sec	86 u/sec	43 u/sec	21.5 u/sec	10.8u/sec	5.4 u/sec	2.7 u/sec	1.3 u/sec

4.5 WEIGHER CONTROL COMMANDS – SZ, RZ, ST, RT

The following commands provide the means to control the setting and resetting of the zero and tare points. The availability of net weighing depends on these functions. The zero point which is set at calibration time, remains the "true" zero, but the "current" zero will be the basis for the output result. Remember that the "current" zero can be influenced by the "zero tracking" function, and this should be taken into account when designing the application. A basic system control is the disabling of the "set zero"and "set tare"functions whenever the weighing signal is not stable, as defined by the "no-motion" function. Furthermore, the zero point cannot be reset if it has moved more than ZERORANGE away from the original calibration zero point.

SZ   Set the system zero - this command will create a "current" zero point which will become the basis for all weigher operation, until further updated by the zero tracking function, or another SZ command or the "reset zero" command (RZ). As previously stated, any attempt to zero a drift of more than +/- ZERORANGE will result in the SZ command being rejected (**ERR**). The SZ command is also rejected if the weighing signal is fluctuating, as defined by the "no-motion" function parameters (NR and NT). The "signal stable" bit in the responses to the "info status" (IS) command must therefore be active before a SZ command can be accepted. Issuing the SZ command, which has no parameters, will return the **OK** or **ERR** response. If **OK** is returned, then the "zero action performed" bit in the response to the "info status" (IS) command will be activated.

RZ   Reset the zero point to the "calibration" zero - this command will return the zero point to that which was stored during the calibration procedure. Issuing the RZ command, which has no parameters, will return the **OK** or **ERR** response. If **OK** is returned, then the "zero action performed" bit in the response to the "info status" (IS) command will be de-activated.

ST   Set the tare point - this command will activate the net weighing function, by storing the current weighing signal output value as a tare value. The ST command is rejected if the weighing signal is fluctuating, as defined by the "no-motion" function parameters NR and NT. The "signal stable" bit in the "info status" return must therefore be active before a ST command can be accepted. Issuing the ST command, which has no parameters, will return the **OK** or **ERR** response. If **OK** is returned, then the "tare active" bit in the response to the "info status" (IS) command will be activated.

RT Reset the tare - this command cancels the net weighing mode, and restores the current zero. The weighing signal output returns to the gross mode. Issuing the RT command, which has no parameters, will return the **OK** or **ERR** response. If **OK** is returned, then the "tare active" bit in the response to the "info status" (IS) command will be activated.

4.6   OUTPUT COMMANDS – GG, GN, GT, GS, GW

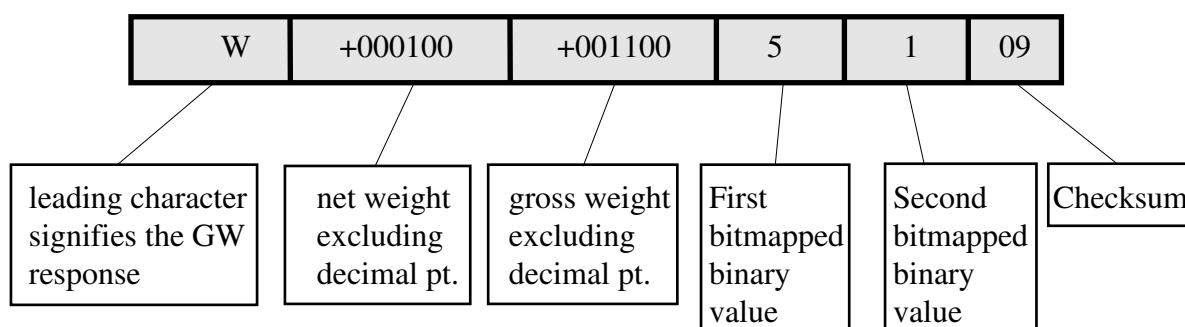The following command provides the means of obtaining an output results from the device.

GG Get the gross value - returns the current gross weight value. Issuing the GG command, which has no parameters, will return the gross weight value in the format **G+001.100**.

GN Get the net value - returns the current net weight value. Issuing the GN command, which has no parameters, will return the net weight value in the format **N+001.100**.

GT Get the tare value - returns the current tare weight value. Issuing the GT command, which has no parameters, will return the tare weight value in the format **T+001.100**.

GS Get the A/D sample value – returns the current output result of the A/D converter (ADC). This facility is useful when developing the application, or when calibrating the system, as it allows a check to be made of the operating range of the ADC. Issuing the GS command, which has no parameters, will return the ADC output value in the format **S+100000.**

GW Get the "long" weight values - returns the current net, gross and status values. Issuing the GW command, which has no parameters, will return the net weight, the gross weight, the status and the checksum values, all combined into one single string in the format **W+000100+0011005109**. The first two sections of the return string comprise the net weight and gross weight results, followed by two hexadecimal characters, which represent two bitmapped status indicators. The last two hexadecimal characters represent the checksum, which is the inverse of the sum of all the ASCII values of the string, not including the checksum characters.

W	+000100	+001100	5	1	09

leading character signifies the GW response	net weight excluding decimal pt.	gross weight excluding decimal pt.	First bitmapped binary value	Second bitmapped binary value	Checksum

The bitmapped characters are:

First Bit value	description	Second Bit value	description
1	not used	1	Signal stable
2	not used	2	Zero action performed
4	not used	4	Tare active
8	not used	8	not used

The checksum is derived as follows:

a. Add the ASCII values of all the 17 characters in the string
b. Convert the decimal result to hexadecimal
c. Remove the most significant digit from the hexadecimal result
d. Invert the remaining hexadecimal value
e. Convert the hexadecimal value to characters

4.7 AUTO-TRANSMIT COMMANDS – SG, SN, SW

The following command provide the means to output the weight results in a continuous stream, which starts upon the issue of the relevant command, and ends upon the issue of any other command.

SG   Auto-transmit the gross weight value - continually returns the current gross weight value. Issuing the SG command, which has no parameters, will continually return the gross weight value in the format **G+001.100**, until interrupted by any other command.

SN   Auto-transmit the net weight value - continually returns the current net weight value. Issuing the SN command, which has no parameters, will continually return the net weight value in the format **N+001.100**, until interrupted by any other command.

SW Auto-transmit the long weight value - continually returns the current net weight, the gross and status values. Issuing the SW command, which has no parameters, will continually return the net weight, the gross weight, the status and the checksum values, all combined into one single string in the format **W+000100+0011005109**, until interrupted by any other command. The decode of the string is exactly as per the "long" weight command GW, listed in section 4.6, "OUTPUT COMMANDS". Note that decimal point information is not transmitted.

4.8   COMMUNICATION SET-UP COMMANDS – AD, BR, DX

AD Set the address of the LDU for networking (0-255). Setting the device address to 0 will set the continuously active mode, where the device becomes permanently active, and will listen and respond to any command on the bus, without the need for an OP xxx command. Issuing the AD command without any parameters will return the current address. Factory default setting: 0.

NOTE: this setting will take effect after power on reset (remember to store the setting using the **WP** command before turning off the power)

BR Set the LDU baud rate. Issuing the **BR** command without any parameters will return the current baud rate. . Set a new value by issuing the **BR** command followed by the desired value, in the format **BR 115200**. Factory default setting: 9600.

NOTE: this setting will take effect after power on reset (remember to store the setting using the **WP** command before turning off the power)

DX Half or full duplex – this command select half or full duplex communication. Parameter = 0 select half duplex communication and parameter = 1 select full duplex communication - use half duplex setting when using two wire RS485.

4.9   SAVE SET-UP PARAMETERS COMMAND – WP

The configuration parameters can be considered as three distinct groups, namely:
- Calibration Parameters   (CZ, CG, CM, CI, MR, DS, DP, ZT, ZR, LC, LN);
- Indicator Parameters   (FL, UR, NR, NT, BR, AD, DX);

The alteration and amendment of the calibration parameters is subject to the control procedure that is described in section 6, "CALIBRATION PROCEDURE". This procedure

includes the use of the "Calibration Save" (CS) command. All other settings can be saved using the save command WP.

WP   Save the "indicator" set-up parameters - saves the settings of the "Filter" (FL, UR), the "No-Motion" settings (NR, NT) and the communication settings (AD, BR, DX) in the EEPROM

4.10 User defined information – RS, UI

These two commands enable the user to set a serial number and a text information for identification of the system.

RS   Read serial number. Issuing the **RS** command without any parameters will return the current serial number in the format **S:12345678**. Set a new value by issuing the **RS** command followed by a password and then the desired number (Up to 8 digits) in the format **RS 330130 12345678**. Factory default setting: undefined. The serial number will automatically be stored in the internal EEPROM.

UI   Set User ID. Issuing the **UI** command without any parameters will return the current user ID in the format **U:LDU69**. Set a new value by issuing the **UI** command followed by the desired text string (up to 16 characters), in the format **UI 'LDU69'**. Factory default setting: ''. The text string will automatically be stored in the internal EEPROM.

4.11 Group commands – HW, GH

For systems requiring simultaneous sampling of data two commands are available:

HW   Hold weight. Issuing the **HW** command, which has no parameters, will latch the current net weight in a register for later readout in all LDU's in a common network regardless of their individual address. NOTE: The LDU's will not respond to the **HW** command on the interface lines – it would lead to bus contention

GH   Get hold weight. Issuing the **GH** command, which has no parameters, will return the current hold weight in the format **N+000100** from the currently addressed LDU.

5. COMMAND PROTOCOL - SHORT DESCRIPTIONS

Comm	Short Description	Usage	Parameter Values	Typical Response
OP	Open connection	Open device XXX	0 to 255	O:002/OK
CL	Close all connections	Close all devices (OP XXX implies CL)	none	none
ID	Inform. device ID	Information - device identification	none	D:6910
IV	Inform. version number	Information - software version number	none	V:0232
IS	Inform. on device status	Information - motion	none	S:000000
SR	Software reset	Restart the LDU	none	OK/ERR
CE	Calibrate enable	Open legal parameters (CE 'TAC')	0 through 65535	E+00001/OK/ERR
CM n	Calibrate max (TAC protected)	Read/modify Max 1, Max 2 and Max 3	0 through 999999	M+999999/OK/ERR
CI	Calibrate min (TAC protect)	Read/modify min	-999999 through 0	I-000009/OK/ERR
MR	Multrange (TAC Protect)	Select multi interval (0) or multi range (1)	0 through 1	M+00001/OK/ERR
DS	Display step size (TAC protect)	Read/modify the display step size	1,2,5,10,20,50,100,200,500	S+00001/OK/ERR
DP	Decimal point (TAC protected)	Read/modify decimal point position	0 through 6	P+00005/OK/ERR
CZ	Calibrate zero (TAC protected)	Calibrate zero - no load on platform	none	OK/ERR
CG	Calibrate gain (TAC protected)	Calibrate gain at some load >> zero	1 through 999999	G+020000/OK/ERR
ZT	Zero track (TAC protected)	Read/modify zero track band	0 through 65535	Z+00001/OK/ERR
ZR	Zero range (TAC protect)	Read/modify zero range	0 through 999999	R+000001/OK/ERR
FD	Factory default (TAC protected)	Load factory defaults into EEPROM	none	OK/ERR
LC	Clear linearization points (TAC protected)	Get back to factory two point calibration	none	OK/ERR
LN n	Define linearization point (TAC protected)	Define calbration point 1 to 7	1-7, X, Y	OK/ERR/Ln:X Y
CS	Calibrate save (TAC protected)	Save CM,CI,MR,CZ,CG,DS,DP,ZT,ZR, LC, LN to EEPROM	none	OK/ERR
NR	No-motion range	Read/modify No-motion range	0 through 65535	R+00010/OK/ERR
NT	No-motion time	Read/modify No-motion time in milliseconds	0 through 65535	T+00500/OK/ERR
FL	Filter setting	Read/modify filter setting	0 through 17	F+00007/OK/ERR
UR	Update rate	Read/modify update rate	0 through 7	U+00002/OK/ERR
SZ	Set system zero	Set system zero point	none	OK/ERR
RZ	Reset system zero	Restores the calibration zero point	none	OK/ERR
ST	Set tare	Set tare point	none	OK/ERR
RT	Reset tare	Restores current zero point	none	OK/ERR
GG	Get gross value	Get gross value	none	G+001100.
GN	Get net value	Get net value	none	N+000000.
GT	Get tare value	Get tare value	none	T+000500.
GS	Get A/D sample	Get A/D sample	none	S+200000
GW	Get long weight	Get long weight	none	W+000100+0011005109
SG	Start auto-transmit gross	Start auto-transmitting gross weight result	none	G+001100.
SN	Start auto-transmit net	Start auto-transmitting net weight result	none	N+000000.
SW	Start auto-transmit long weight	Start auto-transmit long weight result	none	W+000100+0011005109
AD	Network address	Read/modify network address	0 through 255	A:014/OK/ERR
BR	Baudrate	Read/modify baudrate setting	9600 through 115200	B 9600
DX	Duplex	Select half (0) or full (1) duplex	0 through 1	X:001/OK/ERR
WP	Save set-up parameters	Save FL, UR, NR, NT, AD, BR, DX to EEPROM	none	OK/ERR
RS	Read serial number	Read/modify serial number, pass word = 330130	0 through 99999999	S:12345678/OK/ERR
UI	User ID	Read/modify user ID	Max 16 characters	U:LDU69/OK/ERR
HW	Hold weight	Hold net weight	none	none
GH	Get hold	Get net value from hold register	none	N+000000.

6.   CALIBRATION PROCEDURE

The calibration interface features a "**TRACEABLE ACCESS CODE**" (**TAC**), as is required for use in "Approved" applications (see section 7, "USE IN APPROVED APPLICATIONS" for more details). This feature also ensures that access to the calibration functions is protected from inadvertent or unauthorised change. The following parameters are considered as CALIBRATION commands:

CE: Calibration Enable - returns the current TAC value.
CZ: Calibrate zero - sets the system zero point.
CG: Calibrate gain - sets the system gain.
CM: Calibrate maximum - sets the maximum allowable display value in each range.
CI: Calibrate minimum - sets the minimum allowable display.
LC: Clear linearization points.
LN: Define linearization point.
DS: Display step size - sets the output incremental step size.
DP: Display decimal point - sets the position of the output decimal point.
ZT: Zero track band.
ZR: Zero track range.
FD: Factory default setting (return to)
CS: Calibration save.

To make an enquiry as to the setting of any of these commands requires the issue of the command with no parameters attached. The responses are explained in section 4.2, "CALIBRATION COMMANDS".

To make a change to the settings of any of these commands **REQUIRES THE ISSUE OF THE CE COMMAND FOLLOWED BY THE CURRENT TAC VALUE (CE XXXXX).**
For example, if the output step value needs to be changed from 1 to 5, the following steps would be required:

Master send: **CE**
Slave returns: **E+00016**
Master send: **CE 16**
Slave send: **OK**
Master send : **DS 5**
Slave send: **OK**

The output will now increment in steps of 5 divisions. It will then be necessary to SAVE the calibration parameters to non-volatile memory, by issuing the CS command. The CS command, which has no parameters and must be preceded by the **CE XXXXX** command, will return **OK** to signify successful update. The TAC is then incremented by 1.

An example of the recommended calibration procedure follows:

To set the system zero and the system gain:

With the device selected, a suitable load cell in place, with known test weights available, (the example uses 5000 as a test weight value):

Step 1	Master sends:	**CE**	Query the current TAC value
	Slave returns:	**E+00017**	
Step 2	Master sends:	**CE 17**	Enable the calibration sequence
	Slave returns:	**OK**	
Step 3	Master sends:	**CZ**	Ensure that the weigher is unloaded
	Slave returns:	**OK**	
Step 4	Master sends:	**CE 17**	Enable the calibration sequence
	Slave returns:	**OK**	
Step 5	Master sends:	**CG 5000**	Where 5000 is the weight value added
	Slave returns:	**OK**	
Step 6	Master sends:	**GG**	Confirm the calibration is correct
	Slave returns:	**G+005000.**	
Step 7	Master sends:	**CE 17**	Enable the calibration sequence
	Slave returns:	**OK**	
Step 8	Master sends:	**CS**	Write the calibration data to memory
	Slave returns:	**OK**	

The system zero and system gain value will have been updated and written to EEPROM, and the TAC will have been incremented.

7.   USE IN "APPROVED" APPLICATIONS

The term "approved" applies whenever the weighing application is intended to be used for "legal-for-trade" weighing - that is, money will change hands according to the weight result. Such applications are bound by the legal metrology regulations of the relevant governments around the World, but most countries will comply with either the relevant EN's (EuroNorms) or the relevant OIML (Organisation Internationale de Metrologie Legale) recommendations.

- The GLDU 69.1 has been approved as a component for use in weighing systems according to OIML recommendation R76, the performance level approved being Class

III, 10000 divisions. The approval Authority was the Danish Electronics, Light & Acoustics (DELTA), and the approval certificate number was

- DK0199-R76-03.01 Revision 2, dated **2008-10-24** This approval will allow the use in approved weighing systems throughout Europe, and in many other countries of the World.

To achieve approval on a particular application, it will be necessary to satisfy the relevant Governmental Trading Standards Authority that the requirements of the various rules and regulations have been satisfied. This task is greatly simplified if the key components of the weighing system, namely the load cells and the weighing indicator or digitiser, are already approved as "components".

Usually, a discussion with the Weighing Equipment Approvals Officers at the relevant National Weights & Measures Office will then reveal the extent of any pattern testing that may be necessary to ensure compliance.

Restrictions upon usage when in "Approved" applications

A number of performance restrictions must come into force. These restrictions are the number of display divisions, which become limited to 10000 divisions, and the sensitivity per display division, which becomes 0.1 uV per division.

Once installed in the application, an "approved" application will require "stamping" by an Officer of the relevant Governmental Trading Standards Department. This certifies the equipment or system as being in accordance to the relevant regulations and within calibration limits.

The Traceable Access Code (TAC)

The user software must then provide a guard against improper access of the calibration commands (see the "Calibration Commands" section). The GLDU 69.1 digitiser features the "Traceable Access Code" or TAC method of controlling the access to the calibration commands group. This means that a code is maintained within the device, and is incremented whenever any change to any of the calibration commands is saved.

When performing the "stamping" test, the Trading Standards Officer will make a note of the TAC, and advise the user that any change to this code which occurs prior to the regular re-inspection by the Trading Standards Office, will result in legal prosecution of the user.

The user software is required as a condition of approval, to make the TAC available to the weight display indicator or console, on demand.

8.   DOWNLOADING CUSTOM SOFTWARE

For downloading customized software or updates the LDU must be connected to
a PC running Windows through a suitable RS485/RS422 converter using 4 wire
connection. The jumper SW4 must be closed before powering up the LDU to enter this
special download mode.

The download is done using the program PROG78 available from Group four. The
program will promt for the COM-port used (1 to 4) and for the name of the new
software distributed as a file in Motorola S format.