TR2 Electronics Module [Catalogue]

Text-Based Communications Specification

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Document History

Rev.	Date	Author	Details of change
A	5-Dec-18	Terry Gooding	Initial release.

1. Purpose

The purpose of this document is to define a common command set for all text-based interfaces used on the TR2 electronics module.
This command set includes commands for read / write access to calibration values and other data as well as those for the execution of TR2 functions.

2. Scope

This document is applicable only to the TR2 catalogue part firmware. Refer to the Software Release Notes **[1]** for details of the document revision on which a particular firmware release is based.
This specification defines only the software layers of the communication bus; the physical layer implementation is not defined here and is outside the scope of this document.
The command set defined in this specification is applicable to all text-based interfaces of the TR2. Currently, the text-based interfaces comprise the RS232 interface (utilising USART 1) and the USB CDC interface, but future implementations could include any of the other USART-based interfaces, such as the RS485 interface (utilising USART 2) or the USART interface (utilising USART 3).

3. References

This document should be read in conjunction with those detailed in the table below:

#	Doc. Number	Rev.	Title
1	0087550	All	TR2 [Catalogue] Firmware Release Note

Table 1 - References

4. Fixed Functions and Values

As well as the factory-changeable and user-changeable parameters, there are a number of values and functions which are set in the firmware and cannot be altered. These form the basis of the operation of the TR2, and customers' software must work within these parameters to achieve their own required functionality.
The following aspects of the TR2 are fixed as described below:

- The TR2 is single interval, single range.
- The TR2 has a fixed step size of 1 (1 gramme, 1 kg, 1 lb etc)

- The TR2 will output all weight measurements to a precision of one decimal place - in normal use, the number following the decimal point will always be zero.

5. Serial Communications Implementation

Using text-based communication over RS-232 or USB-CDC allows for easy communication between a PC and a TR2 using a basic terminal application such as HyperTerm or TeraTerm.
On all currently-supported USART-based interfaces, the TR2 implements the following:

1. Full-duplex RS232 communication.
2. A fixed protocol of 115200 Baud, 8 data bits, no parity, 1 start bit, 1 stop bit, no flow control. On the USB CDC interface, the virtual COM port settings are irrelevant, as these are taken care of by the host's port driver software.
3. All commands sent and received are terminated with a **Carriage Return** (ASCII code 0x0D) In this document Carriage Return (ASCII code 0x0D) will be denoted by <CR>.
4. Any unrecognised commands, or legal commands trying to set a parameter with an illegal value will respond with **ERR<CR>.**
5. A command that executes a function will respond **OK<CR>** if that function is executed.
6. A command that writes a new parameter will respond **OK<CR>** if that parameter is written.
7. A command that reads a parameter will respond with the value of that parameter.
8. Some functions can only be executed, or parameters set, if the Password command has been sent first. (See PW command)

6. Command Codes

The following is a list of command codes that can be used to access the data and functions of the TR2 module. Where a request can only be executed in calibration mode, this is shown in the 'Special access' field of the command definition.
As described above, these commands can be used over a number of different text-based interfaces. The response for each command (as detailed below) will be sent only on the interface which received the command. All available interfaces can be used concurrently and are independent of one another.

6.1. Read/Write Commands

The following commands are those which read data from the TR2 or write data values to it.

6.1.1. ECU Serial Number

Description:	This command returns the unique serial number of the TR2. The serial number is returned as a null-terminated string of up to 24 ASCII characters.
Read command:	RS<CR>
Read response:	S:XXXXXXXXXXXXXXXXXXXXXXXX<CR> where XXX… is an ASCII string of up to 24 characters.
Write command:	N/A
Write response:	N/A
Special access:	None.

6.1.2. ECU Part Number

Description:	This command returns the Flintec Part Number of the TR2. The number returned signifies the A (5V) or B (10V to 24V) part.
Read command:	FPN<CR>
Read response:	P:TR2-A<CR> (5V Version) P:TR2-B<CR> (10V to 24V Version)
Write command:	N/A
Write response:	N/A
Special access:	None.

6.1.3. ECU Firmware Version Number

Description:	This command returns the ECU's major and minor firmware revision numbers.
Read command:	FFV<CR>
Read response:	V:XXYY<CR> where XX is the major firmware revision and YY is the minor firmware revision of firmware version XX.YY.
Write command:	N/A
Write response:	N/A
Special access:	None.

6.1.4. ECU General Status

Description:	This command returns information about the current state of the ECU. The ECU status is returned as a **6-digit decimal number** representing an 8-bit bitmapped byte with the following bit values: 1: Measurement is stable (no motion). (Bit0 = 0x01) 2: Zero action performed. (Bit1= 0x02)

	4: Tare is active. (Bit2= 0x04) 8: ECU is in calibration mode. (Bit3= 0x08) 16: Gravity compensation is active. (Bit4= 0x10) 32: Tilt sensor detects scale is not flat. (Bit5= 0x20) 64:. TR2 warm-up is in progress. (Bit6= 0x40)
Read command:	IS<CR>
Read response:	S:0000XX<CR> where XX represents the device status as described above.
Write command:	N/A
Write response:	N/A
Special access:	None.

6.1.5. Calibration Counter

Description:	This command returns the current value of the ECU's calibration counter. The value of the calibration counter cannot be changed manually, but will be automatically incremented each time the 'Save Calibration Data' or 'Restore Factory Defaults' command is executed.
Read command:	CE<CR>
Read response:	E+XXXXX<CR> where XXXXX is a 5-digit decimal number representing the calibration counter value.
Write command:	N/A
Write response:	N/A
Special access:	None.

6.1.6. Calibration Mode Password

Description:	In order to change any calibration data, or access any restricted functions a password of **632111** needs to be entered to get into Calibration Mode. (Note: this password is fixed and cannot be changed by the user) If the ECU is already in Calibration Mode, entering an incorrect code will exit Calibration Mode. If the ECU is not in Calibration Mode and an incorrect code is entered, an error will be returned, and this command will become unavailable for a period of around 5000 ms. The ECU will timeout of Calibration Mode if no calibration commands are executed for a period of 10 minutes.
Read command:	N/A
Read response:	N/A
Write command:	PW 632111<CR>

Write response:	OK<CR>
Special access:	None.

6.1.7. Gross Weight

Description:	This command returns the filtered gross weight on the scale in the format: G[+,-]00000.0<CR>
Read command:	GG<CR>
Read response:	G+XXXXX.0<CR> (XXXXX is the gross weight as described above) Guuuuuuuu<CR> will be returned if the gross weight drops below the CI value. Goooooooo<CR> will be returned if the gross weight exceeds the CM value.
Write command:	N/A
Write response:	N/A
Special access:	None.

6.1.8. Stream Gross Weight

Description:	This command repeatedly returns the filtered gross weight in the same format as for the Gross Weight command above. The gross weight is returned every time a new sample is read from the ADC (which depends on the Sample Rate setting below. The gross weight will continue to be transmitted in this way until any other valid command is entered on the RS232 interface.
Read command:	SG<CR>
Read response:	Gross weight streamed (see GG response)
Write command:	N/A
Write response:	N/A
Special access:	None.

6.1.9. Net Weight

Description:	This command returns the net weight on the scale in the format: N[+,-]00000.0<CR>
Read command:	GN<CR>
Read response:	N+XXXXX.0<CR> (XXXXX is the net weight as described above) Nuuuuuuuu<CR> will be returned if the net weight drops below the CI value. Nooooooo<CR> will be returned if the net weight exceeds the CM value
Write command:	N/A
Write response:	N/A

Special access:	None.

6.1.10. Tare Weight

Description:	This command returns the tare weight in the format: T+00000.0<CR> If the tare function is not currently active, the tare weight will be zero. Tare is set using the ST command and reset using the RT command. To check if the tare is active or not look at Bit2 in the status byte – see IS command.
Read command:	GT<CR>
Read response:	T+XXXXX.0<CR> where XXXXX is the tare weight as described above.
Write command:	N/A
Write response:	N/A
Special access:	None.

6.1.11. Hold Weight

Description:	This command returns the **net** weight that was stored in the ECU the last time the 'Set Hold Weight' (HW) command was executed.
Read command:	GH<CR>
Read response:	The GH command will return:- N+XXXXX.0<CR> Nuuuuuuuu<CR> Noooooooo<CR> (see GN command for better description)
Write command:	N/A
Write response:	N/A
Special access:	None.

6.1.12. Current A/D Converter Sample

Description:	This command returns the current A/D converter sample value as a 24-bit unsigned integer.
Read command:	GS<CR>
Read response:	S+XXXXXXXX<CR> where XXXXXXXX is an 8-digit, zero-padded decimal number representing the most recent filtered A/D converter value.
Write command:	N/A
Write response:	N/A
Special access:	None.

6.1.13. Zero-Point A/D Converter Sample

Description:	This command returns the A/D converter value that was used to calibrate the system's zero point. It is given as a 24-bit unsigned integer.
Read command:	ZC<CR>
Read response:	Z+XXXXXXXX<CR> where XXXXXXXX is an 8-digit, zero-padded decimal number representing the zero-point A/D converter value.
Write command:	N/A
Write response:	N/A
Special access:	None.

6.1.14. Gain Point A/D Converter Sample

Description:	This command returns the A/D converter value that was used to calibrate the system's gain (span) point. It is given as a 24-bit unsigned integer.
Read command:	GC<CR>
Read response:	G+XXXXXXXX<CR> where XXXXXXXX is an 8-digit, zero-padded decimal number representing the span-point A/D converter value.
Write command:	N/A
Write response:	N/A
Special access:	None.

6.1.15. No-Motion Range

Description:	This command returns or sets the weight range inside which the weight signal may be considered as stable. If the weight does not fluctuate by more than this value during the time period specified by 'No-motion Time' (NT), the weight is considered to be stable (and Bit0 is set in the system status byte – see IS command).
Read command:	NR<CR>
Read response:	R+XXXXX.0<CR> where XXXXX is a 5-digit, zero-padded decimal number giving the current value of the no-motion range in calibrated units. (grammes, kg etc) **Default = 00001.0**
Write command:	NR XXXXX<CR> where XXXXX is a decimal number specifying the value of the no-motion range in calibrated units. (grammes, kg etc)
Write response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.1.16. No-Motion Time

Description:	This command returns or sets the no-motion time in milliseconds. See the description in command NR for details of the no-motion definition).
Read command:	NT<CR>
Read response:	T+XXXXX<CR> where XXXXX is a 5-digit, zero-padded decimal number giving the current value of the no-motion time in milliseconds. **Default = 01000**
Write command:	NT XXXXX<CR> where XXXXX is a decimal number specifying the value of the no-motion time in milliseconds.
Write response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.1.17. Calibration Span / Gain weight

Description:	This command returns or sets the weight that was (or will be) used to calibrate the gain (span) of the scale. (in calibrated units - grammes, kg etc)
Read command:	CW<CR>
Read response:	S+XXXXX.0<CR> where XXXXX is a 5-digit, zero-padded decimal number giving the current value of the calibration span weight. **Default = 00000.0**
Write command:	CW XXXXX<CR> where XXXXX is a decimal number specifying the value of the calibration span weight.
Write response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.1.18. Minimum Output Value

Description:	This command returns or sets the minimum weight (in calibrated units) at which the gross weight, net weight and hold weight output changes to show the under-range error value of ‘uuuuuuuu’.
Read command:	CI<CR>
Read response:	I+XXXXX.0<CR> where XXXXX is a 5-digit, zero-padded decimal number giving the current value of the minimum output value in calibrated units **Default = -09999.0**

Write command:	CI XXXXX<CR> where XXXXX is a decimal number specifying the value of the minimum output value in calibrated units
Write response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.1.19. Maximum Output Value

Description:	This command returns or sets the maximum weight (in calibrated units) at which the gross weight, net weight and hold weight output changes to show the over-range error value of 'ooooooo'.
Read command:	CM<CR>
Read response:	M+XXXXX.0<CR> where XXXXX is a 5-digit, zero-padded decimal number giving the current value of the maximum output value in calibrated units. **Default = 65535.0**
Write command:	CM XXXXX<CR> where XXXXX is a decimal number specifying the value of the maximum output value in calibrated units.
Write response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.1.20. Zero Range

Description:	This command returns or sets the weight in calibrated units within which the scale can be manually zeroed using the 'Set System Zero' (SZ) command. A value of zero sets the zero range to its default value of ±2% of the maximum weight.
Read command:	ZR<CR>
Read response:	R+XXXXX.0<CR> where XXXXX is a 5-digit, zero-padded decimal number giving the current value of the zero range in calibrated units. **Default = 00000.0**
Write command:	ZR XXXXX<CR> where XXXXX is a decimal number specifying the value of the zero range in calibrated units.
Write response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.1.21. Initial Zero Range

Description:	This command returns or sets the weight in calibrated units within which the scale will perform an **automatic** 'Set System Zero' after power-up or reset.
Read command:	ZI<CR>
Read response:	R+XXXXX.0<CR> where XXXXX is a 5-digit, zero-padded decimal number giving the current value of the initial zero range in calibrated units. **Default = 00000.0**
Write command:	ZI XXXXX<CR> where XXXXX is a decimal number specifying the value of the initial zero range in calibrated units.
Write response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.1.22. Zero Tracking Value

Description:	This command returns or sets the weight in calibrated units within which the scale will perform an **automatic** 'Set System Zero' after power-up or reset.
Read command:	ZT<CR>
Read response:	Z:XXX<CR> where XXX is a 3-digit, zero-padded decimal number giving the current zero tracking value. **Default = 00000.0**
Write command:	ZT XXX<CR> where XXX is a decimal number specifying the zero-tracking value.
Write response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.1.23. Calibration Gravity Value

Description:	This command returns or sets the gravity value that was present during calibration of the scale. The calibration value of g is specified in ms^{-2}. Valid values for calibration gravity are 9.7 ms^{-2} to 9.9 ms^{-2}.
Read command:	GF<CR>
Read response:	F+X.XXXXXX<CR> where X.XXXXXX is a number displayed to 6 decimal places giving the current calibration gravity value in ms^{-2}. **Default = 9.806650**
Write command:	GF X.XXXXXX<CR>

	where X.XXXXXX is a decimal number specifying the calibration gravity value in ms^{-2}. Valid values for user gravity are 9.7 ms^{-2} to 9.9 ms^{-2}.
Write response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.1.24. User Gravity Value

Description:	This command returns or sets the gravity value that is to be used for the current location when gravity compensation is enabled (EG) The user value of g is specified in ms^{-2}. Valid values for user gravity are 9.7 ms^{-2} to 9.9 ms^{-2}.
Read command:	GV<CR>
Read response:	V+X.XXXXXX<CR> where X.XXXXXX is a number displayed to 6 decimal places giving the current user gravity value in ms^{-2}. **Default = 9.806650**
Write command:	GV X.XXXXXX<CR> where X.XXXXXX is a decimal number specifying the user gravity value in ms^{-2}. Valid values for user gravity are 9.7 ms^{-2} to 9.9 ms^{-2}.
Write response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.1.25. Filter Type

Description:	This command returns or sets the current filter setting of the ECU. The filter type is specified as a decimal number with the following valid values: 0: No filtering (uses latest ADC sample only) 1: An 8-sample moving average 2: a 32-sample moving average 3: The Flintec 'baby' algorithm
Read command:	FL<CR>
Read response:	F+XXX<CR> where XXX is a 3-digit, zero-padded decimal number giving the current value of filter type. **Default = 001 (8 sample averaging)**
Write command:	FL XXX<CR> where XXX is a decimal number specifying the filter type.
Write response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.1.26. Sample Rate

Description:	This command returns or sets the current ADC sample rate of the ECU in Hertz (samples per second). The valid range is from 5Hz to 50Hz.
Read command:	UR<CR>
Read response:	U+XXX<CR> where XXX is a 3-digit, zero-padded decimal number giving the current value of the ADC sample rate in Hz. **Default = 020**
Write command:	UR XXX<CR> where XXX is a decimal number specifying the required sample rate in Hz.
Write response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.1.27. CAN Bus Speed

Description:	This command returns or sets the value of the CAN bus prescaler register of the microcontroller. The speed of the CAN bus is then determined from the prescaler value as follows: CAN Bus speed = ($4*10^6$ / prescaler)
Read command:	NS2<CR>
Read response:	B XXX<CR> (space between B and first digit) where XXX is a 3-digit, zero-padded decimal number giving the current value of the CAN bus prescaler register. **Default = 008 (= 500kbs)**
Write command:	NS2 XXX<CR> where XXX is a decimal number specifying the value of the CAN bus prescaler register.
Write response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.1.28. Engineering Mode

Description:	This command enables or disables engineering mode. In engineering mode, weight outputs are given to 0.1 resolution, rather than 1.0 Cycling the power switches Engineering Mode off.
Read command:	EM<CR>
Read response:	E:XXX<CR> where XXX is ‘001’ if engineering mode is enabled, ‘000’ if disabled. **Default = 000**

Write command:	EM X<CR> where X is '1' to enable engineering mode, any other character to disable.
Write response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.1.29. Tilt Sensor Baseline

Description:	This command returns the x-, y- and z-axis data values that were read from the tilt sensor (accelerometer) at the time the factory calibration took place. These values are the references used to determine whether the scale is currently detecting a tilt. The x-, y- and z-axis acceleration data is specified in 1g/1024 per bit.
Read command:	TC<CR>
Read response:	C:xxxx:yyyy:zzzz<CR> where 'xxxx', 'yyyy' and 'zzzz' are the baseline x-, y- and z-axis tilt values.
Write command:	N/A
Write response:	N/A
Special access:	None.

6.1.30. Tilt Sensor Data

Description:	This command returns the current (most recent) x-, y- and z-axis data values that were read from the tilt sensor (accelerometer). The x-, y- and z-axis acceleration data is specified in 1g/1024 per bit.
Read command:	TV<CR>
Read response:	V:xxxx:yyyy:zzzz<CR> where 'xxxx', 'yyyy' and 'zzzz' are the current x-, y- and z-axis tilt values.
Write command:	N/A
Write response:	N/A
Special access:	None.

6.1.31. User Data

Description:	This command returns or sets the content of the user data area. The user data area is a 32-byte space for general purpose non-volatile storage. It has no function within the operation of the ECU itself. The user data is set and returned as a null-terminated string of up to 32 ASCII characters.
Read command:	UD<CR>
Read response:	U:XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX<CR> where XXX… is an ASCII string of up to 32 characters.

Write command:	UD XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX<CR> where XXX… is an ASCII string of up to 32 characters.
Write response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.1.32. Error Status

Description:	This command returns information about the current error / diagnostic state of the ECU. The error status is returned as a 6-digit decimal number representing a 4-bit bitmapped nibble with the following bit values: 1: ECU is not calibrated. (Bit0) 2: A non-volatile memory error checksum has been detected. (Bit1) 4: A broken load cell excitation wire has been detected. (Bit2) 8: An A/D converter result was not received as expected. (Bit3)
Read command:	ES<CR>
Read response:	E:0000XX<CR> where XX represents the device status as described above.
Write command:	N/A
Write response:	N/A
Special access:	None.

6.1.33. Minimum Expected Load Cell Current

Description:	This command returns or sets the minimum combined current (in µA) expected to be consumed by all load cells in the system. The total load cell current is continually monitored by the TR2 diagnostic firmware. If the current consumption of the loadcells falls below the minimum expected value, the broken load cell excitation wire flag (Bit2) is set in the Error Status word, described above.
Read command:	LC<CR>
Read response:	L+XXXXX<CR> where XXXXX is a 5-digit, zero-padded decimal number giving the current value of the minimum expected load cell current in microamps.
Write command:	LC XXXXX<CR> where XXXXX is a decimal number specifying the minimum expected load cell current in microamps.
Write response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.2. ‘Execute’ Commands

The following commands are those which execute internal functions of the Generic Scale ECU.

6.2.1. Set Hold Weight

Description:	This command stores the current net weight value in an internal register. The hold weight can be read by issuing the 'Read Hold Weight' (GH) command.
Command:	HW<CR>
Response:	OK<CR>
Special access:	None.

6.2.2. Set Tare Value

Description:	This command stores the current gross weight value as the tare weight. The net weight calculation is as follows: An error will be returned if this command is issued while the signal is not stable, as defined by the no-motion parameters. Power cycling the ECU clears the tare.
Command:	ST<CR>
Response:	OK<CR> (or ERR<CR> if weight not defined as stable)
Special access:	None.

6.2.3. Reset Tare Value

Description:	This command cancels the 'Set Tare Value' command above, and the tare value is set to zero. (Power cycling the ECU also clears the tare.)
Command:	RT<CR>
Response:	OK<CR>
Special access:	None.

6.2.4. Set System Zero

Description:	This command sets the 'system zero' to a new 'current zero' which is then the basis of all future weight values (instead of the 'true zero' set at calibration). An error will be returned if this command is issued while the signal is not stable, as defined by the no-motion parameters or the gross weight is outside of the zero-range value. Power cycling the ECU reverts back to using the 'true zero'
Command:	SZ<CR>
Response:	OK<CR> (or ERR<CR> if current weight outside the limit or not stable)
Special access:	None.

6.2.5. Reset System Zero

Description:	This command cancels the 'Set System Zero' command above, and the zero reading reverts to that set by the 'Calibrate System Zero' command.
Command:	RZ<CR>
Response:	OK<CR>
Special access:	None.

6.2.6. Enable Gravity Compensation

Description:	This command switches on gravity compensation mode. Subsequent calculations of gross weight, net weight and tare weight will be adjusted for the difference in the value of g specified for calibration and at the user location.
Command:	EG<CR>
Response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.2.7. Disable Gravity Compensation

Description:	This command switches off gravity compensation mode.
Command:	DG<CR>
Response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.2.8. Calibrate System Zero

Description:	This command stores the current 24-bit A/D converter value as the zero-point calibration value. This command should be executed when the scale is unloaded (empty). An error will be returned if this command is issued while the signal is not stable, as defined by the no-motion parameters.
Command:	CZ<CR>
Response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.2.9. Calibrate System Gain Point

Description:	This command stores the current 24-bit A/D converter value as the gain (span) calibration value. An error will be returned if this command is issued while the signal is not stable, as defined by the no-motion parameters.

Command:	CG<CR>
Response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.2.10. Save Calibration Data

Description:	This command saves all calibration data to the ECU's non-volatile memory so that it will be retained when power is removed. Note: 'calibration data' refers to any values which requires calibration mode to be active in order to change their value. Until this command is successfully executed, any unsaved calibration data will be lost if a power-off or reset occurs. The Calibration Counter (which can be accessed with the CE command) will be incremented on successful execution of this command. **Note that the data transfer to non-volatile memory may take up to 50 ms to complete. A success response to this request signifies only that the request was valid, and that the memory transfer has been scheduled to begin. Any further communication sent to the ECU within 50 ms of this command may be lost, as all CPU activity is halted during the memory transfer process.**
Command:	CS<CR>
Response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.2.11. Restore Factory Defaults

Description:	This command causes all volatile and non-volatile memory contents to be over-written with factory default settings. All saved and unsaved calibration values will be lost. The calibration counter will be incremented on successful execution of this command. **Note that the data transfer to non-volatile memory may take up to 50 ms to complete. A success response to this request signifies only that the request was valid, and that the memory transfer has been scheduled to begin. Any further communication sent to the ECU within 50 ms of this command may be lost, as all CPU activity is halted during the memory transfer process.**
Command:	FD<CR>
Response:	OK<CR>
Special access:	The ECU must be in calibration mode to write this value.

6.2.12. Reset Firmware

Description:	This request performs as close to a full firmware reset as possible (warm start). It is essentially the same as cycling the power so any active tare, new system zero point or unsaved calibration will be lost. If successfully executed, the success response will be returned before the ECU is reset (typically within 50ms).
Command:	SR<CR>
Response:	OK<CR>
Special access:	None.

6.2.13. Upgrade Firmware

Description:	This request forces the ECU into boot mode to allow a firmware upgrade via USB. After this command has been successfully issued, no further commands can be sent to the ECU over any interface; the ECU will only respond to firmware upgrade commands received over the USB interface. If this command is issued in error, power cycling the ECU will return it to its normal mode of operation.
Command:	FU<CR>
Response:	OK<CR>
Special access:	None.

7. Command Summary

The table below shows a summary of the commands available on the RS232 and USB interfaces, showing which commands read system data (R), write system data (W) or execute ECU functions(X). A tick (check) mark shows that the operation is available in all modes, whereas a 'C' entry denotes that the ECU must be in calibration mode to access the operation (i.e. the correct passcode has been written to the calibration mode register).

Command code	R	X	W	Description
RS	✓			ECU Serial Number
RP	✓			ECU Part Number
IV	✓			ECU Firmware Version Number
IS	✓			ECU General Status
CE	✓			Calibration Counter
PW			✓	Calibration Mode Password
GG	✓			Gross Weight

Command code	R	X	W	Description
SG	✓			Stream Gross Weight
GN	✓			Net Weight
GT	✓			Tare Weight
GH	✓			Hold Weight
GS	✓			Current A/D Converter Sample
ZC	✓			Zero-Point A/D Converter Sample
GC	✓			Gain Point A/D Converter Sample
NR	✓		C	No-Motion Range
NT	✓		C	No-Motion Time
CW	✓		C	Calibration Span / Gain weight
CI	✓		C	Minimum Output Value
CM	✓		C	Maximum Output Value
ZR	✓		C	Zero Range
ZI	✓		C	Initial Zero Range
ZT	✓		C	Zero Tracking Value
GF	✓		C	Calibration Gravity Value
GV	✓		C	User Gravity Value
FL	✓		C	Filter Type
UR	✓		C	Sample Rate
NS2	✓		C	CAN Bus Speed
EM	✓		C	Engineering Mode
TC	✓			Tilt Sensor Baseline
TV	✓			Tilt Sensor Data
UD	✓		C	User Data
ES	✓			Error Status
LC	✓		C	Minimum Expected Load Cell Current
HW		✓		Hold Weight
ST		✓		Set Tare Value
RT		✓		Reset Tare Value
SZ		✓		Set System Zero
RZ		✓		Reset System Zero
EG		C		Enable Gravity Compensation
DG		C		Disable Gravity Compensation
CZ		C		Calibrate System Zero
CG		C		Calibrate System Gain Point

Command code	R	X	W	Description
CS		C		Save Calibration Data
FD		C		Restore Factory Defaults
SR		✓		Reset Firmware
FU		✓		Upgrade Firmware

Table 2 - Command Summary