m2000D technical manual

high speed 3 channel digital indicator

Manual Release for V1.03D of software

We are continuously improving the manual and will send out updated versions as soon as the manual has been finalized. More examples and features will be added.

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M2000D WEIGHT INDICATOR TECHNICAL MANUAL

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DIGITAL SCALE ALLOCATION GUIDE

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M2000D SYSTEM INTRODUCTION

GENERAL OVERVIEW

A M2000D weighing system consists of an indicator connected remotelly to one or two DLC remote digital intelligent load cell terminal boxes, supporting up to 16 load cells.

A digital M2000D scale system provides for a high level of data integrity between the scale platform and indicator for up to a 1000 feet apart. Because the analog scale data is converted to digital data inside the remote DLC slave and send, as digital data to the indicator, there is no data degradation across long cable runs. The digital system has a high level of resistance to RFI /EMI interference, as required by industrial installations.

The M2000D system consists of an indicator and one or two DLC slave units. The DLC slaves consist of 8 load cells per DLC. The digital system has no AD converters inside the indicator itself. The M2000D supports 3 scale channels and calibration commands allow the user to assign any or all of the load cells on the DLCs to a particular scale. A scale assignment might consist of either a hopper or sectional scale configuration. These hopper / sectional scale groupings are then allocated to the 3 scales provided for by the M2000D indicator – see **Figure 1** for more detail.

MAIN FEATURES

The M2000D Digital Indicator features include:

- Each DLC slave unit has 8 load cells that can be grouped to make up a scale configuration. The M2000 Digital indicator supports up to 16 load cells.
- The system allows for a combination of hopper type and /or sectional scale allocations
- A DLC slave can be up to a 1000 feet from the indicator with no data degradation
- Each load cell converter has a programmable input range of 10,20,40 or 80mV
- Each load cell can produce a maximum of ±512 000 raw counts per converter
- The M2000 Digital system has an optically isolated communications interface
- The system has complete galvanic isolation between indicator and DLC remote slaves for lightning protection

- Load cell inputs are factory matched for field interchangeability of DLC units

M2000D SYSTEM SPECIFICATIONS

INDICATOR PERFORMANCE (Approved for Canada and USA)

Unit Conversion	Lbs/kg
Zero Tracking	1-99% of d or 1,2,3d
Resolution	+/- 512 000 A/D counts per load cell
Sampling Rate	100 times a second per AD/ channel
Span Stability	2ppm/ Celsius
Zero Stability	5nV/Celsius
Linearity Correction	5 span entries
Calibration Method	Calibration through software stored in Flash memory
Calibration Sealing	Class 1 Audit Trail System, password protected
Filtering	FAST STEP quick response
Modes	Display from CH1,CH2,CH3 and Total of all Channels
Firmware Upgrading	Flash Memory - In field Firmware upgrading without affecting calibration data
DLC remote load cells	16 Load cells using two DLC slaves
Display	Red 0.75" 6 digit 7 Segment Display

DLC LOAD CELL INPUTS

DLC Remote Load cells	8 AD converters per DLC remote slave
Full Scale	4 ranges 0-9mV, 0-19mV,0-39 and 0-79V
Excitation	5VDC,16x350,32x700 ohm in total
Resolution	+/- 512 000 A/D counts per load cell
DLC cable length	500ft nominal or @ 1000 ft (22 AWG 2 pair / each pair shielded) with remote power
DLC current	500mA per slave with 8 *350 ohm load cells connected per DLC slave

COMMUNICATIONS

Serial Outputs	2 full duplex RS232/RS422
IO Interface	SMART WIRE perhiperal expansion - RS485 multidrop
External IO – Setpoints	6 channel setpoint via SMART WIRE (optional)
External IO- Analog Output	4-20mA board via SMART WIRE (optional)
External IO- Digital inputs	6 optically isolated inputs via SMART WIRE (optional)
Networking	RS485 Multidrop Networking of up to 32 indicators as slaves

ELECTRICAL

Power Requirements	12VDC 1.5A maximum
Temperature Range	-10C to +40C

ENCLOSURES

M2000D-DT	6x9.75x2.5 Stainless Steel Desktop (External Power Supply)
M2000D-NSB Swivel Stand	7.25x10x3 Stainless Steel NEMA with mounting for one option board
M2000DNSS Light Weight	8x10x4 Stainless Steel NEMA with option board mounting plan
M2000D-NSS-1 Heavy Duty	8x10x4 Stainless Steel NEMA4 with option board mounting plan

APPROVALS

Canada	Class III 10 000 Class IIIHD 25 000
USA	NTEP Class III/IIIL 10 000

M2000D DIGITAL SYSTEM DIAGRAM

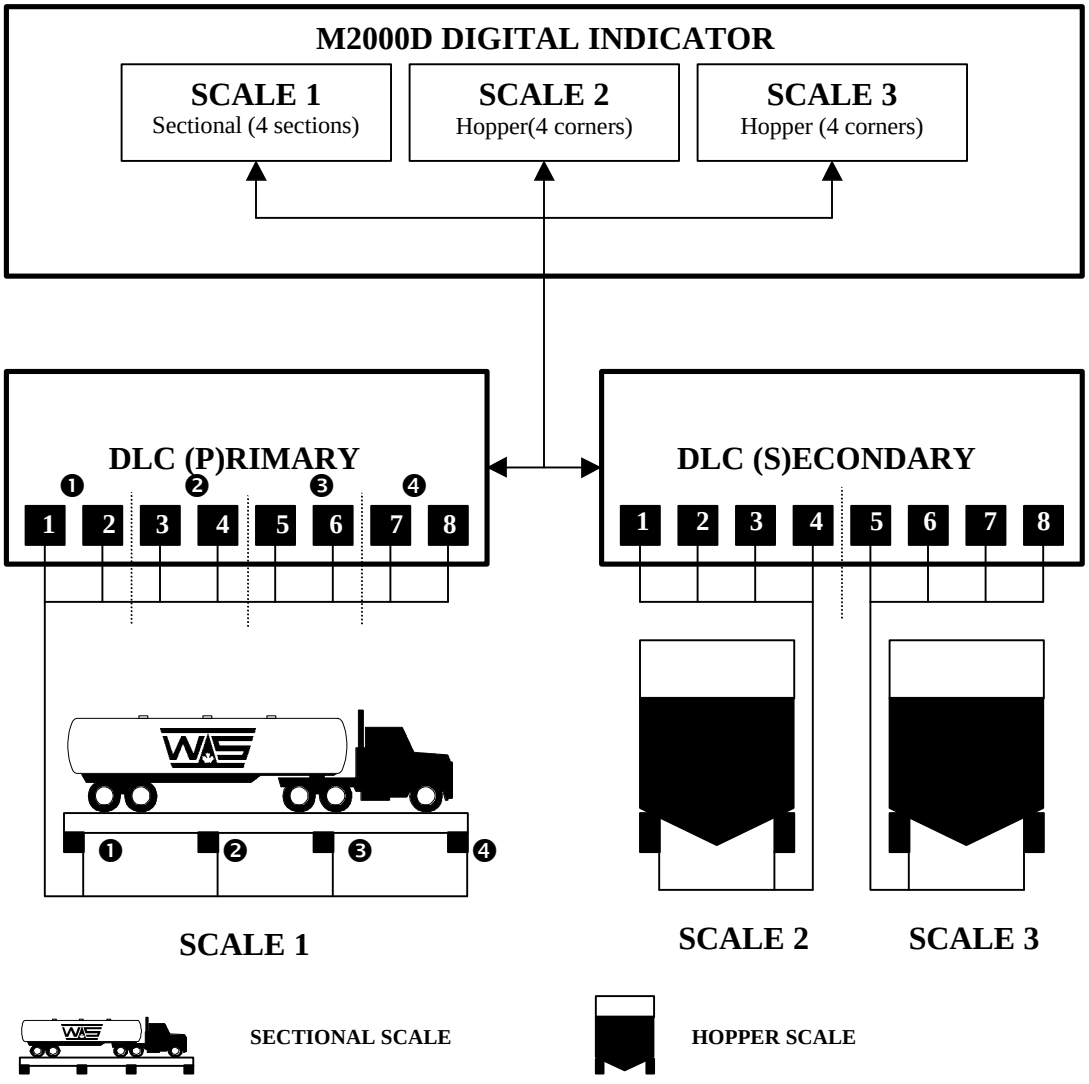


Figure 1: A M2000D Scale Configuration

TYPES OF SCALE SYSTEMS SUPPORTED

The M2000D targets two main types of industry scales, hopper and sectional scales. Hopper scales consist of 2, 3 or 4 cells. In a hopper system each cell is usually referred to as a corner. Each corner represents a load cell channel on the DLC slave. A hopper scale can be assigned to any of the 3 scale channels of the M2000D indicator.

The service personnel have the ability to perform corner corrections (field corrections) during calibration to compensate for small non-linear offsets in load cell values.

No access to the junction boxes are required to setup the system. All load cell corrections are done in software as part of a calibration setup, from the M2000D indicator keyboard. The system stores information in the DC slaves as part of a calibration.

The other type of scale targeted by the M2000D is the sectional scale as implemented in vehicle scales. A sectional scale consists of 2 or more sections, of which each section consists of two paired load cell channels. The service personnel have the ability to perform corrections on a section by section basis or even on a corner basis if required.

DLC CHANNEL ALLOCATION

There can be a total of 2 DLC slaves in a digital system, referred to as the (**P**)rimary and (**S**)econdary DLC slaves. The status LED on each slave indicates whether it is the primary or secondary slave. *Please consult the section on general diagnostics for more information on the status LEDs* .

The slaves are configured as (**P**)rimary or (**S**)econdary slave using the ID select jumper on the DLC terminal box respectively.

The slaves are labeled as outlined in **Figure 2**. If the DLC board is set to be a secondary slave, then the load cell channel numbering will be assigned as (**S**)econdary 1-8, and (**P**)rimary 1-8 if the slave was configured for the primary slave. As outlined in **Figure 2,** the analog to digital converter terminals are refered to as cells. Each cell will represent a corner as part of a scale allocation. The allocation process of a scale that involves multiple load cells are automatically assigned to unallocated cell terminals. The user does not have to manually select and allocate cells for a scale setup.

The following restrictions apply to allocating cells for hopper or sectional scales:

- *Hopper Scales*
  Hopper scale corners can be grouped on a single DLC, they cannot be spread across two DLC terminal boxes. Hopper scales can be grouped from any of the cells on a particular DLC slave terminal box.

- *Sectional Scales*
  A scale that uses sections will function in such a way that sections must be paired together, across from each other as outlined in **Figure 2**. Two DLCs may be used for a sectional scale allocation. Sections are allowed to span across DLC slaves. For instance, the user might apply all 16 cells as a sectional scale which will provide 4 sections on the **P**rimary DLC and 4 sections on the **S**econdary DLC, etc.

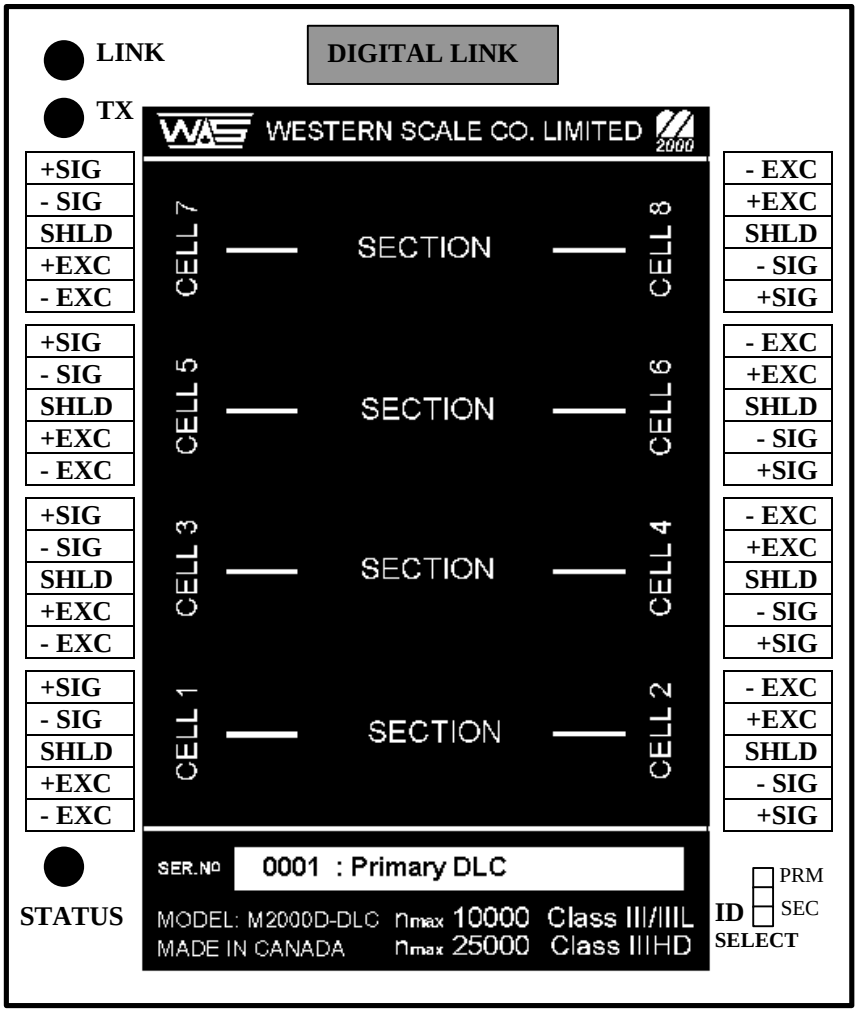
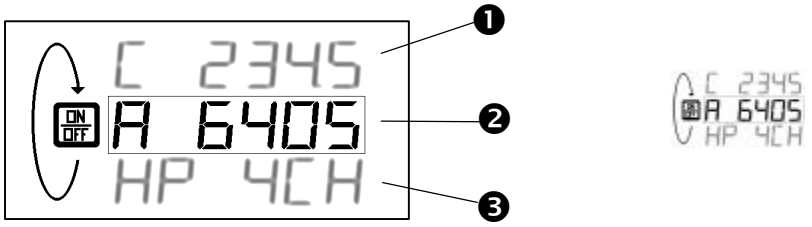


Figure 2: Remote DLC slave Corner & Section grouping

SCALE SETUP USER INTERFACE

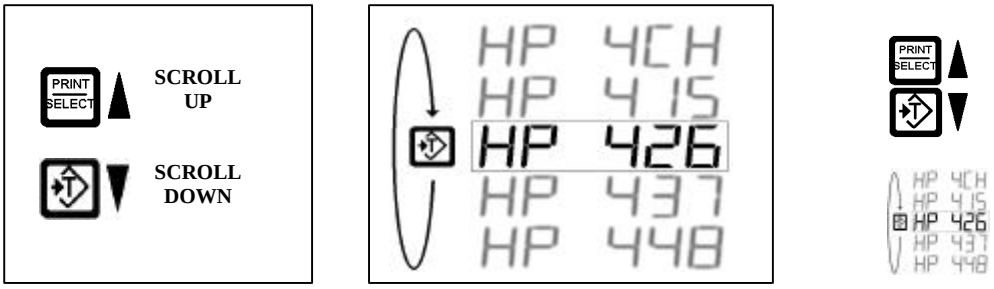
The indicator is calibrated using the numeric keypad. There are no potentiometers or switches to set. The M2000D consists, like its analog counterpart, of 3 scale channels. To enter calibration mode, type in the scale channel number 19, 29 or 39.

The following keys are assigned special function modes during calibration. The [ON/OFF] key does not allow power down during calibration. This key is used to select the type of information to be displayed as outlined below.

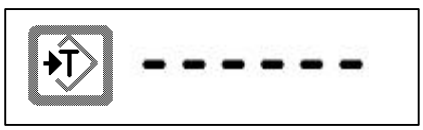


The [ON/OFF] key is used to select between graduated counts ❶, raw counts ❷ (currently displayed) or status information ❸. The status information shows the user what type of scale was allocated, how many load cells are involved and to which terminal block they are assigned. The status information window also shows the current load cell that is selected as part of the calibration process.

The tare key is also assigned a special function and is used to select the current corner or section. Most allocation calibration commands pertain to the currently selected load cell as selected using the [TARE] key. As an example - assume a 4-corner hopper scale assigned on the primary DLC as shown below. Using the [TARE] key, we can scroll and check one corner at a time and also the sum total of the individual corners in terms of raw counts or graduated counts:



If no load cells were allocated to a particular scale, or if an invalid scale allocation exists, the following window will be displayed on the LED display:



SECTIONAL SCALES

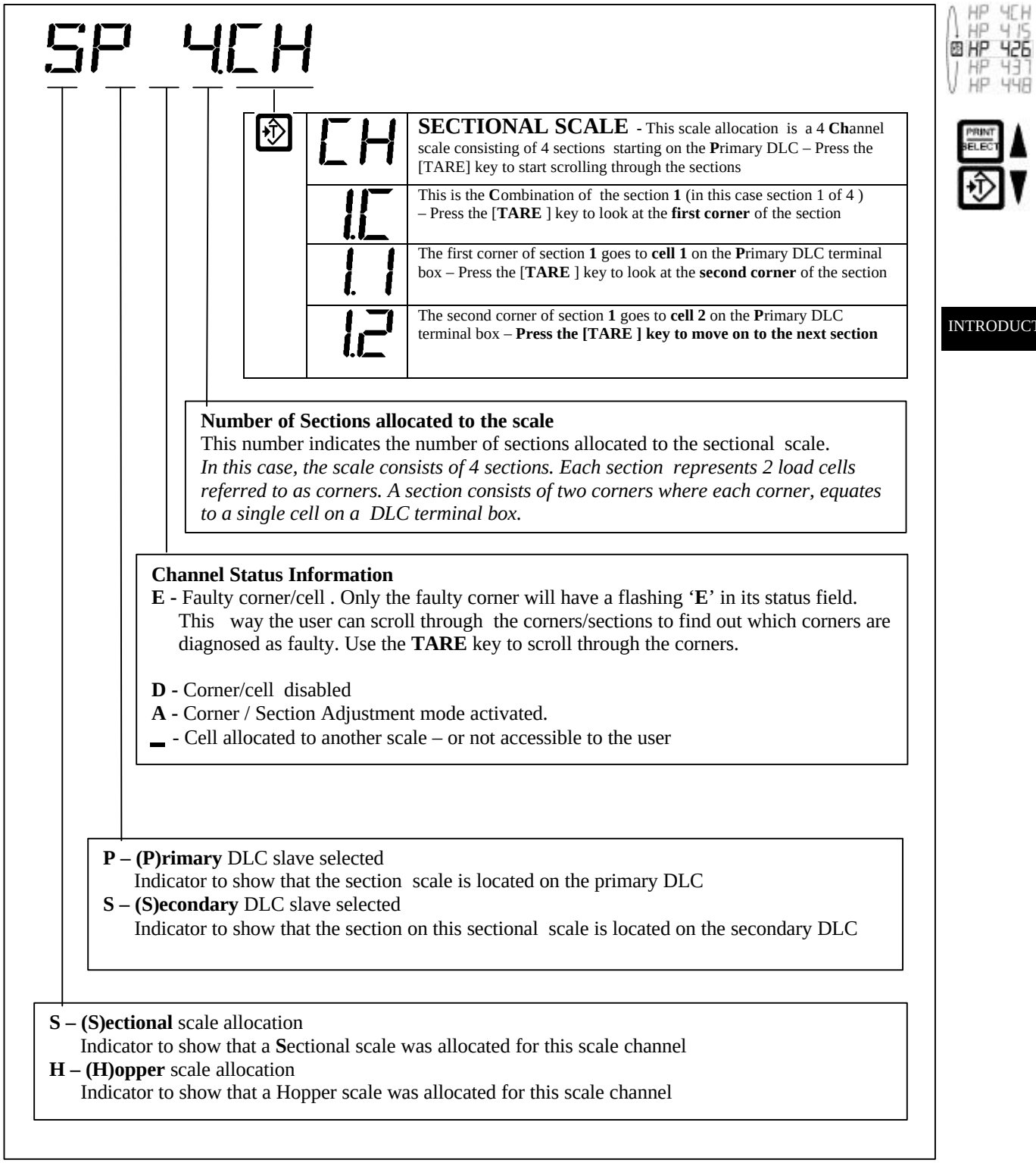


Table 1: Scale Status Information (Sectional Scales)

HOPPER SCALES

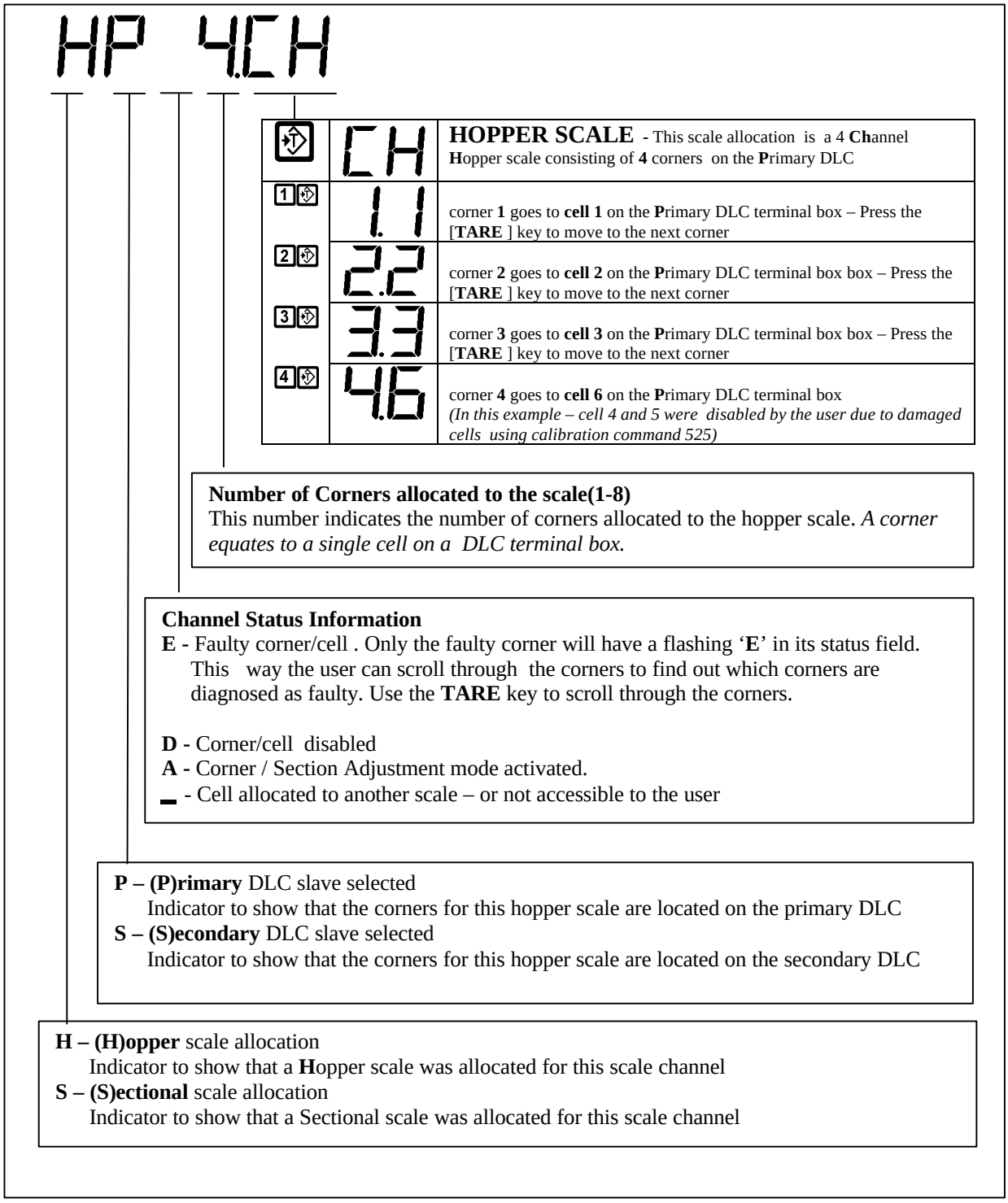


Table 2: Scale Status Information (Hopper Scales)

GENERAL INSTALLATION GUIDE

INTRODUCTION AND OVERVIEW

The following information provides a general guide to a successful installation. Please review these instructions before installing your unit.

High voltages may exist inside the enclosure. To prevent the risk of electrical shock, please unplug the indicator when opening the enclosure. Installation and servicing of the M2000D system should be performed only by qualified service personnel.

Complete the wiring of the external devices before connecting the indicator. Wiring should comply with local area electrical codes. Wherever possible cables should be in conduit or be otherwise protected from physical damage. Devices mounted outside should be mounted in suitable enclosures away from direct sunlight. Once the external wiring is completed, connect the indicator to the remote devices. Use the strain relief fittings provided to route the cables in the indicator.

POWER SUPPLY CONNECTION

The M2000D indicator requires a regulated input with an external source of 10-35 VDC. A 120VAC to 12 VDC adapter is supplied with the indicator. Please pay close attention to polarity of the power cord. It is important to note that in very noisy industrial environments, power-conditioning filters would be a requirement to ensure a fail-safe operation under all conditions. Indicators should not share AC power with electrical motors and switchgear. Consult with the site engineer for clean AC power.

- Line filters and surge protection for minor static environments
- Constant voltage transformer for typical industrial installations
- UPS protection for highly unstable power sources

In cases where the M2000D unit might be installed in a vehicle or truck, it is important to provide for power conditioning between the vehicle's power plant and the indicator. Please consult with your factory representative for more detail.

NOTE: *The M2000D do not include an [ON/OFF] switch. The [ON/OFF] key does not connect /disconnect the line voltage. The key " awakens " the M2000D from a "sleep" mode.*

LOAD CELL CONNECTION

The main characteristic of a digital system is to prevent long analog load cell cable connections between the load cell and the indicator. The installation strategy for a digital system is to have the DLC junction box mounted as close as possible to the weighing platform, to keep load cell cable runs between load cells and the DLC junction box as short as possible, to eliminate contamination of load cell analog signals by RFI and EMI interference.

Because the DLC junction box will be in close approximation to the load cells, losses in load cell cabling will be kept to a minimum, and so the need for SENSE lines is eliminated. For this reason, the DLC junction box do not include sense line terminals for load cells. The load cell interface only requires EXCITATION and SIGNAL lines for a total of 4 wires. Connecting a 6 conductor load cell cable to a DLC terminal recommends the +SENSE and +EXCITATION conductors to be joined together and the –SENSE and –EXCITATION conductors to be joined together respectively.

SERIAL PORT CONNECTIONS

Serial ports can be configured in the normal RS232 modes and to RS485 or RS422 multi drop modes. Before connecting to the serial port, consideration should be given to the communications protocol and to any remote requirements to prevent damaging serial ports. The recommended cable to be used with serial communication is 20 to 28 AWG with a braided or foil shield. The maximum recommended cable length is 15 meters or 50 feet. However much longer connections are possible if using a properly shielded, low-capacitance cable. The shield on a serial cable should only be connected to the M2000D indicators shield terminal for the serial port in question. Do not connect the shield on both ends of the cable – one end should be floating (not connected).

DLC COMMUNICATIONS CABLE CONNECTIONS

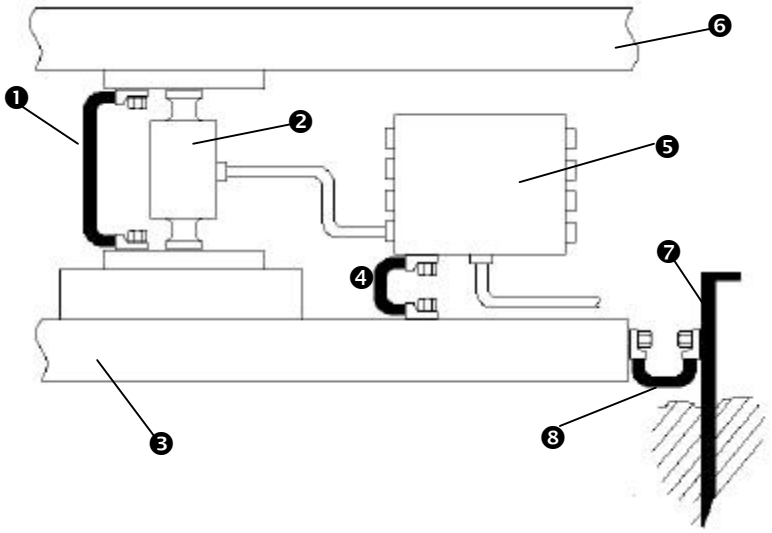
The DLC communications cable is the heart of the M2000D system. This cable conveys high-speed digital packetized data between DLC slaves and the M2000D indicator. This data is error corrected and although some packets might be rejected, the overall system provides a zero loss data path over a maximum of a 1000 feet of cable. The DLC digital cable provides optical isolation between the indicator and each of the remote DLC slaves.

The cable should have 4 conductors, one pair for power delivery and one pair for data communications. The cable should provide a separate foil shield for each pair plus a drain wire to be connected to the M2000D shield terminal. Do not connect the shield on the other end of the cable to anything. The recommended cable to be used is type 22 AWG (0.32 sq. mm), with each pair of conductors foil shielded.

SYSTEM GROUNDING

The following information deals with grounding as it relates to lightning and electrostatic discharges to earth ground. The M2000D provides for surge protection, however in order for surge conditions to be diverted properly, a good earth ground path should be in place. Surge protection components by themselves will not absorb all electrostatic discharge – it should simply divert charges safely to an earth ground path. Because the indicator is galvanically isolated from the remote DLC slaves, both ends should be grounded to a good earth connection.

Normally the DLC terminal box will be mounted onto the steel chassis of the weigh platform with a braided earth strap to the steel structure of the weighing platform. The steel frame should be connected to a metal rod planted in the earth close by the weighing platform. Earth straps should be at least 8 AWG thick and preferably no longer than 2 feet. The earth strap should be kept as straight as possible - kinks in the earth straps induce inductive resistances to the discharge path to earth ground.



1. Earth Strap
2. Load Cell
3. Platform Chassis
4. Earth Strap
5. DLC Junction Box
6. Weigh Platform
7. Earthing Rod
8. Earth Strap

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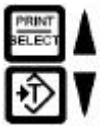
SECTIONAL SCALE INSTALLATION GUIDE

Sectional scale installations do allow sections across multiple DLC slaves. The following set of instructions is a general guideline on how to allocate and calibrate sectional scales:



1. Install load cell cables to DLC slave units starting from the lowest cell number on the primary slave as labeled on the DLC boxes**. Numbering should be incremental from one end of the platform to the other end**.
2. Once all load cells are connected, choose the scale to which you would like to allocate the sectional scale, using commands 19, 29 or 39 to enter the calibration mode for the setup procedure.
3. Note, if this is a new installation, normally the first command in calibration mode before allocating the load cells, is to clear all existing allocations using calibration command 500, else use commands 501,502 or 503 respectively
4. You are now ready to execute the sectional scale allocation command 521. This command requires you to enter the number of sections you would like to assign to the scale (**a section consists of two load cells referred to as corners**) as outlined in **Figure 2**.
5. Once command 521 is executed, you can view the raw counts of the scale on a section by section basis. Use the [ON/OFF] key to select raw counts, and then use the [TARE] key to move incrementally from one section/corner to another. This is an initial test to see if all load cells are responding.
6. Note, if this is a new installation, command 530 needs to be executed to clear any existing corner correction factors that might be resident in the remote DLC slave – **very important**.
7. At this point (as an optional step), the user can use command 11 to set the desired AD range value for all the converters associated with the scale, to optimize the resolution of the AD converters. Each AD converter can produce 512 000 raw counts at full AD input range.
8. Press the [ON/OFF] key until you see graduated counts (prefixed by the letter C). **Graduated counts always represent the sum of all the corners/cells.**
9. The scale is now ready to be dead loaded using command 12 (this might take about 3 to 5 seconds). Do not disturb the platform(s) while the process is in progress. If the graduated counts do not display zero counts, repeat the process.
10. The scale is now ready to be spanned using command 13. Place a graduated weight of ±1/3 of the scale capacity in the center of the scale (if practical) and execute command 13 to span the scale.
11. You are now ready to do section/corner corrections where needed, moving a graduated weight from the center of one section to another **or** to a corner of a section. Press the [ON/OFF] key until you see graduated counts (prefixed by the letter C). Use the [TARE] key to select the summed display of a section **or** a corner (post fixed with the letter C on the display) of interest.
12. Once the section/corner is selected, use command 532/531 (default 532) to adjust the section/corner weight to the expected weight - if required. When using command 532 you must type in a target weight - command 532 will automatically adjust the section/corner to the target weight. When using command 531, you must use the [IN/OUT] keys to increase or decrease the weight. Command 532 is normally the first method used to correct sections/corners. If the results are not satisfactory, command 531 can be used for a final correction. If required, the user may correct on a corner by corner basis.
13. Press the [ON/OFF] key until graduated counts are displayed (prefixed by the letter C).
14. If the results are not satisfactory, move back to step 10 and repeat.

NOTE: Saving calibration data on a regular basis using calibration command 99 is a good calibration practice.

521 Assign a Sectional Scale: calibration command

This command allocates the number of sections specified as the parameter to allocate a sectional scale for the current scale under calibration (**a section consists of 2 corners – each corner gets assigned to a cell on the DLC box**). For example, if a 4 sectional scale is required, 4 will be entered at the keypad.

It is the task of the indicator to find the number of sections to assign for a sectional scale. Sections will always be assigned incrementally starting from the first section on the primary DLC slave 1/2, 3/4, 5/6, 7/8 through to the secondary slave etc., as required. *If the user does not want a section to be assigned (due to damage of the cell in question) the user should first disable the cells using calibration command 525 before assigning the scale*

NOTE: If the system could not find any allocation space on either the primary or secondary DLC, it will return with an error message. If this is a new system and this is the first scale assignment, it is recommended to first perform a command 500 to clear all existing scale allocation information (all scale information will be lost). If the allocation was unsuccessful and other scales do exist that need to stay active, use Commands 501, 502 or 503 to clear only the current scale allocation information. Keep in mind that the M2000D indicator has 3 scales.

The following examples illustrate how to interpret the assignment information displayed on the LED display while in calibration mode for a sectional scale. Use the [ON/OFF] key to select the status display window. Taking the example of a sectional scale with 4 sections – the status information provides the following allocation information. It displays how many sections were assigned to this scale, and to which terminals each corner of each section is assigned to. The status information is displayed as follows:

CH	- This scale allocation is a 4 annel scale consisting of 4 sections starting on the rimary DLC – Press the
1.C	This is the **C** – Press the [**TARE** **first corner** of the section
1.1	**1** goes to on the **P** DLC terminal box – Press the [ ] key to look at the **second corner**
1.2	The second corner of section **1** **cell 2** on the rimary DLC terminal **Press the [TARE] key to move on to the next section**

The sectional **scale assigned consists of a total of 4 sections**. This parameter indicates the number of sections assigned to the sectional scale.

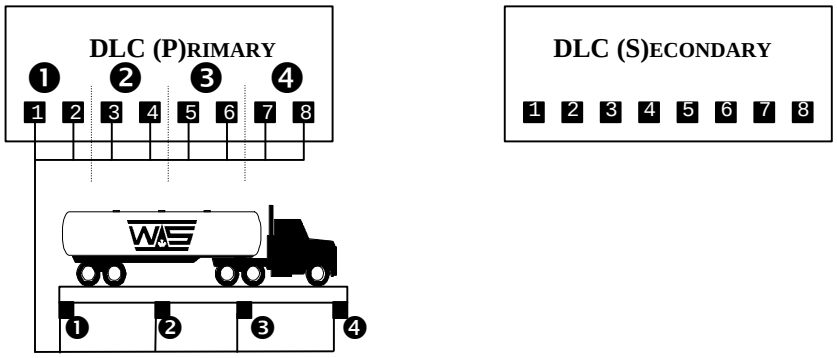
Status information : *Please consult the general status info table for a detailed list of possible status information indicators.*

The section scale starts on the **P**rimary DLC box and might expand to the secondary DLC.

This is a sectional scale allocation S =(**S**)ECTIONAL

SECTIONAL EXAMPLE (1)

Once the 4-section scale is allocated, the allocation information pertaining to each section of the sectional scale can be viewed by pressing the [TARE] key to scroll through all the sections and related corners. At any time we can look at the raw counts of a corner or section using the [ON/OFF] key. When viewing the status information window on the LED display, using the [ON/OFF] key, we can see the related status information as follows:



	SP 4CH	**SECTIONAL SCALE** - The allocation information indicates that we are looking at the sum of all 4 sections of a sectional scale starting on the **P**rimary DLC
1	SP 4.1C	❶ Section as the **C**
	SP 4.1.1	The first corner of section **1** **cell 1** on the rimary DLC terminal box
	SP 4.1.2	**1** goes to on the **P** DLC terminal box
2	SP 4.2C	❷ **2** as the ombination of the two associated corners
	SP 4.2.3	The first corner of section goes to **cell 3** **P**rimary
	SP 4.2.4	The second corner of section **2** **cell 4** on the rimary DLC terminal box
3	SP 4.3C	Section **3** **C**ombination of the two associated corners
	SP 4.3.5	**3** goes to on the **P** DLC terminal box
	SP 4.3.6	The second corner of section **3** goes to **cell 6** on the **P**rimary DLC terminal box
4	SP 4.4C	❹ Section **4** as the **C**ombination of the two associated corners
	SP 4.4.7	The first corner of section **4** goes to **cell 7** on the **P**rimary DLC terminal box
	SP 4.4.8	The second corner of section **4** goes to **cell 8** on the **P**rimary DLC terminal box

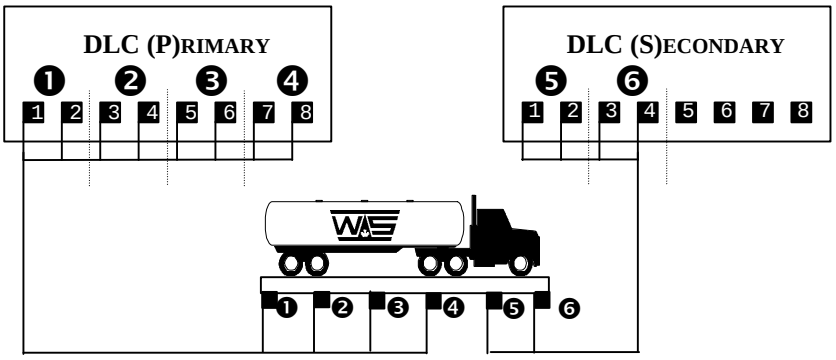
SECTION SCALE INSTALLATIONS

NOTE: At any time the user can press the [ON/OFF] key to view the raw counts related to the corner in question.

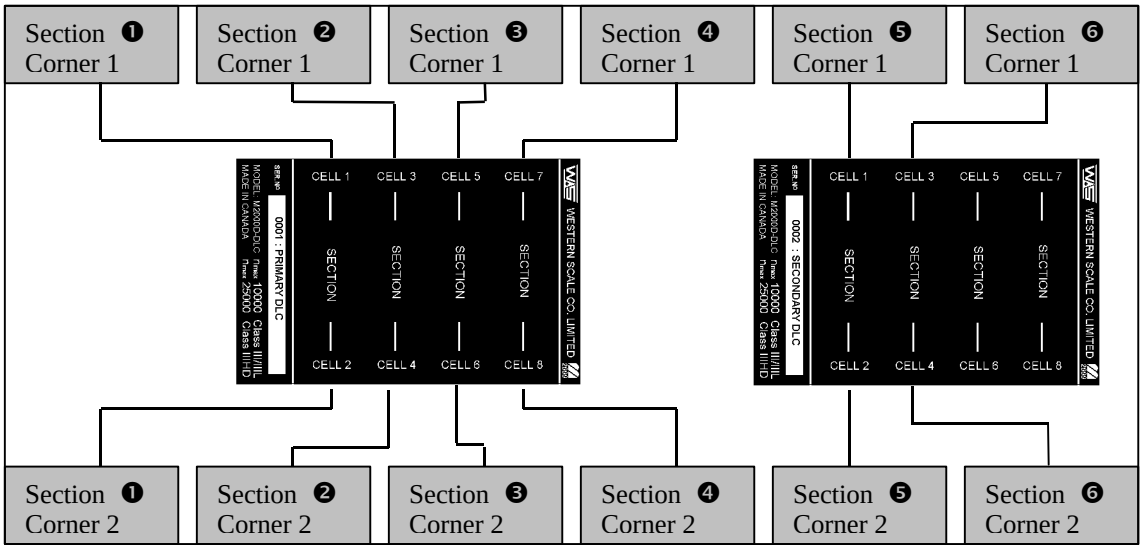
SECTIONAL EXAMPLE (2)

The next example of a sectional scale allocation illustrates the allocation of sections across two DLC slaves, which is valid for sectional scales. We assume the following setup scenario:

- We have two 8 channel DLC slaves for a total of 16 cells
- We have both Primary and Secondary DLC units connected to the M2000D
- We require a sectional scale with 6 sections (total of 12 load cells)



The diagram below outlines the connection diagram of the 6 sectional scale, starting with section ❶ on the **P**rimary DLC terminal box and ending on the **S**econdary DLC.



NOTE: At any time the user can press the [ON/OFF] key to view the raw counts related to the corner in question.

Once we have allocated the sectional scale using command 521, we can use the [TARE] key in calibration mode to scroll through all the sections and related corners and use the [ON/OFF] key to observe the raw counts as required. The table below outlines and explains the status information as we scroll through the sections and corners using the [TARE] key.

	SP 6.CH	**SECTIONAL SCALE** - The allocation information indicates that we are looking at the sum of all **6** sections of a sectional scale starting on the **P**rimary DLC
1	SP 6. 1.C	❶ Section **1** as the **C**ombination of the two associated corners/cells
	SP 6. 1.1	The first corner of section **1** goes to **cell 1** on the **P**rimary DLC terminal box
	SP 6. 1.2	The second corner of section **1** goes to **cell 2** on the **P**rimary DLC terminal box
2	SP 6.2.C	❷ Section **2** as the **C**ombination of the two associated corners /cells
	SP 6.2.3	The first corner of section **2** goes to **cell 3** on the **P**rimary DLC terminal box
	SP 6.2.4	The second corner of section **2** goes to **cell 4** on the **P**rimary DLC terminal box
3	SP 6.3.C	❸ Section **3** as the **C**ombination of the two associated corners/cells
	SP 6.3.5	The first corner of section **3** goes to **cell 5** on the **P**rimary DLC terminal box
	SP 6.3.6	The second corner of section **3** goes to **cell 6** on the **P**rimary DLC terminal box
4	SP 6.4.C	❹ Section **4** as the **C**ombination of the two associated corners/cells
	SP 6.4.7	The first corner of section **4** goes to **cell 7** on the **P**rimary DLC terminal box
	SP 6.4.8	The second corner of section **4** goes to **cell 8** on the **P**rimary DLC terminal box
5	SS 6.5.C	❺ Section **5** as the **C**ombination of the two associated corners/cells
	SS 6.5. 1	The first corner of section **5** goes to **cell 1** on the **S**econdary DLC terminal box
	SS 6.5.2	The second corner of section **5** goes to **cell 2** on the **S**econdary DLC terminal box
6	SS 6.6.C	❻ Section **6** as the **C**ombination of the two associated corners/cells
	SS 6.6.3	The first corner of section **6** goes to **cell 3** on the **S**econdary DLC terminal box
	SS 6.6.4	The second corner of section **6** goes to **cell 4** on the **S**econdary DLC terminal box

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HOPPER SCALE INSTALLATION GUIDE

The following set of instructions is a general guideline on how to allocate and calibrate a hopper scale with no more than 4 load cells per hopper scaled.

1. Install load cell cables to DLC slave unit starting from cell 1 as labeled on the DLC slave. The first corner is always assigned to the cell with the lowest number.
2. Once all load cells are connected, choose the scale to which you would like to allocate the hopper scale, using commands 19, 29 or 39 to enter the calibration mode for the setup procedure.
3. Note, if this is a new installation, normally the first command in calibration mode before allocating the load cells, is to clear all existing allocations using calibration command 500.
4. You are now ready to execute the hopper scale allocation command 520. This command requires you to enter the number of corners you would like to assign to the scale.
5. Once command 520 is executed, you can view the raw counts of the scale on a corner by corner basis first, using the [ON/OFF] key to select raw counts, and then using the [TARE] key to move incrementally from one corner to another – **each corner is assigned to a cell on the DLC terminal box**. *This is an initial test to see if all load cells are responding.*
6. Note, if this is a new installation, command 530 needs to be executed to clear any existing corner correction factors that might be resident in the remote DLC slave – **very important**.
7. At this point (as an optional step), the user can use command 11 to set the desired AD range value for all the cells/corners associated with the scale, to optimize the resolution of the AD converters. Each cell can produce 512 000 raw counts at full input range.
8. Press the [ON/OFF] key until you see graduated counts (prefixed by the letter **C**). **Graduated counts always represent the sum of all the corners/cells.**
9. The scale is now ready to be dead loaded using command 12 (this might take about 3 to 5 seconds). Do not disturb the platform while the process is in progress. If the graduated counts do not display zero counts, repeat the process.
10. The scale is now ready to be spanned using command 13. Place a graduated weight of ±1/3 of the scale capacity in the center of the scale and execute command 13 to span the scale.
11. You are now ready to do corner/cell corrections where needed, moving a graduated weight from one corner to another. Use the [TARE] key to select the corner of interest. Once the corner is selected, use command 532/531 (default 532) to adjust the corner weight to the expected weight - if required. When using command 532 you must type in a target weight - command 532 will automatically adjust the corner to the target weight. When using command 531, you must use the [IN],[OUT] keys to increase or decrease the weight. Command 532 is normally the first method used to correct corners. If the results are not satisfactory, command 531 can be used for a final correction.
12. Press the [ON/OFF] key until graduated counts are displayed (prefixed by the letter **C**). Graduated counts always represent the sum of all the corners/cells.
13. If the results are not satisfactory, move back to step 10 and repeat
14. Once calibration is finished, you can use command 600 outside calibration mode to inspect the scale behavior without violating the government certification.

NOTE: *A hopper scale is not allowed to have load cells spread across multiple DLC slaves terminal boxes – must be grouped on a single DLC slave . A sectional scale does not have this limitation.* ***Saving calibration data on a regular basis using calibration command 99 is a good calibration practice.***

520 Assign a Hopper Scale: calibration command

This command allocates the number of corners typed in as a parameter for a hopper scale allocation for the current scale under calibration. For example - if a 4-corner hopper scale is required, 4 will be entered. **A corner equates to a single cell on the DLC terminal box**. *The M2000D has 3 scales, to enter calibration mode for any one, use commands 19, 29 or 39.*

It is the task of the indicator to find the number of cells not disabled or assigned to other scales. The available cells will then be mapped to the corners. The indicator will scan the online DLC slaves available and enabled cells starting on the primary DLC and ending on channel 8 on the secondary DLC.

NOTE: If the system could not find any allocation space on either the primary or secondary DLC, it will return with an error message. If this is a new system and this is the first scale assignment, it is recommended to first perform a command 500 to clear all existing scale allocation information (all scale information will be lost). If the allocation was unsuccessful and other scales do exist that need to stay active, use Commands 501, 502 or 503 to clear only the current scale allocation information. Command 501-503 only clears the current scale under calibration. Keep in mind that the M2000D indicator has 3 scales.

The following examples illustrate how to interpret the assignment information displayed on the LED display while in calibration mode for a hopper scale. Taking the example of a 4-corner hopper scale – we will look at the following aspects. First we specified 4 (the logical) corners as part of the hopper scale. Secondly, we need to know to which of the cells on the DLC boxes these 4 corners were assigned to (the physical cell terminal numbers). This information is displayed as follows:

HP 4CH

HOPPER SCALE - This scale allocation is a 4 **Ch**annel hopper scale consisting of **4** corners on the **P**rimary DLC – Press the [**TARE**] key to start scrolling through the scale corners

The hopper scale allocated consists of a total of 4 corners. This parameter indicates the number of corners assigned to the hopper scale.

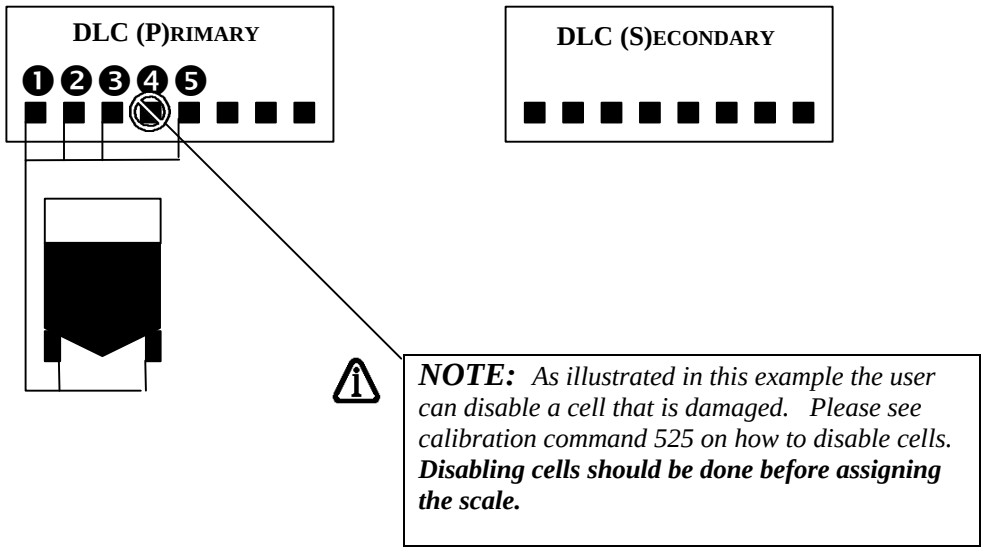
Status information: *Please consult the general status info table for a detailed list of possible status information indicators.*

Primary DLC - the corner in question is assigned on the **P**rimary DLC unit

H – (H)opper scale allocation - the user allocated a **H**opper type scale

HOPPER EXAMPLE (1)

Once the 4-corner hopper scale is allocated (in calibration mode), the allocation information pertaining to each corner of the hopper scale can be viewed as follows by pressing the [TARE] key while in calibration mode:



NOTE: *As illustrated in this example the user can disable a cell that is damaged. Please see calibration command 525 on how to disable cells.* ***Disabling cells should be done before assigning the scale.***

[T]	HP 4CH	**HOPPER SCALE** - This scale allocation is a 4 **Ch**annel **H**opper scale consisting of 4 corners on the **P**rimary DLC
1 [T]	HP 4.1.1	❶ corner **1** goes to **cell 1** on the **P**rimary DLC terminal box
2 [T]	HP 4.2.2	❷ corner **2** goes to **cell 2** on the **P**rimary DLC terminal box
3 [T]	HP 4.3.3	❸ corner **3** goes to **cell 3** on the **P**rimary DLC terminal box
4 [T]	HP 4.4.5	❺ corner **4** goes to **cell 5** on the **P**rimary DLC terminal box *(In this example cell 4 was disabled due to damage)*

NOTE: At any time the user can press the [ON/OFF] key to view the raw counts related to the corner in question.

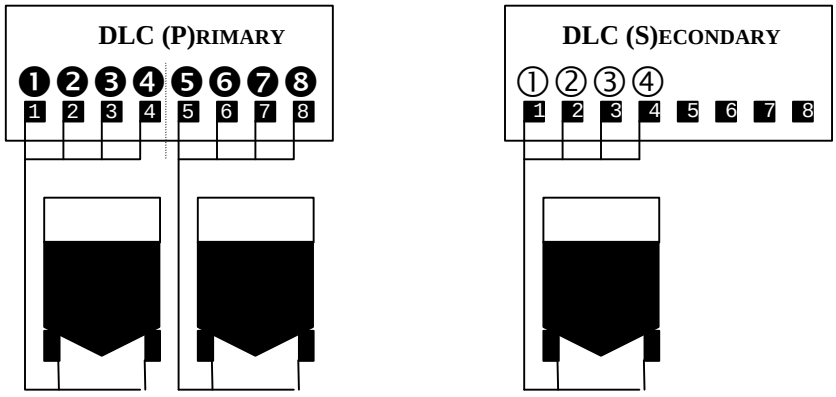
HOPPER EXAMPLE (2)

The next example of hopper scale allocation assumes the following scenario:

- We have two 8 channel DLC slaves for a total of 16 cells
- We have both Primary and Secondary DLC units connected to the indicator
- We require 3 hopper scales of 4 corners each

The M2000D supports 3 scale channels. We must allocate a single hopper scale per scale channel. First we enter calibration mode for scale 1 by executing command 19, and after entering a password we allocate the first hopper scale using calibration command 520. After completing the first scale allocation, we exit calibration mode. The next step is to allocate hopper scale 2 by entering calibration mode for scale 2, the executing command 29. After entering a password we allocate hopper scale 2 using calibration command 520. Once we complete the hopper scale installation, we exit calibration mode. The final step is to enter calibration mode executing command 39 to allocate the third hopper scale. Once in calibration mode we use calibration command 520 to allocate the third hopper scale.

Once all 3 the hopper scales are allocated based on the above criteria using calibration command 520, we may observe the following allocation setup information:



The following information can be viewed by entering calibration mode for each of the 3 scales respectively, and using the [TARE] key to scroll through the status information.

The hopper scale allocation information for **scale 1** on the **primary** DLC slave would look as follows:

	HP 4CH	**HOPPER SCALE 1** - The allocation information indicates that we are looking at the sum of 4 corners of a hopper scale on the *primary* DLC
1	HP 4.1.1	❶ corner **1** goes to **cell 1** on the **P**rimary DLC terminal box
2	HP 4.2.2	❷ corner **2** goes to **cell 2** on the **P**rimary DLC terminal box
3	HP 4.3.3	❸ corner **3** goes to **cell 3** on the **P**rimary DLC terminal box
4	HP 4.4.4	❹ corner **4** goes to **cell 4** on the **P**rimary DLC terminal box

The hopper scale allocation information for **scale 2** on the **primary** DLC slave would look as follows:

	HP 4CH	**HOPPER SCALE 2** - The allocation information indicates that we are looking at the sum of 4 corners of a hopper scale on the *primary* DLC
1	HP 4.1.5	❺ corner **1** goes to **cell 5** on the **P**rimary DLC terminal box
2	HP 4.2.6	❻ corner **2** goes to **cell 6** on the **P**rimary DLC terminal box
3	HP 4.3.7	❼ corner **3** goes to **cell 7** on the **P**rimary DLC terminal box
4	HP 4.4.8	❽ corner **4** goes to **cell 8** on the **P**rimary DLC terminal box

The hopper scale allocation information for **scale 3** on the **secondary** DLC slave would look as follows:

	HS 4CH	**HOPPER SCALE 3** - The allocation information indicates that we are looking at the sum of 4 corners of a hopper scale on the *secondary* DLC
1	HS 4.1.1	① corner **1** goes to **cell 1** on the **S**econdary DLC terminal box
2	HS 4.2.2	② corner **2** goes to **cell 2** on the **S**econdary DLC terminal box
3	HS 4.3.3	③ corner **3** goes to **cell 3** on the **S**econdary DLC terminal box
4	HS 4.4.4	④ corner **4** goes to **cell 4** on the **S**econdary DLC terminal box

NOTE: At any time the user can press the [ON/OFF] key to view the raw counts related to the corner in question.

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GENERAL ALLOCATION RELATED COMMANDS

500 Clear All Remote DLC scale allocations : calibration command

This command will reset and invalidate any scales allocated to scale channels 1, 2 and 3. All information will be erased. This command is typically used for a new installation to clear any existing scale allocations. This command is also recommended as the first command to be executed during a new, first time configuration.

To perform a remote reset function, press 1 followed by the [TARE] key. The indicator will clear all scale allocations locally and remotely inside the DLC slaves.

NOTE: All scale calibration data for all 3 scales will be cleared and erased. All data will be lost. This command is of use typically in new installations where the installation and calibration process needs to be performed.

501 Clear Scale 1 Allocation: calibration command

502 Clear Scale 2 Allocation: calibration command

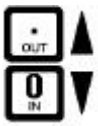
503 Clear Scale 3 Allocation: calibration command

This command will reset and invalidate the current calibrated scale. The M2000D has 3 scales, to enter calibration mode for any one, use commands 19, 29 or 39. All information will be erased. This command is typically used for a new installation to clear any existing scale allocations to scale 1.

To perform a remote clear function on scale 1, press 1 followed by the [TARE] key. The indicator will clear the scale allocated locally and remotely inside the DLC slaves.

525 DLC Load Cell Masking: calibration command

The purpose of this command is to disable/enable cell channels to be allocated to a scale. This is an advanced feature, for normal scale allocations using commands 520/521 this command would not be necessary. This command is of use where a cell inside a DLC box is not operational or for a custom setup as required.



Use the [TARE]/[ZERO] or the [IN/OUT] keys to scroll through the available cells in the DLC system.

Every time the user enters calibration mode, the cell mask table will be cleared to enable all unallocated cells for possible allocation. It is then up to the user to exclude cells that should not be part of the scale allocation process, using 520/521 for possible scale allocation.

The scale allocation commands 520/521 always start looking for available analog channels, starting at the first cell on the primary DLC slave and ending the search at the last cell on the secondary slave. If the user would not want a cell to be included during this scale allocation search, command 525 allows cells to be disabled to be excluded from a scale allocation.

Use the [PRINT/SELECT] key to toggle between enabled state and disabled state for the corner in question. If nothing happens when the [PRINT/SELECT] key is pressed, it means that the corner that is currently selected is in use by another scale channel.

Once all the preferred mask settings are made, press the [CLEAR] key to exit the command. The mask settings will be cleared once calibration mode is exited. Please consult the table in **Table 1** - *scale status information.*

This command works closely with scale allocation commands 520 and 521. This command will display the status information on the LED display.

530 Reset Corner Field adjustment entries: calibration command

Field adjustment entries are the corner span corrections applied to corners during calibration, these entries would be cleared for new scale installations. Normally command 530 is performed directly **after** a scale was allocated using commands 520 or 521. This command only affects the selected scale under calibration.

This command will reset the field span and zero adjustment entries for the scale in question.

In scales containing multiple load cells it is often required to do small corrections to selected load cells in order to make the scale's response consistent for any weight placement. Commands 532/531 are used to make these small corrections to the corner/cell selected by the user using the [TARE] key. If the user is not satisfied with the current span adjustment values, command 530 can be used to clear the correction values and the user can then repeat the adjustment process using commands 532/531 if required.

531 Corner / Section Manual Span Adjustment: calibration command

This command allows the field personnel to adjust for small linearity discrepancies on a corner or section basis for a hopper or sectional scales.

This command will act on the currently selected corner or section as outlined in the status display. Before executing this command, use the [TARE] key to select the corner / section to be adjusted for span corrections. Place a reference weight on the corner/section to be adjusted.

Execute command 531 followed by [PRINT/SELECT], the display will flash the currently selected corner/section to be adjusted – press [PRINT/SELECT] to confirm the corner to be adjusted or [CLEAR] to abort the command.

The adjustment mode is now activated. The correction can be viewed in real time, use the [ON/OFF] key to view either scale-graduated counts (default) or the raw counts related to the corner under correction. The following keys are assigned special functions while in adjustment mode:

- Use the [IN] key to increase the weight of the corner or section
- Use the [OUT] key to decrease the weight of the corner or section
- Use keys **1, 2, 3 and 4** to select the coarseness of the correction increments, where **4** is very coarse and **1** very small increments (default to **4**)
- Use the [CLEAR] or [PRINT/SELECT] or [TARE] key to exit corner / section adjustment mode
- Use the [ON/OFF] key to toggle between display modes, raw counts, graduation counts or status display as shown in the example below

Channel Status Information
A – This field will flash while in Corner / Section Adjustment mode

While in corner or section adjustment mode, the allocation information will indicate that we are correcting a corner or section. While in corner/section adjustment mode, switching to a new corner or section will not have any effect. Use [CLEAR] or [PRINT/SELECT] to exit corner correction mode.

The new correction values will only be saved to permanent storage once calibration mode is exited.

532 Auto Corner Span Adjustment: calibration command

This command allows the field personnel to adjust for small linearity discrepancies on a corner or section basis for a hopper or sectional scales. This command serves the same purpose as command **531** but instead of adjusting weight in a manual way, we simply type in the weight and the system will automatically span the selected corner/section to the target weight.

This command will act on the currently selected corner or section as outlined in the status display. The instructions below outline the steps for corner/section adjustments:

- Before executing this command, use the [TARE] key to select the corner / section to be adjusted for span corrections.
- Use the [ON/OFF] key to display graduated weight counts before executing the command – display prefixed with a flashing letter '**C**'.
- Place a reference weight on the corner/section to be adjusted.
- Execute command 532 followed by [PRINT/SELECT], the display will flash the currently selected corner/section to be adjusted – press [PRINT/SELECT] again to confirm the corner to be adjusted or [CLEAR] to abort the command.
- Enter the value of the weight currently on the scale (gross) followed by pressing the [TARE] key. Once the user pressed [TARE] the adjustment to the target weight will take place. *This command remembers the last weight entered, so the user can just press the [TARE] key in stead of repeatedly having to enter the weight value.*

If you are not happy with the correction you can clear it using command 530, please see command 530 for details. *Command 530 clears all correction entries for all section and corners.*

While the adjustment is in progress the following information will be displayed as shown in the example below:

Channel Status Information
A – This field will flash while in Corner / Section Adjustment mode

551 DLC communications Error Counter: Calibration command

This command is accessible from within or outside calibration mode.

This command displays the number of aborted packets on the DLC communications line in real time. If this error count seems to increase abnormally high over a short period of time, it may indicate a noisy communications path or a general communications hardware failure.

552 DLC Packet Counter: Calibration command

This command is accessible from within or outside calibration mode.

This command displays the number of successful transmitted packets on the DLC communications line. This command keeps track of the number of packets received in real time. The throughput of the system can be measured by sampling this counter over 1 minute. Dividing the packet counter by 60 will yield the number of packets received per second.

In the case of only one scale being allocated, the through put of the system will simply be the samples per second as calculated above. With two scales attached to the system, the throughput of the system will be the packets per second divided by 2. In the case where there are 3 scales allocated to the system, the throughput will be the packets per second divided by 3.

555 DLC Software Upgrade Download: calibration command

This command prepares the indicator for a software upgrade to one of the remote DLC slave units. The software is downloaded via the M2000D indicator to one of the DLC slave units using the M2000 download software. For a DLC slave to be upgraded, it must be registered with the system – use command 620 to register slaves or to check their online status.

The download sequence takes place over COM1 of the M2000D indicator and communicates with a PC, using the M2000 download software supplied by the factory. Upgrading the firmware of a DLC remote unit should in most cases not influence the calibration information and scale allocation settings.

The DLC to be upgraded should be specified by supplying a parameter to indicate which DLC unit to upgrade.

- 1 – Primary DLC
- 2 – Secondary DLC

After entering the parameter the command should be completed by pressing 1, followed by the [TARE] key.

556 Obtain DLC BIOS Firmware version information: calibration command

This command will require a parameter to obtain the firmware version of the DLC in question:

- 1 – Primary DLC
- 2 – Secondary DLC

557 Obtain DLC BOOT Firmware version information: calibration

This command will require a parameter to obtain the firmware version of the DLC in question:

- 1 – Primary DLC
- 2 – Secondary DLC

558 DLC Set AD Range For Active Corner: calibration command

This command is similar to calibration command 11 but has some distinctions. Command 558 will change the currently displayed corner/section or scale as a whole, depending on which corner the user scrolled to in calibration mode. Use the [TARE] key to scroll to the corner in question while in calibration mode – *please see the table on scale status information for more detail.*

When entering command 558, it will return with the current setting of the corner/section. If the value displayed on the screen is zero, it implies that the AD range settings for the individual corners in a section are not the same.

NOTE: *Changing the AD range will require a mandatory dead load and span*

The input range values are as follows:

- 0 Indicate AD range not the same for the grouping of corners
- 1 for 0 to +/- 9mV
- 2 for 0 to +/- 19mV
- 3 for 0 to +/- 39mV (default)
- 4 for 0 to +/- 79mV

592 Restore System Setup From DLC slave: calibration command

This command is a calibration command. It will restore a previous backup from any one of the two DLC slaves to the master indicator. This command goes hand in hand with calibration command **591** – used to backup the system data. This process will overwrite any existing setup information with that provided by the backup stored in the DLC slave.

The information affected is the calibration information and the action tables. For this command to work correctly, the correct number of DLC slaves should be connected to the network in order to facilitate a correct system configuration. This command is of use in the following scenarios:

- After a typical calibration session, it is recommended to back up the calibration and action table information, for possible disaster recovery scenarios.
- It might be useful to provide a user with a pre-configured DLC in the field, in order to speed up the installation process.
- The user would like to revert to a backup due to a setup failure or corruption of system data during installation or maintenance.

This command requires a parameter to specify the slave from which the backup should be obtained, as follows:

- 1 – restore system data from Primary Slave
- 2 – restore system data from Secondary Slave

To exit this command press the [CLEAR] key.

591 Backup System Setup To a DLC slave: calibration command

This command is a calibration command. This command will back up the current system setup to any one of the two DLC slaves from the master indicator. This command goes hand in hand with calibration command **592**.

It is important to note that the backup will be generated from the last saved calibration and action table information as stored in the M2000D indicator. ***The user should first exit calibration mode to make sure that the information is saved to backup memory****. The user should then enter calibration mode and issue command 591 to backup to one of the DLC slaves in question.*

The information included in the backup image of the system data is the calibration information and the action tables. This command is of use in the following scenarios:

- After a typical calibration session, it is recommended to back up the calibration and action table information, for possible disaster recovery scenarios.
- It might be useful to provide a user with a pre-configured DLC in the field in order to speed up the installation process, by just issuing a restore command to configure the system.
- The user would like to revert to a backup due to a setup failure or corruption of system data during installation or maintenance.

To exit this command press the [CLEAR] key.

594 Reload Scale Allocation: calibration command

This command is a calibration command. This command is typically used for field DLC replacements. This command can be used to download the latest scale allocation to a DLC. This is handy when performing a field replacement of a DLC unit. This command will download the original setup to the new DLC. This command assumes that a valid calibration and scale allocation is available to be downloaded to the new DLC. Once down loaded the user can save the settings by exiting calibration mode -command (99).

All DLCs are factory calibrated to give the same counts per millivolt input for all DLC cells. This allows the user to replace a faulty DLC in the field without having to recalibrate the scale. The user simply install the new DLC and in calibration mode execute command 594 to download the previously stored calibration data to the new DLC. Exiting calibration mode (99) will save the calibration data in the new DLC slave.

576 Query Active DLC Cells on Slaves: calibration command

This command is a calibration command. This command provides a means of first obtaining the current active cells per DLC slave, and secondly providing the option of changing the number of active AD converters per slave. If the user does not know the number of active cells per slave, the user may simply count the number of installed load cell connectors on the DLC slave. Enter this number as a parameter to set the number of active converters for the DLC slave in question.

The command first requires the user to enter the slave to be queried. Please enter one of the following values:

- 1 - Query the primary slave for active cells
- 2 - Query the secondary slave for active cells

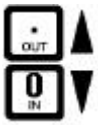
The indicator will return number from the slave in the range from 1-8 representing the number of active cells on that slave. The user may enter a new AD converter number between 1-8 followed by [PRINT/SELECT] or simply press the [CLEAR] key to exit the command. **Only the factory is allowed to make permanent changes to this setting – the user may only look at the setting.**

The factory can supply 3 variations of DLC slaves

- 4 channel DLC slave
- 6 channel DLC slave
- 8 channel DLC slave

Every time the user allocates a scale, the indicator will query the slave for its active AD converter number in order to know how many load cells to make available to the user for a scale allocation. When using calibration command 525 in conjunction with commands 520 and 521, command 525 will prevent the user from selecting corners/sections outside the boundaries as reflected by command 576. For instance, if command 576 returns an active number of 4, then corners 5,6,7 and 8 will not be made available to the user for a scale allocation. Also, if command 576 returns an active number of 6 corners, then corners 7 and 8 will not be made available to the user for a scale allocation, and so on.

600 Scale Status/Diagnostics Information: non-calibration command



This command displays the status information pertaining to the currently selected scale. This is a non-calibration command executed outside of calibration mode.
First select the scale for which status information is desired from, by using 1, 2 or 3 followed by [PRINT/SELECT].

This command has the following important information:

- The primary purpose of this command is to show what type of scale was allocated to the scale in question.
- The user can scroll through all the corners and sections to obtain status information on each corner using the [IN]/[OUT] keys. Please consult the table on *Scale Status Information* for more details on how to interpret this status information.
- The command allows us to look at each of the corner's error timeout counters by pressing the [TEST] key.
- The command allows the user to look at each of the corner's raw counts in real time by pressing the [TEST] key.

After entering the command, use the [IN/OUT] keys to scroll through the allocation information pertaining to the scale in question. If at any point the user wishes to look at the error timeout counter or raw counts of a particular corner, just press the [TEST] key once. Pressing the [TEST] key will toggle the display between the timeout display and the raw counts display until the user presses the [CLEAR] key. The error counter should under normal operating conditions stay at zero, if this number fluctuates heavily it is an indication of a possible hardware problem.

To exit the error counter information, press [CLEAR] key once. To exit this command, press the [CLEAR] key once more.

*The user can scan through all corners/sections of the system to check the error status field for each corner/cell of the DLC. A flashing "**E**" in the status screen for a particular cell will indicate a fault condition related to the cell. The user can then inspect the raw counts of the cell and do a physical inspection on the load cell in question.*

620 DLC Slave Line Status: non-calibration command

This command can be executed in or outside of calibration mode. This command will indicate to the user how many slaves were found to be online. The results can be interpreted as follows:

- 0 – no slaves found to be online
- 1 – only Primary slave found
- 2 – only Secondary slave found
- 3 – both Primary and Secondary slaves found

TIP: *If both slaves are configured for the same slave ID, no slaves will be detected. If the user has only one DLC installed, it should be configured as the primary slave. If the user has two DLC slaves installed, the slave with the largest number of cells should be configured as the primary slave.*

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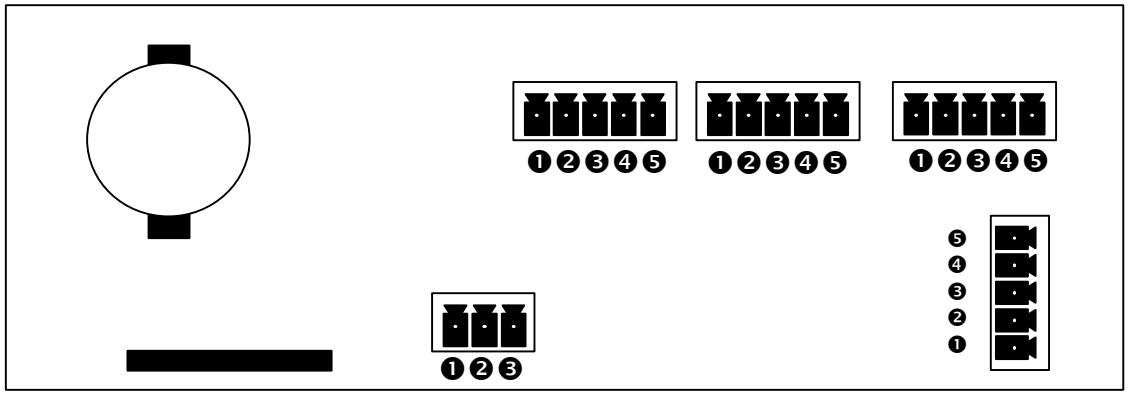
GENERAL CABLE CONNECTION GUIDE

M2000D INDICATOR CONNECTIONS

The diagram below is a general outline of the connectors as seen on the back of the circuit board for the M2000D indicator:

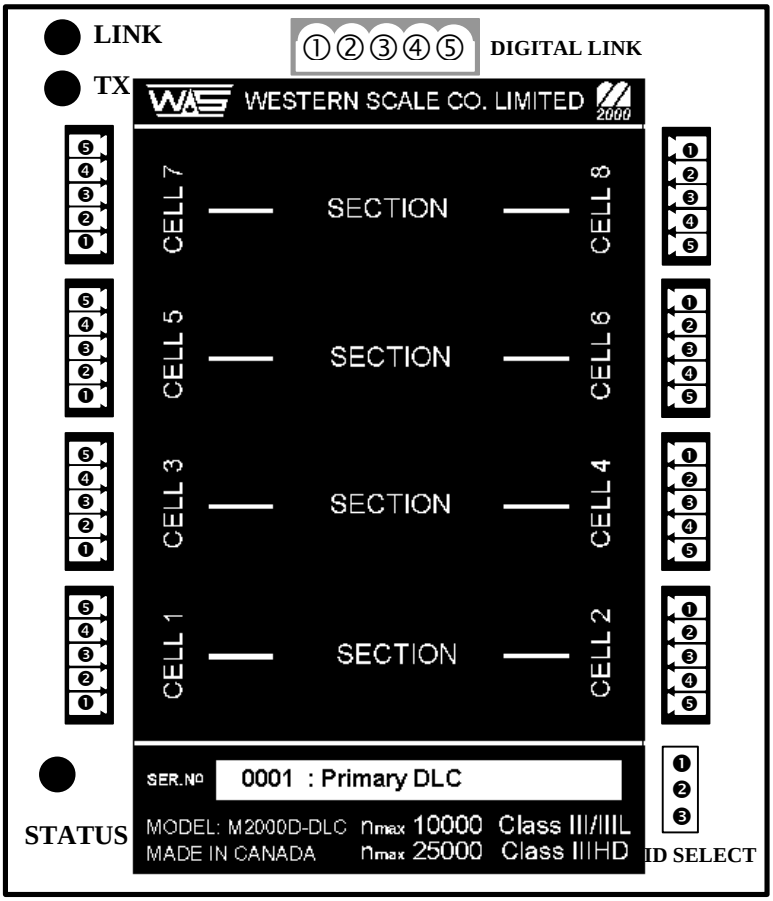


M2000D Indicator External Connections

CONNECTOR	PIN DESCRIPTION	
DLC LINK (SCALE)	❺	CTL - (DLC network cable)
	❹	CTL + (DLC network cable)
	❸	SHL (Ground)
	❷	V - (DLC slave power supply)
	❶	V + (DLC slave power supply)
COM 1	❶	CTS (Input –Printer telling the Indicator to send more data RTS)
	❷	RX (Input – data received by the Indicator)
	❸	TX (Output – data transmitted by the Indicator)
	❹	RTS (Output – Indicator signal readiness to receive data
	❺	COM (Ground)
COM 2	❶	CTS (Input –Printer telling the Indicator to send more data RTS)
	❷	RX (Input – data received by the Indicator)
	❸	TX (Output – data transmitted by the Indicator)
	❹	RTS (Output – Indicator signal readiness to receive data
	❺	COM (Ground)
SMART WIRE	❶	NC (No connection)
	❷	B (RS485 differential signal)
	❸	A (RS485 differential signal)
	❹	V+ (SMARTWIRE Power supply)
	❺	V- (SMARTWIRE Power supply)
POWER	❶	V- (negative)
	❷	GND (earth ground)
	❸	V+ (positive power)

DLC CONNECTIONS

The diagram below is a general outline of the connectors as seen on the remote DLC terminal boxes:



DLC External Connections

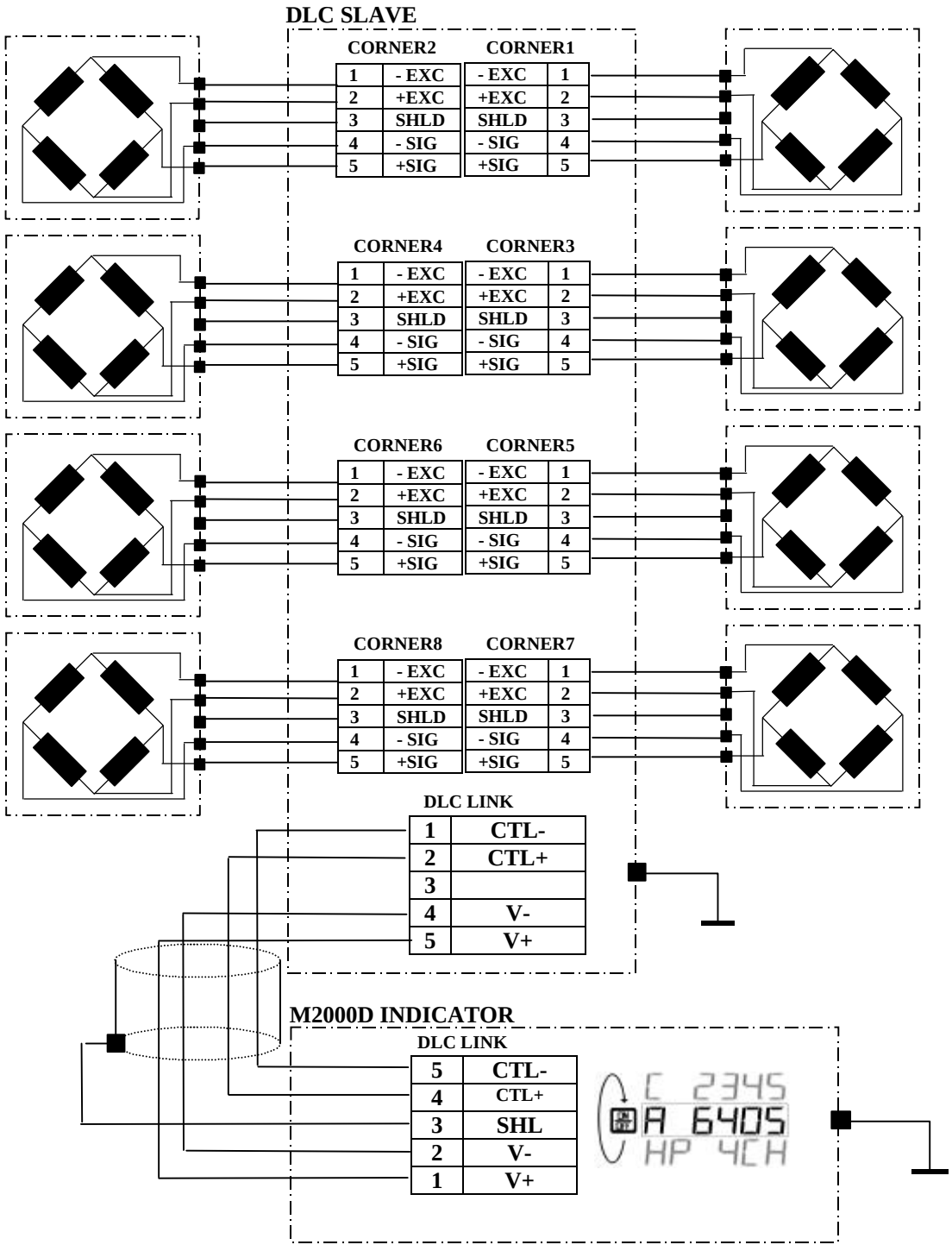
CONNECTOR	PIN DESCRIPTION	
CELL 1-8	❶	EXC - (0VDC excitation voltage for load cells)
	❷	EXC+ (+5VDC excitation voltage for load cells)
	❸	SHL (Ground)
	❹	SIG - (- Load cell signal)
	❺	SIG+ (+ Load cell signal)

DIGITAL LINK	❶	V+ (DLC Power supply)
	❷	V- (DLC Power supply)
	❸	Spare terminal
	❹	+ CTL (Current loop network input)
	❺	- CTL (Current loop network output)

ID SELECT (JUMPER SELECT)	❶ ❷ ❸	SECONDARY DLC SLAVE	PRIMARY DLC SLAVE	MAINTENANCE MODE

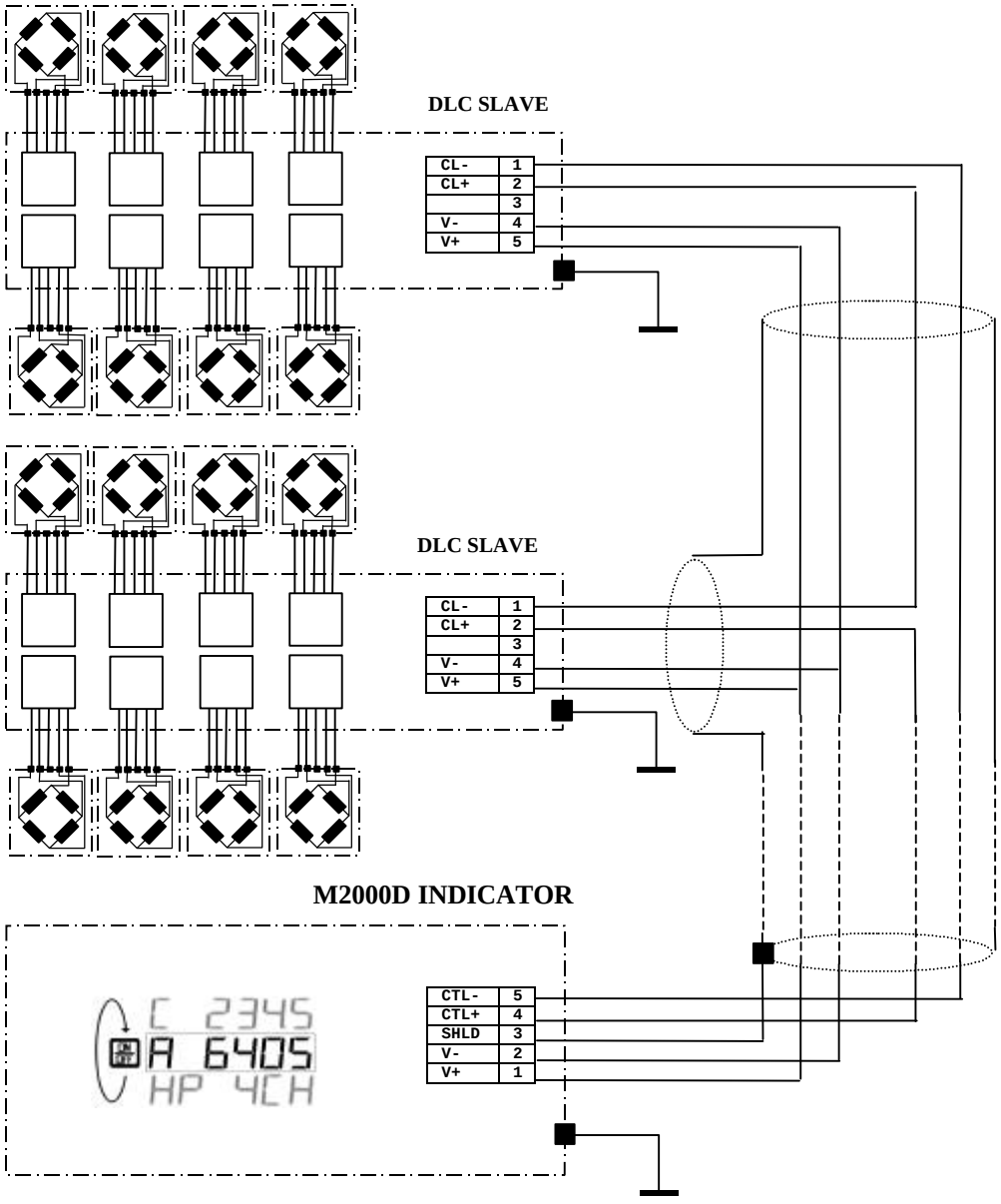
SINGLE DLC SLAVE CONNECTION

The diagram below demonstrates a typical wiring diagram of load cells to the slave DLC and the DLC slave to the M2000D indicator:



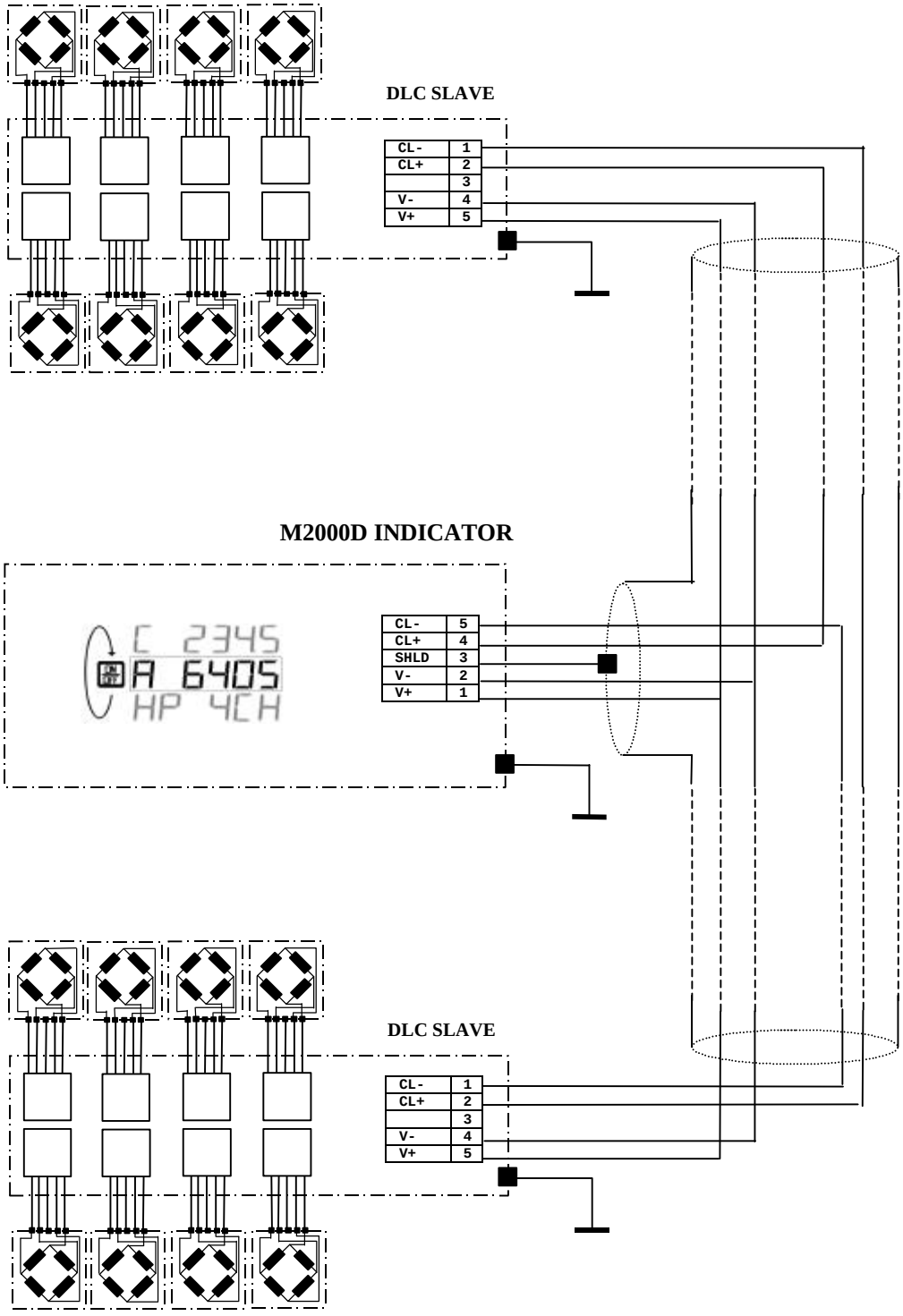
DUAL DLC SLAVE CONNECTION – TYPE 1

The diagram below demonstrates a wiring diagram for instances where the two DLC slaves are grouped close to one another but far from the indicator. Please pay attention to the current loop cable configuration when connecting two DLC slaves:



DUAL DLC SLAVE CONNECTION – TYPE 2

The diagram below demonstrates an alternative wiring diagram for instances where the two DLC slaves are far removed from each other. Please pay attention to the current loop cable configuration when connecting two DLC slaves:



GENERAL DIAGNOSTICS

DLC STATUS INDICATORS

The following information describes the use of the 3 status LEDs located on the DLC slave boards as a means of making a meaningful diagnosis of the state of the DLC communications link.

DLC - STATUS LED

LED STATE	INTERPRETATION	REMEDY
❶ Blinking consistently once every second	DLC slave is configured to operate as the primary slave in normal run mode. CONDITION – normal	OPTIONAL: To operate the DLC as secondary slave, change the slave ID jumper to the secondary position. This jumper is located on the DLC slave board. **Changing the slave ID jumper should only be done in calibration mode. The jumper setting gets stored with the calibration data.**
❷ Blinking consistently 10 times a second	DLC slave is configured to operate as the secondary slave in normal run mode CONDITION – normal	
❸ Blinking one short followed by one long consistently	DLC slave is in firmware upgrade mode and configured as the primary slave. CONDITION – abnormal	This state is entered when the user removed the ID select jumper from the DLC slave before power up. This state is used in conjunction with calibration command 555 to update the firmware in the DLC slave. This mode might also be entered automatically during bootup if the DLC slave detects an invalid code image of the firmware. If this mode was entered intentionally, proceed with firmware upgrading. Else, power down and up again to alleviate the condition. If condition persists, perform a firmware upgrade.
❹ Blinking two short followed by one long consistently	DLC slave is in firmware upgrade mode and configured as the secondary slave. CONDITION – abnormal	
❺ Non of the above sequences ⚠	CONDITION - abnormal	When two DLC slaves are connected, one DLC should be in state ❶ and the other slave in state ❷ Slaves should never be in the same state, which will cause communication failures. In such a case, make sure that the ID select jumpers on the slaves are not set to the same position. **Changing the slave ID jumper should only be done in calibration mode. The jumper setting gets stored with the calibration data.**

DLC – LINK LED

LED STATE	INTERPRETATION	REMEDY
❶ Permanently on	Indicates that network communications link is valid.	If the LINK LED does not light up at all, a communications error exist. Check DLC communications cabling. Consult the section on general wiring diagrams for proper connection of communications lines.
❷ Flickering but mostly on	Indicates that network commands are send to the slaves.	Normal while in calibration mode, however outside calibration mode it should be in state ❶
❸ Non of the above 	CONDITION - abnormal	If the LINK LED does not light up at all, a communications error exist. Check DLC communications cabling. Consult the section on general wiring diagrams for proper connection of communications lines.

DLC – TX LED

LED STATE	INTERPRETATION	REMEDY
❶ Permanently on	Indicates that slave in question is responding to commands send by the indicator and is valid - normal	If the TX led does not light up at all, diagnosis might be one of the following: • The DLC slave has no corners assigned to any scale by the indicator – this is not an error condition • If the user intended to allocate corners on the slave in question and the TX LED does not light up, slave has a serious operating error. Try to clear all scale allocations and re-assign the scale allocations using commands 501,502,503 or 500. **NOTE:** Command 500 erases all calibration data for all three scales.
❷ Flickering but mostly on	Indicates that network commands are send to the slaves - normal	Normal while in calibration mode, however outside calibration mode it should be in state ❶ if the DLC has corners assigned to a particular scale. If the DLC in question does not contribute to any scale allocations, the TX led on the slave in question should be permanently off, **outside calibration mode.**
❸ Permanently off	Indicates that the indicator does not require any runtime data from the slave outside calibration mode - normal	Normal while in calibration mode, however outside calibration mode it should be in state ❶ if the DLC has corners assigned to a particular scale. If the DLC in question does not contribute to any scale allocations, the TX led on the slave in question should be permanently off, **outside calibration mode.**

Error Messages

1 Invalid parameter number for calibration mode
2 Graduation size invalid
3 Decimal Position Invalid
4 Flag values must be 1 for ‘ON’ and 0 for ‘OFF’
5 Push to Zero Window must be 0-99
6 Zero tracking must be 1-99 or 100, 200, 300.
7 Only 1 will reset parameters
8 Only 1 will reset span table
9 Span exceeds maximum capacity or span too small
10 IZSM value can be 1 for ON and 0 for OFF
11 Test Weight units must be 0=lb or 1=kg.
12 Motion settle time out of range 1-100
13 Power on units may only be 0=lb, 1=kg.
14 Invalid Time entry HH.MM.SS
15 Invalid Date entry YY.MM.DD
16 Motion value is out of range
17 Press tare to increment span table, any other key invalid
18 Press tare to decrement span table, any other key invalid
19 Span table cannot be decremented past 1
20 Parameter memory write error, indicator requires service
21 Parameter checksum error, parameters have been lost.
22 Program check fault, indicator requires service
23 Invalid Serial Port speed setting
24 Invalid Serial Port Parity parameter
25 Cannot increment Span Table any further
26 Entered offset larger than Capacity
27 Invalid String mode for com port
28 Power on Zero warning 0=Off, 1=On
29 Channel enable is 0=Off and 1=On
30 Only 1 will set the deadload
31 Sound Volume can be between 0-3
32 Keypress feedback can be 0=OFF or 1=ON
33 Invalid Com String mode parameter
34 Invalid Com Port Interface value
35 *
36 *
37 Channel 1 cannot be disabled
38 Invalid Print Select Function Number
39 *
40 Scale channel is not enabled
41 Pushbutton Tare is invalid (Over, Motion,or disabled)
42 Keyboard tare available on channel 1 only
43 Tare greater than capacity
44 Invalid Password number range, can only be 0000-9999.
45 Only a value of 0, 1 or 80 is accepted as a parameter

46 *
47 Invalid Filter value
48 Invalid Filter Fast step value
49 Invalid Fast step Sensitivity
50 Invalid Fast step on/off
51 Invalid Tare Function Parameter 0-4
52 Invalid input for AD voltage range

90 Calibration checksum failed
100 SRAM failure
110 RTC RAM failure
112 Clock Reset
115 Clock Failed

120 Battery flat or does not exist
121 Battery must be removed
130 COM1 loop back test failed
131 COM2 loop back test failed
133 COM driver chip failed

140 FLASH memory erase failed
141 FLASH memory write failed

151 Database CRC failed
152 CAL copy CRC failed
153 Ticket Buffer CRC failed
150 Audit trail CRC failed
154 DPAGE stack overflow

185 SMART wire COM link not responding

186 SMART wire set-point checksum failed
191 Channel 1 AD converter not responding
192 Channel 2 AD converter not responding
193 Channel 3 AD converter not responding

DLC communications related errors

160 DLC slaves not detected communications failure
161 Scale 1 allocation action table does not verify with slave entries
162 Scale 2 allocation action table does not verify with slave entries
163 Scale 3 allocation action table does not verify with slave entries
165 Slave assigned to a scale but not detected by system
170 Scale 1 allocation action table does not verify with slave entries
171 Scale 2 allocation action table does not verify with slave entries
172 Scale 3 allocation action table does not verify with slave entries
200 General communications timeout – non critical
210 Scale allocation was not successful
215 Scale validity checksum failed - restart system if persist, inspect system