M2000 DIGITAL WEIGHING SYSTEM

SECTIONAL TRUCK SCALE INSTALLATION GUIDE

MEASUREMENT CANADA

NTEP NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

FOR SOFTWARE VERSION 1.21 (MAY 2003)

M2000 DIGITAL WEIGHING SYSTEM
SECTIONAL TRUCK SCALE INSTALLATION GUIDE

Published by:

WESTERN SCALE CO. LTD.
1670 Kingsway avenue
Port Coquitlam, B.C.
Canada
V3C 3Y9

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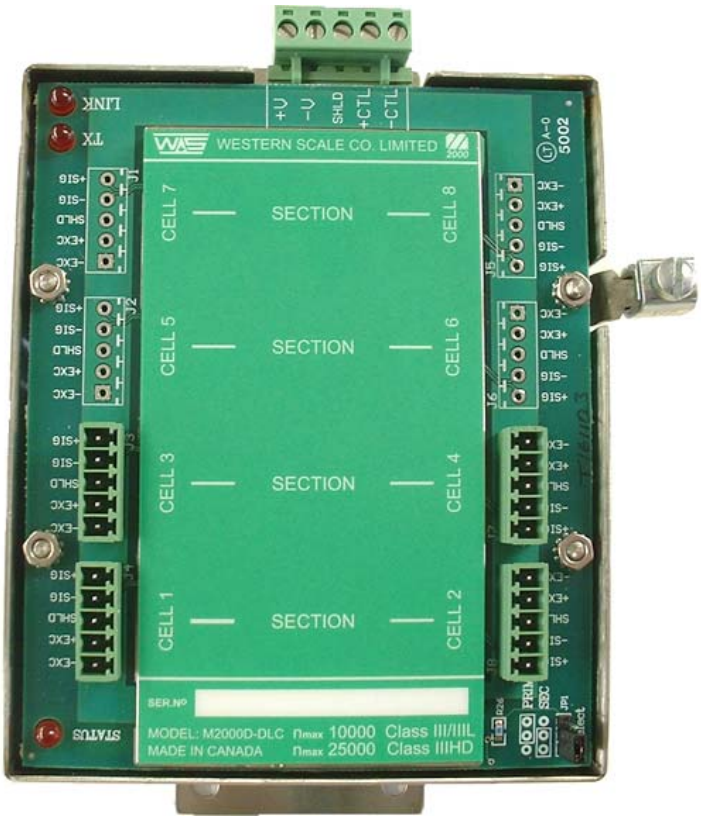
INTRODUCTION

The M2000D Digital Smart Weigh System utilizes Digital Load Cell (DLC) technology to provide high-level data integrity, easier maintenance, and lightning protection for your weighing applications. Load cell connections to the DLC Smart Box (mounted on the weighbridge) are the same as connections to traditional analog summation cards. There are no pots to adjust and all sectional adjustments are made digitally through the keypad on the M2000D indicator.

Each DLC Smart Box is available with 4, 6, or 8 load cell channels (inputs). The M2000D indicator can support up to 2 DLC Smart Boxes for a maximum of 16 load cells (8 Sections) per scale system. DLC Smart Boxes communicate with the indicator digitally through a current loop interface, resulting in no data degradation for up to 1000 feet. The cable link between the M2000D indicator and the DLC Smart Box is optically isolated and contains surge suppression devices to help protect the scale from lightning damage.



DLC SMART BOX

INSTALLATION STRATEGIES

1. Mount the DLC Smart Boxes as close as possible to the weighing platform.

2. The DLC Smart Boxes must be mounted in a NEMA rated enclosure, as the modules themselves are not watertight.

3. Keep cable runs between load cells and the DLC Smart Boxes as short as possible, to help eliminate the contamination of analog load cell signals by RFI and EMI interference.

4. Identify the end of the scale where Section 1 will be located. The DLC Smart Box that connects to Section 1 will be configured as the Primary DLC.

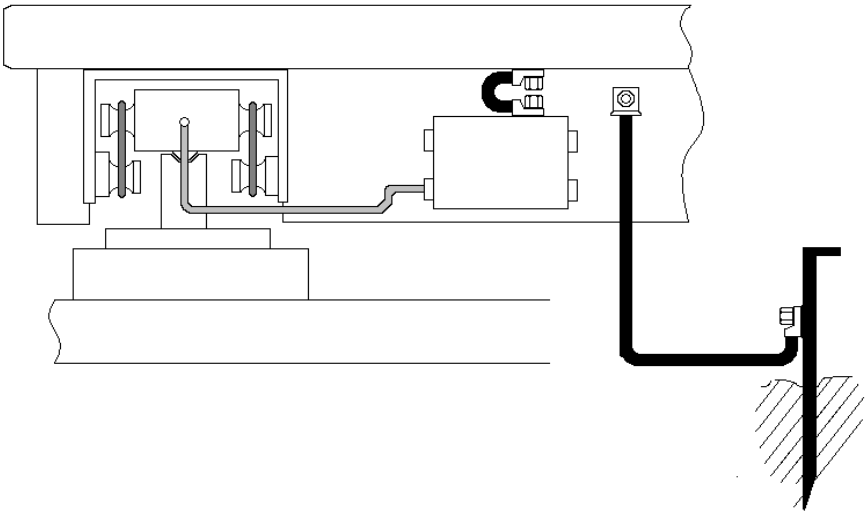
5. Observe the green Cell/Section label on the DLC Smart Box. This label is a miniature diagram of your scale. Where the loadcell is physically connected becomes its “Electronic Address” when navigating the scale elements during calibration.

M2000D INDICATOR

SYSTEM GROUNDING

The M2000 Digital System provides state of the art lightning surge protection. In order for surge conditions to be diverted properly, a good earth ground path must be in place. Since the M2000D indicator is optically isolated from the DLC modules, both ends should be grounded to a good earth connection.

In most cases, the DLC Smart Box modules will be grounded to the steel structure of the weighing platform with a braided Earth Strap. The steel frame should be connected to a ground rod planted in the earth next to 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 to reduce any loops or kinks which may cause inductive resistances to the earth ground discharge path.



(Fig. 1)

SCALE GROUNDING DIAGRAM (SAMPLE)

EXAMPLE:
GROUND WIRE FIRMLY CONNECTED TO DLC SMART BOX GROUND LUG

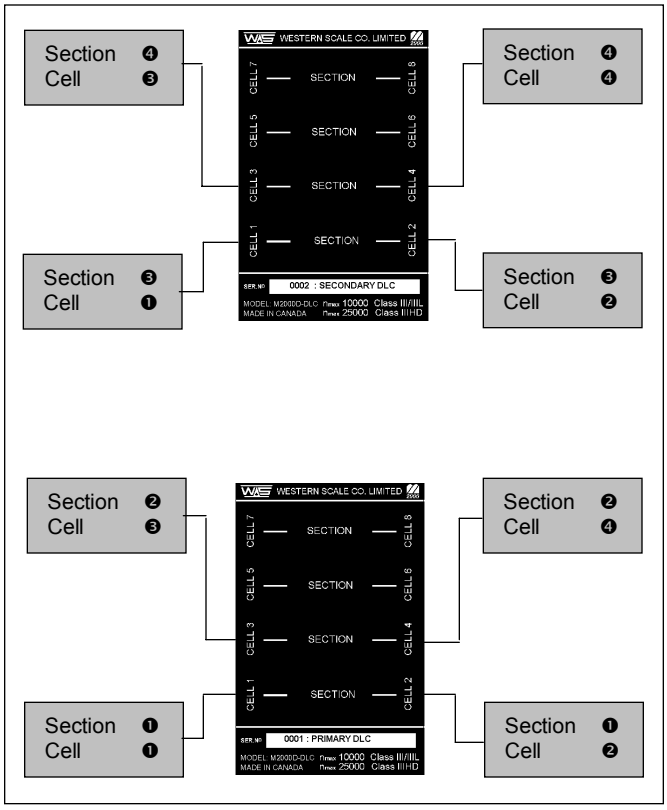
GETTING STARTED

The most common Sectional Truck Scale installations have 4 sections with a total of 8 loadcells. Due to manufacturing preferences and loadcell cable lengths, **2** DLC Smart Box modules, each wired to 4 loadcells (2 sections) are typically used. **This type of installation will be the default example for this guide.**

- It is good practice to think of the green Cell/Section label on the DLC Smart Box as a miniature diagram of the scale. Where a loadcell is physically wired becomes its "Electronic Address", used to identify the scale elements during calibration.

- The loadcell pair comprising the 1st Section of the scale MUST ALWAYS be wired into the connectors labeled CELL1 & CELL2. This DLC Smart Box will be the "Primary" DLC.

- Wire the rest of the sections the same way, with odd numbered cells on one side, even numbered cells on the other. In the case of two DLC modules, loadcell numbering will restart at 1 on the Secondary DLC module. (See Navigating the M2000)

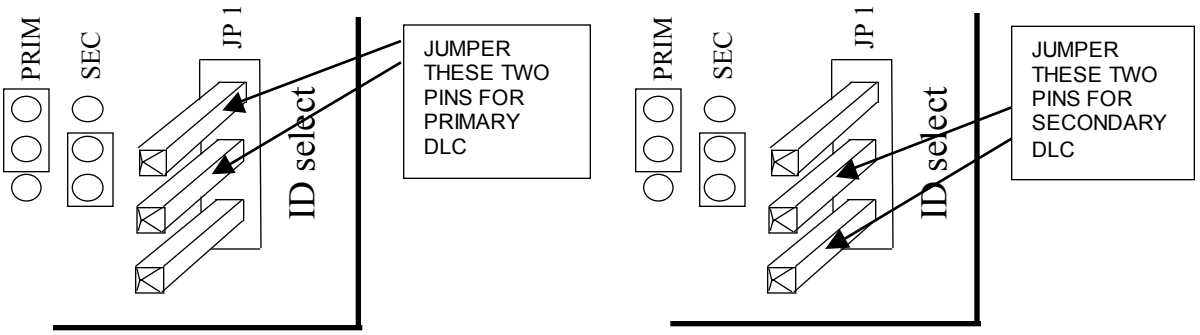


(Fig. 2) **4 SECTION SCALE**

SETTING THE DLC ID JUMPER

When using two DLC Smart Boxes, the M2000D indicator needs to differentiate between the Primary and Secondary modules. **An ID switch must be set via the ID jumpers in the bottom right hand corner of each module.** For systems utilizing only one DLC Smart Box, the jumpers must be in the "Primary" position.

- It is *extremely* important to note which module is the PRIMARY DLC as it ALWAYS identifies the first section of the scale.
- There cannot be two primary (or two secondary) DLC Smart boxes. Setting the switches properly is crucial for the system to function.

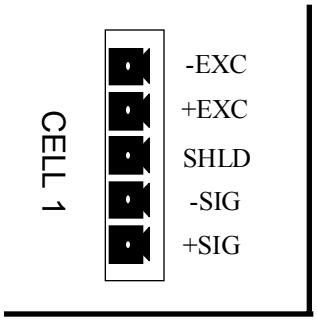


(Fig. 3)

NOTE: If changing the DLC ID jumper after the initial scale setup, the indicator must be in Calibration Mode as jumper settings are stored with Calibration data.

WIRING LOAD CELLS TO THE DLC SMART BOX

Load cells are wired to the DLC Smart Box using 5 pin terminal connectors. The connectors can be unplugged from the DLC to make wiring easier. The Primary DLC Smart Box will always contain Section 1.



(Fig. 4)

Loadcell connections are labeled as follows:

- EXC	Negative Excitation
+ EXC	Positive Excitation
SHLD	Loadcell Shield
- SIG	Negative Signal
+ SIG	Positive Signal

Loadcell pairs in a section must be wired directly across from each other on the DLC Smart Box. Sections are marked on the DLC module for easy reference. (See Figure 2.)

Note: The DLC Smart Box does not include SENSE line terminals for load cells. For connecting a 6 conductor load cell cable to a DLC terminal, it is recommended that the +SENSE and +EXCITATION conductors to be joined together and the –SENSE and –EXCITATION conductors to be joined together respectively.

WIRING THE DLC SMART BOXES TO THE M2000D INDICATOR

The scale wiring requires 2 pairs of shielded wire (one pair for power delivery and one pair for data communications) plus a separate shield conductor. The recommended cable type is Beldon 9873 20 AWG or equivalent. For cable runs over 100 feet, Beldon 9773 18 AWG or equivalent is recommended.

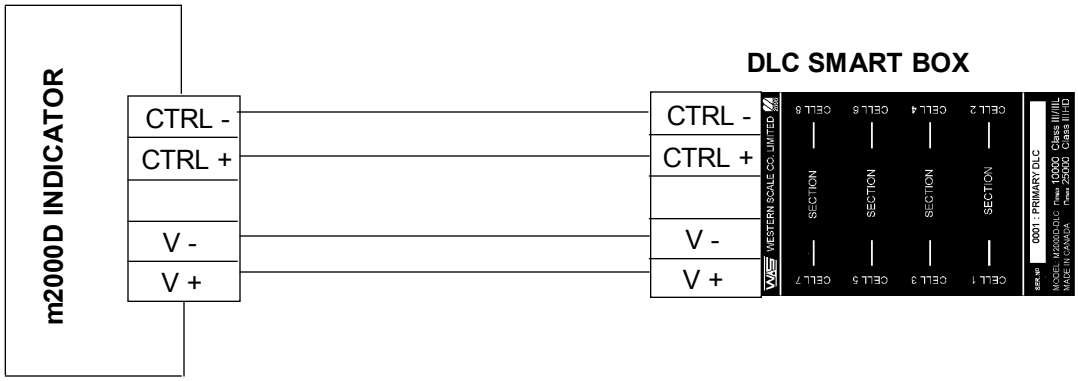
The wires that connect the M2000D indicator to the DLC Smart Boxes are labeled as follows:

CTRL-	Current loop negative (WHITE wire)
CTRL+	Current loop positive (GREEN wire)
V+	Positive DC supply 18-24volts (RED wire)
V-	Negative supply (BLACK wire)

While wiring a single DLC Smart Box to the indicator is very straightforward, two DLC boxes will require some extra attention. The power supply V+ and V- is wired in parallel, but the digital link, being a current loop, must be wired as shown in Figures 5 & 6.

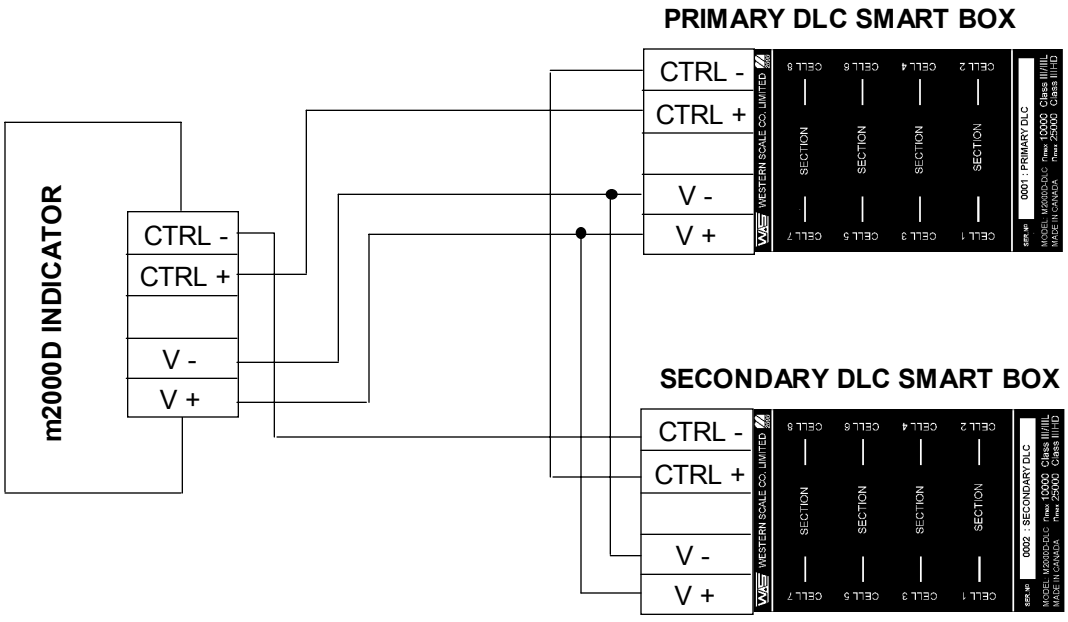
NOTE: When wiring the scale, power to the M2000D indicator should be disconnected.

ONE DLC SMART BOX



(Fig. 5)

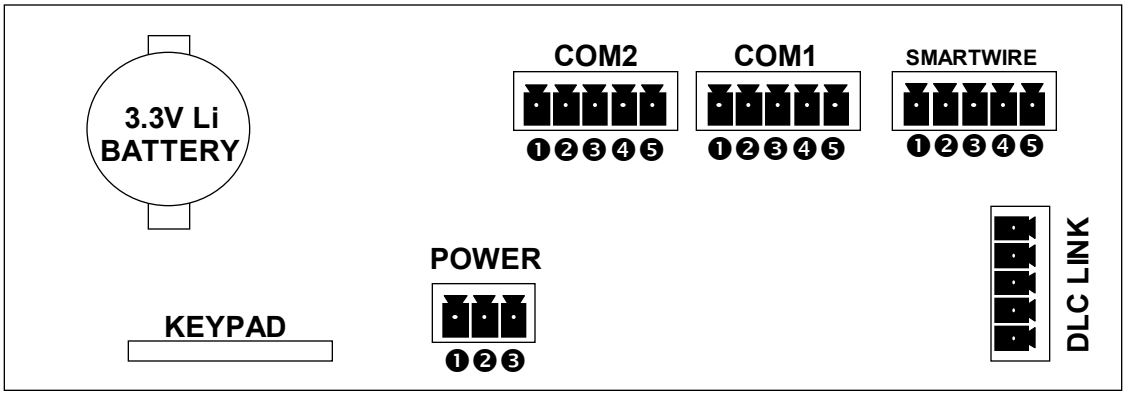
TWO DLC SMART BOXES



(Fig. 6)

OTHER WIRING TO THE M2000D INDICATOR

All wiring to the scale indicator terminates at the main circuit board. If possible, all wiring to the M2000D motherboard should be done before power is applied to the unit.



(Fig. 7)

J1 RS 232/422 PORT COM1	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)

J2 RS 232/422 PORT COM2	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)

J3 MAIN POWER CONNECTOR	❶	V- (Negative)
	❷	GND (Earth ground)
	❸	V+ (Positive power)

J5 SMARTWIRE (FOR PERIPHERAL INTERFACE)	❶	NC (No connection)
	❷	B (RS485 differential signal)
	❸	A (RS485 differential signal)
	❹	V+ (SMARTWIRE Power supply)
	❺	V- (SMARTWIRE Power supply)

POWERING UP THE INDICATOR FOR THE FIRST TIME.

The M2000 Digital System must be used with the 12V power supply adapter included with the indicator.

The M2000D indicator powers up and should display a scrolling "M2000" followed by the software version number. If this is the first time powering up the indicator, the software version number may be followed by a set of dashes across the display "------". The dashes are *NOT* an error. They are a result of the indicator not recognizing new DLC Smart Boxes. The DLCs must be allocated in the indicator's Calibration Mode. (See Allocating Sections - Parameter 521)

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.

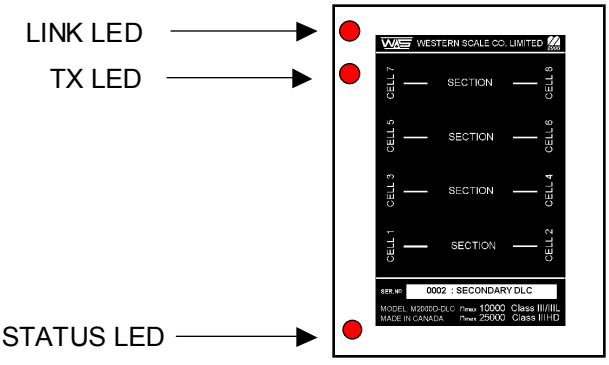
LEDs ON POWER UP

There are three diagnostic LED lights on the DLC Smart Box. On power up:

1. The **LINK** light must be illuminated. If the **LINK** light is not illuminated, there is a problem with the wiring of CTRL- and CTRL+ signals. (See Fig. 5 & 6, Wiring the DLC Smart Box to the M2000 Indicator)

2. The **STATUS** light is the DLC "heartbeat". It must be blinking. The **STATUS** LED light should be blinking consistently once per second to indicate a properly running PRIMARY DLC module. A **STATUS** LED blinking rapidly 10 times per second indicates a properly functioning SECONDARY DLC module.

3. The **TX** light may not be active at this point in time



(Fig. 8)

CALIBRATION MODE

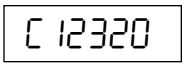
ENTERING INTO CALIBRATION MODE

All calibration functions are executed from the keypad. Each calibration function or parameter has a unique code with which to access and edit values.

To enter into calibration mode:

1. Enter **19** followed by the **[PRINT/SELECT]** key.

2. The display will flash " PASS ". At this point, a four-digit password is required.



3. Enter **1111**, which is the factory default password. A blinking "C" should appear on the left hand side of the display, indicating Calibration Mode.

Note: To calibrate Channels 2 & 3, use **29** & **39** respectively

ENTERING CALIBRATION COMMANDS

Calibration parameters are selected using their unique numeric code and the **[PRINT/SELECT]** key. After a parameter is selected, its current value will be displayed. There is a 6 second window to edit the parameter. Parameter values are entered using the numeric keys followed by the **[PRINT/SELECT]** key. The **[CLEAR]** key can be used to abort any parameter change.

Following are examples of setting the first 3 parameters necessary to get the system up and running: Graduation Size, Capacity, and Calibration Units. Remember, the indicator must be in Calibration Mode before calibration parameters can be entered. A quick reference list of all calibration parameters is provided. (Appendices A & B)

SETTING GRADUATION SIZE (PARAMETER 3)

The factory default for Grad Size is 1. This example sets the parameter to 20.

1. To select Parameter 3, press **3** on the keypad followed by **[PRINT/SELECT]**. The current Grad Size is displayed.

2. Enter the new value (**20**) followed by the **[PRINT/SELECT]** key. This saves the entry. The Grad Size is now 20.

3. To verify the change, simply access Parameter 3 again (Press **3**, **[PRINT/SELECT]**) and the new value of 20 should be displayed. Hit the **[CLEAR]** key to cancel and return to weighing mode.

NOTE: *ALL* parameters for M2000 Indicators are entered and edited in this way.

SETTING SCALE CAPACITY (PARAMETER 4)

1. To select Parameter 4, press **4** on the keypad followed by **[PRINT/SELECT]**. The current capacity is displayed.

2. Enter the new capacity weight on the keypad (For Example: **100000**) followed by the [**PRINT/SELECT**] key.

3. To verify the change, simply access Parameter 4 again (Press **4**, **[PRINT/SELECT]**) and the new value of should be displayed. Hit the **[CLEAR]** key to cancel and return to weighing mode.

SETTING CALIBRATION UNITS (PARAMETER 7)

1. To select Parameter 7, press **7** on the keypad followed by **[PRINT/SELECT]**. This will toggle the Calibration Units between Lbs & Kgs.

2. Make sure the correct Unit Indication light is illuminated.

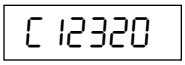
ALLOCATING SECTIONS (PARAMETER 521)

For an initial scale installation, the M2000D indicator needs to be told how many sections are in the scale. The scale must be installed and wired to the DLC Boxes before executing this command. There can be a maximum of 8 sections per scale. If the DLC Smart Boxes have not been allocated, dashes will appear on the display.

EXAMPLE: Allocate a 4 section scale (default example).

1. Press **521** on the keypad followed by the **[PRINT/SELECT]** key. The message " ALLOC" will appear on the display followed by "SEC" (Allocate Sections).

2. Press **4** followed by the **[PRINT/SELECT]** key. It will take a couple of seconds for the indicator to communicate with the DLC boxes. The display will then switch from dashes to a weight.



Note: A 6 section scale would require a parameter value of 6

DEADLOADING THE SCALE (PARAMETER 12)

Once the scale sections have been allocated, the scale must be deadloaded.

1. Remove any load from the scale.

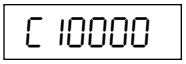
2. Press **12** on the keypad followed by the **[PRINT/SELECT]** key. " PASS " will appear on the display as the password is required to activate this command.

3. Enter the password (factory default "**1111**"), followed by the **[PRINT/SELECT]** key to confirm. The indicator will then deadload the scale. The display should show **"0"**.

SPANNING A SCALE WITH A TEST WEIGHT (PARAMETER 13)

1. Place your test weights on the scale.

2. Press **13** followed by the **[PRINT/SELECT]** key.

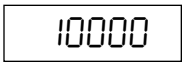


3. Enter the test weight value (Example: **10000**) followed by the **[PRINT/SELECT]** key. The indicator will calibrate the scale and the correct weight will be displayed.

Pressing the **[ON/OFF]** key cycles the display between Graduated Counts (Displayed Weight prefixed by the blinking letter **"C"**) and Raw Counts (prefixed by the blinking letter **"A"**.)

HOW TO EXIT CALIBRATION MODE (PARAMETER 99)

- To exit Calibration Mode, enter **99** followed by the **[PRINT/SELECT]** key.
- The indicator display will show "CAL", "SAVE", and "WAIT".

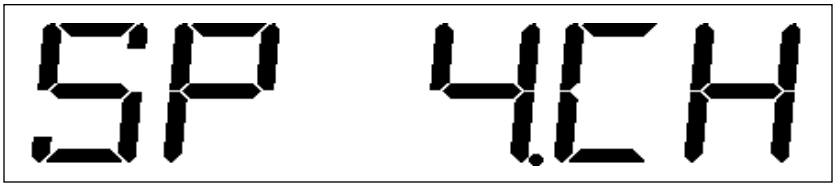


- Weigh Mode will be entered with the scale weight being displayed without the blinking "C" on the left hand side.

NOTE: None of the calibration changes are permanently saved until Calibration Mode is exited.

NAVIGATING THE M2000

The "Status / Electronic Address" screen appears in Calibration Mode and is used to navigate through the various elements of the scale. Details of Scale Set-up and Status are also displayed. The most important LED digits for navigation are the 2nd digit (P or S) and the last two digits ("CH" on the diagram). These are the "Electronic Address".



(Fig. 9)

CH	ALL CHANNELS: This is the Electronic Address for the entire Scale. Values displayed include all Loadcells.
1.C	SECTION 1: Values displayed include Loadcells 1 & 2 combined.
1.1	SECTION 1, LOADCELL 1: Values displayed are for this Loadcell (corner) only.
1.2	SECTION 1, LOADCELL 2: Values displayed are for this Loadcell (corner) only.

NUMBER OF SECTIONS allocated to the scale, in this case, 4. Each section contains 2 load cells (corners).

CHANNEL STATUS INFORMATION (USUALLY BLANK)
[E] = Faulty corner/cell. Only the faulty corner/cell will have a flashing '**E**' in its status field.
[D] = Corner/cell Disabled
[A] = Corner / Section Adjustment mode activated.
[_] = Cell allocated to another scale or not accessible to the user

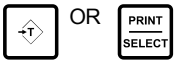
[P] = ***PRIMARY*** DLC Smart Box
[S] = ***SECONDARY*** DLC Smart Box (if necessary)

[S] = ***SECTIONAL*** Scale
[H] = ***HOPPER*** Scale

Note: Press the **[TARE]** or **[PRINT/SELECT]** key to display the Electronic Address Screen.

SELECT A SECTION OR CELL (SCROLLING METHOD)

Starting with the scale as a whole, sections and individual cells may be selected easily, using their "Electronic Address".



1. Press the **[TARE]** or **[PRINT/SELECT]** key to display the Electronic Address screen. The address of the currently selected scale element will appear.

Before the indicator returns to weight display,

2. Press the **[TARE]** key to scroll forward through the scale elements' Electronic Addresses, *OR…*

3. Press the **[PRINT/SELECT]** key to scroll backwards.

EXAMPLE: Scrolling forward through all the sections and cells in a 4 section truck scale with 2 DLCs.

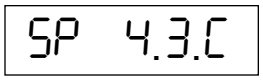
Status-Electronic Address Screen	Description
SP 4.1.C	Section 1 Combination. The total of the 2 cells in Section 1
SP 4.1.1	Section 1, Cell (corner) 1. For Individual Cell Adjustments
SP 4.1.2	Section 1, Cell (corner) 2. For Individual Cell Adjustments
SP 4.2.C	Section 2 Combination. The total of the 2 cells in Section 2
SP 4.2.3	Section 2, Cell (corner) 3. For Individual Cell Adjustments
SP 4.2.4	Section 2, Cell (corner) 4. For Individual Cell Adjustments
*SS 4.3.C	Section 3 Combination. The total of the 2 cells in Section 3 *Note Address located on SECONDARY DLC
SS 4.3.1*	Section 3, Cell (corner) 1. For Individual Cell Adjustments *Note Loadcell # 1 SECONDARY DLC
SS 4.3.2	Section 3, Cell (corner) 2. For Individual Cell Adjustments
SS 4.4.C	Section 4 Combination. The total of the 2 cells in Section 4
SS 4.4.3	Section 4, Cell (corner) 3. For Individual Cell Adjustments
SS 4.4.4	Section 4, Cell (corner) 4. For Individual Cell Adjustments

QUICK SELECT METHOD (FOR SECTIONS)

This method allows a technician to go directly to a particular section instead of scrolling through all the scale elements. To quickly jump to a section, enter the section number followed by the **[TARE]** key.

EXAMPLE: Select Section 3.

1. Enter **3** followed by **[TARE]**. The display will briefly show the Electronic Address for confirmation and return back to weigh mode.

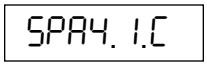


SECTIONAL ADJUSTMENT (PARAMETER 531)

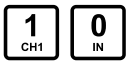
Before a sectional adjustment can be made, the specific section must be selected.

1. Enter **531** followed by the **[PRINT/SELECT]** key. The display will flash the currently selected section.

2. Confirm the correct section by pressing the **[PRINT/SELECT]** key. The display will confirm by briefly showing the selected section with a flashing **"A"** to indicate that **"ADJUST"** mode has been entered. The display will return to weigh mode, showing the current weight on the scale.



COARSE ADJUSTMENT



FINE ADJUSTMENT

3. **TO INCREASE THE DISPLAYED WEIGHT:** Pressing the **[IN]** key will increment the number of counts, causing the displayed weight to increase. The keys **1**,**2**,**3** and **4** select the coarseness of the adjustment, where **4** is a very coarse and **1** is a very fine weight increment. When using fine weight increments, the **[IN]** key may need to be pressed several times to see the weight change.

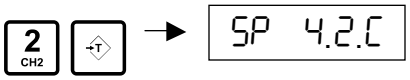
TO DECREASE THE DISPLAYED WEIGHT: Pressing the **[OUT]** key will decrement the number of counts, reducing the displayed weight. The same Coarse and Fine adjustments apply.

Once the correction is complete, press the **[TARE]** button to exit Adjustment Mode.

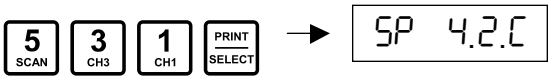
EXAMPLE: Weight Correction on Section 2.

Section 2 is weighing 9920 lbs. The actual weight on the scale is 10,000 lbs.

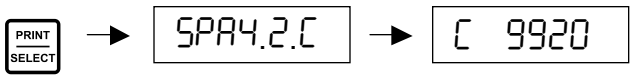
1. Use the Quick Select Method to select Section 2. Enter **2** followed by the **[TARE]** key. The display will briefly confirm that you are pointing to Section 2.



2. Enter **531** followed by the **[PRINT/SELECT]** key.

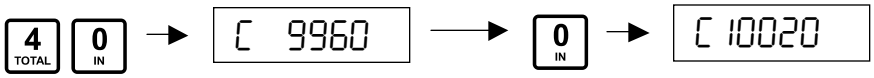


3. Press **[PRINT/SELECT]** again to confirm Section 2. Note the flashing '**A**' in the Channel Information digit. The weight (**9920**) will be displayed. The section can now be adjusted.

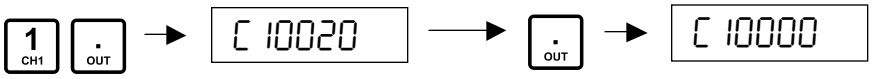


4. Press **[IN]** to increase the displayed weight. If nothing happens, select a courser adjustment. (Step 5)

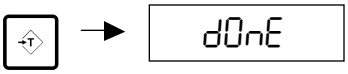
5. Press **4**. Pressing the **[IN]** key will now cause a jump in the weight. Continue to press **4** until the displayed weight approaches 10,000 lbs. If you overshoot the target weight, press **[OUT]** to reduce the weight.



6. At this point, fine-tuning may be required.



7. Press **[TARE]** to save adjustment values.



CORNER & SIDE-TO-SIDE ADJUSTMENTS (PARAMETER 531 CONTINUED)

Corner adjustments are identical to sectional adjustments. Instead of selecting a section to correct, select an individual loadcell.

NOTE: None of the calibration changes are permanently saved until Calibration Mode is exited.

SERIAL COMMUNICATIONS

The M2000 has two fully independent serial ports (COM1 and COM2) on the back of the indicator. The factory default settings allocate COM1 for printing tickets at 9600 baud. COM2 is allocated for outputting a weight string (DF1500) in continuous mode at 9600 baud.

DATA BITS (PARAMETER 27 - COM2 ONLY)

COM1 on the M2000 is fixed at 8 Data Bits. However, if EVEN or ODD Parity is selected then 7 Data Bits will automatically be used.

COM2 allows for independent selection of Data Bits.

Parameter Value	Data Bits
0	COM2 Data Bits set to 4
1	COM2 Data Bits set to 5
2	COM2 Data Bits set to 6
3	COM2 Data Bits set to 7
4	COM2 Data Bits set to 8 (default)

BAUDRATE (PARAMETER 30 & 32)

Baud rate for COM1: Parameter 30
Baud rate for COM2: Parameter 32

Parameter Value	Baud Rate
0	150
1	300
2	600
3	1200
4	2400
5	4800
6	9600 (factory default)
7	14400
8	19200
9	32400

PARITY (PARAMETER 31 & 33)

Parity for COM1: Parameter 31
Parity for COM2: Parameter 33

Parameter Value	Parity
0	No parity (factory default)
1	ODD parity
2	Even parity

STRING FORMATS FOR CONTINUOUS OUTPUT (PARAMETER 34 & 35)

String Format for COM1: Parameter 34
String Format for COM2: Parameter 35

Several different indicator string formats are supported on the M2000. If creating a custom Output string for a ticket, the Com port connected to the printer must be set to 99. (See M2000 Ticket Formatting Guide)

Parameter Value	Output String
1	DF1000
3	DF2000
5	DF2500 mode1
8	DF1500 (factory default)
9	DF2500 mode 6
10	DF2500 mode 7
12	AD4321, AD4323, AD5000
13	Cardinal 708
14	Cardinal 738
15	Toledo & Fairbanks R2500
16	Weightronix 120
17	Consolidated Controls UMC600
18	Analogic 5316
99	Set the com port to custom transmit mode

EXAMPLE: Output a UMC600 string from COM2.

1. Enter **35** on the keypad followed by the **[PRINT/SELECT]** key.
2. Press **17** followed by the **[PRINT/SELECT]** key.

SERIAL HANDSHAKING - RTS/CTS (PARAMETER 36 & 37)

Handshaking for COM1: Parameter 36
Handshaking for COM2: Parameter 37

Parameter Value	Hardware Handshaking
0	Disabled (default)
1	Enabled

COM PORT STRING OUTPUT MODE (PARAMETER 38 & 39)

String Output Mode for COM1: Parameter 38
String Output Mode for COM2: Parameter 39

Both COM ports output continuously by default.

Parameter Value	String Transmits To COM Port…
1	When the PRINT/SELECT key has been pressed
2	When the COM port receive data input is at logic low (-9 volts dc)
3	When the COM port receive data input is at logic high (+9 volts dc)
4	When the '?' character is received
5	Continuously (default)

CONFIGURING COM PORTS TO TRANSMIT IN RS422 MODE (PARAMETER 40)

The wire connections to the COM ports on the back of the indicator are different for RS422 then for RS232. RS422 requires 2 lines for transmit (TX+ and TX-) and 2 lines for receive (RX+ and RX-).

FOR RS422 COMMUNICATIONS:

CTS	on the connector becomes	**RX -**
RX	on the connector becomes	**RX +**
TX	on the connector becomes	**TX +**
RTS	on the connector becomes	**TX -**

Parameter Value	COM1	COM2
0 (default)	RS232	RS232
1	RS422	RS232
2	NOT CURRENTLY SUPPORTED	
3	RS422	RS422

TRANSMISSION DELAY FOR COM1 AND COM2 (PARAMETER 65)

Some older equipment may experience problems keeping up to the high update rate of the M2000. Parameter 65 inserts delays between string transmissions to slow down the output rate. The delay can be set with ¼ second increments. Calibration mode must be exited before this parameter takes effect.

The value entered for Calibration Parameter 65 must be a number between 0 – 100.

EXAMPLE: Update the strings on the serial ports once every second.

1. Enter **65** on the keypad followed by the **[PRINT/SELECT]** key.
2. Press **4**, followed by the **[PRINT/SELECT]** key. For the fastest possible update, enter **0**, which is the factory default.

M2000D SYSTEM SPECIFICATIONS

INDICATOR PERFORMANCE (NTEP Certified)	
UNIT CONVERSION	Lbs/kg
ZERO TRACKING	1-99% of d or 1,2,3d
RESOLUTION	+/- 256 000 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

DLC LOAD CELL INPUTS	
DLC REMOTE LOAD CELLS	8 AD converters per DLC module
FULL SCALE	4 ranges 0-9mV, 0-19mV,0-39 and 0-79V
EXCITATION	5VDC,16x350,32x700 ohm in total
RESOLUTION	+/- 256 000 A/D counts per load cell
DLC CABLE LENGTH	1000 feet - DLC module may be up to 1000 feet from indicator
DLC CURRENT	500mA per slave with 16 *350 ohm load cells connected

COMMUNICATIONS	
SERIAL OUTPUTS	2 full duplex RS232/RS422
IO INTERFACE	SMART WIRE peripheral expansion - RS485 multi-drop
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 Multi-drop Networking of up to 32 indicators as slaves

ELECTRICAL	
POWER REQUIREMENTS	12VDC 1.5A maximum
TEMPERATURE RANGE	-10C to +40C

ENCLOSURE	
STAINLESS	Washdown stainless steel enclosures. Panel mount, swivel bracket, or desktop Stainless or NEMA 4-X

APPENDIX A – M2000 PARAMETERS

Parameter	Function
1	Reload Factory Default Values
2	Decimal Point Position
3	Display Divisions
4	Scale Capacity
5	Motion Window
6	Power On Units
7	Calibration Scale Units
8	Scale Over
9	Power On Rest Warning
10	Power Switch Bypass
11	Selecting Input Range
12	Deadloading the Scale
13	Set Span (Spanning the Indicator)
15	Clearing the Span Tables
16	Incrementing the Span Table Pointer
17	Decrementing the Span Table Pointer
19	Display Update Rate
20	Scale Over Message
21	Push to Zero Window
22	Auto Zero ON/OFF
23	Zero Tracking Window
24	Motion Settle Time
25	Offset Value
26	Offset Flag
27	COM 2 Data Bit Rate
28	Sound Volume
29	Keypress Feedback
30	Changing the Baud Rate on the COM 1 Port
31	Changing the Parity
32	Changing the Baud Rate on the COM 2 Port
33	Parity for COM 2
34	String Mode for the COM 1 Port (Enabling the Bar Code Scanner)
35	Setting the String Mode for the COM 2 Port
36	Flow Control for COM 1
37	Flow Control for COM 2
38	String Output Mode for COM 1
39	String Output Mode for COM 2
40	Changing COM Port Driver Configuration
41	Digital Averaging Filters
42	Filter Faststep Threshold
43	Faststep Sensitivity
44	Disable Faststep
45	Power Up Zero
46	Selecting Power Up Default Channel
47	Serial String Output Routing for COM 1 (Channel Allocation)
48	Serial String Output Routing for COM 2 (Channel Allocation)

50	Tare Function Mode
51	Set Weight for Setpoint 1
52	Set Weight for Setpoint 2
53	Set Weight for Setpoint 3
54	Set Weight for Setpoint 4
55	Set Weight for Setpoint 5
56	Set Weight for Setpoint 6
57	Set Point Control Mask
58	Set Point Hysteresis Adjustments
59	Enabling SmartWire Interface
60	Selecting Scale Channel to Connect to Current Loop
61	Current Loop Offset Adjustment
62	Current Loop Span Adjustment
63	Current Loop Gross or Net Mode
63	Current Loop Gross or Net Mode
64	Current Loop Span
65	Serial Port Update Rate for COM 1 and COM 2
70	Enable Total Mode
71	Force Zero for Keyboard Tare
75	Transit Calibration Information to Serial Port
76	Capture Calibration Information From a Serial Port
77	Transmit Ticket Buffer Information To Serial Port
78	Capture Ticket Buffer Information From Serial Port
80	Set Time of Day
81	Set the Date
83	Time Format Mode
84	Add New Ticket
85	Edit Existing Ticket
86	Number of Ticket Saved in the Ticket Buffer
87	Show Available Space in Custom Ticket Buffer
88	Clear Custom Ticket Buffer
89	Print Specific Ticket
90	Scanner Handshaking Mode
95	Assigning a Ticket Event to the Scanner
98	Enables Scale Channel
99	Exit Calibration Mode
100	Delete Truck IN/OUT Database
101	Delete Truck IN/OUT Database
105	Disable Units Function
240	Boot Loader Version Information
244	Testing Battery Information
255	Software Upgrade Download
260	Complete Factory Initialize

APPENDIX B – M2000 D SPECIFIC PARAMETERS

Parameter	Function
500	Clear All Remote DLC Scale Allocations
501	Clear Scale 1 Allocation
502	Clear Scale 2 Allocation
503	Clear Scale 3 Allocation
520	Assign a Hopper Scale
521	Assign a Sectional Scale
525	DLC Load Cell Masking
530	Reset Corner Field Adjustment Entries
531	Corner / Section Manual Span Adjustment
532	Auto Corner Span Adjustment
551	DLC Communications Error Counter
552	DLC Packet Counter
555	DLC Software Upgrade Download
556	Obtain DLC BIOS Firmware Version Information
557	Obtain DLC BOOT Firmware Version Information
558	DLC Set AD Range For Active Corner
591	Backup System Setup To a DLC Slave
592	Restore System Setup To a DLC Slave
594	Reload Scale Allocation (filed replacements)
600	Scale Status / Diagnostics Information
620	DLC Slave Line Status

APPENDIX C - 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
150	Audit trail CRC failed
151	Database CRC failed
152	CAL copy CRC failed
153	Ticket Buffer CRC failed
154	DPAGE stack overflow
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
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
200	General communications timeout – non critical
210	Scale allocation was not successful
215	Scale validity checksum failed - scale not valid