NORAC
WEIGHING AND CONTROL SYSTEMS

M2000 Based Scale Instrumentation

Technical Manual

Applies to the following part numbers:
82-M2000A-DT
82-M2000A-SL
42300
42300M
42301

Canada

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Reorder P/N: 42349 Rev C

NOTICE

NORAC Systems International Inc. reserves the right to improve products and their specifications without notice and without the requirement to update products sold previously. Every effort has been made to ensure the accuracy of the information contained in this manual. The technical information in this manual was reviewed at the time of approval for publication.

Table of Contents

1 Introduction

This manual covers the complete line of NORAC scale instrumentation based on the M2000 digital indicator. The list of instrument configurations, along with their part numbers that are covered by this technical manual are shown in section 2.

Please take the time to read this manual completely through before contacting Norac for further technical assistance. If you have questions not covered by this manual, please contact technical support at:

Phone (toll free): 1-800-667-3921

Extension 316

E-mail: service@norac.ca

2 Device Configurations

To identify the device your are dealing with, look for a part number on the units serial plate. The pictures in this section will help identify the various devices.

2.1 M2000 Desktop

Part Number: 82-M2000A-DT

2.2 M2000 Slimline

Part Number: 82-M2000A-SL

Note – this part is used in the OnBoard Weigh Center (see section 2.4).

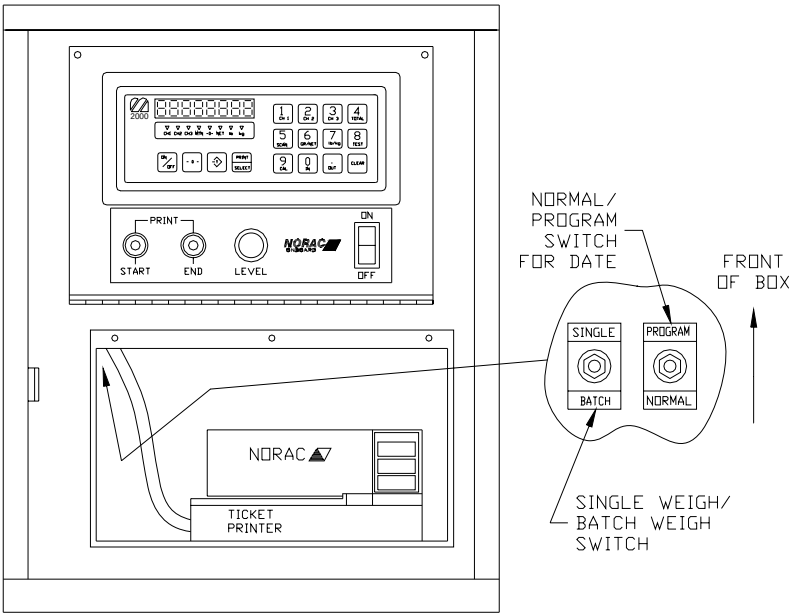
2.3 M2000 NEMA

Part Number: 82-M2000A-NEMA

2.4 OnBoard Weigh Center

Part Number: 42300, 42300M

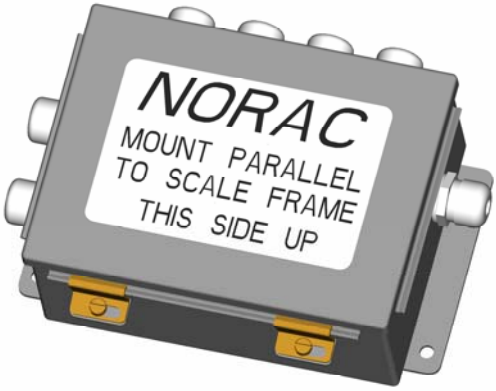
Indicator, OnBoard Circuit Board and Printer are all housed in the Weigh Center.



2.5 OnBoard Compact Weigh Center

Part Number: 42301

Cab Mounted Indicator Housing



Level Switch and Load Cell Sum Box (Scale Frame Mounted)

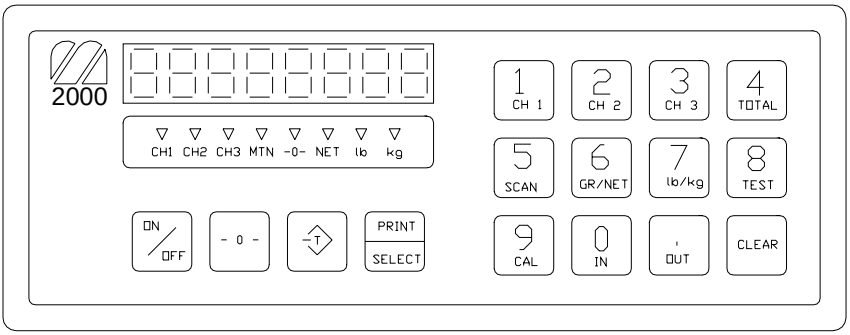
M2000 Instrument Specifications

- Power requirements: 12VDC 1A.
- Temperature range: 14°F to 104°:F (-10°C to +40°C).
- Full scale input signal: 4 ranges: 0-9mV, 0-19mV, 0-39mV and 0-79mV.
- Excitation voltage: 7.5VDC, 16x350 Ohm and 32x700 Ohm for all 3 channels combined.
- Sense amplifier: Differential amplifier with 4 and 6 wire.
- A/D internal resolution: 520,000 counts in both positive and negative direction.
- A/D Sampling rate: 100 times a second on each channel.
- Span stability: 2ppm/°C.
- Zero stability: 5nV/°C.
- Linearity correction: 10 span entries.
- Calibration method: Calibration through software stored to flash memory.
- Calibration sealing: Physical seal or class 1 audit trail system, password protected.
- RFI protection: Filtered signal, excitation and sense lines.
- Analog output: Optional 4-20mA board via SMART WIRE.
- Serial communications: 2 full-duplex RS232/RS422 ports.
- I/O interface: Peripheral expansion through SMART WIRE multi drop RS485 port.
- External I/O: Up to 6 channel set point board via SMART WIRE.
- Set points: 6 programmable set points.
- Digital filtering: Adjustable filter parameters with FAST STEP quick response algorithm.
- Display modes: Weight can be displayed from CH1, CH2, CH3 and as TOTAL of all channels.
- Tare: Keyboard and scale tare, multiple tare IDs can also be stored in memory.
- Time/Date: Y2K compliant time/date clock, internal battery back up.
- Truck database: Capable of storing 15-0 truck IDs with associated tare weights.
- Truck in/out loop: program for weigh-in and weigh-out applications.
- Units conversion: lb/kg.
- Zero tracking: 1-99% of 1d, 1d, 2d or 3d.
- Ticket editor: Create custom tickets for any serial printer, indicator can store and recall different tickets.
- Enclosure dimensions: SL=9"x4"x1", DT=9.75"x6"x2.5", NSS=10"x7.5"x3".

Approvals: NTEP Class III/IIIL 10000, Measurement Canada Class III 10000 and IIIHD 20000

3 General Operation

The layout of the M2000 indicator is shown below.



3.1 Keypad Functions Keys

The M2000 has several function keys, all of which are selected via the front panel. The function key operations are discussed below. All the keys have audio feedback when a key is pressed. The sound volume can be set in calibration mode.

A description of the important keys and buttons are as follows:

Indicator [**ZERO**] Key

Indicator [**TARE**] Key

Indicator [**PRINT/SELECT**] Key

3.1.1 On/Off Key

This is the ON/OFF button for the indicator. Pressing the switch once turns on the indicator. To turn off the indicator press the switch for 1 second. It is important to note that there is a power bypass switch option flag that can be set in calibration (parameter 10). If power bypass is enabled the indicator will always be on and cannot be turned off via the ON/OFF button. This

option should be used if the indicator is used in process control applications where the indicator must power up running after a power outage.

When the indicator starts “m2000 “ will scroll across the screen followed by the version number of the software. The indicator performs a full diagnostic of its internal circuits and will display any error messages if there is an internal problem with the indicator.

When the indicator is in calibration mode this key can be used to toggled between displayed weight and AD converter internal counts.

3.1.2 ZERO Key

This key is used to zero the indicator. The scale cannot be zeroed if there is motion on the scale or the weight on the scale is out of the zero range. Three quick beeps will sound from the indicator if the zero key is unable to zero the indicator.

This key also functions as a ZERO key when the indicator is in calibration mode.

3.1.3 TARE Key

This key is used for taring weight on the scale. A tare can also be entered from the keypad. To tare from the scale simply press the tare key and what ever the weight on the scale will be tared. The NET indicator light should be illuminated showing that the indicator is in net weight display mode.

To manually tare from the keypad enter the weight using the numeric keypad followed the tare key. The indicator will only accept a tare from a stable and valid positive weight.

An invalid tare will cause error message 41 to be displayed. Pressing the tare key will always overwrite any previously stored tare weight. Use the clear key to clear the tare weight.

It is important to note that the tare key can be disabled in the calibration menu using parameter 50.

3.1.4 CLEAR Key

This will clear any previously entered tare values entered using the tare key. Clear will also function as an escape key to cancel any key entry operations.

3.1.5 PRINT SELECT Key

Print select is a dual function key. Pressing the key will cause a ticket to be printed to a connected printer. If you have typed a numeric value from the keyboard followed by the PRINT SELECT key then the key acts as a function select key. More information on this will be discussed below.

3.2 Special Keypad Functions

Keypad functions are selected by entering a numeric function code on the keypad followed by the PRINT SELECT key. Some functions are marked on the key itself. The most common functions are discussed below.

3.2.1 Selecting scale channels

The M2000 has three independent scale channels. Press the channel number followed by the PRINT SELECT key as shown below.

To select channel 1 press 1 followed by the print select key.

To select channel 2 press 2 followed by the print select key.

To select channel 3 press 3 followed by the print select key.

Note: that by default only channel 1 is enabled. To enable channels 2 and 3 you must enter calibration mode and use parameter 98 to enable them. Trying to select a scale channel that is not enabled will display error message 40.

3.2.2 Summing channels in TOTAL mode

Up to 3 channels may me summed together to display a total weight. An example of an application that may require this operation would be a truck scale with three sections. Each section would be a separate channel on the indicator allowing the operator to simultaneously record the total weight of the vehicle along with the individual axle weights of the truck.

To enter total mode press 4 followed by the print select key. Total mode must be enabled before it can be used. Parameter 70 in calibration mode is used to enable the total mode function. Enter 1 followed by the TARE key to enable TOTAL mode. Total mode *cannot be used for legal for trade* applications in Canada. Only channels that are enabled and calibrated with the same grad size, decimals and units of weight will be displayed in total mode. Total mode is indicated by illuminating more than one channel on the channel indicators. Channel 1 is always part of the total.

Example:

Ch1 and 3 are calibrated as 2000 x 2 lbs and Ch2 is calibrated to 500 x 0.2 lb . When you press 4 followed by the PRINT SELECT key the CH1 and CH3 indicators will illuminate showing that the weight on the display is the sum of these two channels. Channel 2 however is excluded from the total as it is calibrated in 0.2d instead of 2d for channels 1 and 3.

When the indicator is in TOTAL mode all the channel operations are combined. Pressing the ZERO button will zero all the channels that are part of the total. The TARE function will tare all channels simultaneously

displaying the total net weight. The motion indicator and center of zero indicators will indicate the status of all the scales that are part of the total. For example scale 1 may be at the center of zero, but channel 3 might not be at zero. The center of zero indicator would then not illuminate reflecting that we are not at zero.

To set the indicator back to single channel mode, select a channel followed by the print select

3.2.3 Scan mode

Scan mode allows the indicator to cycle between the scale channels that are enabled. The indicator will automatically switch the display to the next available channel and pause for 3 seconds before switching to the next channel. To stop scanning press a channel key followed by the print select key.

To enter scan mode press 5 followed by the print select key.

3.2.4 Gross/Net

Pressing 6 followed by the print select key switches between displayed net weight and gross weight.

3.2.5 Pound/Kilograms selection

To change the displayed units on the display press 7 followed by the print select key. The indicator will toggle the displayed units on the display from lbs to kgs or kgs to lbs. The units that the indicator uses as a default when turning on the indicator is determined by the power up setting set in calibration.

3.2.6 TEST display

To test the display segments press 8 followed by the print select key. All the segments in the display will light up for a short period of time.

4 Application Parameter Settings

Parameters not listed in the table should be set to their factory default values. For factory defaults, see section 8.

4.1 OnBoard Scale Settings

M2000 Parameter	Value
2	0
5	2
8	0
9	0
10	1
11	3
19	1
21	2
22	0
23	15
24	16
30	3*
31	0
34	3
38	0
40	0
41	100
42	12
43	8
44	0
50	1
65	2

Table 1 – Onboard Parameters

Parameters 3 and 4 will vary depending on application see the table below for the proper values of each.

** Set Parameter 6 power on units to 1 for Kg or 0 for lbs.

*** Set Parameter 30 to 3 for Ticket Printers or 6 for roll printer (Also see printer section)

M2000 Parameter Number	Net Capacity x Divisions		
	8000 x 2 kg	12,000 x 2 kg	15,000 x 5 kg
3	2	2	5
4**	8400	12600	15750
6	1	1	1

Table 2 - Parameter Settings (Metric units)

M2000 Parameter Number	Net Capacity		
	10,000 x 2 lb	20,000 x 5 lb	60,000 x 10 lb
3	2	5	10
4**	10500	21000	63000
6	1 kg	0	0

Table 3 - Parameter Settings (US units)

Notes:

* Set parameter 30 to 3 for ticket printers. Set parameter 30 to 6 for roll printers.

** Values listed are maximum settings. Parameter 4 may be set anywhere from net capacity plus one division up to the maximum setting.

4.2 Multiple Animal Scale Settings

TABLE 4.0 - M2000 Parameter Settings Multiple Animal Scale

M2000 Parameter Number	**MMAS Model 7-13 (all lengths<14 Ft)**	**MMAS Model 7-20 (all lengths>14 Ft)**
2	0	0
3	2 kg (5 lb)	2 kg (5 lb)
4	6900 kg (15200 lb)	9100 kg (20060 lb)
5	4	4
6	0	0
8	1	1
9	0	0
10	1	1
11	3	3
19	0	0
21	2	2
22	0	0
24	8	8
25	0	0
30*	3 (ticket printer) 6 (roll printer)	3 (ticket printer) 6 (roll printer)
34	3	3
38	0	0
41	200	200
42	5	5
43	20	20
44	1	1
50	0	0

*Also see printer section

5 Calibration and Sealing

To calibrate a scale the indicator must be placed in calibration mode. Only qualified scale technicians should be performing these operations. The 3 scale channels are independent of each other and must be calibrated separately.

5.1 Placing the indicator into Calibration Mode

To calibrate channel 1 press 19 followed by the print select key.

To calibrate channel 2 press 29 followed by the print select key.

To calibrate channel 3 press 39 followed by the print select key.

Note that standard OnBoard and Mobile Multiple Animal applications use single channel indicators. Channels 2 and 3 are not available.

The display will be showing a blinking “PASS” message. This prompts you to enter a 4 digit password. Key presses are not displayed on the display. If the 4 digit password sequence is correct then the indicator will automatically enter calibration mode.

The factory default for the password is 1111. This can be changed but we recommend keeping the password to the factory default, more on this later. You have 30 seconds to enter calibration mode before the indicator cancels and returns back to normal weighing mode.

Calibration mode is indicated when there is a blinking ‘C’ displayed in the left most digit on the display.

5.1.1 Special Keypad function keys during calibration

5.1.1.1 Selecting a calibration parameter.

The M2000 uses parameter numbers to access calibration functions. Each cal function has a unique number used to access that parameter. In calibration mode the print select key now becomes the calibration function select key. Entering a calibration function number followed by the print select key selects a calibration parameter to edit. Immediately after a function parameter has been entered followed by the print select key the value of that parameter will be displayed on the display for a short period of time.

5.1.1.2 Editing a calibration parameter.

After selecting a cal parameter with the print select key a new value for that cal function can be entered. The TARE key now becomes an ENTER key for entering calibration parameters. Parameter values entered from the keypad must immediately follow with the TARE key to take affect.

5.1.1.3 Canceling a calibration parameter.

If you would like to cancel a calibration function you can use the CLEAR key as an ESCAPE key. This key will get you out of most calibration operations.

5.1.1.4 Toggle between weight and AD counts.

A unique feature of the M2000 is the ability to toggle between weight and the AD converters internal counts. This can be an excellent diagnostic tool for the experience scale technician. Pressing the ON/OFF key will show the internal AD counts. The blinking ‘C’ will now change to a blinking ‘A’ to indicate analog AD counts are being displayed. Press the ON/OFF button again to switch back to weight mode.

5.1.1.5 Exiting Calibration Mode.

To exit calibration mode press 99 followed by the print select key. All calibration parameters will be saved and the indicator will restart in weighing mode. Note: Channels 2 and 3 are disabled by default. Remember to enable them before exiting calibration mode by using parameter 98.

5.2 Calibrating with Weights

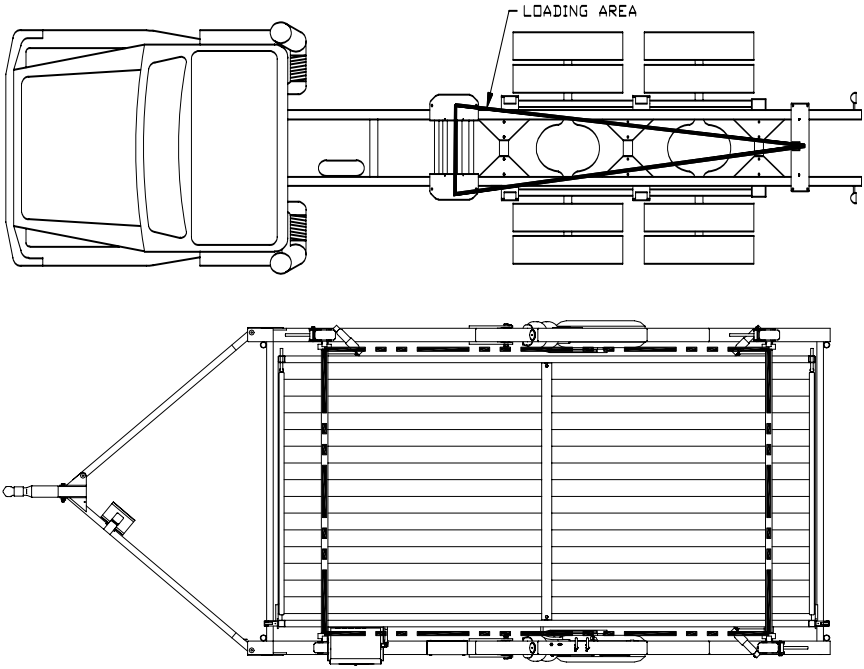
A complete calibration of the scale would include all the steps described in this section in order: set the parameters, balance the scale, deadload the indicator, and set the span.

5.2.1 Set the Scale Parameters

Set or verify all the parameter settings for your application. Refer to section 4 for details on the settings for common applications.

5.2.2 Balance the Scale

When loading test weights on the scale (for balancing or calibration), it is important to position the weights correctly for your application. Imagine lines connecting the load cell positions (see below). Keep the weights inside the area defined by the lines connecting the load cell positions. The loading area for a typical onboard system is shown below.



Typical Loading Areas

1. Before the scale can be calibrated, all load cells must be balanced and responding to loading equally by adjusting the balance trimmers. If you have a weigh center, the balance trimmers are located on the main circuit board, inside the control panel. If you do not have a weigh center, your balance trimmers will be located inside a junction box on the scale. All trimmers are initially set to 2-Ohm resistance. Use the following procedure to balance the load cells.

2. Use proper balancing weights to ensure good balancing. Use a minimum of ¼ of the net capacity of the scale for balancing. I.e. for a 10,000-lb net capacity, use at least 2500 lbs. for balancing. However, be careful not to exceed the capacity of the individual load cells.

3. Activate the scale so that the platform is live. Load weights to the full capacity of the scale: then, unload all the weights. This process "exercises" the load cells.

4. Press the zero key to obtain a good center of zero. Load one cell by placing the balancing weights on that corner of the scale (inside the loading area). Keep the weights as close to the cell as possible directly above the cell being preferred. Record the weight on the M2000.

5. Repeat step 4 for the other cells with the same procedure (remembering to press the zero key to obtain a good center of zero). All the readings should be within approximately one percent (1%) of each other. If the readings are significantly farther apart, you may not be able to balance your system. Contact NORAC for technical assistance.

6. Pick the lowest reading and adjust the other cells down to this value with the trimmers inside the control box. To adjust a cell use the following procedure:

7. With no test weights on the scale, press the zero key to obtain a good center of zero

8. Load the balancing weight over the cell to be adjusted.

9. If you have to adjust the cell by one or two graduations, simply turn the trimmer clockwise to reduce the displayed reading to the desired reading. Make sure you are adjusting the appropriate trimmer. Typical load cell numbering conventions are shown below.

10. If you have to adjust the cell by more than one or two graduations, the system may undergo a zero shift during the adjustment. Adjust the cell (by turning the trimmer clockwise) to one graduation LOWER than the desired value. Remove the weights and check the zero. Re-zero the scale and repeat the process until the desired reading is obtained.

11. Test the final balance by loading each cell again and recording the M2000 readings. The cells must read within one graduation of each

other for an acceptable final balance. However, it is more desirable that there be no difference in the readings (zero balance error).

12. The system can now be spanned.

EXAMPLE: OB30L-F3 System

Balancing Weights: English = 5000 lb. Metric = 2000 KG

Graduations: English = 5 lb. Metric = 2 KG

First Loading

English Units (lbs.)			Cell	Metric Units (kg)		
M2000 Reading				M2000 Reading		
Start	Loaded	Unloaded		Start	Loaded	Unloaded
0	4995	0	1	0	1998	0
0	4990	0	2	0	1996	0
0	5005	0	3	0	2002	0

From the above results, it can be seen that cells 1 and 3 must be adjusted down to read 4990 lbs. (1996 kg in the metric example). First, the trimmer for cell 1 is turned clockwise to bring the reading down (step 6(c)).

Second Loading

English Units (lbs.)			Cell	Metric Units (kg)		
M2000 Reading				M2000 Reading		
Start	Loaded	Unloaded		Start	Loaded	Unloaded
0	4990	0	1	0	1996	0
			2			
			3			

Next, the trimmer for cell 3 is turned clockwise to bring its reading down. Because this cell is being adjusted by three graduations, the procedure in 6(d) should be followed, adjust cell 3 down to 4985 lbs. (1994 kg in the metric example) and check for a zero shift.

Third Loading

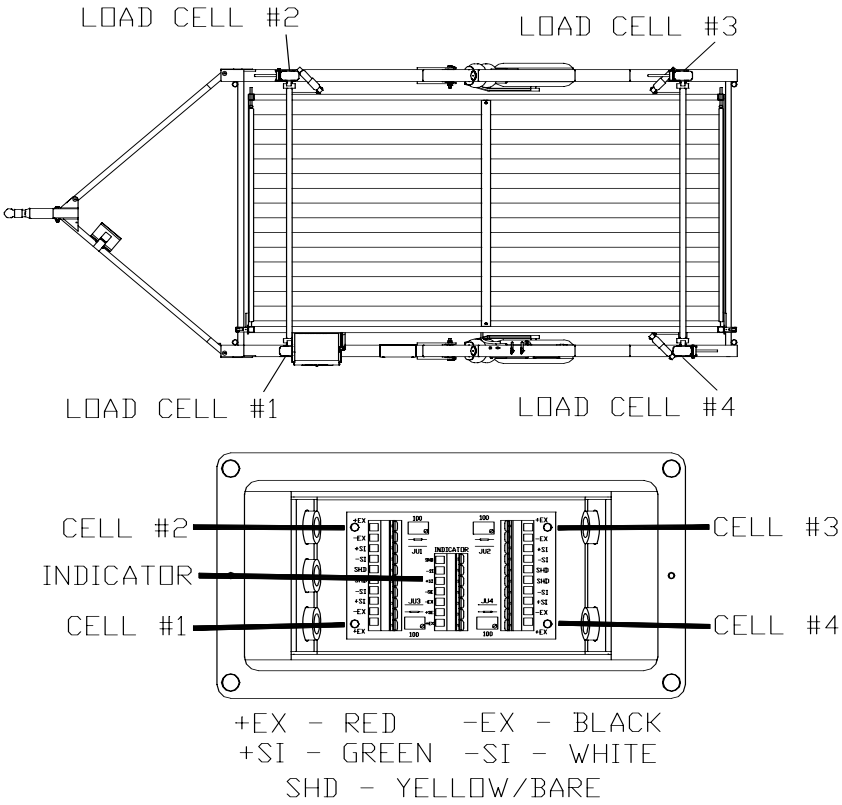
English Units (lbs.)			Cell	Metric Units (kg)		
M2000 Reading				M2000 Reading		
Start	Loaded	Unloaded		Start	Loaded	Unloaded
			1			
			2			
0	4985	-5	3	0	1994	-2

The unloaded reading is found to be –5 lb (-2 kg), indicating a zero shift. The scale must therefore be re-zeroed, and cell 3 checked again.

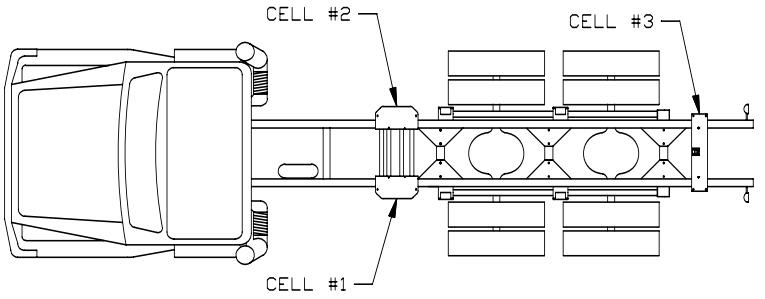
Fourth Loading

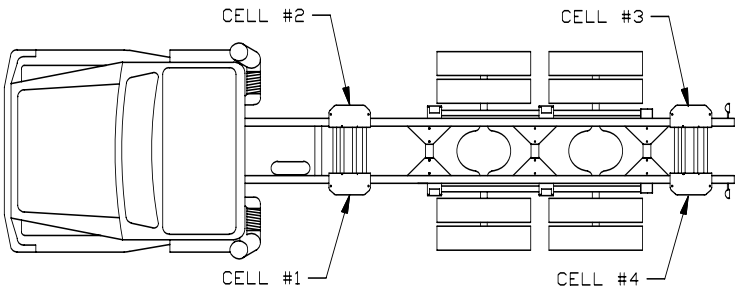
English Units (lbs.)			Cell	Metric Units (kg)		
M2000 Reading				M2000 Reading		
Start	Loaded	Unloaded		Start	Loaded	Unloaded
0	4990	0	1	0	1996	0
0	4990	0	2	0	1996	0
0	4990	0	3	0	1996	0

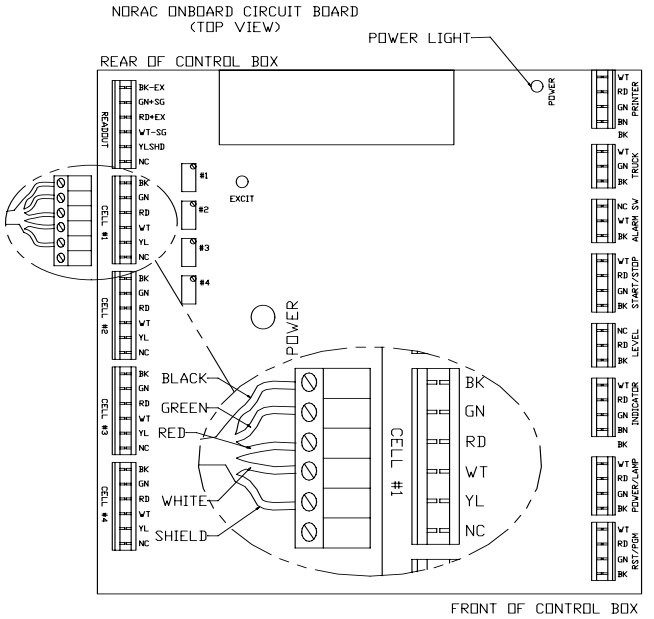
THE CELLS ARE NOW BALANCED WITHIN THE TOLERANCE OF ONE GRADUATION.



Standard Load Cell Numbering, Cell and Trimmer locations – Multiple Animal Scales







Standard Load Cell Numbering, Cell and Trimmer loactions – Onboard Scales

5.2.3 Deadloading the Scale (scale zero)

Before the indicator can be calibrated the deadload or scale zero value must be obtained. Remove all test weights from the scale. Key parameter 12 followed by the PRINT/SELECT key. The display will show 'r' for "reconfirm". Press 1 followed by the TARE key to confirm to continue with deadloading the scale. The indicator will pause for a short duration and then display the deadload value in AD counts to the display. The indicator will then return back to weight display mode. The indicator can now be calibrated with a known test weight.

5.2.4 Spanning the indicator

Place a known test weight on the scale. Enter 13 followed by the PRINT/SELECT key. The display will briefly flash "1". Shortly after the display will freeze with the last displayed weight. Enter the value of your test weight followed by the TARE key. The indicator will immediately calibrate and return back to weight display mode. If the display shows "EEEEEE" then you have exceeded the scale capacity value set in parameter 4 and 8. If the display shows "AAAAAA" then you have exceeded the input analog range of the indicator. The output voltage from the load cells exceeds the input for the AD converter.

Once the proper weight is displayed, exit calibration mode by pressing 99 followed by the PRINT/SELECT key.

5.3 Sealing the indicator

The M2000 is sealed electronically with a password. There is also provision for physical sealing on all products. The 42300 and 42300M have faceplate screws that accommodate a wire and lead seal.

5.3.1 Electronic Seal

Passwords are 4 digit numbers. The factory default for the password is 1111, which can be changed in calibration mode. To change or view the password in calibration mode use parameter 96. Enter a 4 digit password followed by the TARE key. Important note: if you forget your password you will not be able to enter calibration mode on the indicator. Contact the factory for assistance at 604-941-3474.

5.3.2 Audit Trail

The M2000 is equipped with a Category 1 Audit Trail system. It is **important** that the correct time and date be set, as this is saved as part of the

audit trail. The audit trail is permanent and cannot be disabled or erased by removing the internal battery inside the indicator. The Audit Trail has two counters, the Calibration counter and the Parameter counter. Changing parameters that affect the calibration of weight will increment the Calibration counter by 1. All other parameters will increment the Parameter counter. The counters will count from 000 to 999 before rolling over again. Changing one or more parameters will only increment the counter by 1 per calibration session. Only an actual change of value to the calibration parameter will register to the audit trail.

Important Note:

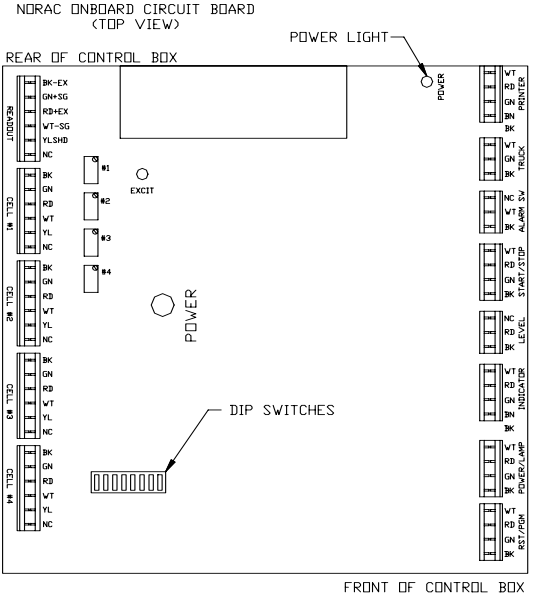
Because the audit trail becomes active at the factory, the counters may not show 0 even when the indicator is new out of the box.

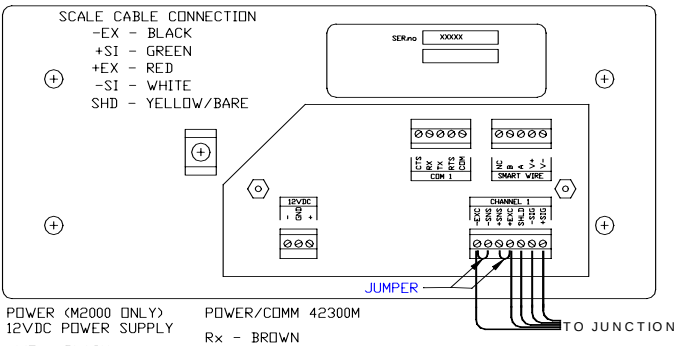
5.3.3 Accessing the Audit Trail

The audit trail can only be accessed from normal weighing mode and cannot be accessed while you are in calibration mode. Enter 1000 followed by the PRINT SELECT. The message “Audit” will briefly be displayed on the display. Shortly after the indicator will cycles through 3 times displaying the date of when the last change was made to the indicators calibration parameters, the calibration (CAL) counter and the configuration (CFG) counter. You may press the CLEAR key at any time to cancel this operation.

6 Weigh Center Circuit Board

The weigh center circuit board is located in the weigh center, behind the indicator faceplate.



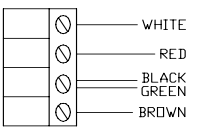


POWER (M2000 ONLY)
12VDC POWER SUPPLY

-VE - BLACK
GND - GREEN
+VE - RED

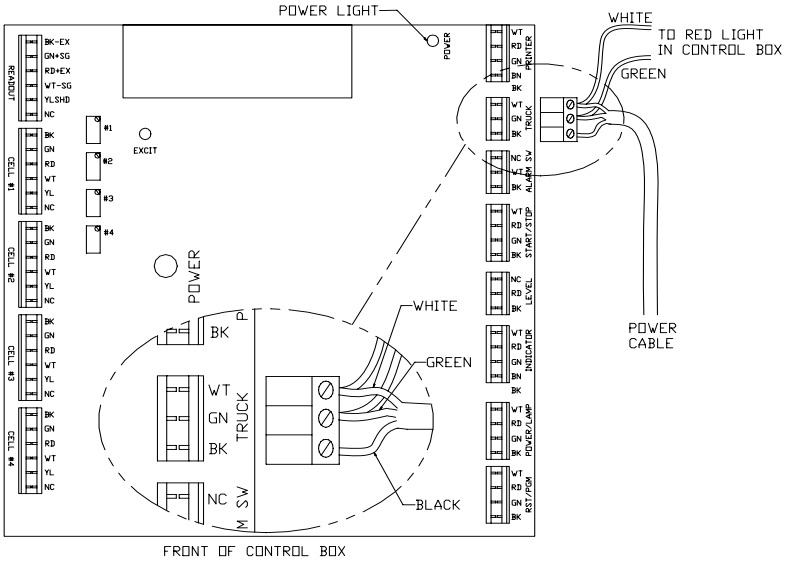
POWER/COMM 42300M

Rx - BROWN
Tx - WHITE
Com - GREEN
-VE 12VDC - BLACK
+VE 12VDC - RED

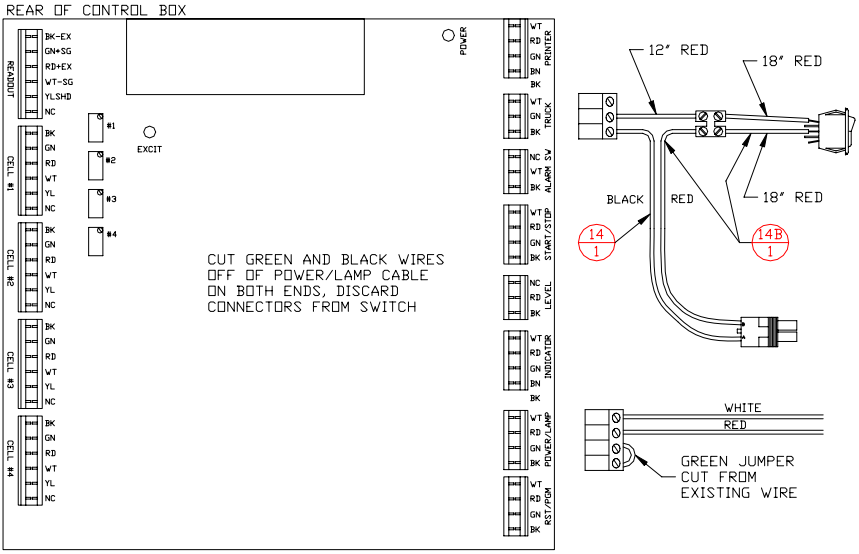


INDICATOR PCB CONNECTION

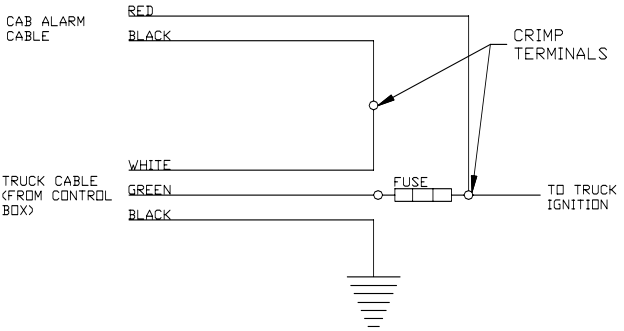
Indicator Wiring, 42300, 42300M



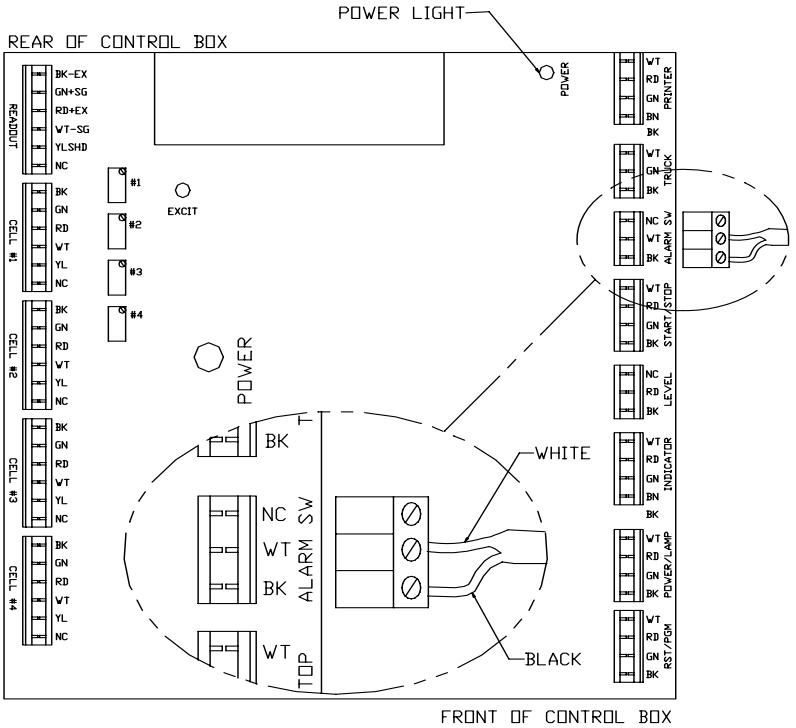
Power Connections OnBoard Application



Power Connections Multiple Animal Scale Applications



Cab Alarm Wiring (OnBoard Applications)



Scale Up Alarm (Magnetic Reed Switch) Wiring OnBoard Applications

6.1 Setting Time and Date

Inside the control panel, in the ceiling of the printer compartment you will find two toggle switches near the back (See **Error! Reference source not found.**). The right toggle switch is a two-position switch (Program switch) that puts the indicator PROGRAM TIME AND DATE or NORMAL modes. Pull the program switch ahead to put the system into indicator PROGRAM TIME AND DATE mode. Push the switch toward the back of the box to resume NORMAL operation.

1. Pull the program switch into the PROGRAM TIME AND DATE position as described above.
2. Place a piece of paper into the printer.
3. Enter the desired date into the indicator set point register in a DDMMYY (Day Month Year) format using the key sequence outlined below. For example June 16, 2002 would be entered as:
   [**2**][**0**] [**PRINT/SELECT**]
   [**1**][**6**][**0**][**6**][**0**][**2**] [**PRINT/SELECT**]
   Note: You have a limited amount of time to enter the actual date keystrokes (about 4 seconds). If the indicator goes back to *GROSS* mode before you get the entire date entered you must type [**2**][**0**][**PRINT/SELECT**] again then enter the date keystrokes.
4. Hold the [**START**] button until your keystrokes start to be displayed, about 5 seconds, then release. The indicator will automatically repeat your keystrokes and the printer will output the following message:

   Enter date please:
   date received, start to continue
5. Enter the desired time into the indicator set point register in HHMM (Hours Minutes) format using the key sequence outlined below. The time must be in a 24-hour format. For example 1:15 PM (13:15) would be enter as:
   [**2**][**0**] [**PRINT/SELECT**]
   [**1**][**3**][**1**][**5**] [**PRINT/SELECT**]
   Note: You have a limited amount of time to enter the actual time keystrokes (about 4 seconds). If the indicator goes back to *GROSS* mode before you get the entire date entered you must type [**2**][**0**][**PRINT/SELECT**] again then enter the date keystrokes.
6. Press the [**START**] button briefly once. The indicator will automatically repeat your keystrokes and the printer will output the following message:
   time received, start to continue
7. Press the [**START**] button briefly once again. The printer will output the following message:
   1606021315 rec'd
8. Push the program switch back into NORMAL position.
9. End of procedure.

Note: The toggle switch must be in the NORMAL position for the normal functions of the system to operate.

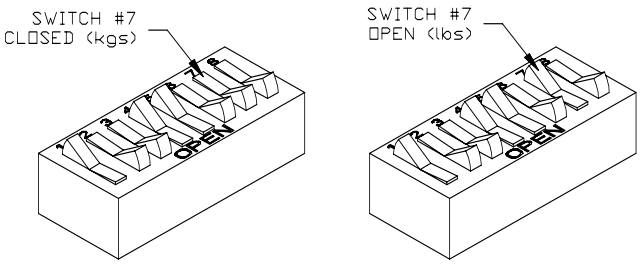
6.2 Setting Units

Note: To change units, the Weights and Measures seal will have to be broken. Contact NORAC prior to breaking the seal or have a qualified scale dealer break the seal. Breaking the seal may violate the Weights and Measures approval of the scale.

NOTE: If you attempt to change the units through the indicator, the Weigh Center will automatically switch the units back to the DIP switch setting (see below).

1. Open the faceplate where the indicator is mounted. To open the faceplate, remove the two screws at the top of the panel and fold it forward (see **Error! Reference source not found.**).

2. Inside the control panel there is a circuit board with a small bank of switches (DIP switches). These DIP switches are located on the front corner of the circuit board. As shown in the diagram below, the side of the DIP switch that is down determines if the switch is in the open or closed position.



3. The units can be in kilograms (kgs) or pounds (lbs). To change this setting find switch #7 and set appropriately.

Closed = kgs Open = lbs

6.3 SETTING SYSTEM ID NUMBER

Supply 14 Volts potential to the circuit board through the Truck Cable. Power up the M2000.

Open DIP-switch 3 on the circuit board.

Key in 20 <SELECT> and enter in the last three digits of the indicator serial number, e.g. S/N S0750 key in 750, and press <SELECT>.

Close DIP-switch 3.

6.4 Standard DIP Switch Settings

The standard DIP switch settings on the main circuit board should be set as follows:

Mobile Multiple Animal

Switch #	Position	Description
1	Open	**DO NOT CHANGE**
2	Closed	DO NOT CHANGE
3	Closed	DO NOT CHANGE
4	Open	DO NOT CHANGE
5	Open	DO NOT CHANGE
6	Closed	DO NOT CHANGE
7	a) Closed b) Open	a) Kilograms (kgs) b) Pounds (lbs)
8	Closed	DO NOT CHANGE

OnBoard

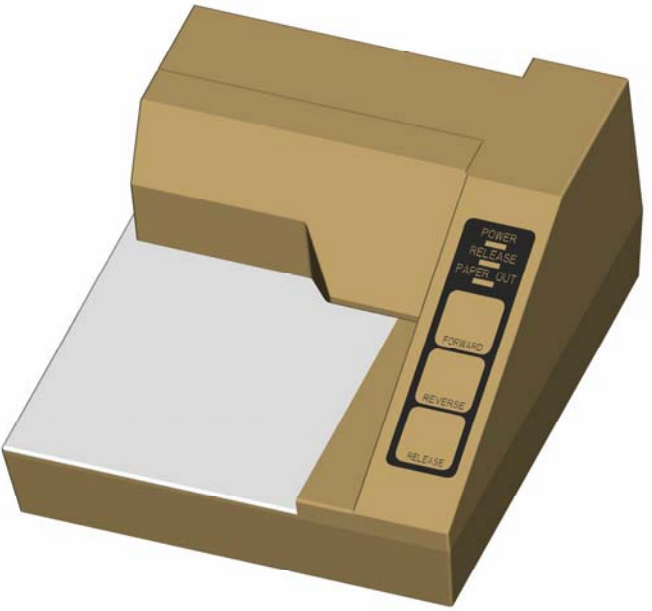
The standard DIPswitch settings on the main circuit board should be set as follows:

Switch #	Position	Description
1	Open	**DO NOT CHANGE**
2	Closed	DO NOT CHANGE
3	Closed	System ID number
4	Open	DO NOT CHANGE
5	Open	DO NOT CHANGE
6	Closed	DO NOT CHANGE
7	c) Closed d) Open	c) Kilograms (KGS) d) Pounds (LBS)
8	Closed	DO NOT CHANGE

7 Printers

7.1 Ticket Printer

Epson TM290, TM295



Printer DIP Switch Settings:

For Onboard and Mobile Multiple Animal Applications:

DIP Switch Settings

1	2	3	4	5	6	7	8	9	10
ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF

THE DIP SWITCHES 6 & 8 ON THE NORAC WEIGH CENTER CIRCUIT BOARD MUST BE CLOSED.

7.2 Roll Printer

Epson TM-U200D

Bank #1

1	2	3	4	5	6	7	8
OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON

Bank #2

1	2	3	4	5	6	7	8
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

The DIP switches 6 & 8 on the Norac Weigh Center circuit board must be OPEN.

8 M2000 Indicator Parameter List

The following gives a partial list of the M2000 parameters. The list explains the use of the most commonly needed parameters on the indicator. However, the M2000 features over 80 parameters. For a complete list contact Norac.

8.1 CAL INITIALIZATION Parameters

1 Reload Factory Default Values

This function will reinitialize the indicators scale calibration parameters for the specific channel to the default factory values. When you have selected his function you must confirm by pressing [1] followed by the [TARE] key. This will only initialize a single channel. The indicator will automatically exit calibration and reboot to initializing the calibration data to factory default. Any other values will display error 7. The indicator will reboot after performing a factory reset. Use parameter 260 below to reinitialize completely to factory defaults.

260 Complete factory initialize

Similar to parameter 1 above. This parameter completely initializes all indicator settings to factory defaults on all 3 channels. This includes COM port settings and all other system related settings. Ticket data and tares stored in memory are not initialized.

98 Enables scale channel (0)

This parameter enables scale channels 2 or 3. Channel 1 is always enabled and cannot be disabled. By default channels 2 and 3 are turned off. To enable a channel enter 1followed by the [TARE] key. To disable a channel enter 0 followed by the [TARE] key.

99 Exit calibration mode

This parameter will exit calibration mode and restart the indicator. All calibration changes are stored to flash memory and the audit trail is updated.

8.2 SCALE SETUP Parameters

2 Decimal Point Position (0)

Sets the decimal position for the display. Values 0 to 4 can be entered followed by the [TARE] key. An invalid entry will display error 3.

3 Graduation size (1d)

Selects the grad size to be used on the scale. Values that can be enter are 1, 2 , 5, 10, 20, 50 and 100 followed by the [TARE] key. An invalid graduation size will display error 2.

4 Scale Capacity (10000d)

This should be set to the scale capacity for the scale. For example if your scale capacity is1000 lbs then you would enter would be 1000 followed by the [TARE] key. The zero range window is calculated from this parameter

8 Scale Over (1d)
Enter the number of divisions for scale over. For example if your scale capacity is 1000lbs (parameter 4) and you want the scale to indicate scale over at Scale Capacity + 9dthen the value you would enter would be 9 followed by the [TARE] key.

20 Scale Over Message
Scale over is displayed as "EEEEEE" on the M2000 display and in the strings. If you require maintaining compatibility of older Western Scale equipment then set this parameter to 1. Scale over will now be displayed with the traditional all eights "888888".

98 Enables scale channel (0)
This parameter enables scale channels 2 or 3. Channel 1 is always enabled and can not be disabled. By default channels 2 and 3 are turned off. To enable a channel enter 0 followed by the [TARE] key. To disable a channel enter 0 followed by the [TARE] key.

99 Exit calibration mode
This parameter will exit calibration mode and restart the indicator. All calibration changes are stored to flash memory and the audit trail is updated.

8.3 Scale *MOTION Parameters*

5 Motion Window (2d)
Enter the value to determine the motion sensitivity. A typical value is 2 times the graduation size. This is set automatically when the grad size changes (Parameter 3).

24 Motion Settle Time (8)
Displays the number of ¼ second intervals for which Motion will remain asserted after the scale reading has stabilized within the motion tolerance. Enter a value 1-255 followed by the [TARE] key. An invalid motion value will display error 50.

8.4 Scale ZERO Parameters

9 Power ON Zero Scale Message (0)
With this parameter set to 1 the indicator will power up displaying "Zero" on the display. The operator must Zero the scale before continuing. This must be set for certain legal for trade requirements. If the parameter is set to 0 the indicator powers up displaying weight. An invalid parameter entry will display error 28.

21 Push to Zero Window or Zero Range (2)
This command displays the percentage of scale capacity that can be zeroed by the zero key. The allowable range is between 0 and 99%. Enter the range followed by the [TARE] key. An invalid value will display error 5.

22 Auto Zero Tracking ON/OFF (1)

This command displays the Auto Zero flag value. The value of 1=ON and 0=OFF. To turn auto zero tracking off enter 0 followed by the [TARE] key. An invalid entry will display error 4.

23 Auto Zero Tracking Window (AZSM) (60)

This command displays the percentage of a graduation that can be tracked off during zero tracking. Enter the value followed by the [TARE] key. This value can be the following:

1-99: to track 1 to 99% of d.
100: to track off 1d.
200: to track off 2d.
300: to track off 3d.

To turn off zero tracking use parameter 22 above. Any other value entered will display error 6.

45 Power up zero IZSM (0)

When this parameter is set to 1 the indicator will zero the scale automatically on power up. The maximum range the scale will zero on power is set to +-10% of full scale capacity. If the initial load on the scale exceeds 10% of scale capacity then no initial scale zero will take place. Enter 1 to enable or 0 to disable.

8.5 Parameters related to SCALE CALIBRATION

7 Scale Units

Toggles between pounds and kilos. Make sure that you have selected the units you are calibrating with. If your test weights are in pounds or kilos then make sure that the scale units illuminator is displaying the correct units.

11 Indicator Load Cell voltage range (39mV)

This parameter adjusts the input range for the scale-input channel. It is important that the correct range be selected for optimal performance of the indicator. Use values 1 to 3 to select the following input ranges:

1 for 0 to +-9mV input range
2 for 0 to +-19mV input range
3 for 0 to +-39mV input range
4 for 0 to +-79mV input range.

If the loadcell input voltage exceeds the input range of the indicator the display will display 'AAAAAA' which means "Analog over-range". Select the next highest input range to rectify the problem. Only values 1 to 4 can be entered and any other value will display error 57. It in important to understand that selecting a lower input range, for example 9mV range does not necessarily guarantee better performance. The 9 mV range has more amplification that lets say the 19 mV or 39mV range. You will get more AD counts for sure, but you are also amplifying noise. This depends on the scale installation. It most cases the default 39mV or 19mV range will be adequate.

12 Deadload Scale

Before spanning the indicator for the first time the indicator must be deadloaded. Ensure that the scale has all test weights removed from the scale

and the scale is stable before performing a deadload. To perform the deadload function press 1 followed by the [TARE] key. The indicator will perform the deadload function. After the deadload has completed the indicator will briefly display the deadload value in AD raw counts before returning to weight display mode.

13 Set Span

This command is used to span the indicator with a known test weight. Place the test weights on the scale. When the set span function has been activated the current displayed weight will be frozen on the display. Using the numeric keypad enter the known test weight followed by [TARE]. The display should now show the new weight on the scale. You can cancel a span any time by pressing the [CLEAR] button before [TARE] is pressed.

99 Exit calibration mode

This parameter will exit calibration mode and restart the indicator. All calibration
changes are stored to flash memory and the audit trail is updated.

8.6 INDICATOR POWER UP Parameters

6 Power On Units (0)

Determines what units the indicator defaults to when the indicator is turned on. Entering 1 followed by the [tare] key selects Kilograms. Entering 0 selects Pounds. An invalid entry will display Error 13.

9 Power ON Zero Scale Message (0)

With this parameter set to 1 the indicator will power up displaying “Zero” on the display. The operator must Zero the scale before continuing. This must be set for certain legal for trade requirements. If the parameter is set to 0 the indicator powers up displaying weight. An invalid parameter entry will display error 28.

10 Power Switch Bypass (1)

This parameter controls the keypad ON/OFF switch for the indicator. Entering 1 for this parameter disables the ON/OFF switch and the indicator can never be turned off from the keypad. Also when the indicator power is plugged into the wall the indicator will turn on without pressing the ON button. This should be used in applications such as control systems where the indicator must power up running after a power outage. An invalid entry will display error 56.

46 Power up channel select (1)

This parameter will determine what channel to be the default channel at boot up. This parameter will only be implemented if the calibration values meet the criteria.

- 1 channel 1 as default at startup
- 2 channel 2 as default at startup (if enabled)
- 3 channel 3 as default at startup (if enabled)
- 4 Total mode (if criteria met)
- 5 Scan mode

70 Enable Total Mode (0)
Using 4 PRINT/SELECT puts the indicator in total mode and sums channels into a single total. Total mode is disabled by default. Total mode is not legal for trade in Canada and can only be used in non-legal for trade applications. 0 Total mode disabled 1 Total mode enabled

8.7 Scale TARE Parameters

25 Offset Value (0)
Allows the entry of tare offset value. At scale zero, the center of zero light will illuminate , but the weight will be at the tare offset value. Enter the offset weight followed by the tare key.
26 Offset flag (0)
This command controls the operating mode of the tare offset. Enter the parameter followed by the [TARE] key. The following values accepted are: 0=Offset Disabled 1='Legal for trade mode' – Indicator cannot be put in 'NET' mode if no value has been set for tare. If tare has been entered the offset value is included in the NET display.80=Not "Legal for Trade mode - Allows gross/net switching at zero value. If NET is selected , the offset value is subtracted from the displayed gross weight.
50 Tare function mode (1)
This parameter controls how the tare function works on the indicator. The options available are: 0: disable keyboard and scale tare No tare can be entered using the keypad or taring off the scale using push button tare. 1: enable both keyboard and scale tare Both keyboard tare entry and pushbutton tare can be used. 2: enable pushbutton tare only Taring is only allowed from the scale. 3: enable keyboard tare Tare entry can only be done from the keyboard **71 Force Zero for keyboard tare (0)** This parameter checks if the scale is at zero before allowing an operator to enter a keyboard tare. If the scale is not at zero when a keyboard tare is entered then error 35 is displayed. Enter 1 to enable, 0 to disable.

8.8 SYSTEM SETTINGS Parameters

28 Sound volume (2)
This command controls the volume of the internal buzzer. The following values can be entered followed by the [TARE] key:
0: sound off
1: volume low
2: volume medium
3: volume high
Error Message 51 will be displayed for an invalid entry.
29 Keypress Feedback
This function will blink the display every time a key is pressed. This gives a sense of feedback to the end user when a key is pressed. This is especially handy in noisy environments where the operator may not be able to here the

key beeps from the indicator. Parameters are 0 (off) or 1 (on) followed by the [TARE] key. Error 32 will be displayed for an invalid entry.

80 Set Time

Time is set out side of calibration mode in normal weighing mode (you must exit cal mode). This parameter allows you to set the battery backed real time clock on the indicator. Pressing 80 followed by the [PRINT/SELECT] key will display the current time on the display. To change the time, enter your new time as HHMMSS followed by the [TARE] key. Example: to change the time to 9 hours 33 minutes and 30 seconds enter 093330 followed by the [TARE] key.

81 Set Date

Date is set out side of calibration mode in normal weighing mode. This parameter allows you to change the battery-backed date on the indicator. Pressing 81 followed by the [PRINT/SELECT] key will display the current date on the display. To change the time, enter your new time as YYMMDD followed by the [TARE] key. Example: to change the date to December 14 year 2001 enter 011214 followed by the [TARE] key.

8.9 SERIAL COMMUNICATIONS Parameters

30 baud rate for COM 1 (6)

Changes the baud rate for COM1. Valid parameters are 0-9. An invalid entry will display error 52.

32 baud rate for COM 2 (6)

Changes the baud rate for COM1. Valid parameters are 0-9. An invalid entry will display error 52.

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

9600 baud is the default baud rate for both ports. *Note: only a single COM port can be used for printing.*

31 Parity for COM 1 (0)

Changes the parity setting for COM1. Valid parameters are 0-2. An invalid entry will display error 53.

0: No parity
1: ODD parity
2: Even parity.

33 Parity for COM 2 (0)

34 Stringmode for COM1 (99)

The M2000 supports several string output modes through either COM1 or COM2. Select the string mode from the table below. Use 99 if you are using the COM port for ticket printing.

1 DF1000
3 DF2000
5 DF2500 mode1
8 DF1500
9 DF2500 mode 6
10 DF2500 mode 7
12 AD4321, AD4323, AD5000
13 Cardinal 708
14 Cardinal 738
19 Toledo & Fairbanks R2500
16 Weightronix 120
17 Consolodated Controls
18 Analogic 5316
99 Set to ticket printer mode

35 Stringmode for COM2 (8)

36 Flow Control for COM1 (0)

Select 0 for none and 1 for Hardware

37 Flow Control for COM2 (0)

38 String output polled mode for COM1 (5)

39 String output polled mode for COM2 (5)

0 selected output string will be continuously transmitted on COM1

1 selected output string will be transmitted on COM1 when the PRINT/SELECT key is pressed

2 output when the receive data input is at logic low (-9 volts dc). A string will be transmitted after each sample whenever the receiver data line is held low – send on break. output when the receive data input is at logic high(+9 volts dc). A string will be transmitted after each sample whenever the receiver data line is held high – send on idle

4 output string to COM1 on '?' character received

5 output string to COM1 continuously

47 Serial String Output Routing FOR COM1 (0)

48 Serial String Output Routing FOR COM2 (0)

Parameter 47 and 48 will determine which channel's weight will be routed the COM serial port. This parameter will only be implemented if the calibration values meet the criteria.

- 0 COM1 serial output string weight a function of current active channel
- 1 COM1 serial output string locked on channel 1
- 2 COM1 serial output string locked on channel 2
- 3 COM1 serial output string locked on channel 3
- 4 COM1 serial output string locked on Total mode

8.10 Scale Filtering Parameters

19 Display Update Rate (0)

This parameter will set the LED display update rate. The update rate has nothing to do with the actual AD converter update rate or filtering. The parameter may have a value between 0-9. A value of 0 will introduce no delay in the display update, while a maximum value of 9 will introduce a display update rate of a 3-second delay. The update rate at a value of 0 is very fast and the display may appear jittery in some applications. In this case increase the value of this parameter.

41 Digital Averaging Filter (64)

Changing this parameter changes the mount of averaging performed on the final weight. This function is used to help filter the scale from vibrations and display a stable weight. The default setting should be adequate for most installations however if heavier filtering is required then increase the filter value. Changing the filter does alter the settling time for the final weight response. Values that can be entered are 1-255 followed by the [TARE] key. The higher the number the heavier the filtering. Error 14 is displayed for an invalid entry.

42 Filter Faststep threshold (8)

The filter averaging system has a filter bypass mode called faststep. Faststep dramatically improves the display response time for a step change in weight. When the faststep mode is active the digital averaging filter is bypassed (parameter 41) displaying an instant change in weight. The threshold or the amount of instant weight change that has to occur before the indicator is to go into faststep mode is defined by this parameter. This parameter normally does not have to be changed. Let us look at an example, we have a 500lb-floor scale. The faststep value is 8. If a 200 pound man jumps on the scale, the scale will go into faststep mode, bypassing the averaging filter and displaying a quick jump to 200lbs. When the final weight is settling filter averaging is returned back to normal weight averaging. If you place a 5 pound weight on the scale the faststep will not kick in and the weight change will be a little slower. How slow the weight changes to the 5lb load is a function of parameter 41.

43 Fastep Sensitivity (8)

This parameter normally does not need to be changed, and may be removed in future releases of the software. This parameter controls how sensitive faststep is to be (see parameter 42). The value entered here indicates how many AD samples the weight has to change in a row before the faststep filter kicks in. For example a 200 pound man jumps on a 500 pound scale. The “Faststep parameter” 42 has been set to 20 and the “Fastep Sensitivity” parameter 43 has been set to 5. Only when a weight change of more than 20lbs and has occurred 5 samples in a row then the filter averaging will go into fastep
mode. Increasing this parameter makes the Fastep filter threshold less sensitive. **44 Disable Faststep (0)**

This parameter disables the faststep system altogether. The values for parameter 42 and 43 are ignored and the system runs in weight averaging mode only. The response time for the indicator is a function of parameter 41. Some control batching applications may require that faststep be turned off.

8.11 PRINTING Parameters

84 Add new ticket

This parameter appends a new ticket to the end of the ticket buffer. You can have several different formatted tickets defined, which can be recalled when needed. A new ticket number is displayed briefly and then the display will switch over to tick editor mode. If the user does not want to add a new ticket but start a new ticket from scratch then the ticket buffer can be cleared using parameter 88.

85 Edit existing ticket

You can edit an existing ticket by entering the ticket number followed by the [TARE] key. This will put the display in ticket editing mode with the ticket loaded. You can now modify the ticket.

86 Number of tickets saved in the ticket buffer

This Parameter displays how many tickets that have been saved in the ticker buffer. Several different ticket formats can be defined and recalled depending on the weighing operation.

87 Show available space in Custom ticket buffer

This parameter displays how much room you have left for storing ticket formats. In most cases you never will run out of room as the ticket buffer can hold 4000 characters used for formatting 1 or more tickets.

88 Clear Custom Ticket buffer

This parameter will erase all custom ticket formats in memory. Press 1 followed by the [TARE] key to confirm to clear the print buffer. All ticket formatting will be lost.

89 Print specific ticket

Enter the ticket number you want to print followed by the [TARE] key. The ticket will be printed with the current displayed weight.

100 Delete Truck IN/OUT Database

This command clears the SRAM based truck in out database. The truck in/out database is SRAM battery backed up and would only be destroyed if the battery were removed or low while power is removed from the indicator. After entering the parameter the command should be completed by pressing key one followed by PRINT/SELECT followed by TARE.

101 Delete Truck IN/OUT Database

This command clears the FLASH memory based truck in/out database. The truck in/out database is stored in non-volatile FLASH memory and this is the only way to clear the database. After entering the parameter the command should be completed by pressing key one followed by PRINT/SELECT followed by TARE. There are a total of 6 set points available on the M2000A. Each set point can be allocated to any of the 3 channels. This parameter will be

used to enter the weight at which the set point will do its evaluation. This value is channel dependent as far as the lb/kg units are concerned.

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 to 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 passed 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 Scale must be at zero before entering a keyboard tare (see parameter 71)
36 Scale not ready to print
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 Parameter 1 to enable password, 0 to disable
46 Only a value of 0, 1 or 80 is accepted as a parameter
47 *
48 Invalid Filter value
49 Invalid Filter Fast step value
50 Invalid Fast step Sensitivity
51 Invalid Fast step on/off
52 Invalid Tare Function Parameter 0-4
53 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 exists
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 SmartWire is enabled and is trying to find devices. This error will occur as a result of not having devices connected to the Smart Wire port or a bad wire connection. Hit clear to bypass this error message. To disable smart wire use parameter 59 in weight mode. Enter 0 to disable smart wire and 1 to enable it again.
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

Error message "Cannot Print"

Note: If you try and print and there is motion, or the scale is overweight then a

message will scroll across the display "Cannot Print". It is important to understand

9 Statement Of Limited Warranty

NORAC SYSTEMS INTERNATIONAL INC., also known as NORAC, warrants all equipment of its manufacture to be free of defects in material and workmanship for a period of one year. This warranty period is for a period of twelve months from the date the equipment is delivered by NORAC or its authorized dealer to the purchaser. Items include weighing systems, instrumentation, and control systems or genuine replacement parts manufactured by NORAC. Auxiliary components not manufactured by NORAC such as tires, axles, pumps, or NORAC rebuilt parts are covered by a 90-day warranty.

NORAC will repair free of charge items returned within the warranty period to one of NORAC's authorized service centers. In countries where NORAC maintains authorized service centers, freight will be paid one way and returned by the same carrier unless instructed differently. The purchaser is responsible that the item is properly packaged for shipment. Shipping damage is not covered under this warranty.

NORAC or its authorized Service Center will repair or replace, at its option, any defective part or component at no cost to the purchaser during the Warranty period. If service in the field is required NORAC will authorize on-site repairs at no charge for parts and labor. Travel time, travel costs and per diem expenses to and from the place where repairs are made, will not be covered by this warranty.

For the nearest Service Center visit our website at www.norac.ca or call 306-664-6711 or e-mail service@norac.ca.

Any evidence of, negligent or abnormal use, alteration of serial numbers, or repairs attempted by other than NORAC authorized personnel or not using NORAC certified or recommended parts, automatically voids the warranty. Normal wear is not covered under this warranty.

NORAC will not warranty any complaints relating to inadequate installation (unless the installation was performed by NORAC), adjustments or calibration.

The forgoing states the entire liability of NORAC regarding the purchase and use of its equipment. The purchaser agrees that NORAC accepts no liability for any consequential loss or damage of any kind. The purchaser further agrees that the warranties contained herein are in lieu of all other warranties, expressed or implied, and, specifically NORAC disclaims any implied warranty regarding merchantability or fitness for a particular purpose. This paragraph is of no force or effect in those jurisdictions, where the limitations of the type noted herein are prohibited by law.

To ensure warranty coverage the customer must register within 30 days of their purchase by either sending in a registration form included with the equipment or on line at www.norac.ca.