WESTERN SCALE CO. LIMITED

OPERATION MANUAL

MODEL DF1500

DIGITAL WEIGHT

INDICATOR

Revision C

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PREFACE

GENERAL DESCRIPTION

The DF1500 Weight Indicator is an economical single channel indicator for bench, floor, hopper and vehicle weighing. This is a legal-for-trade 10,000 graduation indicator; it is capable of 20,000 graduations for special applications. There are 100,000 internal counts. The sample rate is fixed at 6 measurements per second and is independent of live/deadload settings.

A set of test weights is used to calibrate the scale. Scale linearity errors may be corrected using three separate span points.

Up to 12 load cells of 350 ohms each may be connected to the 10VDC sensed excitation.

Set-up, which is accessed by an internal pushbutton switch, is done through the 4-button front panel keypad.

Nonvolatile memory is used to store the following:

- set-up
- calibration
- default set points
- print formats.

EQUIPMENT REQUIRED

Table 1-2 lists the required equipment.

SECTION 1 - GETTING STARTED

DF1500 SPECIFICATIONS	
CHARACTERISTIC	SPECIFICATION
LED Display Colour Brightness Digit Height	 Red (660nm peak wavelength) 10mcd/segment typical 1.5cm (0.6")
4-Button Keypad	Chemical resistant
Capacity	lb, kg unrestricted
Graduations Displayed Internal	 10,000 by 1, 2 or 5 100,000
Load Cell Type Excitation Maximum number	 2-3mV/V typical 10VDC Sensed 12 x 350 ohm
Temperature Operating Storage	 -10C to +40C (14°F to 104°F) -65C to +150C (-85°F to 302°F)
Relative Humidity	0 to 90% non-condensing
Power Requirement	12VDC 1A
Dimensions Width Height Length	 9.5cm (3.75") 9.5cm (3.75") 6.4cm (2.50")
Power Supply	0.125A @ 120VAC 50-60Hz
Serial Port Interface Speed Format	 RS-232C or RS-422 75-9600 Baud no parity, 8 bits, 1 stop bit
Setpoint Output	6 x 120VAC 3A or 240VAC 3A SSRs
Remote Input	6 x 12-24VDC isolated
Analog Output	4-20mA or 0-10V

TABLE 1-1

EQUIPMENT REQUIREMENT	
External	12VDC power source Scale with 350 or 700 load cell(s)
Optional	Power supply - DF2PS RS-232C interface (±10VDC) RS-422 interface (5VDC differential) Remote input (12-24VDC) Isolated 4-20mA (0-5VDC or 0-10VDC) output Setpoint output module rack (120VAC or 240VAC) Line printer - ML320 Ticket printer - TK4000, TM295 Tape printer - TM-U200B Thermal label printer
Test	Certified weights Digital multimeter Load cell simulator RS-232C terminal RS-232C/RS-422 converter

TABLE 1-2

1.1 LOCATION

The DF1500 Weight Indicator should not be exposed to direct sunlight, excessive mechanical abuse, vibration or moisture. A suitable enclosure should be used in wash down environments.

1.2 POWER SUPPLY

The DF1500 Weight Indicator requires a 12-16 VDC @ 1A power supply. Although this indicator has built-in voltage regulation, the supply voltage must be stable. See figure 1-1 for connection.

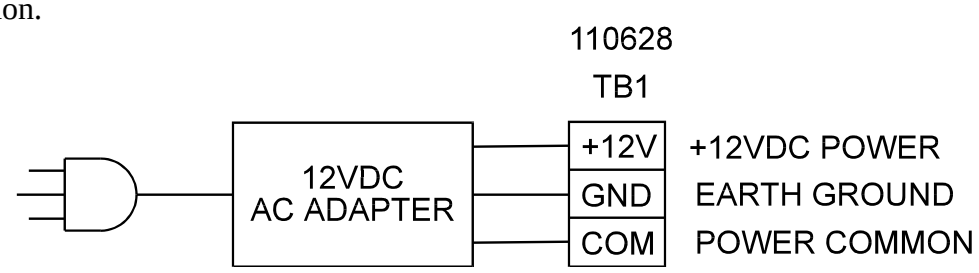


FIGURE 1-1 POWER SUPPLY CONNECTION

1.3 LOAD CELL

Connect load cell(s) to TB2 on the DF1500 Digital Indicator board; see Figure 1-2. Refer to Table 1-3 for load cell wiring by manufacturer.

CAUTION: To prevent shorting, any exposed length of shield wiring should be insulated with heat shrink tubing or tape.

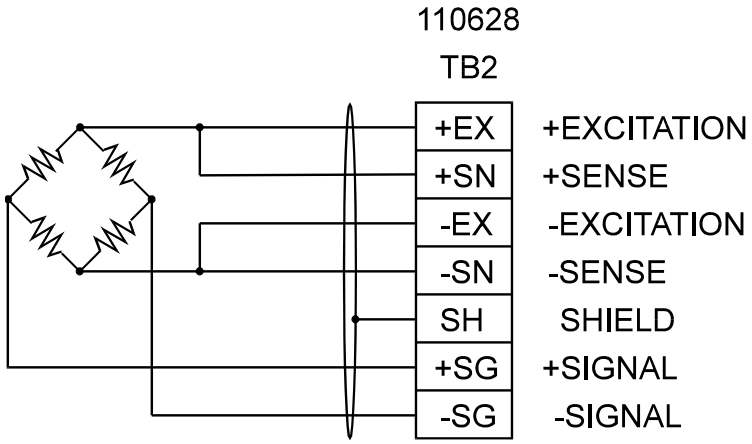


FIGURE 1-2 LOAD CELL TERMINATION

LOAD CELL WIRING GUIDE					
	EXCITATION (+)	EXCITATION (-)	OUTPUT (+)	OUTPUT (-)	SHIELD
Massload	Red	Black	Green	White	Bare
Revere	Green	Black	White	Red	Orange
BLH	Green	Black	White	Red	Yellow
HBM	Green	Black	White	Red	Bare
Tedea	Green	Black	Red	White	Bare
Transducers	Red	Black	Green	White	Orange
Interface	Red	Black	Green	White	Bare
Genisco	Red	Black	Green	White	Bare
LeBow	Red	Black	Green	White	Bare
Ametek	Red	Black	Green	White	Bare
Sensortronics	Red	Black	Green	White	Bare
Celesco	Red	Black	Green	White	Bare
Strainsert	Red	Black	Green	White	Bare
Pesage Promotion	Blue	White	Red	Black	Yellow

TABLE 1-3

1.4 ANNUNCIATORS

On power up, the DF1500 displays any Program or Setup Error messages followed by the display self test. The Reset and Clear messages correspond to total and tare register zeroing respectively. The DF1500 indicates the current display mode and conditions using annunciators shown in Table 1-4.

ANNUNCIATOR LIST	
INDICATOR	FUNCTION
MOTION	Unstable weight
OVER	Over capacity
ZERO	Centre zero
NET	Net Weight
T/t	TONS/tonne
lb	pounds
kg	kilograms

TABLE 1-4

1.5 INDICATOR SOFTWARE LAYOUT

The DF1500 software has various modes and display formats, depending on the current function of the indicator. Figure 1-3 graphically represents the internal layout and keypad relationship between the various modes and display formats:

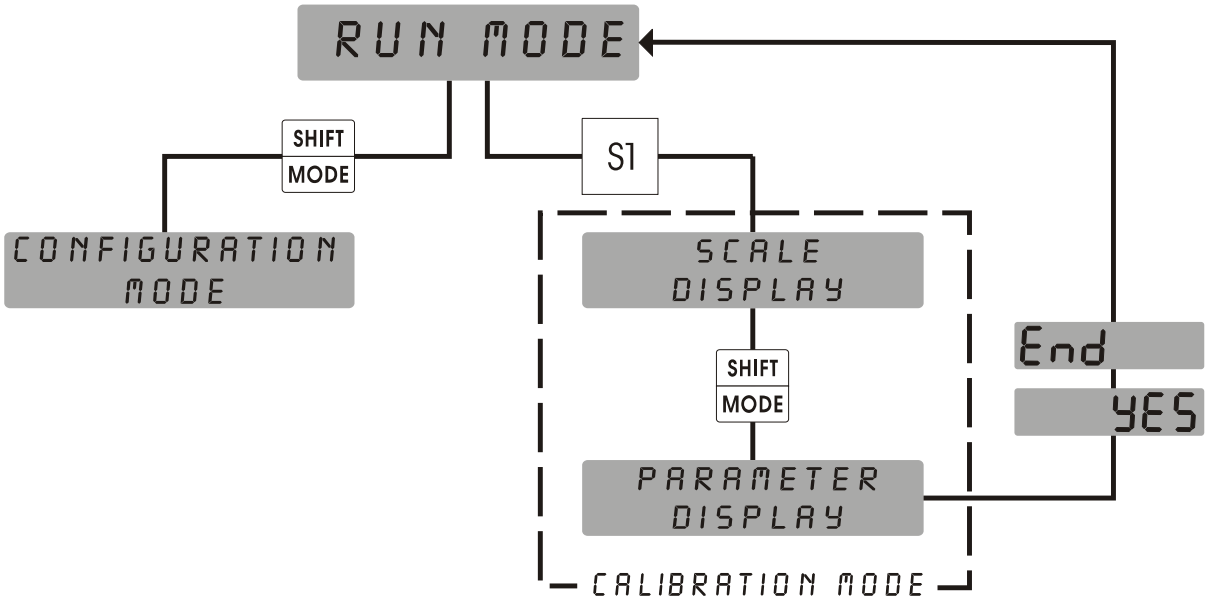


FIGURE 1-3

1.6 RUN MODE/SCALE DISPLAY KEYPAD LAYOUT

The DF1500 functions are selected using a four button keypad. The keypad operates in one of two ways; Run Mode/Scale Display and Parameter Display. The functions of the keypad are unique for each. For keypad operation in the Parameter Display, See Section 3.3. Using Figure 1-4 as a guide, the function of each key in the Run Mode/Scale Display is as follows:

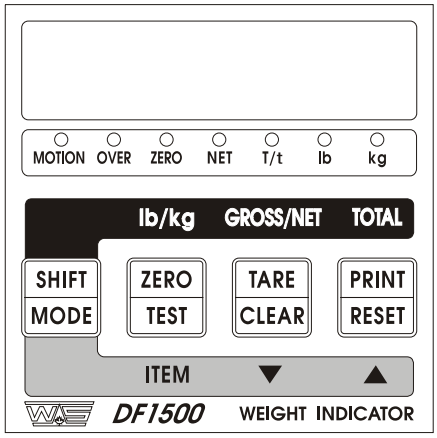


FIGURE 1-4

SHIFT / MODE — The SHIFT/MODE key is used to access the functions in the remaining three keys.

-To select a **Shift** function, press and release the SHIFT/MODE button.

-The display will flash. Then press the corresponding button. There is a 2 second time out.

-To enter Configuration Mode, press and hold the button SHIFT/MODE until ConF iG appears

-To exit this mode, press and hold SHIFT/MODE again until SCALE appears.

-See Section 1.7 for details on the Configuration Mode.

ZERO / TEST — Push ZERO/TEST to zero the scale with no weight applied.

-The weight must be stable and within the zero window. The 'ZERO' annunciator will turn on.
-To test the display, press and hold . All display segments and annunciator`s will light.
-This is followed by a diagnostic weight display.

TARE / CLEAR ——— Press to store the scale weight for Net weight display.

-The 'NET' annunciator will light.
-To clear the stored tare weight, press and hold TARE / CLEAR until CLEAr appears.

PRINT / RESET ——— In serial out continuous or polled modes:

-Press PRINT / RESET to add the displayed weight to the accumulator.

-The weight must be positive and not in motion.

PRINT / RESET ——— In serial out print mode:

Press PRINT / RESET to print format 1.

-To clear the Total accumulator, press PRINT / RESET and hold until rESEt appears.

lb/kg

Press SHIFT / MODE then ZERO / TEST to alternate between units.

-The corresponding 'units' annunciator will turn on.

GROSS/NET

Toggle between the Gross and Net weight displays, press SHIFT / MODE then TARE / CLEAR

TOTAL

Press SHIFT / MODE then PRINT / RESET :

- To display the accumulated weight, in serial out continuous and polled modes.
-To print format 2, in serial out print mode.

1.7 CONFIGURATION MODE

The configuration mode allows certain parameters to be adjusted while the indicator is in run mode. The values entered via the configuration mode will override the ones set in the calibration mode **but** will be lost when power is removed from the indicator. The following parameters can be adjusted in the configuration mode:

1) Tare Weight
2) Setpoint Values (Setpoints 1 thru 6)
3) Time and Date

Figure 1-5 lists the parameters by group and item.

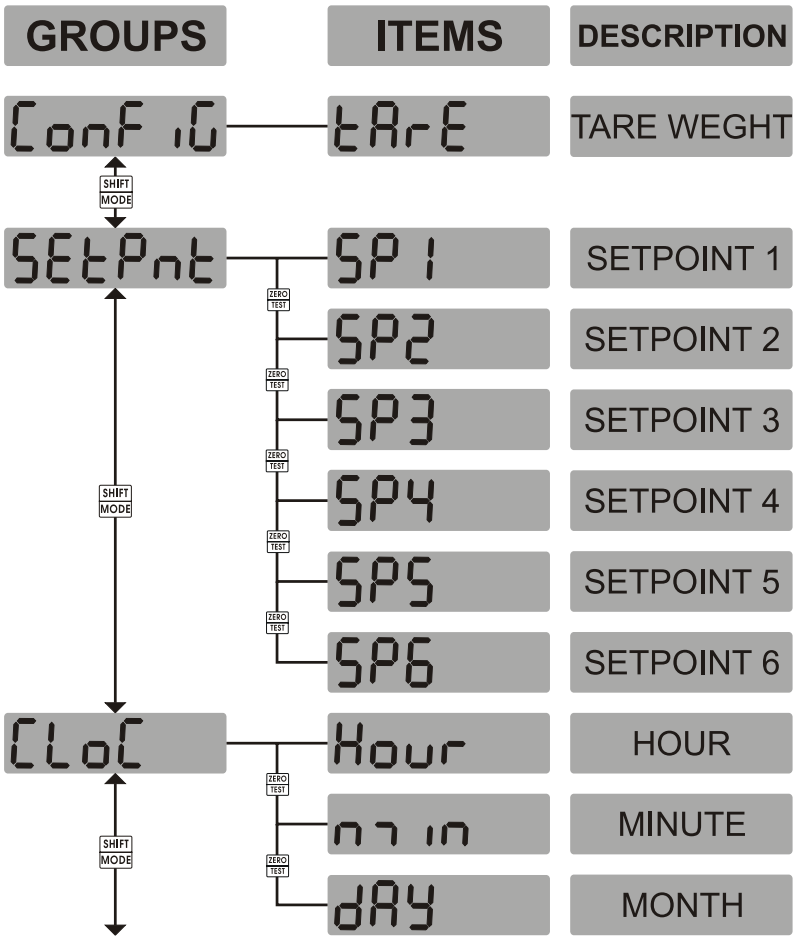


FIGURE 1-5

1.71 SETTING THE TARE WEIGHT

To set the tare weight, press and hold SHIFT/MODE until  appears.

1) The display will alternate between  and the value in memory.

2) Use TARE/CLEAR and PRINT/RESET to decrement and increment the tare weight respectively.

3) Return to the scale display by pressing and holding SHIFT/MODE until  appears.

1.72 ADJUSTING SETPOINTS

To set the tare weight, press and hold SHIFT/MODE until  appears.

1) Use SHIFT/MODE to move the display to the  group.

2) The display will alternate between  and the value in memory.

Note: The value of 'n' correspondes to the setpoint numbers 1 thru 6

3) Use TARE/CLEAR and PRINT/RESET to decrement and increment the setpoint value respectively.

4) Use ZERO/TEST to move to the next setpoint.

5) Repeat steps 3 and 4 to enter the remaining setpoints.

6) Return to the scale display by pressing and holding SHIFT/MODE until  appears.

1.73 SETTING TIME AND DATE

To set the time and date, press and hold SHIFT/MODE until  appears.

1) Use SHIFT/MODE to move the display to the  group.

2) The display will alternate between  and the value in memory.

1.73 SETTING TIME AND DATE (CONT)

3) Use TARE/CLEAR and PRINT/RESET to decrement and increment the hour respectively.

4) Use ZERO/TEST to move to the  display.

5) Use TARE/CLEAR and PRINT/RESET to decrement and increment the minutes respectively.

6) Use ZERO/TEST to move to the  display.

7) Use TARE/CLEAR and PRINT/RESET to decrement and increment the date respectively.

8) Return to the scale display by pressing and holding SHIFT/MODE until  appears.

1.74 Y2K INFORMATION

The DF1500 will continue to maintain time, but does not support leap years for dates. This means that for leap years on February 28th the calender roles over to March 1st when it should display the extra day February 29th. Leap years occur every four years. If you reset the date on the indicator after a leap year then you do not have to worry about the date until the next leap year 4 years down the road.

The year field will still remain 2 digits and will simply role over from 99 to 00. So on the 1st of January year 2000 your date stamp on a ticket will appear as (YYMMDD) 000101.

1.8 STARTING THE INDICATOR

The DF1500 will start automatically on application of power. The indicator will cycle through a series of self-tests and display the following:

DISPLAY TEST

RESET TOTAL WEIGHT ACCUMULATOR

AUTO-ZERO SELF CALIBRATION

CLEAR TARE REGISTER

After the indicator completes the self-test procedure, the display will indicate either:

Zero the indicator to begin weighing operations **or** continue to Section 3 to calibrate the indicator.

Indicator is underrange.

-Check scale for Loadcell and/or mechanical problems
-Check the wiring between the indicator and the scale.
-Continue to Section 3 to calibrate the indicator.

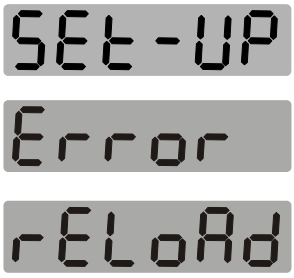
Indicator is overrange.

-Check scale for Loadcell and/or mechanical problems
-Check the wiring between the indicator and the scale.
-Continue to Section 3 to calibrate the indicator.

SECTION 2 - ERROR MESSAGES

2.1 POWER - UP ERROR MESSAGES

On application of power the DF1500 can display up to four types of error messages depending on the type of problem. They are:



SET-UP ERROR.
The indicator has reloaded factory parameters. This usually indicates that the CPU has been replaced and/or the indicator is being powered up for the first time. Continue to Section 3 to calibrate the unit. If the error message continues, the indicator requires service.

PROGRAM ERROR
The CPU ROM self test has failed. On power-up the indicator calculates a checksum of the program and compares it to a value stored in EEROM. These values must be identical for the test to pass. The indicator requires service.

EEROM ERROR
The CPU EEROM self test has failed. The EEROM portion of the CPU has failed. The indicator requires service.

LOW INPUT VOLTAGE WARNING
The input voltage to the indicator is too low. The minimum input voltage to the DF1500 is 11.8VDC. Increase the applied input voltage.

2.2 CALIBRATION ERROR MESSAGES

During calibration, the DF1500 internally limits the range of any given parameter based on the values of other parameters. Users are not prompted with the usual range of error messages they are accustomed to because of this self limiting adjustment feature.

The three error messages that can occur during calibration are listed below:

DEADLOAD VALUE TOO LARGE
Cannot do the deadload calculation. The input signal is greater than the Liveload. Increase the liveload value.

DEADLOAD VALUE IS TOO SMALL
Cannot do the deadload calculation. The input signal is too far negative. Increase input signal above - (Liveload/10)mV.

SPAN VALUE IS TOO SMALL

Span entry is equal to or smaller than previous span entry. Decrease the value of span entry 1 or increase the values of span entries 2 and 3.

CALIBRATION EXIT ERROR
When exiting calibration mode, the user must do so using the End Item of the Setup group. If calibration is exited by removing power, a flashing “E” will be displayed in the left corner of the display. To clear this prompt reenter calibration and exit again using the Setup group. Cycle the power on and off and the error will clear itself.

SECTION 3 - CALIBRATION

3.1 ENTERING CALIBRATION

The indicator is calibrated using the four button keypad. To select calibration mode, press 'S1' on the backside of the 110628 printed circuit board. See Figure 3-1.

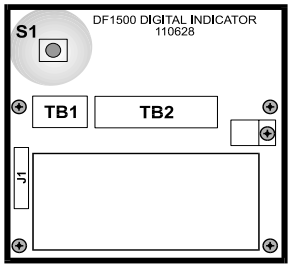


FIGURE 3-1

Once the S1 button has been pressed the indicator will display the following:

After the indicator completes the self-test procedure, the display will show the following:

or if the scale was in an invalid state it will show that current invalid state.

3.2 CALIBRATION SECTIONS

The calibration mode is divided into two display sections;

Scale Display Parameter Display

The Scale Display is used to view the actual weight value. The Parameter Display is used to view and edit the calibration parameters of the indicator.

The Parameter Display is broken down into groups. Within each group, is a list of items. Each item is either a toggle function or a multiple setting function. Figure 3-2 illustrates the layout of the parameter display. Refer to Sections 3 & 4 and for a description of each item.

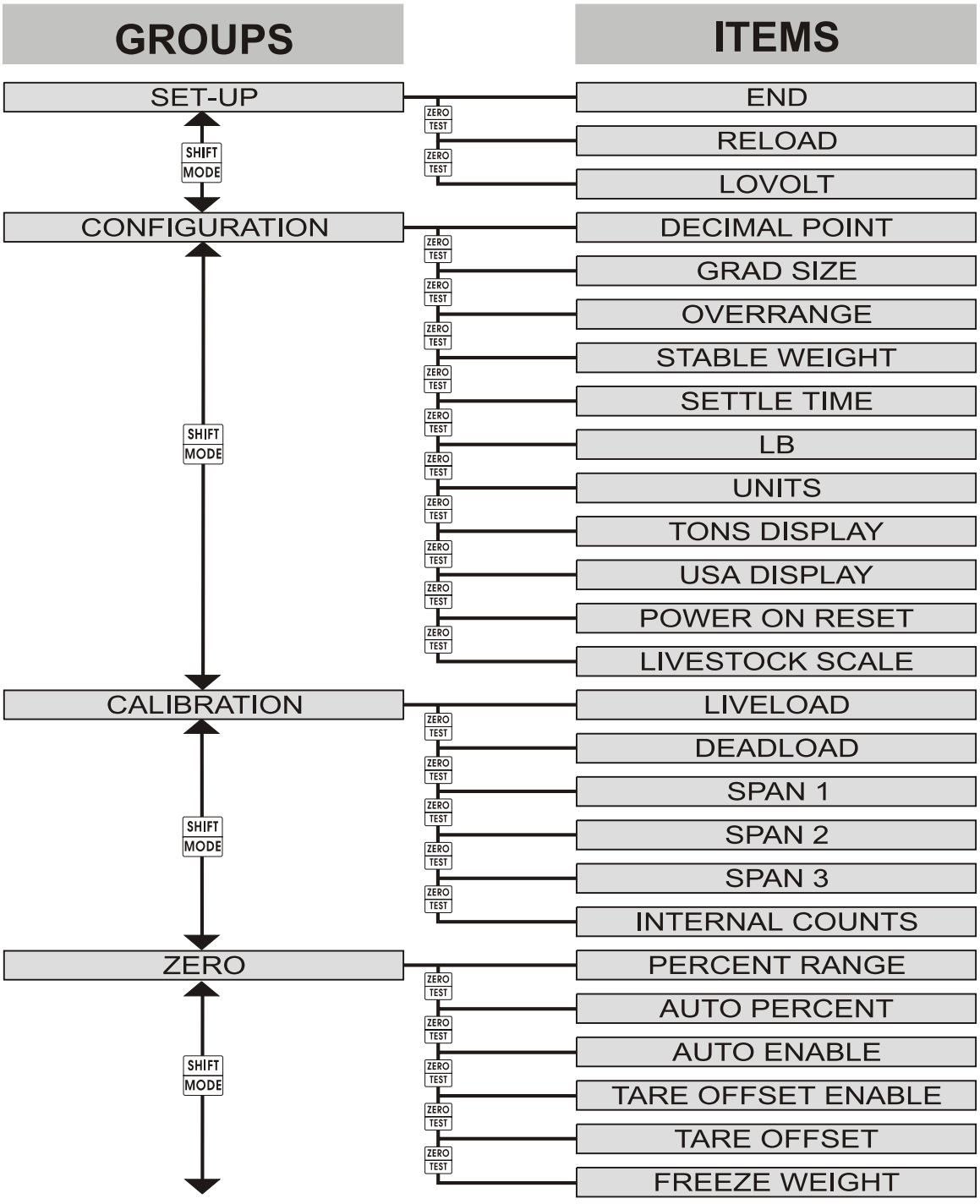

GROUPS
ITEMS
SET-UP
CONFIGURATION
CALIBRATION
ZERO
SHIFT MODE
ZERO TEST
END
RELOAD
LOVOLT
DECIMAL POINT
GRAD SIZE
OVERRANGE
STABLE WEIGHT
SETTLE TIME
LB
UNITS
TONS DISPLAY
USA DISPLAY
POWER ON RESET
LIVESTOCK SCALE
LIVELOAD
DEADLOAD
SPAN 1
SPAN 2
SPAN 3
INTERNAL COUNTS
PERCENT RANGE
AUTO PERCENT
AUTO ENABLE
TARE OFFSET ENABLE
TARE OFFSET
FREEZE WEIGHT

FIGURE 3-2

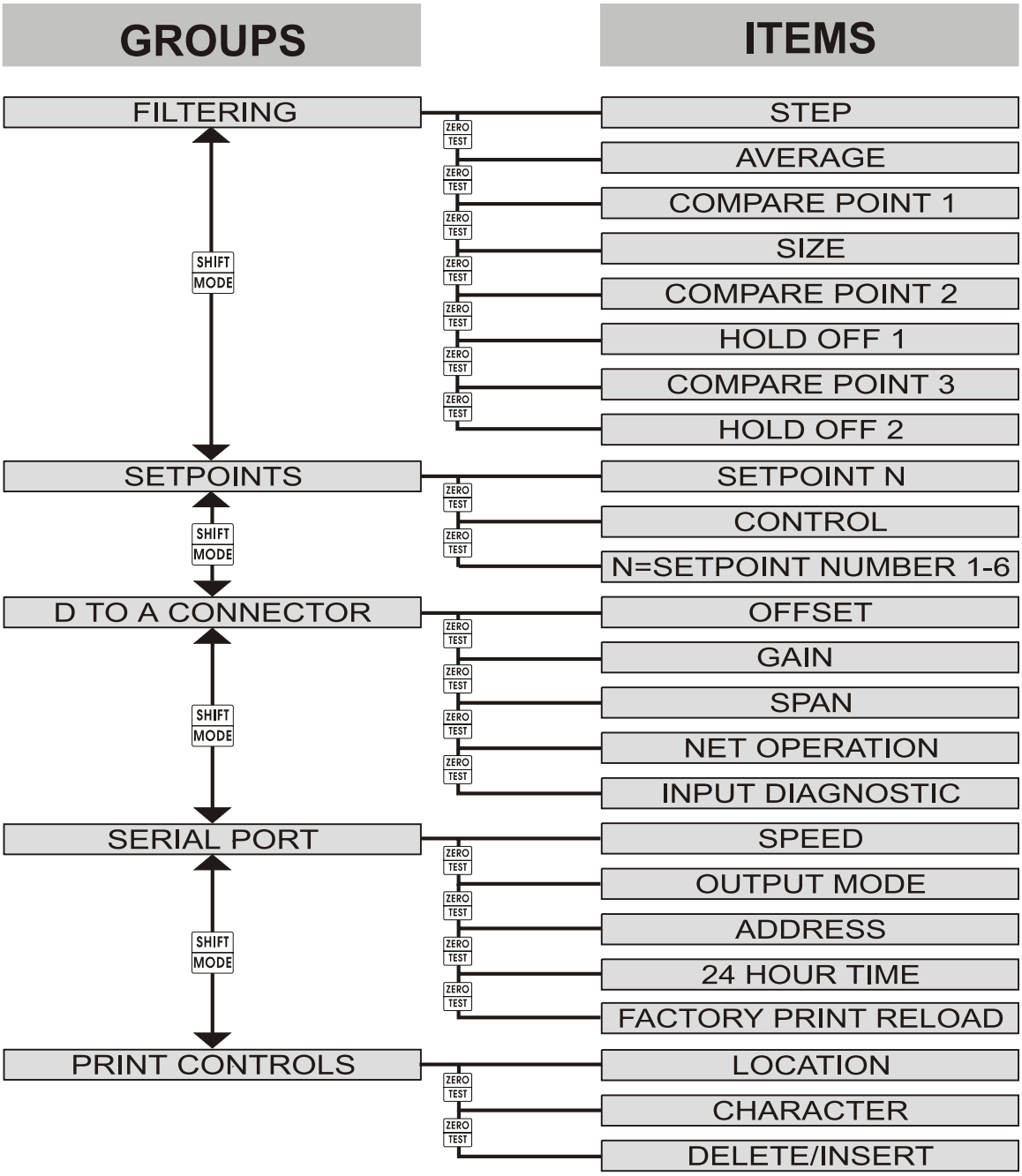


FIGURE 3-2(Cont)

3.3 CALIBRATION KEYPAD LAYOUT

The DF1500 functions are selected using a four button keypad. The keypad operates in one of two ways; Run Mode/Scale Display and Parameter Display. The function of the keypad is unique for each. For keypad operation in the Run Mode/Scale Display, See Section 1.10. Using Figure 3.3 as a guide, the function of each key in the Parameter Display is as follows;

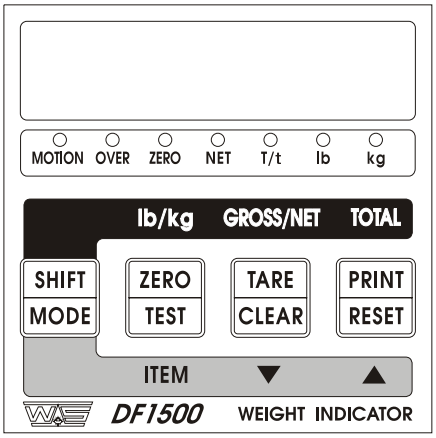


FIGURE 3-3

SHIFT / MODE The SHIFT / MODE key performs two functions during calibration:

1 - Press and hold the SHIFT / MODE key to toggle between the Scale Display and Parameter Display.

Scale Display

Parameter Display

2 - Press the SHIFT / MODE key to cycle to the next Parameter Group.

ZERO / TEST Press the ZERO / TEST key to cycle to the next Item in a Parameter Group.

TARE / CLEAR Press the TARE / CLEAR key to decrement an Item value.

PRINT / RESET Press the PRINT / RESET key to increment an Item value.

3.4 INDICATOR SETUP

In order to calibrate the indicator, certain parameters must be setup first before weights are applied to the scale. Setup the parameters in the order they appear, the reason for this is, if the deadload is set or the span is calibrated and one of the indicated parameters is changed, the span or the deadload will be changed as well.

See Section 3.3 for keypad instructions.

NOTE: Factory values in [ ]

EXIT [NO]

Select ‘YES’ to return to RUN mode.

RELOAD [NO]

WARNING: Setting this parameter resets ALL parameter values to factory defaults.

To reset the parameters to factory values, select ‘YES’.

LOVOLT [52]

This is the Indicator Low Voltage threshold. This value should not normally need to be changed from the factory default.

DECIMAL PLACES [1]

The decimal point is displayed with the current graduation size.

GRADUATION SIZE [1kg/2lb]

Select one of the following graduation sizes:

lb .0002 / .0005 / .0010 / .002 / .005 / .010 / .02 / .05 / .10 / .2 / .5
1 / 2 / 5 / 10 / 20 / 50 / 100

kg .0001 / .0002 / .0005 / .001 / .002 / .005 / .01 / .02 / .05
.1 / .2 / .5 / 1 / 2 / 5 / 10 / 20 / 50 / 100

NOTE: The range of graduation size selection will change depending on the decimal point value.

OVERWEIGHT [21000kg/46298lb]

The **'OVER'** annunciator turns on and the **'OVER'** message is displayed when the weight exceeds this value. Set the overweight value to no more than 5 % over capacity to be 'Legal For Trade'. The capacity should not exceed 10,000 displayed graduations.

STABLE WEIGHT [2kg/4lb]

The weight is stable when it changes less than this value. To be 'Legal For Trade', set to three graduations for greater than 2000kg capacity or one graduation for less than 2000kg capacity.

SETTLE TIME [2.0SEC]

The 'MOTION' annunciator turns off after the weight stabilizes for the settle time. Set to at least 0.4 seconds for 'Legal For Trade' applications.

POWER ON UNIT SELECT [NO]

Select the power on displayed units as follows: 'no' = kg 'YES' = lb

UNITS KEY [YES]

Disable the [lb/kg] button by selecting 'no'. This stops the operator from changing the displayed units from the power on setting.

TONS DISPLAY [NO]

The ‘T/t’ annunciator turns on when `YES’ is selected. Indicates that the displayed reading is in either Tons or tonne depending on the units displayed.

Tons display - ‘T/t’ and ‘lb’ annunciators both on.
tonne display - ‘T/t’ and ‘kg’ annunciators both on.

USA DISPLAY [NO]

Choose ‘YES’ for ‘Legal For Trade’ applications in the USA where dead zeros:

-before the decimal point are displayed in the active digit at zero.
-behind the decimal point are not displayed in inactive digits.

POWER ON RESET [YES]

The Power On Reset forces the operator to zero the scale when power is applied by displaying ‘ZEro’ until the ‘ZERO’ button is pressed with no weight applied. Select ‘no’ for ‘Not Legal For Trade’ applications.

LIVESTOCK SCALE [0]

Set this parameter to 1, 2 or 3 to enable the livestock digital filter. This allows for the weighing of live animals moving randomly on the scale. Increasing the filter setting slows the step response (time to weight) and widens the stability band of the weight display. The corresponding settle times are approximately 4, 6 and 8 seconds.

3.5 ACTIVE CALIBRATION

After the Setup and Configuration parameters have been set, the active calibration of the indicator begins. There are three basic steps in the active calibration of the DF1500:

1)Setting the Liveload
2)Setting the Deadload
3)Setting the Span

Each of these three steps must be completed in the order listed above. A change in one of the steps will affect the value of the next.

Note: That changing any Setup or Configuration parameters will affect the active calibration.

LIVELOAD [1.8mV/V]

This parameter represents the output of the loadcell, in millivolts, at maximum scale capacity. This entry acts as a course span or span range adjustment for the indicator, matching it with the working range of the loadcell. This value must be set accurately to achieve to the rated performance from the indicator. The range of entries allowed is from 0.8 to 3.5 mV/V.

You may use one of two methods for determining the value of this parameter, Formula or Trial and error.

FORMULA

The formula for determining the output of the loadcell is as follows:

$$\frac{Amount\ of\ Load\ Cell\ Used}{Load\ Cell\ Capacity}\ x\ Rated\ Millivolt\ Output\ of\ Load\ Cell\ at\ Capacity$$

Note: The amount of load cell used = Platform weight + Capacity weight

Example:

Using 40,000kg of load cells of 2.0 mV/V output, 25,000 kg scale capacity with approximately 5000kg of deckweight, you would obtain the formula:

$$\frac{5000kg + 25000kg}{40000kg} \; x \; 2.0mV/V = 1.5mV/V$$

Either decrement or increment the Liveload value to 1.5mV/V. Continue on to Deadload.

TRIAL AND ERROR

In this method you will try various values for Liveload and observe the resultant indicator readings. The DF1500 has 100,000 internal raw counts. For any given weight on the scale, adjusting the liveload value will increase or decrease the internal raw counts for that given weight. The maximum performance of the indicator is achieved, when at scale capacity, the internal raw counts are at or near 100,000.

Example:

1) Scale capacity is 5000kg.
2) Apply 1000kg test weight.
3) Calculated internal raw counts = 100,000 x (1000/5000) = 20,000counts.

4) Using the  display, observe the internal raw counts value.

5) If the counts are **below** 20,000, decrease the liveload value.
6) If the counts are above 20,000, increase the liveload value.
7) Repeat steps 4 thru 6 as required.

If the counts are less than 90,000 the displayed weight readings will become more unstable. If the counts exceed 110,000 the indicator will over range at capacity. Make sure your calculated counts will fall between these limits. With some load cells you will be unable to reach 100,000 counts.

DEADLOAD

This function automatically compensates for the scale platform. When you have selected this function, the indicator automatically zero's the deadload. Upon completion of this routine, the weight display will be at or near zero. Press 'INC' to perform deadload or press 'DEC' to reset it. The following error messages may appear:

DEADLOAD VALUE TOO LARGE
Cannot do the deadload calculation. The input signal is greater than the Liveload. Increase the liveload value.

DEADLOAD VALUE TOO SMALL
Cannot do the deadload calculation. The input signal is too far negative. Increase the input signal above -(Liveload/10)mV

3.5.1 SPAN ADJUSTMENT

The DF1500 allows up to 3 span points. Most scale applications will require only span point 1 to be set. For applications that are non-linear span points 2 and 3 are provided. These extra span points should be used to compensate for **slight** mechanical or loadcell problems on the scale.

NOTE: Before setting the Span, ensure that the Setup, Configuration, Liveload and Deadload parameters have been set.

SPAN POINT 1

Use this parameter to set the span of the indicator to scale capacity in single point adjustment or to a portion of the scale capacity in multi-point adjustment. Adjusting this parameter clears span points 2 & 3. Weight is displayed.

SPAN POINT 2

To correct scale linearity error's, use this parameter to set the span of the indicator to a portion of scale capacity in multi-point span adjustments. This value must be greater than the span point 1 value. Adjusting this parameter clears span point 3.

SPAN POINT 3

To correct scale linearity error's, use this parameter to set the span of the indicator to a portion of scale capacity in multi-point span adjustments. This value must be greater than the span point 2 value.

INTERNAL RAW COUNTS

Displays the raw internal counts of the analog to digital convertor. This display is used for liveload adjustments and scale diagnostics.

When used for scale diagnostics this display reflects the true output of the a/d convertor without any zero tracking or filtering effects. This can be useful to check the stability of the scale or to see if the scale is drifting.

There are two methods for adjusting the span, single point adjustment and multi-point adjustment:

SINGLE POINT ADJUSTMENT:

1) In the scale display, zero the indicator.
2) Place the required test weights on the scale.
3) In the Span 1 Item of the Parameter display, either increment or decrement the Span 1 value to the desired scale capacity.
4) Switch to the scale display and remove the test weights.
5) Zero the scale and reapply the test weights in steps observing the display for scale linearity. When all the test weights have been placed on the scale, check the scale capacity. If the linearity is either fast or slow refer to the multi-point adjustment. If the scale capacity reading is incorrect repeat steps 1 thru 3.

MULTI-POINT ADJUSTMENT:

1) In the scale display, zero the indicator.
2) Place the 1/3 of the required test weights on the scale.
3) In the Span 1 Item of the Parameter Display, either decrement or increment the Span 1 value to 1/3 of the scale capacity.
4) Place 2/3 of the required test weights on the scale.
5) In the Span 2 item of the Parameter display, either decrement or increment the Span 2 value to 2/3 of the scale capacity.
6) Place the all the required test weights on the scale.
7) In the Span 3 item of the Parameter display, either decrement or increment the Span 3 value to the scale capacity.
8) Switch to the scale display and remove the test weights.
9) Zero the scale and reapply the test weights in steps, observing the display for scale linearity. When all the test weights have been placed on the scale, check the scale capacity. If the linearity is either fast or slow check the scale for mechanical or load cell problems. If the scale capacity reading is incorrect, repeat steps 1 thru 7.

Once the span adjustments have been made, active scale calibration is complete. You may continue on to Section 3.6 for the advanced calibration features. **They are not required for the indicator to operate.** These features will affect the performance of the indicator but not alter the settings made during the active calibration.

If option boards are installed, such as RS232 output, 4-20ma output, setpoint outputs or opto-isolated inputs, see Section 4. Otherwise exit calibration (See Section 3.7) and your unit is ready for operation.

3.6 ADVANCED CALIBRATION

The features contained in this section are not required to calibrate the indicator. They are meant to enhance or alter the performance of the indicator in certain applications. These might include scale vibration/motion, high speed batching and zero drift applications.

NOTE: These features will not operate in the Scale Display. You must exit calibration mode to the run mode to use these features.

PUSH TO ZERO WINDOW [2%]

This represents the percentage of scale capacity that can be zeroed by the zero key. The allowable range is 0 - 99% of the overweight value. This should be set to2% in most cases.

AUTO ZERO WINDOW [50%]

This determines the amount of change that can be tracked by the Auto Zero function. The allowable range is from 0 to 99% of 1 graduation per 1/4 second. This should be set to 60% in most cases.

AUTO ZERO ENABLE [YES]

Controls the Auto Zero Tracking function. Set to ‘NO’ to disable AutoZero Tracking. When this function is enabled, the ‘Zero’ annunciator will be on when the scale is within 1/4 graduation of center zero.

TARE OFFSET ENABLE [YES]

Controls the Tare Offset function. Set to ‘NO’ to disable the Tare Offset.

TARE OFFSET [0kg/0lb]

Allows the entry of a Tare Offset value. At scale zero, the ‘ZERO’ and ‘MOTION’ annunciators will will be on, but the weight display will be at the Tare Offset value. As weight is applied to the scale the ‘MOTION’ annunciator will remain on and the ‘ZERO’ annunciator will turn off.

FREEZE WEIGHT [0kg/0lb]

This is the weight value that must be achieved before the highest value is frozen after motion ceases. Use this feature to display the weight when the loadcell signal decreases after the load is applied. When the scale weight drops below this value the display returns to normal operation. Set to zero for 'Legal For Trade' applications.

STEP [0]

To adjust the filter for its optimum step response, press 'DEC', place a typical load on the scale and press 'INC'. Half the change is placed in Average Shift Value 3.

AVERAGE [0]

Adjust the filter for the typical frequency response by keeping a load on the scale, pressing 'DEC', waiting for the display to stop changing and pressing 'INC'. Twice the change is placed in Average Shift Value 2.

AVERAGE SHIFT VALUE 1 [3 counts]

CAUTION: If this value is too high, the scale will not be sensitive to a one graduation change in weight.

The system has a register which averages 10 or more scale readings. When the raw scale reading changes less "Average Shift Value 1" counts, no new readings are shifted into the register resulting in a very stable display. The allowable range for this parameter is from 1 to 50 counts. A typical value is 3 counts, approximately 1/2 a display graduation.

NUMBER OF AVERAGES [10 SHIFTS]

Selects the size of the Average Register. Allowable range is 10 shifts to 200 shifts.

CP2 **AVERAGE SHIFT VALUE 2 [500 counts]**

When the raw scale reading changes more than Average Shift 1 counts and less than Average Shift 2 counts, the new reading is shifted into the register once. The averaged reading changes slowly over 10 or more readings. The allowable range for this parameter is from 1 to 5000 counts. A typical value for Average Shift 2 is 500 counts, approximately 2 display graduations.

HoLd 1 **HOLD OFF DELAY 1 [5 CYCLES]**

Sets the number of integrated cycles that the indicator remains in full update mode even though the rate of change of the raw scale readings has reached a point where the averaging system would take over. The greater the number of delay cycles, the faster the indicator display reaches the target weight. The range of adjustment for this parameter is from 0 to 30 cycles.

CP3 **AVERAGE SHIFT VALUE 3 [1000 COUNTS]**

When the internal raw counts changes more Average Shift Value 2 and less than Average Shift Value 3 counts, the new reading is shifted into the register five times. The averaged reading changes quickly over 2 two readings. The allowable range for this parameter is from 1 to 10,000 counts. A typical value for Average Shift Value 3 is 1000 counts, approximately 8 display graduations.

HoLd2 **HOLD OFF DELAY 2 [5 CYCLES]**

Sets the number of integrated cycles that the indicator remains in half update(Average Shift 3) mode even though the rate of change of the internal raw counts has reached a point where the averaging system would take over. The greater the number of delay cycles, the faster the indicator dispaly reaches the target weight. The range of adjustement for this parameter is from 0 to 30 cycles.

3.7 EXITING CALIBRATION

To exit calibration, cycle the SHIFT / MODE key until End is displayed.

Press PRINT / RESET to select YES .

Note: If power is removed during calibration, a flashing "E" will be displayed. Refer to Section 2.2 to clear this error message.

SECTION 4 - OPTIONS

4.0 GENERAL INFORMATION

The DF1500 can be equipped with the following options: RS232 output, 4-20ma output, setpoint outputs or opto-isolated inputs. The physical installation and parameter setup is discussed in the following sub-sections. For information on the external wiring of these options, see Section 7.

To connect the option boards to the DF1500, a 10C ribbon cable is provided with every board. This connects J1 of each option board to J1 of the DF1500. Be sure to make note of the keyway on each connector.

In applications were more than one option is required, each option board is equipped with two headers. The first, J1 would connect to the DF1500, and the second, J2 would connect to J1 of the second option board. This allows for a theoretical maximum of four options to be installed on the DF1500, starting with the 110877 and ending with the 110479.

4.1 SETPOINTS

The DF1500 can be equipped with the 110479 option board. This gives the DF1500 up to 6 independently controlled, solid state relay ouputs**.** Each of the setpoints can operate as normally open or normally closed contacts. The setpoint values can either be permanently set using the parameters in calibration or temporarily set via the configuration mode.

Note: The values set in the configuration mode will be lost once power is removed from the DF1500.

4.11 INSTALLATION

The 110479 option board cannot be installed in the Desktop DF1500. It must be installed in either a Nema DF1500 or a panel were the DF1500 is installed. To install a 110479 option board the following hardware is required:

W.S. PART NUMBER	DESCRIPTION	QUANTITY
1555.110479	Setpoint Option Board	1
3555.111023	Optional Mounting Pan	1
3135.3177488012	6/32 x 3/8 Standoff	4
3104.F404	6/32 x 3/8 Phillips Screw	4
445.110890	14" 10C Ribbon Cable	1

For DF1500 nema units that are equipped with a 110479 board, the standard mounting pan is replaced with the Power Supply/Option board mounting pan. Figure 4-1 illustrates the correct mounting procedure for DF1500 Option Boards:

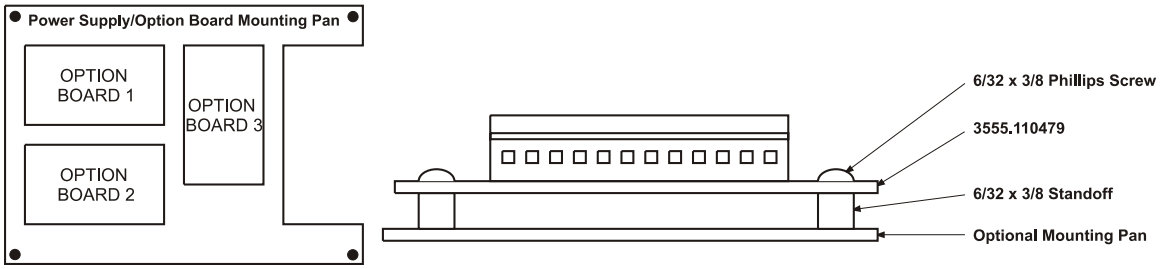


FIGURE 4-1

4.12 INDICATOR SETUP

The operation of each setpoint requires two parameters to be set. The Setpoint Action Value and the Control Bit. Setpoints can also be temporarily set in the configuration mode. See Section 1.72

Note: The value of 'n' correspondes to setpoint numbers 1 thru 6

SETPOINT 'n' ACTION VALUE

This is the weight value at which the setpoint 'n' will change states. This value can be over-ridden by the value entered in the Configuration Mode. This change however is temporary and will be lost when power is removed from the indicator.

SETPOINT CONTROL BIT [ON]

This parameter selects whether the setpoint will act as a normally open contact or a normally closed contact. Set to 'oFF' for normally open operation. Set to 'on' for normally closed operation.

4.2 DIGITAL TO ANALOG CONVERTOR

The DF 1500 can be equipped with the 110583 option board. This gives the DF1500 the following output options:

1) 4-20ma 2) 0-5VDC 3) 0-10VDC

4.21 INSTALLATION

The 110583 option board cannot be installed in the Desktop DF1500. It must be installed in either a Nema DF1500 or a panel were the DF1500 is installed. To install a 110583 option board the following hardware is required:

W.S. PART NUMBER	DESCRIPTION	QUANTITY
1555.110583	4-20 ma Option Board	1
3555.111023	Optional Mounting Pan	1
3135.3177488012	6/32 x 3/8 Standoff	4
3125.#6NYL	#6 Nylon Washer	4
3104.F503	6/32 x 1/4 Phillips Screw	4
445.110890	14" 10C Ribbon Cable	1

For DF1500 nema units that are equipped with a 110583 board, the standard mounting pan is replaced with the Power Supply/Option board mounting pan. Figure 4-2 illustrates the correct mounting procedure for DF1500 Option Boards:

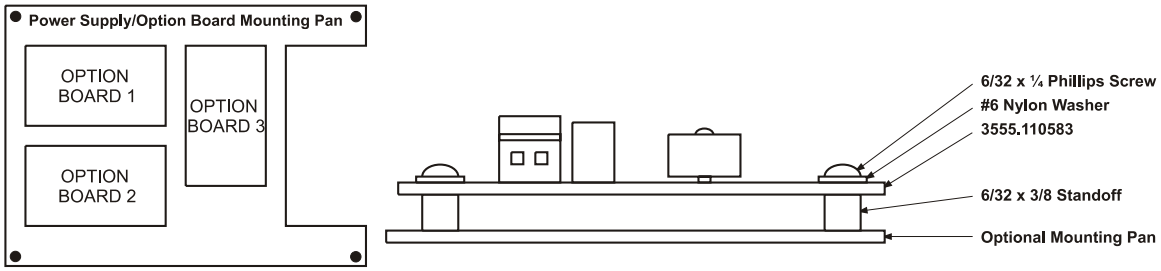


FIGURE 4-2

4.22 INDICATOR SETUP

The setup of the parameters for the analog output option is done in three steps. For any given scale application, the values used in each of these parameters will vary depending on the type of analog output required. In addition, voltage based outputs will also require bias resistors.

Bias Resistor Calculation:

0 - 10VDC Output) R=V(Voltage at Capacity) / I(Current at Capacity)
R=10VDC/20ma = 500 ohms

0 - 5VDC Output) R=V(Voltage at Capacity) / I(current at Capacity)
R=5VDC/20ma = 250 ohms

ANALOG OUTPUT ZERO [16000]

Calibrate analog output zero. This function allows the calibration of the analog output at zero. Use the 'INC' and 'DEC' keys to set the analog output for zero (0 Volts or 4ma). This value is factory set to 16000. At this setting with the scale input at 0mV/V the analog output will be 4ma. For 0-10VDC and 0-5VDC outputs, with the appropriate bias resistors, set this value to approximately 7000.

ANALOG OUTPUT SPAN [36000]

Set the weight value used for calculating the analog output at scale capacity. This parameter is automatically set to the scale capacity. Use the 'INC' and 'DEC' keys to set the analog output for span (5VDC, 10VDC or 20ma) at scale capacity.

Note: If the analog output span is at a value other than scale capacity, then the span parameter further in this section must be set to that value, before the Analog Output Span can be set.

SPAN [10000kg/22046lb]

Sets the weight value used for calculating the analog output signal. This parameter is automatically set to the scale capacity. It can be altered, if required, for specific applications.
Use the 'INC' and 'DEC' keys to change this value.

NET OPERATION [NO]

Select ‘YES’ to operate the analog output on net weight operation.

4.3 REMOTE INPUTS

The DF1500 can be equipped with optically isolated inputs for remote operation of the following keypad functions:

Zero(ZR), Print(PR), Tare(TR), Clear(CL), Add(AD), Gross(GR)

By using an external 12 - 24VDC power supply and a remotely mounted switch, the above keypad functions can be accessed from multiple locations or hostile locations.There are no setup parameters for this option. The only user configurable parameter is listed in Section 4.32 Diagnostics.

4.31 INSTALLATION

The 110590 option board cannot be installed in the Desktop DF1500. It must be installed in either a Nema DF1500 or a panel were the DF1500 is installed. To install a 110590 option board the following hardware is required:

W.S. PART NUMBER	DESCRIPTION	QUANTITY
1555.110590	Remote Input Option Board	1
3555.111023	Optional Mounting Pan	1
3135.3177488012	6/32 x 3/8 Standoff	4
3104.F503	6/32 x 1/4 Phillips Screw	4
445.110890	14" 10C Ribbon Cable	1

For DF1500 nema units that are equipped with a 110590 board, the standard mounting pan is replaced with the Power Supply/Option board mounting pan. Figure 4-3 illustrates the correct mounting procedure for DF1500 Option Boards:

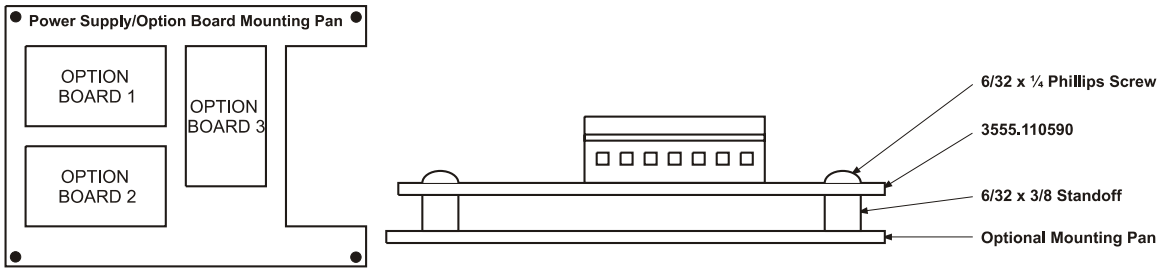


FIGURE 4-3

4.32 INPUT DIAGNOSTICS

There are no setup parameters for the Remote Input Option of the DF1500. The inputs are active continuously. There is an input diagnostic to trouble shoot the wiring portion of the Remote Input Board.

INPUT DIAGNOSTIC [000000]

Display the real-time key closures on the remote input board. Each digit coincides with a remote input. The least significant digit (LSD) correspondes to “ZR” and the most significant digit (MSD) corresponds to “GR”. Applying a voltage to any of the inputs will result in a “1" being displayed in the inputs display digit.

4.4 SERIAL PORT

The DF1500 can be equipped with either a RS232 or RS422 communications output. With this option the DF1500 can communicate with any serial communications devices such as printers, computers or scoreboards. Using the RS422 output the DF1500 can be connected on a multiple drop line with each indicator having a unique address number.

4.41 INSTALLATION

The 110877 option board is installed inside the DF1500 case. To install the 110877 option board the following hardware is required:

W.S. PART NUMBER	DESCRIPTION	QUANTITY
1555.110877	RS332/RS422 Interface	1
3135.4/40x.500	4/40 x 1/2 M/F Hex Spacer	2
3102.F020	4/40 x 1/4 Phillips Screw	2

Figure 4-4 illustrates the correct mounting procedure for the 110877 option board.

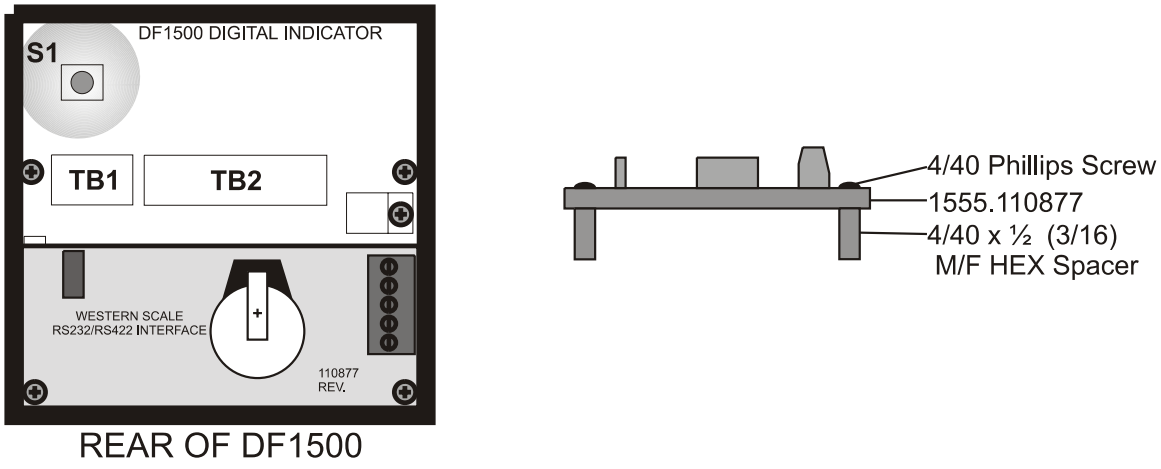


FIGURE 4-4

4.42 INDICATOR SETUP

Setting up the DF1500 for serial communications is done in two steps; Baud rate selection and output mode selection. The three remaining parameters are optional features and are not required for most applications.

BAUD RATE SELECTION [9600]

Use the 'INC' or 'DEC' key to select one of the following baud rates for the serial port:

75, 150, 300, 600, 1200, 2400, 4800 or 9600

OUTPUT MODE [POLL]

Use the 'INC' or 'DEC' key to select one of the following output modes for the serial port:

- Continuous Output.

- Polled or Command Mode Output.

- Output when PRINT / RESET button is pressed.

- Strobe, output when a negative going pulse or logic low is present on the recieve input.

Note: For information on the Data Word Configuration and Serial Format for each ouput, see Section 5 - Support Information.

ADDRESS [0]

Selects the address or select code of the indicator. The range of values is from 1 to 127. Used in conjunction with poll output mode. This allows for multiple indicators to be connected to a common multidrop RS-422 data interface. Only the indicator being addressed will respond to the poll command. Addresses must be sent with the MSD (Bit 8) set high in order to be interpreted as a select code. Transmit outputs of non-selected indicators remain off (tri-state).

24HOUR TIME FORMAT [YES]

Sets both the Time and Date in one of two formats:

24 Hour - (Time) hh:mm	(Date) yymmdd
12 Hour - (Time) hh:mm am/pm	(Date) dd-mm-yy

Press the ‘INC’ key to select ‘YES’ to the 24 Hour format.

FACTORY PRINT RELOAD [NO]

Resets the ticket information in the indicator to the factory values described in Section 5.2 Serial Formats.

4.5 TICKET SETUP

The DF1500 is capable of printing two independent formatted tickets. These ticket formatts and the continuous output can be configured manually using the controls detailed in the following sections. These controls have been provided for emergency field use only. Ticket programming via the manual controls is very tedious and time consuming.

For this reason, ticket formatting software is available. Tickets are created in a windows based environment and down loaded to the DF1500 via the serial port. The ticket formatting software is available free of charge with the purchase of the DF1500 indicator.

The DF1500 ticket format is structured in a continuous column of sequential control codes. A listing of the codes for the factory ticket is illustrated in figure 4-5.

All control codes are ASCII hex characters. This allows the DF1500 to work with any

printer that uses ASCII control characters. When the ASCII delimination character 10h is encountered, the following character determines the function of the print control. The ASCII null (00h) is used to mark the end of ticket. Table 4-1 lists all the print codes for the DF1500.

PRINT CONTROL CODES		
Character	Hex Code	Function
SOH	01	Print code 1
STX	02	Print code 2
A	41	Add total
C	43	Clear tare
E	45	Error print
G	47	Gross set
H	48	Time print
K	4B	kg set
L	4C	lb set
M	4D	Mode print
N	4E	Net set
R	52	Reset total
S	53	Sum print
T	54	Tare weight
U,u	55,75	Units print
V	56	Valid only
W	57	Weight print
Y	59	Date print
Z	5A	Zero scale

Table 4-1

SECTION 5 - SUPPORT INFORMATION

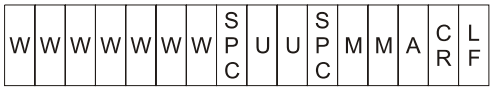
5.1 DATA WORD CONFIGURATION

Data word configuration is: 1 Start bit
7 Data bits
No parity
1 Stop bit

5.2 SERIAL FORMATS

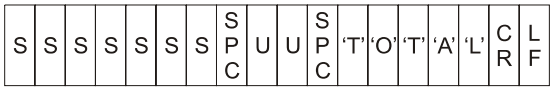
PRINTER OUTPUT

Factory data string whenever the [Print] button is pressed during normal operation of the indicator. The weight display must be valid or the request will be ignored until the weight becomes valid. The output string is:



W = weight.
U = units, LB or KG.
SPC = space.
M = Display mode, GR for gross, NT for net.
A = add weight value to total accumulator
CR = carriage return (0DH).
LF = line feed (0AH).

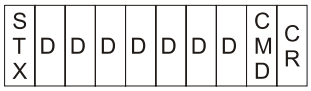
Factory data string whenever the [Shift] [Print] button is pressed during normal operation of the indicator. The output string is:



S = total sum print.
U = units, LB or KG.
SPC = space.
CR = carriage return (0DH).
LF = line feed (0AH).

POLLED AND COMMAND MODE

Computer command operation without checksum.A fully interactive command set can be sent from a remote computer to operate the indicator. The command structure is as follows:



STX	=	start of text (02H).
CMD	=	the command character.
D	=	data, only if required.
CR	=	carriage return (0DH).

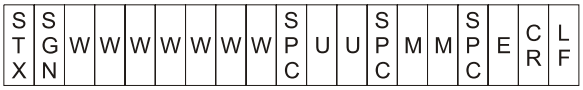
Note: The STX character is required. It is used to clear the input buffer. The command processor works from the CR back allowing the inclusion of data or other characters without consequence.The maximum number of characters sent before the CR must not exceed 20.The indicator may fail to respond to the command if this number is exceeded. Preceding the message with the STX insures the input buffer is cleared before the next message. The indicator ignores LF and other control characters.

The following is a list of commands that can be executed:

CMD	MM	Data	Function
G	GR	none	Set to gross display.
N	NT	none	Set to net display.
P	TR	none	Capture weight as tare.
T	TR	tare wt	Set tare weight.
R	TR	none	Recall tare weight.
C	TR	none	Clear tare weight.
?	??	none	Poll for weight.
L	??	none	Set units to LB.
K	??	none	Set units to KG.
Z	??	none	Zero the scale.
1	SP	setpoint 1	Set setpoint 1.
2	SP	setpoint 2	Set setpoint 2.
3	SP	setpoint 3	Set setpoint 3.
4	SP	setpoint 4	Set setpoint 4.
5	SP	setpoint 5	Set setpoint 5.
6	SP	setpoint 6	Set setpoint 6.

POLLED OUTPUT

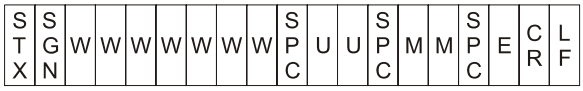
The indicator only responds when it receives a valid command.



STX	=	start of text character (02H).
Sgn	=	sign, - = negative, spc = positive.
W	=	weight, 7 characters, may include decimal point.
Spc	=	space.
U	=	units, LB or KG.
M	=	Display mode, GR for gross, NT for net.
E	=	status, O = over, M = motion, - = negative, (20H) = positive.
CR	=	carriage return (0DH).
LF	=	line feed (0AH).

CONTINUOUS AND STROBE OUTPUT

A standard string will be transmitted after each sample whenever the receive data line is held low. One sample time may be required before the string is transmitted. The standard string is:



STX	=	start of text character (02H).
SGN	=	sign: - = negative, spc = positive.
W	=	weight.
SPC	=	space.
U	=	units, LB or KG.
M	=	Display mode, GR for gross, NT for net.
E	=	status, O = over, M = motion, - = negative, (20H) = positive.
CR	=	carriage return (0DH).
LF	=	line feed (0AH).

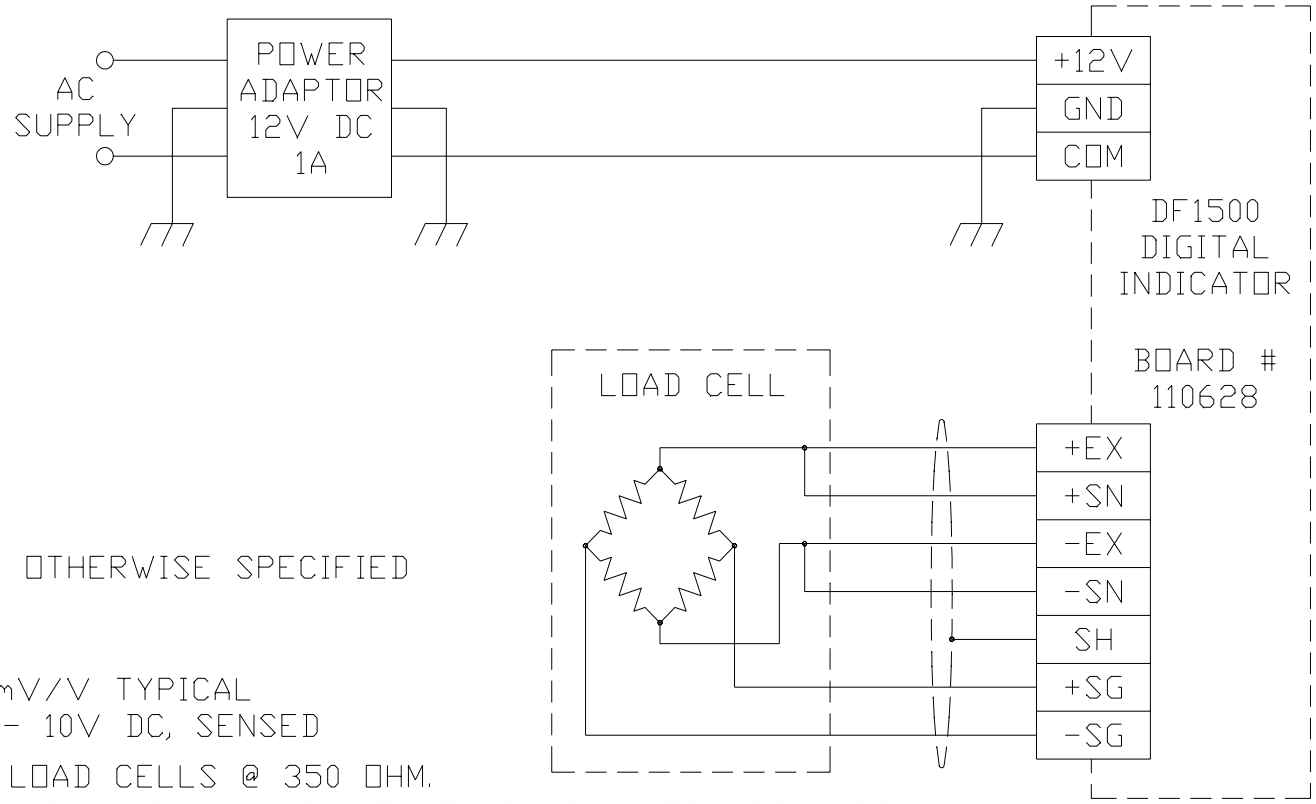
SECTION 6 - TROUBLE SHOOTING

TROUBLE SHOOTING GUIDE	
SYMPTOM	CAUSE/SOLUTION
The indicator will not turn on - no display.	1. No Power - check AC power source. 2. Check power connection - see Section 1.2. 3. Defective power supply - replace.
'ProG Error' on power up.	1. Bad indicator board - requires service.
'SetUP Error' on power up.	1. Setup parameters not saved - scale requires calibration. 2. Parameters corrupted - requires service.
'undEr' on display.	1. Load cell(s) not wired correctly - see Section 1.3. 2. Defective load cell - replace.
'ovEr' on display.	1. Scale is overloaded. 2. Dead load or span not set properly - recalibrate. 3. Load cell(s) not wired correctly - see Section 1.3. 4. Defective load cell - replace.
'LovoLt' on display.	1. Low voltage power input - check AC power source. 2. Defective power supply - replace.
'ZEro' on display and cannot zero scale.	1. Weight is outside Zero Window - empty or clean scale. 2. Incorrect dead load setting - reset dead load.
Display unstable.	1. Load cell cabling wet or damaged - dry or rewire. 2. Live load not set correctly - see Section. 3 Poor grounding - check ground wiring.
No output to printer, host computer or scoreboard.	1. Interface cable disconnected - reconnect. 2. Serial interface not wired correctly - see Section 1.4. 3. Output port not set up correctly - set parameters.

TABLE 4-3

SECTION 7 - WIRING DIAGRAMS

REVISIONS			
REV.	DESCRIPTION	DATE	APPD.

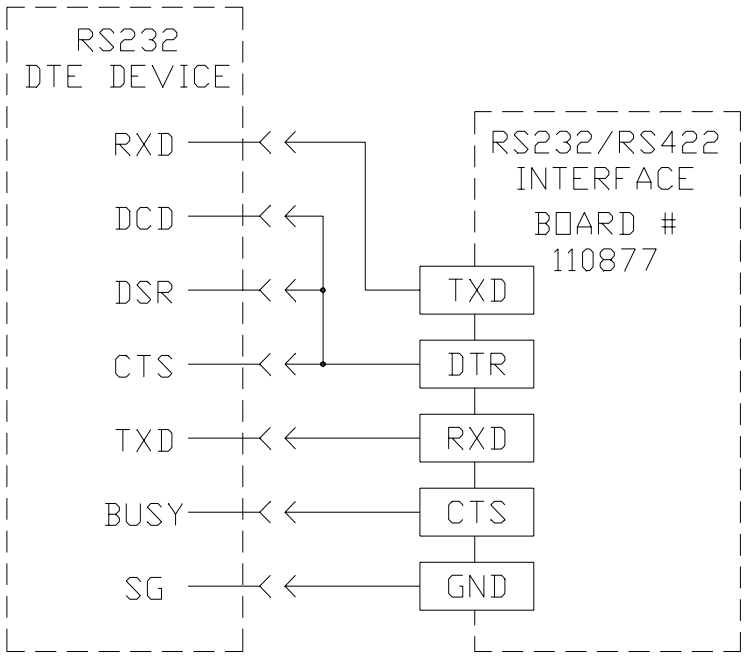


NOTES: UNLESS OTHERWISE SPECIFIED

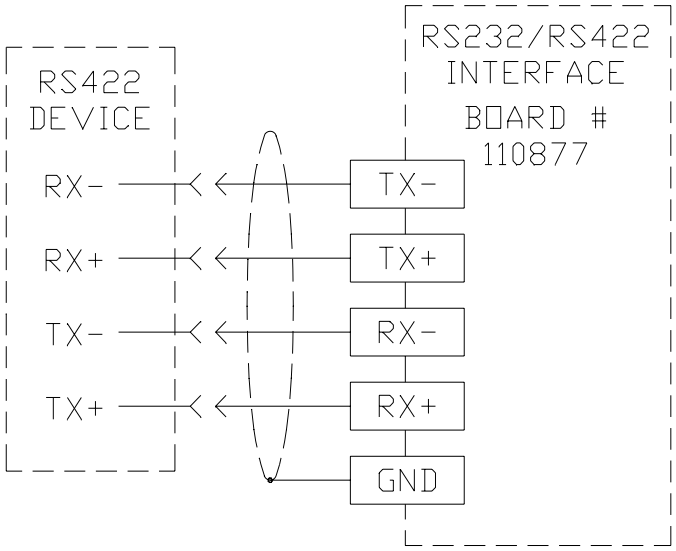
1. LOAD CELL:
   TYPE - 2-3mV/V TYPICAL
   EXCITATION - 10V DC, SENSED
2. MAXIMUM 12 LOAD CELLS @ 350 OHM.
3. JUMPER +SN/+EX AND -SN/-EX IF NO SENSE LINES ARE USED

TOL. .X± .XX± .XXX± ANG.±	DATE 96-09-13	DRAWN P. MUELLER	CUSTOMER		SHEET 1 OF 1
DO NOT SCALE DRAWING	SCALE NTS	DESIGNED	DF1500 DIGITAL INDICATOR - TYPICAL WIRING	JOB NO.	
WESTERN SCALE COMPANY LIMITED PORT COQUITLAM, B.C., CANADA		CHECKED		SIZE A / DRAWING NUMBER 111156	REV. --
		APPROVED			

REVISIONS			
REV.	DESCRIPTION	DATE	APPD.



TYPICAL RS232 WIRING



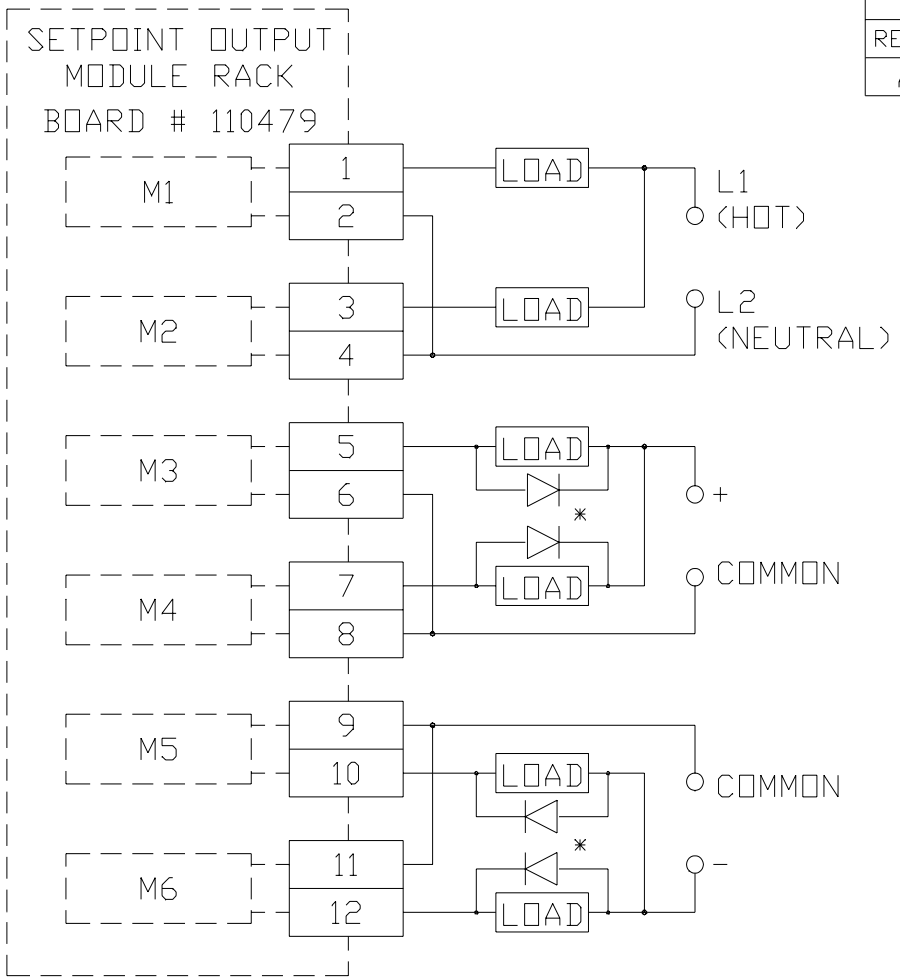
TYPICAL RS422 WIRING

TOL. .X± .XX± .XXX± ANG.±	DATE 96-09-13	DRAWN P. MUELLER	CUSTOMER	SHEET 1 OF 1
DO NOT SCALE DRAWING	SCALE NTS	DESIGNED	RS232/RS422 INTERFACE - TYPICAL WIRING	JOB NO.
WESTERN SCALE COMPANY LIMITED PORT COQUITLAM, B.C., CANADA		CHECKED		SIZE A / DRAWING NUMBER 111157 / REV. --
		APPROVED		

DF1500 TO SERIAL DEVICE
CABLE CHART

	TXD	RXD	CTS	DTR	GND	NOTES
Printer	3	2	20		7	
PC-DB25	3	2			7	Tie pins: 4,5,6,8
PC-DE9	2	3			5	Tie pins: 1,6,7,8
DT1200	13	5			25	Use: **110877-2**
SMART1	2	3		8	5	
WRD	RD				SG	
RD2000	2	3			1	

TABLE 7-1



REVISIONS			
REV.	DESCRIPTION	DATE	APPD.
A	REDRAWN W/CHANGE. DCN# 500	96-09-16	

TYPICAL AC CIRCUIT

MAXIMUM VOLTAGE: 120V AC
MAXIMUM CURRENT / MODULE: 3A
USE G4OAC5 MODULES (black)

TYPICAL DC CIRCUITS

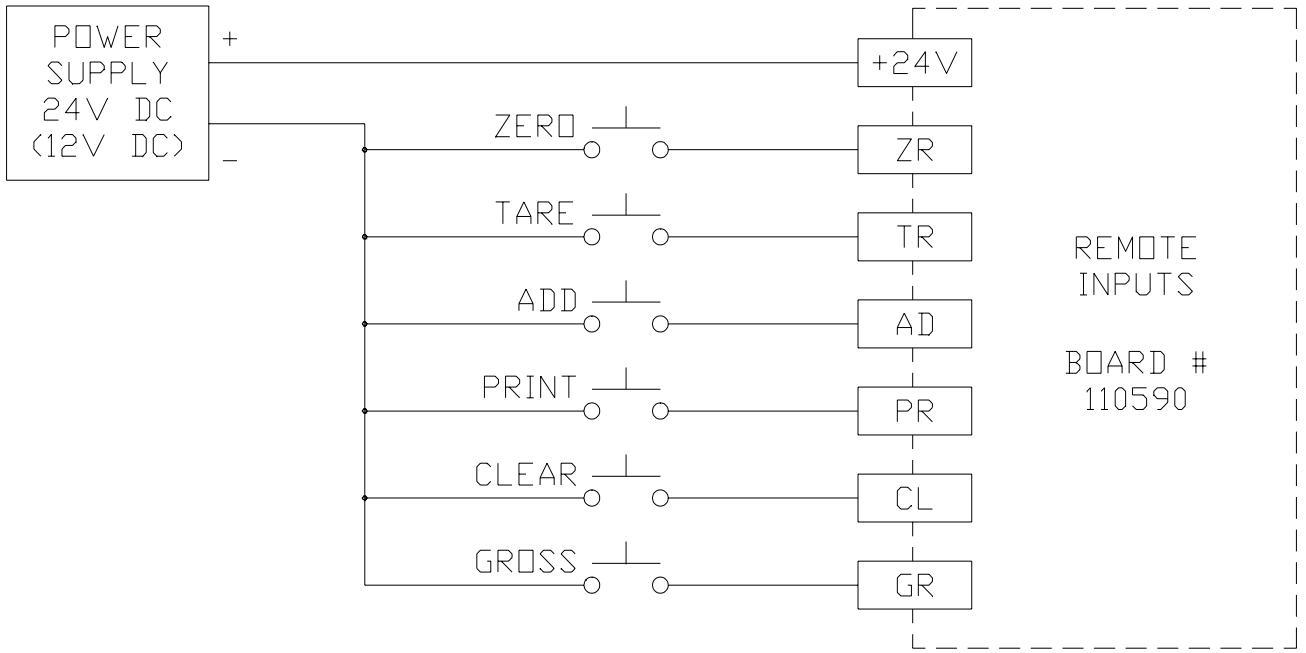
MAXIMUM VOLTAGE: 60V DC
MAXIMUM CURRENT / MODULE: 3A
USE G4ODC5 MODULES (red)
* COMMUTATION DIODES MUST BE USED ON INDUCTIVE LOADS. (TYPICALLY, USE 1N4005)

NOTES: UNLESS OTHERWISE SPECIFIED

1. OUTPUTS ARE OPTICALLY ISOLATED FROM INDICATOR GROUND.

TOL. .X± .XX± .XXX± ANG.±	DATE 96-09-12	DRAWN P. MUELLER	CUSTOMER	SHEET 1 OF 1
DO NOT SCALE DRAWING	SCALE NTS	DESIGNED	SETPOINT OUTPUT MODULE RACK - TYPICAL WIRING	JOB NO.
WESTERN SCALE COMPANY LIMITED PORT COQUITLAM, B.C., CANADA		CHECKED		SIZE A / DRAWING NUMBER 111155 / REV. A
		APPROVED		

REVISIONS			
REV.	DESCRIPTION	DATE	APPD.

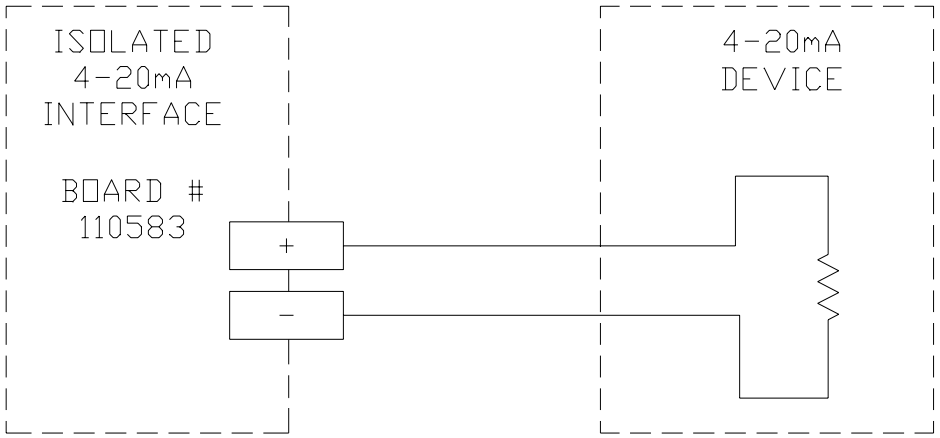


NOTES: UNLESS OTHERWISE SPECIFIED

1. INPUTS ARE OPTICALLY ISOLATED FROM INDICATOR GROUND.
2. EACH INPUT REQUIRES A SUPPLY CURRENT OF 10mA (5mA FOR 12V).

TOL. .X± .XX± .XXX± ANG.±	DATE 96-09-12	DRAWN P. MUELLER	CUSTOMER	SHEET 1 OF 1
DO NOT SCALE DRAWING	SCALE NTS	DESIGNED	JOB NO.	
WESTERN SCALE COMPANY LIMITED PORT COQUITLAM, B.C., CANADA		CHECKED	REMOTE INPUTS - TYPICAL WIRING	SIZE A / DRAWING NUMBER 111154 / REV. --
		APPROVED		

REVISIONS			
REV.	DESCRIPTION	DATE	APPD.
A	REDRAWN W/CHANGE. DCN# 501	96-09-16	



NOTES: UNLESS OTHERWISE SPECIFIED

1. THE OUTPUT IS ISOLATED FROM THE INDICATOR GROUND.
2. LOADS RANGING FROM 100 TO 500 OHM CAN BE DRIVEN.

TOL. .X± .XX± .XXX± ANG.±	DATE 96-09-13	DRAWN P. MUELLER	CUSTOMER	SHEET 1 OF 1
DO NOT SCALE DRAWING	SCALE NTS	DESIGNED	ISOLATED 4-20mA INTERFACE - TYPICAL WIRING	JOB NO.
WESTERN SCALE COMPANY LIMITED PORT COQUITLAM, B.C., CANADA		CHECKED		SIZE A / DRAWING NUMBER 111158 / REV. A
		APPROVED		

APPENDIX A

ASCII CONVERSION TABLE

HEX	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	0	@	P	`	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{
C	FF	FS	,	,	L	\	l	|
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
F	SI	US	/	?	O	_	o	DEL