# M5000

Service Manual

# INTRODUCTION

This publication is provided solely as a guide for individuals who have received METTLER TOLEDO Technical Training in servicing the METTLER TOLEDO product.

Information regarding METTLER TOLEDO Technical Training may be obtained by writing to:

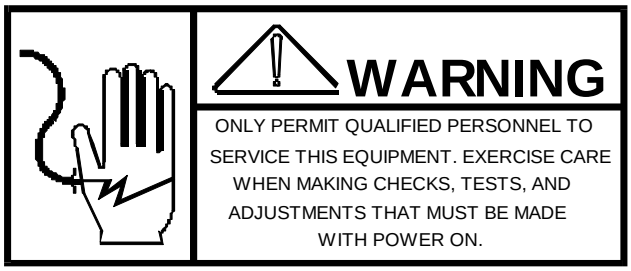
METTLER TOLEDO
Training Center
P.O. Box 1705
Columbus, Ohio 43216
(614) 438-4400

# PRECAUTIONS

- **READ** this manual before operating or servicing this equipment.


- **ALWAYS REMOVE POWER** and wait at least 30 seconds **BEFORE** connecting or disconnecting any internal harnesses. Failure to observe these precautions may result in damage to, or destruction of the equipment.

- **ALWAYS** take proper precautions when handling static sensitive devices.




- **DO NOT** connect or disconnect a load cell scale base to the equipment with power connected or damage will result.

- **SAVE** this manual for future reference.

- **DO NOT** allow untrained personnel to operate, clean, inspect, maintain, service, or tamper with this equipment.

- **ALWAYS DISCONNECT** this equipment from the power source before servicing.


- **CALL** METTLER TOLEDO for parts, information, and service.

# *CONTENTS*

# 1.0 GENERAL DESCRIPTION

The M5000 is a modular, computer controlled, electronic scale instrument for use with strain gauge load cels, providing a digital indication of their output. It is designed to provide the user with maximum application flexibility to satisfy most any requirement encountered in the weighing industry. Circuit design combined with a comprehensive inspection, quality control and testing program all contribute to making the M5000 a reliable trouble-free instrument.

The M5000 Scale Instrument is built using modular components which are packaged in several configurations. Three basic modules (printed circuit boards)(PCB) are used in the instrument: 1) keyboard display (KB/DSPY), 2) data processing unit (DPU), and 3) analog to digital (A/D). Each module board is free standing with its own serial communication channel.

All setup and calibration settings are entered via keyboard and retained in a non-volatile memory.

## 1.1 MECHANICAL CONFIGURATIONS

There are over (10) configurations of the M5000. They fall into two basic categories; self-contained instruments (see Fig. 1-1), and displays with remote electronics. (Fig 1-2)

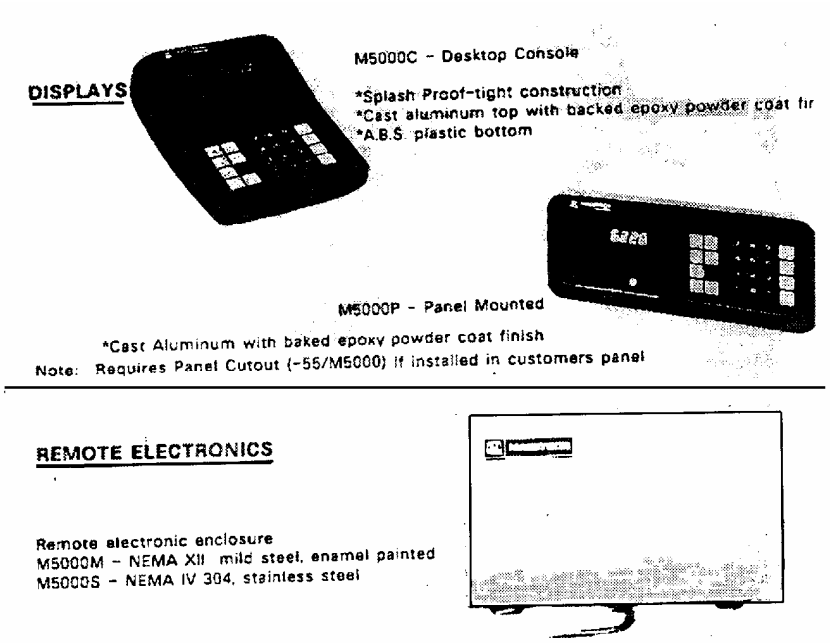



**Figure 1-2**

**Displays and Remote Electronics**

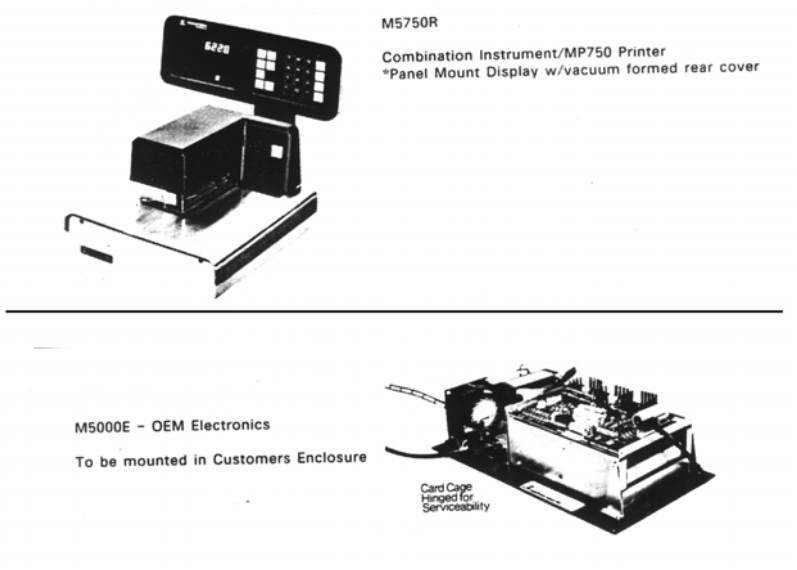
### 1.1.2 M5000 Displays w/Remote Electronics

M5000's can be configured by selecting any combination of (1) display with (1) remote Electronics (see Fig 1-2). The model numbers use a (2) digit suffix as follows:

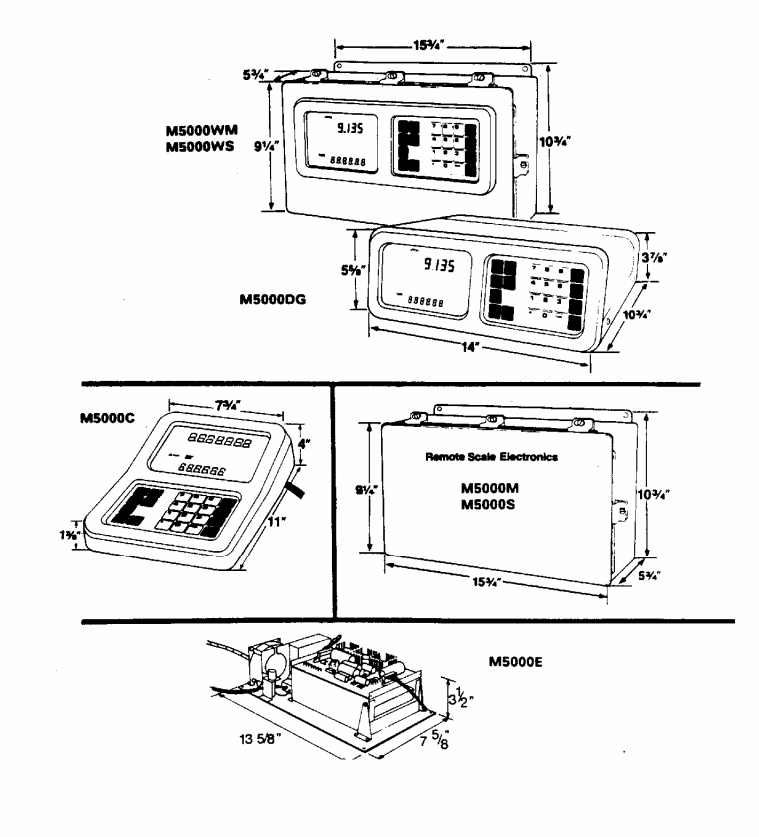
**EXAMPLE:** M5000XY; X = Display, Y = Remote Electronics

Possible Configurations:

**M5000CM**
**M5000CS**
**M5000PE**
**M5000PM**
**M5000PS**
**M5750RM**
**M5750RS**




**M5750R**
**M5000E - OEM Electronics**
**To be mounted in Customers Enclosure**




**M5000WM THRU M5000E**

**sEE BELOW**

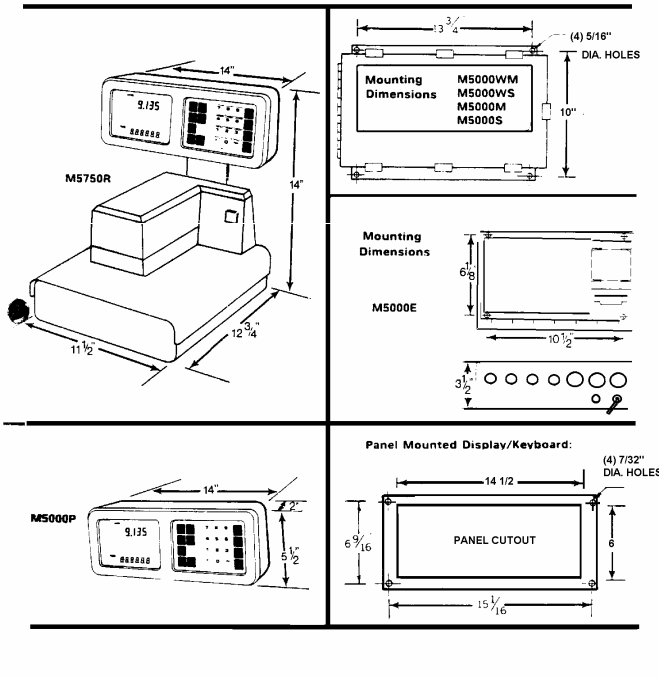



**Figure 1-3 Dimensions M5000**

## 1.2 SPECIFICATIONS

### 1.2.1 Analog Input

| | |
|---|---|
| Sensitivity: | .6uV/grad |
| Full Scale Range: | 30mV/45mV maximum jumper selectable |
| Input Filter: | Keyboard adjustable digital filter works in conjunction with analog filter to provide 1 to 10 Hz cutoff filter. |

### 1.2.2 Load Cell Excitation

| | |
|---|---|
| Voltage: | 15 volts |
| Drive: | up to (12) 400 ohm load cells |

### 1.2.3 Analog to Digital Conversion

Type: Auto zeroed, dual slope integrator, ratiometric reference

| | | |
|---|---|---|
| Resolution: | Internal | - 250,000 divisions @ 30 mV |
| | Maximum Displayed | - 50,000 divisions (20,000 dd NBS approved) |

Conversion Rate A/D: 10/sec.

Display Update Rate: From 1 to 255 A/D conversions can be averaged between display updates, giving display update rates of from 10 per second to 1 every 25 seconds.

**1.2.4 Calibration**

Digital; access through keyboard

**1.2.5 Accuracy and Stability**

Span temperature coefficient: 10mmp/ºC or better from -10ºC to 50ºC

Zero temperature coefficient: .1uVºC from 10ºC to 50º C

Linearity: .01% full scale

**1.2.6 Data I/O Interface**

Standard Output: (1) printer port, 20 ma ASCII; baud rate of 300, 1200, 4800

(3) continuous data output ports, 20 ma ASCII; baud rate of 4800

(1) bidirectional computer port 20ma ASCII; or RS232; baud rate of 300, 1200 or 4800

Optional Output: Analog Output

Digital I/O Port,

| 0-5V TTL: | INPUTS | OUTPUTS |
|---|---|---|
| | Remote tare | Motion |
| | Remote zero | SP7 |
| | Remote print request | SP8 |
| | Remote net/gross | |
| | Remote blank display | |
| | Remote print complete/inhibit | |
| | Remote Accumulated total; print and clear | |
| | Remote hold display | |

**1.2.7 Front Panel Displays**

**Type:** Main Display - 7 segment LED, .6” high, 7 digits

Tare Display - 7 segment LED, .3” high, 6 digits

**Under Zero:** Displays negative weight.
Selectable print inhibit.

**Overload** Displays---OL---and inhibits data output to printer.Adjustable form 80% to 110% of capacity.

**Annunciators:** Back lighted legends. NET, GROSS, TIME, lb, kg, Zero, *, TARE, DATE, Printer, ERROR, SETUP, Scale, Enter Data, Enter Code, Keyboard, Memory

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ERROR, SETUP, Scale, Enter Data, Enter Code, Keyboard Memory

**1.2.8 Power**

Input Voltage: Nominal 117/VAC, 230VAC, -15% +10% with ± 10% taps @ 126.5VAC, 103VAC, 253VAC and 207VAC.

Input Frequency: 50-60HZ

Power Drain: Maximum 50 watts, maximum 12 cells

Fuse: MDL 1/2 amp

**1.2.9 Environmental**

Operating Temperature -10ºC to 50ºC

Humidity: 10% to 95% relative humidity, non-condensing

**1.2.10 Physical**

Construction: (5) printed circuit boards (A/D, data processing unit, display driver, power supply, display)

Enclosure: NEMA I Desk Top, NEMA IV Wall Mount, NEMA IV Console

Size: Desk Mount - 14"W x 10"D, 5-1/2" H
Wall Mount - 16"w x 5-1/2"D, 9-1/2"H

Weight: 18 pounds Desk
31 pounds Wall

**1.2.11 Options**

**1.2.11.1 Setpoint Control**

The M5000 standard program provides (8) programmable setpoints. An optional, free-standing I/O module is required for setpoint operation (Model MD3015). Also available is a model MD3016 setpoint option with 2 outputs (SP7 and SP8) that connect directly to J1 of the M5000.

**1.2.11.2 Analog Output**

Internal PCB module with user choice output rante, voltage or current, gross, net or displayed weight, and isolated or non-isolated operation. Refer to analog output manual.

# 2.0 UNPACKING AND INSTALLATION

Upon opening the M5000 container, check that all parts are present and physically undamaged. The container should include the M5000 unit, a capacity strip, service manual, warranty form and option connectors, if ordered. In addition, panel mounting parts are enclosed, if ordered.

## 2.1 PHYSICAL INSTALLATION

Desk Mount - Unit simply rests on a table top.

Wall Mount - Flanges are provided to anchor unit to wall.

Display with Remote Electronics

• Refer to mounting dimensions to mount remote electronics

• J1 on Display/keyboard should be connected to J12 on the electronics module or OEM Chassis

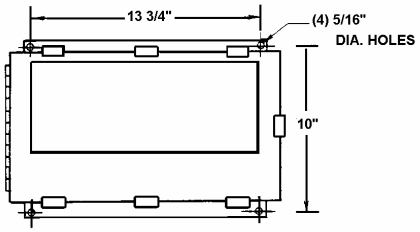



**Figure 2-0 Wallmount**
**Mounting Hole Dimensions**

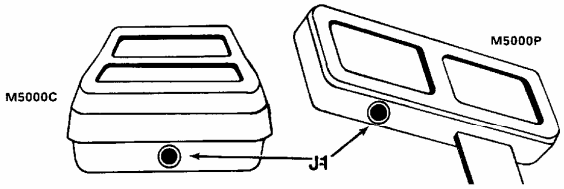



**Figure 2-1 M5000 Interface J1**

# 3.0 SETUP AND CALIBRATION

Figure 3-1 summarizes the setup and calibration routines.

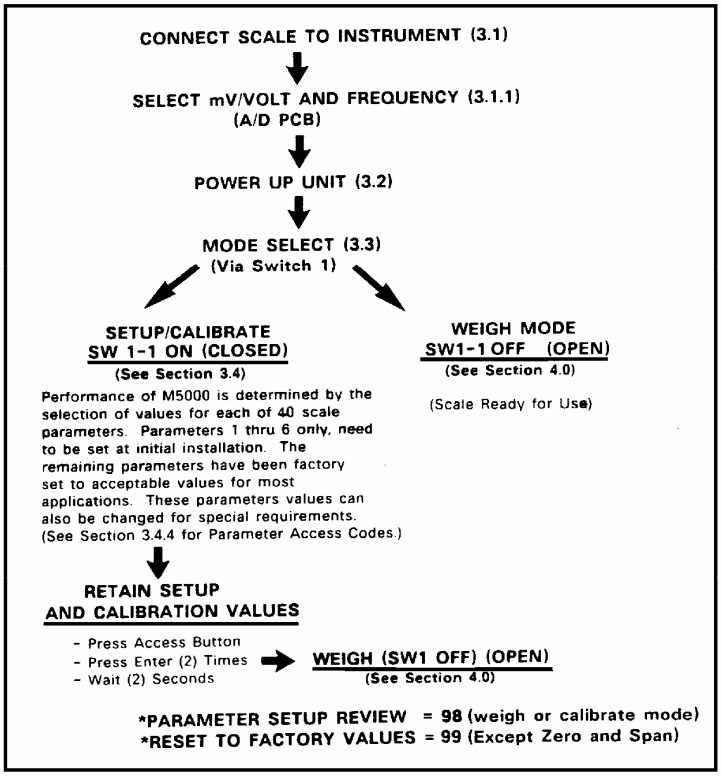



**Figure 3-1 Setup/Calibration Flow Chart**

## 3.1 LOAD CELL CONNECTOR

Pins designated for the load cell connector are as follows:

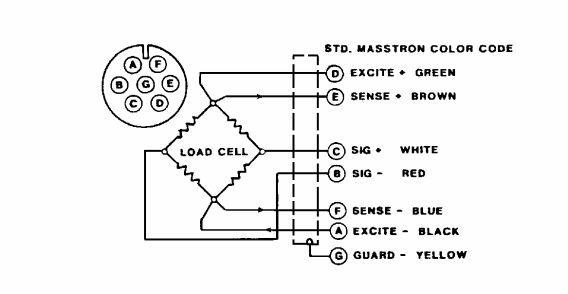



**Figure 3-2 Load Cell Connections**

If the load cell cable contains 4 wires only, connect as follows with jumpers:

Excitation (+) to Sense (+)
Excitation (-) to Sense (-)

### 3.1.1 mV/Volt Line Frequency Setup

There are 3 jumpers on the A/D board which allows for compatibility with different types of load cells and AC line frequency filtering.

In the 2mV/Volt position, the maximum full scale input is 30mV, and in the 3mV/Volt position, the maximum full scale input is 45mV. This jumper should be positioned based on the maximum full scale output that is expected from the cell. As an example, even though a 3mV/Volt cell is being used, if the full scale output will never exceed 30mV, better sensitivity can be obtained by leaving the jumper in the 2mV/Volt position.

The frequency is selectable 50 or 60 Hz via jumper JUI on the A/D PCB (see Figure 3-2-1). In addition, parameter 11 needs to be set in the setup mode.

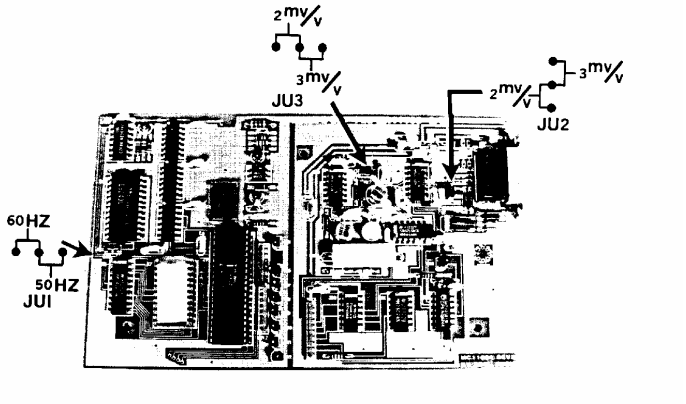
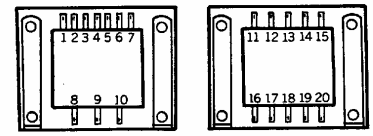



**Figure 3-2-1 mV/V /Frequency Jumpers on A/D PCB**

## 3.2 POWER UP

The M5000 requires an independent power line with a dedicated ground. Verify proper voltage levels before plugging unit in (see Figure 3-2-2). The display should light up after applying power. Allow 30 minutes warm-up time before beginning calibration.



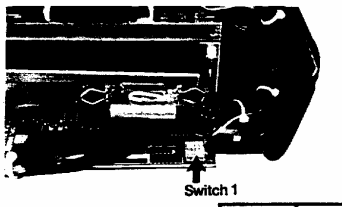

FOR 117VAC, LINE INPUT TO 1 and 2; JUMP 3 and 1 AND 4 and 2
FOR 126.5VAC, LINE INPUT TO 1 and 6; JUMP 3 and 1 AND 4 and 2 and 5
FOR 103.5VAC, LINE INPUT TO 1 and 8; JUMP 3 and 1 AND 4 and 2 and 7
FOR 230VAC, LINE INPUT TO 1 and 4; JUMP 2 and 3
FOR 252VAC, LINE INPUT TO 1 and 7; JUMP 2 and 3 AND 4 and 5
FOR 207VAC, LINE INPUT TO 1 and 5; JUMP 2 and 3 AND 4 and 7

**Figure 3-2-2 Transformer Taps**

## 3.3 OPERATING MODES: SETUP/CALIBRATION; WEIGH

The M5000 operates in one of two modes: Setup/Calibration or Weigh. These modes are selected via internal switch #1-1 (see Figure 3-3) on the DPU Board. All scale parameters that effect instrument performance and calibration are selected in the setup/calibration mode.

The weigh mode is for normal operation of the instrument and is discussed in detail in Section 4.0. Setup parameters can be viewed but not changed while in the weigh mode. View a parameter setting by pressing access, parameter #, then enter. Weight pushbutton returns to weigh mode.




| | SETUP/CALIBRATE | WEIGH |
|---|---|---|
| SW #1-1 DPU BOARD | ON (CLOSED) | OFF (OPEN) |

**Figure 3-3 Switch 1 on DPU PCB**

## 3.4 SETUP/CALIBRATION MODE

Performance of the M5000 is determined by the selection of values for each of 40 scale parameters. Parameters one through six only, need to be set at initial installation. The remaining parameters have been factory set to acceptable values for most applications. These remaining parameter values can be changed for special requirements. (See Section 3.4.4 for description of parameters).

The calibration of the M5000 is, in fact, performed during the setup procedure. Parameters 4 and 5 establish the zero and span of the instrument respectively.

Access codes are assigned to each setup parameter and are used to access the instrument memory for entering new or changing a setup parameter. The 40 access codes and parameters are summarized in Table 3-2. A complete description is found in Section 3.4.4.

| ACCESS CODE | PARAMETER | SELECTABLE VALUES | FACTORY SETTING |
|---|---|---|---|
| 0 | Save Setup Values | Press ENTER twice after all Parameters are set. | |
| 1 | Scale Capacity | 1 to 2,000,000 | 120,000 |
| 2 | Division Size | .00001 to 200 | 20 |
| 3 | Motion | 0 to 3 dd | 3 |
| 4 | Initial (Zero) | Push ENTER | NA |
| 5 | Scale Span | Enter weight on scale | NA |
| 6 | lbs/kg - cal. | 0 = kg; 1 = lb. | 1 |
| 7 | Display Update | 1 (fast) to 255 (slowest) | 4 |
| 8 | Filter Rate | 1 (100%) to .001 | 4 |
| 9 | Zero/Tare Motion | 1 or 3 dd | 3 |
| 10 | Over-capacity | 80% to 110% | 105 |
| 11 | Line Frequency | 0 = 50 Hz, 1 = 60 Hz (+set jumper on A/D PCB) | 1 |
| 12 | Zero Delta Band | 0 = 5 dd; 1 to 3 dd | 1 |
| 13 | Delta Bank T. Delay | 1 to 15 sec. | 4 |
| 14 | Zero Aperture | 0 to 125 dd | 60 |
| 15 | Low Pass Filter | 1 (OFF) to 20 (Hz) | 6 |
| 16 | Display Blank/On Motion | 0 = No Blanking; 1 = Blank | 0 |
| 17 | Neg. Print Inhibit | 0 = No Inhibit on Neg. | 1 |
| 18 | lb/kg Switching | 0 = Disable; 1 = Enable | 1 |
| 19 | Alternate Unit | Enter cal. Units/Alt. Unit | 0 |
| 20 | T & D Display | 0 = Disable; 1 = Enable | 1 |
| 21 | Date Format | 1 = US; 2 = Canada; 3 = Europe | 1 |
| 22 | T & D Print Location | 1 = Disable T & D Print<br>2 = T & D precedes weight line;<br>3 = T & D same line weight | 3 |
| 23 | Print Complete Check | 0 = Disable; 1 = Enable | 0 |
| 24 | Print Comp. T. Out | 0 to 10 sec. | 0 |
| 25 | Tare | 0 = Disable; 1 = Enable | 1 |
| 26 | Keyboard Tare | 0 = Disable; 1 = Enable | 1 |
| 27 | Tare Auto Clear | 0 = Disable; 1 = Enable | 1 |
| 28 | Tare Clear Interlock | 0 = Disable; 1 = Enable | 0 |
| 29 | Tare Motion Interlock | 0 = Tare w/motion; 1 = No Tare w/motion | 1 |
| 30 | Print Format | 1 = Single Line Weight<br>2 = Calculated Net Weight Option;<br>3 = G-T-N on Single Line;<br>4 = G-T-N on Three Lines<br>5 = Calculated Net wt option; and wt only | 1 |
| 31 | Min. Print Threshold | 0 = Disable; 1 to Scale Cap. | 0 |
| 32 | Double Width Print | 0 = Disable, 1 = Enable | 0 |
| 33 | Scale ID | 0 = Disable, 1 - 127 | 0 |
| 34 | Print Scale ID | 0 = Disable; 1 = Enable | 0 |
| 35 | Setpoint | 0 = Disable, 1 = Enable | 0 |
| 36 | Inhibit Print On Motion | 0 = Disable; 1 = Enable | 1 |
| 37 | Print lb/kg lower case | 0 = Print upper case<br>1 = Print lower case<br>2 = Inhibit printing all units and mode indicators | 1 |
| 38 | Accumulator/Consec. No. | 0 = Disable Accum/CN<br>1 = Enable Accumulator<br>2 = Enable CN | 0 |
| 39 | Zero Print Interlock | 0 = Disable, 1 = Enable | 0 |
| 40 | Line Feed | 0 = Lines to 10 lines | 0 |
| 98 | Parameter Setup Review | Prints all current values | NA |
| 99 | Reset Parameter | To factory setting | NA |

**Table 3-2 Setup Parameters**

### 3.4.1 Display Panel for Setup and Calibration

The weight displays and lighted legends are used in the calibration mode for operator prompting and displaying stored settings. (See Figure 3-4)

Gross Weight Display (upper) - stored parameter settings

Tare Weight Display (lower) - parameter access code

Lighted Legends

| | | |
|---|---|---|
| Set-up | - | Indicates M5000 is in setup mode (SWI-1 closed). |
| Enter Code | - | M5000 is ready for operator prompting to access a scale setup parameter |
| Enter Data | - | M5000 is ready for operator to retain the current parameter data (value) or enter new data. |
| Error | - | Blinks for 3 seconds if invalid data or code is entered. |

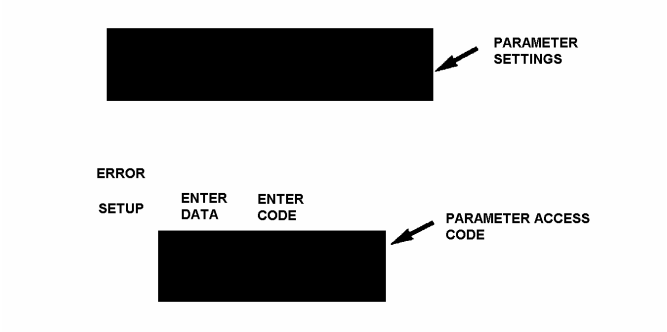



**Figure 3-4 Display Panel in Setup Mode**

### 3.4.2 Setup and Calibration Sequence

The M5000 setup and calibration parameters can be changed when in the setup and calibration mode. Table 3-2 shows all of the scale parameters along with access codes. Figure 3-5 depicts how to individually access parameters 1 thru 99 in the event that they must be changed.

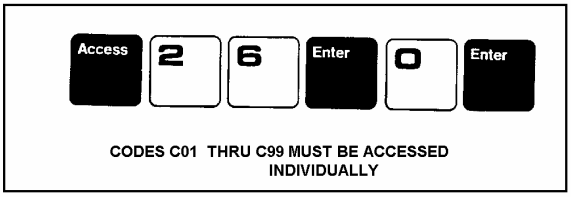
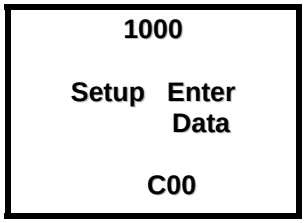


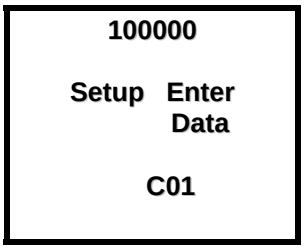

**Figure 3-5 Procedure for Accessing Parameter #26 (Keyboard Tare) and Then Disabling the Function (Inhibit Keyboard Tare).**

**Before exiting the calibration mode, the setup data must be saved by pressing the access button followed by the enter key twice.** This sequence indicates to the instrument that the setup procedure is complete and will cause the instrument to run through a calculation sequence to generate and store data required internally for the instrument to run (this takes two seconds). If this sequence is not performed the instrument will display an error 8 upon exiting the calibration mode. No data will be lost if this happens, and it can be corrected by re-entering the setup mode and pressing the access button followed by the enter button twice.

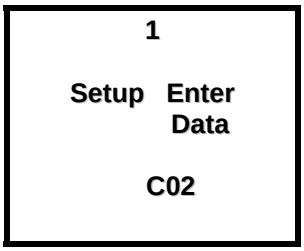
The following example and illustrations walks through an initial setup and calibration sequence step by step. In this example, we are calibrating a truck scale, 100,000 lbs by 20 lbs.



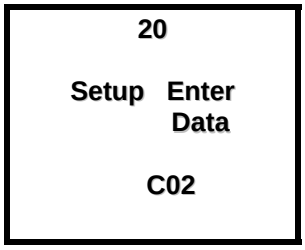

**A**. **C00** When switch 1-1 is closed on the DPU board to enter the setup and calibration mode, C00 (parameter - Save setup values) will always be displayed. To select the scale capacity parameter, press access, followed by entering (1) thru the numeric keyboard, then press enter. Refer to Fig. 3-5. The current capacity value will be displayed. If this value is acceptable, press enter to retain it. You can now select a new parameter to set..



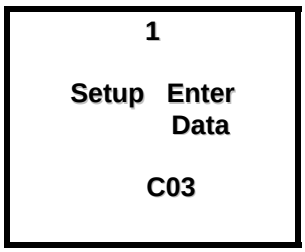

**B.** In our example, the capacity needs to be set to 100,000 lbs. Enter 100,000 thru the numeric keyboard and depress the enter button. 100,000 lbs full scale capacity is now retained. The bottom display automatically indexes to C00. Access parameter C02



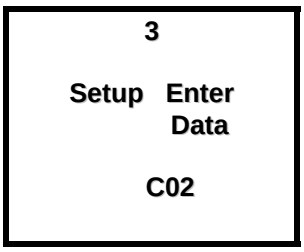

**C**. **C02** is the access code for the division size parameter. Again the upper display shows the current retained division size. To retain the current division size, simply press the enter button. In our example, the division size needs to be 20. See frame D.



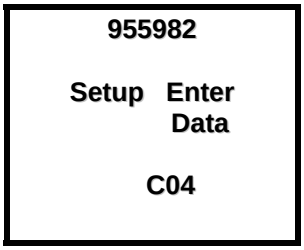

**D.** Select the value 20 via the numeric keyboard and depress enter. The new division size is now selected and retained in memory. The bottom display now returns to C00. Access Code C03 per figure 3-5.



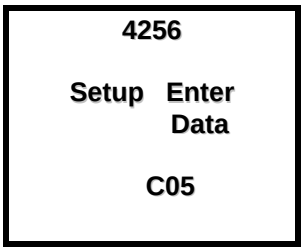

**E.** C03 is the access code for the motion parameter. The top display shows the current retained setting of one division .



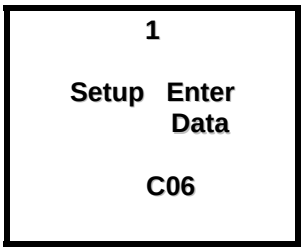

**F.** In our example, we want the motion parameter set to three divisions. Enter three via the numeric keyboard and depress the enter pushbutton. The motion parameter is now set and retained at three divisions. The bottom display returns to C00. Access Code C04.



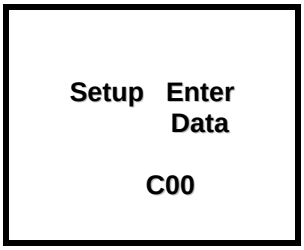

**GC04** is the access code for setting the initial weight (zero). The value displayed is a meaningless number. With the required initial weight on the scale only, depress the enter button. Note that after changing the weight on the scale, the scale and instrument must be allowed to settle for no less than 20 seconds before pressing the enter button. The M5000 automatically retains this weight as zero in memory. The bottom display returns to access code C00. Access code is C05.




**H.** **C05** is the access code for the scale span. The value initially shown is a meaningless number. Place the known test weights (it is recommended that at least 20% of the load cell capacity be used) on the scale platform. In this example, 20,000 lbs will be used. After the Value is selected depress the enter button. Note that after changing the weight on the scale, the scale and instrument must be allowed to settle for no less than 20 seconds before pressing the enter button. The scale is now linearly calibrated from zero to full scale. The bottom display returns to C00. Access Code C06.




**I.** **C06** is the access code for LBS/KG calibration. (1) equals calibration in pounds; (0) equals calibration in kilograms. In our example, the truck scale was calibrated in pounds, so enter (1) one and depress the enter button. The bottom display automatically increments to C00.




**J.** C00 is the access code for the parameter, save setup values. At this time, if any other scale parameter is to be changed, it must be accessed individually per Figure 3.5. After all parameters are set, press access, and then press enter twice. Before going to step K the bottom display should read C00, while the top should be blank.

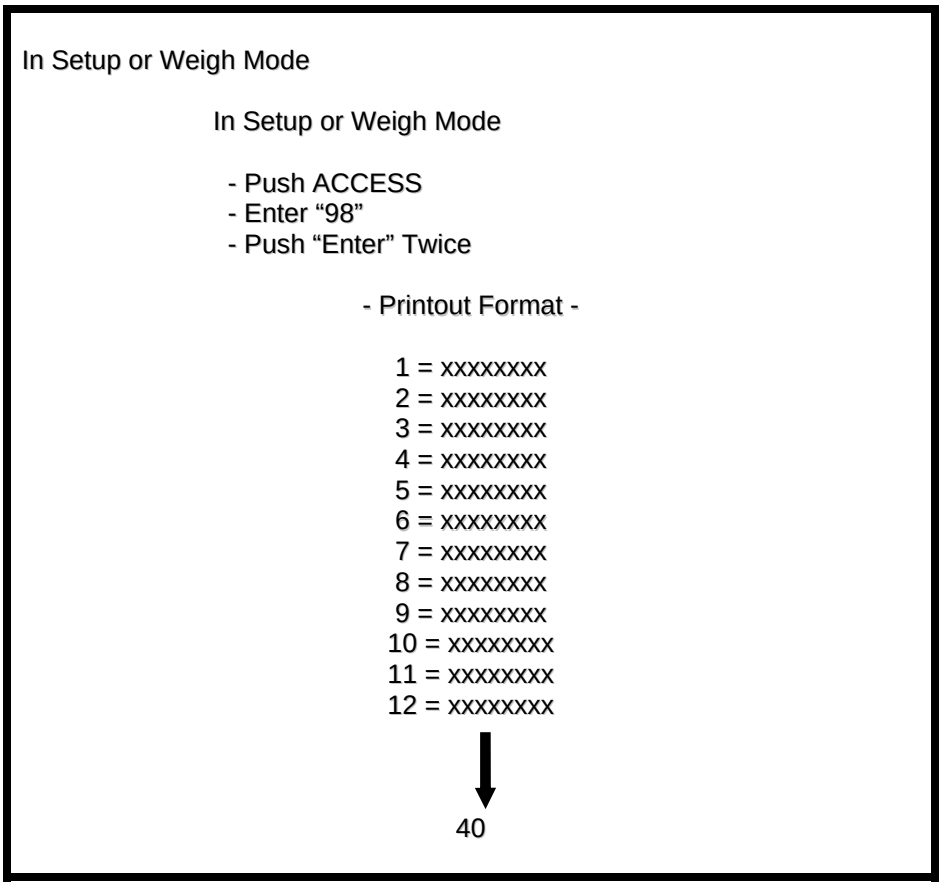
**K.** **WAIT (2) SECONDS** before returning to the weigh mode (switch 1-1 off).

Note: after entering access code 0, the instrument will take approximately 2 seconds to preserve all of the calibration data. If the calibrate switch (1-1) isturned off within this 2 second period, an error code of 2 will appear in the main weight display, indicating the calibrate data is not correct. Should this occur, re-enter the calibrate mode and save the data again by pushing the ACCESS button, followed by pushing the ENTER button twice. Wait 2 seconds before turning the calibrate switch off.

If the calibrate switch is turned off without saving the calibration data (by entering access code 0), an error message 8 will appear in the main display. Should this occur, re-enter the calibrate mode and save the data by pushing the ACCESS button followed by the ENTER button twice.

### 3.4.3 Parameter Review and Printout

If the M5000 instrument is connected to a printer, a list of access codes and current parameter settings can be printed for quick review (see Table 3.3).




### 3.4.4 Access Codes - Parameter Description

The following is a detailed list of all setup parameters. This list is set up in the following format:

**Access Code = Parameter Name** - Description

- Data to be entered
- Allowable range
- Factory setting
- Notes

**IMPORTANT: Access Code 0, "SETUP DATA SAVE," Must be Entered After All Other Parameters Have Been Set and Before Exiting the Setup/Calibration Mode.**

0 = Setup Data Save - Retains current or newly entered data in memory.

Enter: Press ENTER TWICE to retain data.

Note: Setup data save parameter must be entered after all parameters have been setup. After initiating this parameter, and waiting 2 seconds the scale mode switch can be turned off to return to weigh mode. If this is not done, an ---8--- will be displayed while in weigh mode.

1 = Scale Capacity - Rated capacity of the scale.

Enter: Capacity
Range: 1 to 2,000,000
Factory Setting: 120,000
Note: Enter scale capacity in same units that scale is calibrated in.

2 = Division Size - Smallest change in weight that the instrument will be able to lindicate.

Enter: Division size, including decimal point
Range: .00001 to 200
Factory Setting: 20

3 = Motion Detection Threshold - Number of divisions change that must occur between two successive display updates for an in-motion detection to be registered. Once an in-motion condition has been registered, a no-motion condition will not be registered until the display is stable within the motion detect threshold for the number of display updates as determined by parameter 15. That is, if parameter 15 is set for 5, then the display must be stable within the motion detect threshold for 5 display updates before a no-motion condition is registered.

Enter: Number of division
Range: 0 to 3
Factory Setting: 3
Note: 0 Entry will disable the motion detection feature.

4 = Acquire Dead Load - Weight will be stored as dead load. Allow scale to settle 20 seconds before pushing ENTER.

Enter: Push “ENTER” button
Note: 10 A to D conversions will be averaged before storing.

5 = Scale Span Data - Weight in calibration units that is currently on the scale will be used to span the instrument. Allow 20 seconds of settle time before pushing ENTER.

Enter: Weight on scale
Range: Up to scale capacity
Factory Setting: None
Note: 10 A to D conversions will be averaged before storing

6 = Calibration Mode; Pounds or Kilograms - This parameter defines whether the scale is to be calibrated in pounds or kilograms.

Enter: 0 = Kilograms mode
1 = Pounds mode
Factory Setting: 1
Note: The instrument will always power up in the mode it is calibrated in.

7 = Display Update Rate: - This parameter controls the averaging as the number entered relates to the number of A/D conversions that are averaged together before being displayed. 1 = fastest update; 255 = slowest update.

Enter: Units of A to D conversions per update

Range: 1 to 255 conversions per display update

Factory Setting: 4

Note: All A to D conversions between display updates will be added together and divided by the number of conversions to produce an average before it is displayed.

Note: The time between display updates will be determined by the combination of the number of A to D conversions per update, and the number of A to D conversions per second.

8 = Exponential Filter Rate - This number helps determine the digital filtering applied to the digital weight data. This parameter works in conjunction with parameter number 15 to allow field adjustable, selective dampening of the scale reading. Parameter 15 determines when the dampening,or filtering is in effect, and parameter 8 determines the amount of filtering or dampening. The lower number entered for parameter 8, the more dampening will take place.

Enter: Number corresponding to the amount of dampening required to stabilize the scale. Entering a 1 will disable the dampening, and entering a .001 will apply the maximum dampening.

Range: .001 through 1

Factory Setting: .4

9 = Digital Zero + Tare Motion Detect Range - This parameter defines band width of motion in which the digital zero function + tare will work. Once an in-motion condition has been registered, a no-motion condition will not be registered until the display is stable within the motion detect threshold for a number of display updates as determined by parameter 15. That is, if parameter 15 is set for 5, then the display must be stable within motion detect threshold for 5 display uupdates before a no-motion condition is registered.

Enter: 1 to 3 divisions

Factory Setting: 3

Note: The digital zero function and tare will be disabled until a no-motion condition is detected.

10 = Overcapacity Display Blanking Point - This is the weight in percentage of capacity at which the display will blank out because of an overcapacity condition.

Range: 80 to 110 percent

Factory Setting 105 percent

Note: OL, for overload, will be indicated

11 = 50/60 HZ - Line Frequency Setting

Enter: 0 for 50 HZ; 1 for 60 HZ

Factory Setting: 1

Note: Filter jumper on A/D Board must also be changed.

12 = Automatic Zero Maintenance, Delta Band - This Parameter defines the dead band in which auto zero maintenance will track zero changjes.

Enter: Dead band in number of divisions
Range: 0 to .5 divisions; 1 = 1 divisions, 2 = 2 divisions; 3 = 3 divisions
Factory Setting: 1

13 = Auto Zero Maintenance, Delta Band Time Delay - This parameter defines the length of time the scales reading must stay within the delta band before it can be tracked off.

Enter: Time in seconds
Range: 1 to 15
Factory Setting: 4

14 = Auto Zero Maintenance, Aperture - This parameter defines the total number of divisions that can be tracked off.

Enter: Number of divisions
Range: 0 to 125 divisions
Factory Setting: 60
Note: Entering 0 disables ZMA.

15 = Exponential Filter Cut Off Point - This parameter, in conjunction with parameter 8, determines the characteristics of the digital filtering or dampening of the scale readout. This parameter will determine when the exponential filter (parameter 8) is in effect. The intent of the exponential filter is that it is to be only in effect when the scale is at or approaching its target value, and not to be in effect when the scale is in motion. If a number of scale readings are obtained that show the weight on the scale continuously changing in the same direction, it is assumed that the scale is not at or approaching its target value an thus the exponential filter is disabled. Parameter 15 defines the number of readings (A/D conversions) that the instrument must see changing in one direction (that is, one reading goes up, and the next reading goes down, or vice versa) then the exponential filter will be put into effect and any further weight changes will be dampened per the setting of parameter 8.

As an example, let's assume parameter 15 was set to be 5, and the scale had no load on it. Assume due to mechanical vibrations the raw scale reading was oscillating plus or minus one graduation. In this situation, the exponential filter (parameter 8) would be applied to the raw reading to generate a dampened display reading. If a load was then placed on a scale, the reading would start to increase. Once the instrument detected 5 readings (equal to parameter 15) that all increased, the exponential filter would be disabled until the scale reading stopped increasing.

Enter: Cut off point of exponential filter. Entering a 1 will disable the filter totally, and entering a 10 will keep the filter in effect until 10 readings changing in the same direction have occurred. Numbers can be entered between 1 and 20 to allow finer adjustment of the filter.

Note: This parameter also controls the motion detector (see parameter 3).

Range: 1 through 20.

Factory Setting: 6

16 = Display Blanking On Motion, Enable/ Disable - This parameter will allow blanking of the display when scale is in motion, as defined by the motion detection threshold.

Enter: 0 - no display blanking
1 - display blanking on motion
Factory Setting: 0

17 = Print Inhibit When Scale is Negative, Enable/Disable This parameter allows printing to be inhibited when the scale goes below gross 0.

Enter: 0 - printing can occur though scale is below zero
1 - printing is inhibited below zero
Factory setting: 1

18 = LB/KG Button, Enable/Disable - This parameter allows the pounds/kilogram switching functions to be disabled.

Enter: 0 - to disable; 1 - enables function
Factory Setting: 1

19 = Alternate Display Units - This parameter defines a display unit that will replace either pounds or kilograms in the instrument - example: tons.

Enter: The number of calibrated units per the new unit.
Example: If the instrument was calibrated in pounds the Alternate Display Unit was to be tons, with 2,000 pounds per ton, enter 2,000.

Range: Limited by display capacity and minimum and maximum graduation size. The instrument will attempt to calculate a comparable grad size for the new display unit, keeping the approximate resolution of the scale the same. If the conversion factor is such that a comparable grad size cannot be calculated, then the instrument will automatically disable the lbs/kg button.

Note: 0 disables alternate display units.

Note: Parameter can be less than 1.

Note: Parameter 37 must be set to 0 or 1 for proper operation

Note: If the instrument was calibrated in pounds, this factor will replace the kilograms, and vice versa.

Note: "*" will be displayed when displaying alternate units.

20 = Time and Date Fprmat Selection - This parameter allows selection of 3 different time and date formats, to accommodate different standards.

Enter: 1 = month/day/year (United States)
2 = year/month/day (Canada)
3 = day/month/year (Europe)
Factory Setting: 1

22 = Time and Date Printer Location - This parameter allows enabling of time and date printouts on the printer, and the location of the time and date on the printed ticket.

Enter:
1 - to disable time and date printing
2 - time and date will be printed on the line preceding the weight data
3 - time and date will be printed on the same line and to the right of the weight data

Factory Setting: 3

Note: Certain other printing formats will cause inherent conflicts with the place that the time and date are printed, and this option may be overridden at the time printing takes place if time and date cannot be located where it is requested.

2 = Print Complete Check, Enable/Disable - This parameter allows enabling or disabling the print complete signal check. If enabled, the instrument, after issuing a print command, will check the print complete signal from the printer to make sure it changes state twice to insure that the printer did complete printing. If this parameter is enabled, the instrument will reject any print command while the print complete signal from the printer is in the busy state.

Enter: 0 to disable; 1 to enable feature

Factory Setting: 0

24 = Print Complete Time Out - This parameter defines the time in .5 seconds that the instrument will wait after issuing a print command for the printer to indicate that it has completed printing. If the printer does not issue a print complete signal during this time period, then an "error printer" message will be displayed on the readout. If parameter 23 is disabled, then the instrument will use this parameter as a time delay between prints, giving the printer time to cycle. Any print commands will be rejected during this time period. Note also that weight and display updating is frozen during this time period.

Enter: Tiime in .5 seconds

Range: 1 to 5 seconds

Factory Setting: 0

25 = Tare Feature, Enable/Disable - This setting allows the tare feature to be disabled.

Enter:
0 - disable all tare features
1 - enables tare

Factory Setting: 1

26 = Keyboard Tare, Enable/Disable - This setting allows the keyboard tare feature to be enabled or disabled.

Enter:
0 - disables keyboard tare function
1 - enables keyboard tare function

Factory Setting: 1

27 = Tare Auto Clear, Enable/Disable - This parameter allows enabling a feature where once the scale value has stabilized at a weight above 10 divisions and then returns to zero, the existing tare will automatically be cleared.

Enter:
0 - to disable feature
1 - to enable tare auto clear

Factory Setting: 1

Note: Whether the scale is stable or not will be determined by the no-motion condition as defined by the motion detection threshold.

28 = Tare Interlock, Enable/Disable - This parameter allows enabling a feature where the tare value can only be changed or cleared when the scale is at 0.

Enter: 0 - to disable feature
1 - to enable tare clear interlock
Factory Setting: 0

29 = Tare Motion Interlock, Enable/Disable - When this feature is used, tare weight entry is inhibited when the scale is in-motion.

Enter: 0 - tare weights can be entered when there is motion.
1 - tare weights inhibited with motion
Factory Setting: 1
Note: A motion condition will be determined by the digital zero motion detect range.

30 = Printer Output Format - This allows selecting 1 of 5 weight output formats.

Enter: 1 - single line of weight will be printed when print button is pushed
2 - calculated net weight option
3 - gross/tare/net weight output when print button is pushed - printed on single line.
4 - gross/tare/net weight is printed on 3 separate lines
5 - calculated net weight option and weight only

Factory Setting: 1
Note: See Sec. 4.4 and 4.5 for explanation of calculated net/gross/tare printouts.

31 = Minimum Print This parameter allows setting a value below which the printer will not print.

Enter: Weight in calibration units
Range: 1 division to scale capacity
Factory Setting: 0
Note: Entering a 0 disables this feature.

32 = Double Width Print Enable/Disable - Entering a 1 for this option will enable double width printing on a Masstron Ticket Printer. Enabling this feature will allow the weight only of a printout to be printed in large figures. This feature is automatically inhibited if gross/tare/net printouts on a single line has been selected.

Enter: 0 - to disable
1 - to enable
Factory Setting: 0

33 = Scale ID - This parameter assigns an ID number to the scale which must be included in all communications over the computer port. This will allow daisy chaining many instruments into one current loop with a computer, and allow the computer to individually address the instruments. A code of 0 - 127 can be entered. The ID transmitted can be found in Table 5-6, page 46. This ID can also be printed on the printer (see parameter 34).

Enter: Desired scale ID number
Range: 0 to 127
Factory Setting: 0
Note: If ID is entered as 0, it will be disabled.

34 = Printing of Scale ID, Enable/Disable - This parameter allows the scale ID, if entered, to be printed on the printer preceding all printouts.

Enter: 0 -to disable
1 - enables scale ID printing
Factory Setting: 0

35 = Setpoints, Enable/Disable - Enable setpoint program for use with remote I/O module.

Enter: 0 - setpoint option off
1 - setpoint option on
Factory Setting: 0

Note: Must be enabled to use stored tare values.

36 = Print On Motion, Enable/Disable - This parameter allows enabling a feature which will inhibit printing when the scale is in motion.

Enter: 0 - printing allowed when scale is in motion
1 - printing inhibited when the scale is in motion
Factory Setting: 0

37 = Print lb/kg in Lower Case, Enable/Disable -

Enter: 0 - Weight units are printed in upper case letters
1 - Weight units are printed in lower case letters
2 - G-T-N indicators are not printed
Factory Setting: 1

38 = Accumulator/ Consecutive Numbering Enable/Disable - Allows Accumulator or Consecutive numbering to be used.

Enter: 0 - disables both Accumulator and consecutive numbering
1 - enables Accumulator only
2 - enables Consecutive Numbering only
Factory Setting: 0
Note: Accumulator and Consecutive Numbering Cannot be used simultaneously. (See Section 4.7 and 4.8 for detailed operation).
Note: ***If expanded print and consecutive numbering are enabled, and time and date are to be on the same line, They will not fit.***

39 = Zero Print Interlock, Enable/Disable - When enabled, only 1 print will be allowed when the scale weight is above 10 graduations. Another print will not be allowed until the scale weight stabilizes at no motion below 10 graduations. No motion is determined by parameter 9.

Enter: 0 - to disable
1 - to enable

Factory Setting: 0

| | |
|---|---|
| 40 = Line Feeds Between Print Lines | This parameter controls the number of line feeds that will be sent to the printer between each printed line. When combined with printer options such as auto line feed and the number of lines/inch, customer formatting of printed tickets is possible |
| | • If the printer being used has a buffer which will allow data to be sent to it faster than it can print (such as the MP750), then it is suggested that the print complete check be disabled (#23=0), and the print timer be set to 0 (#24=0). This will allow maximum printing speed as there will be no time delay between transmission of the line feeds. |
| | • If the printer does not have a buffer then the print complete signal must be wired to the instrument, or the print timer set so time is given for the printer to cycle. The print timer is adjustable in .5 second increments (#24), that is if parameter 24 is set to 3, then there will be a 1.5 second delay between each line of data sent to the printer (and between each line feed if parameter 40 is not 0). |
| Note: | A minimum of 1 line feed is always sent to the printer. This parameter controls the number of additional line feeds over and above this one. |
| Enter: | 0 - 10 (0 - 0 line feed; 10 = 10 line feeds) |
| Factory Setting: | 0 |
| 98 - Parameter Setup Review - | This parameter outputs all current parameter setup values by access code when interfaced with a 20 ma current loop ASCII printer. |
| | • Push ENTER twice after displaying Code 98 to printout current setup values. |
| 99 = Reset to Factory Settings | This parameter resets all the parameter settings to factory status. |
| | • Push ENTER after displaying Code 99 to reset all parameters to factory settings. |
| Note: | Parameters 4 and 5 (initial and span) will not be changed by entering this parameter. |

## 3.5 ANALOG TO DIGITAL CONVERTOR AND ANALOG LOW PASS FILTER

The M5000 has an analog section shielded from RFI with a metal can. Its output is transmitted to the DPU (digital processing unit) via digital data. The A/D assembly has been revised several times since the advent of the M5000 scale indicator. See figure 3-6 for data regarding the different versions/revisions of the A/D assembly.

| A/D Analog Assembly | PCB (inside can) | Application Suitability: Standard 15V exc. | R Stahl Barriers | Toledo HAP* Module | Filter Procedure |
|---|---|---|---|---|---|
| MB10018 all rev. | MA11109 up to rev D | YES | YES | YES | no filter |
| MN10069 up to rev E | MA11109 rev E-J | YES | YES | YES | procedure 1 sect.3.5.2.1 |
| MN10069-F | MA11318 up to rev D | YES | YES | YES | procedure 2 sect. 3.5.2.2 |
| MN10069-G | MA11383 up to rev C | YES | NO | NO | procedure 3 sect. 3.5.2.3 |
| MN10069- rev H-J | MA11383 rev D-E | YES | YES | YES | procedure 3 sect. 3.5.2.3 |
| TN000104 | TN000103 all rev | NO | YES | YES | procedure 3 sect. 3.5.2.3 |

**Figure 3-6**

***Note: Use of the Toledo HAP module requires reduced excitation voltage power supply (part number 90064500A) in the M5000 Indicator, see section 3.5.1.5 of this manual.**

### 3.5.1 A/D PRINTED CIRCUIT BOARD JUMPER DESCRIPTIONS

#### 3.5.1.1 MA11109 PCB Assembly

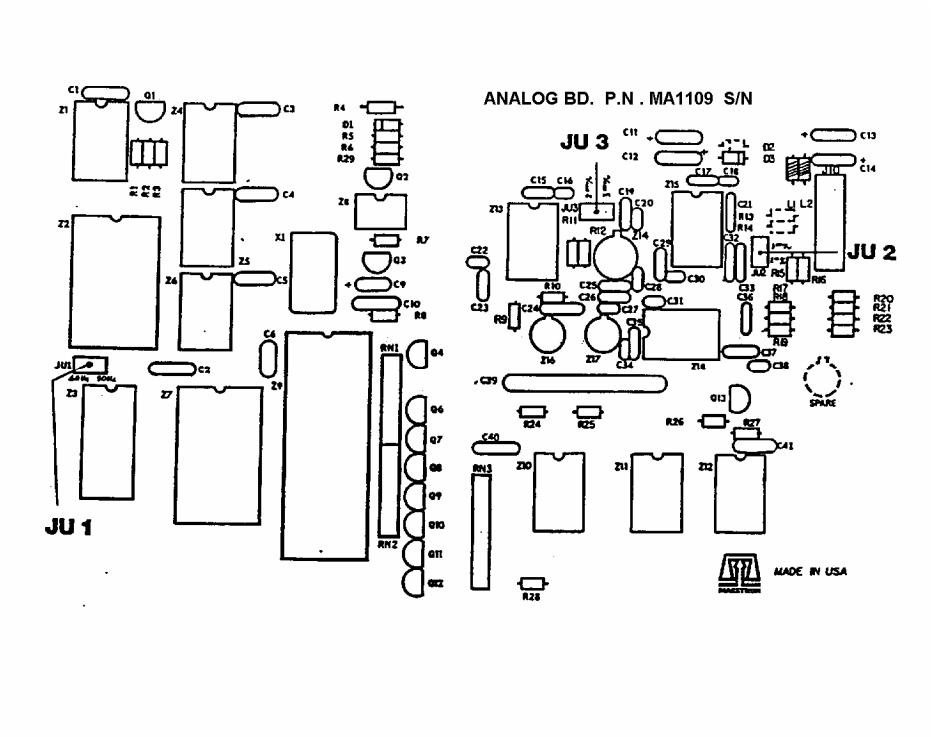



**Figure 31A**

There are 3 jumpers on the MA11109 A/D PCB which allow for compatibility with different types of load cells and AC line frequency filtering.

| | |
|---|---|
| JU1 | 60/50 HZ |
| JU2, JU3 | 2mV/3mV (both must be set the same) |

When the JU2 qnd JU3 jumpers are in the 2mV/Volt position, the maximum full scale input is 30mV, and in the 3mV/Volt position, the maximum full scale input is 45mV. These jumpers should be positioned based on the maximum full scale output that is expected from the cell. As an example, even though a 3 mV/Volt cell is being used, if the full scale output will never exceed 30mV, better sensitivity can be obtained by leaving the jumpers in the 2mV/Volt position.

The frequency is selectable 50 HZ or 60 HZ via jumper JU1 on the MA11109 A/D PCB. In addition, parameter 11 needs to be set in the setup mode.

### 3.5.1.2 MA11318 PCB Assembly

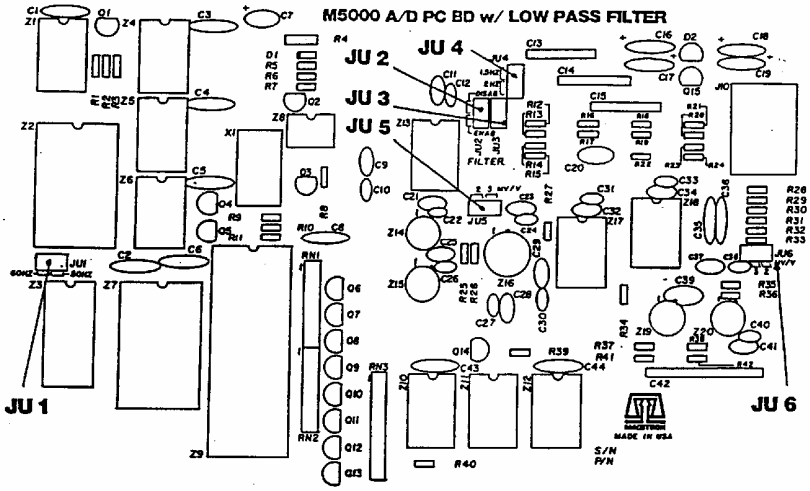



Figure 31B

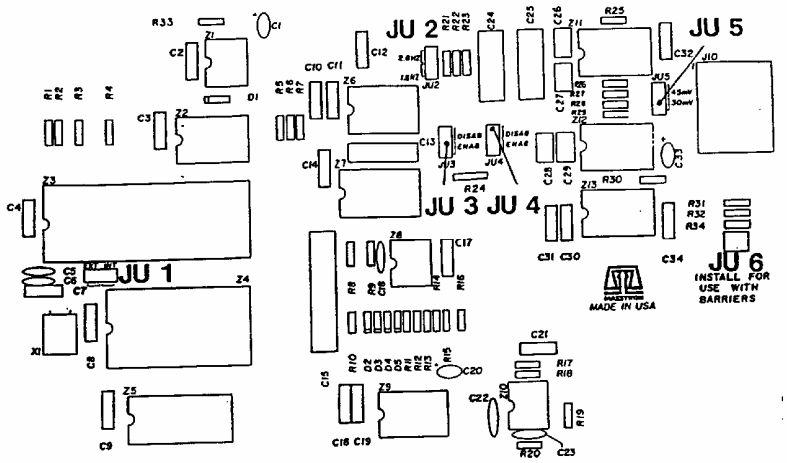
There are 6 jumpers on the MA11318 PCB, configurable as explained below.

| | |
|---|---|
| JU1 | 60 HZ/50 HZ |
| JU2, JU3 | filter enable (see sect. 3.5.2.2) |
| JU4 | filter rate (see sect. 3.5.2.2) |
| JU5,JU6 | 2mV/3mV (both must be set the same) |

The AC line frequency is selectable 50 HZ OR 60 HZ via jumper JU1 on the MA11318 A/D PCB. In addition parameter 11 needs to be set in setup mode.

In the 2mV/Volt position, the maximum full scale input is 30mV, and in the 3mV/Volt position, the maximum full scale input is 45mV. These jumpers should be positioned based on the maximum full scale output that is expected from the cell. As an example, even though a 3mV/Volt cell is being used, if the full scale output will never exceed 30mV, better sensitivity can be obtained by leaving the jumpers in the 2mV/Volt position.

### 3.5.1.3 MA11383 PCB Assembly




There are 6 jumpers to be configured (see below).

| JUMPER | | |
|---|---|---|
| JU1 | Ext/Int. | Must be set to Ext |
| | EXT | Factory setting via trace on the back of the pcb. |
| | IN | Not used |
| JU2 | Low pass filter rate select jumper. (JU3 & JU4 must be set to enable position). | |
| | 1.8 Hz filter frequencies higher than 1.8 hertz | |
| | 2.8 Hz filter frequencies higher than 2.8 hertz | |
| JU3, JU4 | Analog filter select. Two position jumpers to enable/disable the analog filtering of the scale analog load cell signal. | |
| | BOTH ENABLED | Enable Filtering |
| | BOTH DISABLED (or removed) | Disable Filtering |
| JU5 | Gain adjustment select. Set in accordance with the maximum output of the scale/load cell system. | |
| 30 mv | Use if maximum output of the scale/load cell system is 30fmv or less. Use if barriers are installed and the load cells are 2mv/V or 3mv/V. Use if Toledo HAP module is installed and the load cells are 2mv/V or 3mv/V. (see note on page 31) | |
| 45 mv | Use this setting if the maximum output of the scale/load cell system exceeds 30 mv. | |
| JU6 | Sense voltage reference select. | |
| INSTALLED | Using R Stahl barriers or the Toledo HAP module. (see section 3.5.1.5 of this manual) | |
| REMOVED | Using the standard 15v excitation without barriers. | |

### 3.5.1.4 RB000103 PCB Assembly

Jumper descriptions are the same as for MA11383, except that Jumper JU6 must always be installed.

### 3.5.1.5 Use of Toledo Scale HAP Module

Use of the Toledo Scale HAP module (model 0901-0148 U.S. and 0901-0197 Canada), requires a reduced excitation voltage (5 VDC) power supply (part number 90064500A) lin the M5000 indicator. M5000 indicators that are compatible with the Toledo Scale Hazardous Area Protection module can be identified by the letter "H" in the model number.

Caution: The standard M5000 power supply (part #MA11108) has an excitation voltage of 15 volts and will destroy the HAP fuse module part number 11906900A if the load cell connections are made between the indicator and the HAP module.

M5000 indicators using R Stahl barriers for hazardous area load cell applications will use the standard M5000 power supply (part number MA11108) with a 15 volt excita tion.

Installation instructions for the Toledo Scale Hazardous Area Protection module are given in document number 11816400A and drawings 103997 and 103998.

### 3.5.2 Analog low pass filter setup procedures

(ref. figure 3-6 for applicable A/D assemblies)

### 3.5.2.1 Filter procedure #1

The analog low pass filter works in conjunction with the tunable digital low pass filter to allow optimum adjustment for response time and filter characteristics of the scale. The filter is a small printed board located on top of the A/D board in the area around the connector. A 1.5 HZ/2 HZ jumper is provided on the low pass filter to select two different filtering characteristics. The analog low pass filter is a 3 pole passive type filter. Each of the poles are configured to have a slightly different 3 DB cut off frequency. The last pole, which as a 1 HZ 3 DB cut off frequency, can be selected in or out of the circuit by using the jumper located on the filter. With it removed from the circuit, settling time will be faster, but also less filtering will take place. With the last pole lin the circuit (the jumper in the 1.5 HZ spot), the filter will have a 3 to 4 second settling time depending on the micro-volt build. The setup of the M5000 filtering is an experimental process to obtain the best combination of settling time and stability. The following steps should be followed:

1) Scale must be calibrated.

2) Disable the digital filtering by setting parameters 7, 8, and 15 to 1.

3) Tune the analog low pass filter by moving the jumper between the two available positions on the filter until the best combination of settling time and stability is achieved.

4) Adjust the digital averaging (parameter 7) until it also provides the best combination of settling time and filtering. The larger that parameter 7 is made, the more filtering will take place, but also the longer the scale will take to settle.

Adjust the digital filter (parameter 8 & 15) to achieve the best stability. Parameter 15 should not be set to anything less than 4, lower values of parameter 15 may allow printing before scale motion has truly stopped.

The tuning of parameters 8 and 15 is also an experimental process. A good starting point is to set parameter 8 at .1(0.1), and parameter 15 at 6. The smaller parameter 8 is made the more dampening will take place, and the larger parameter 15 is made, the lower the frequency at which dampening will start to take effect. There is some small interaction between these two.

For example, changing parameter 8 will change the effect of parameter 15 slightly, so experiment with these until the optimum filtering is obtained. In general, not much is gained by making parameter 8 smaller than .01, or parameter 15 greater than 10.

If tuning these two parameters does not remove the remaining vibrations, the analog filter may have to be adjusted for greater filtering by moving the jumper, or the digital averaging (parameter 7) may have to be increased.

#### 3.5.2.2 Filter procedure #2

Procedure is the same as procedure #1 except as follows:

1) Scale must already be calibrated.

2) Disable the digital filtering by setting the M5000 parameter 7, 8 & 15 equal to 1.

3) On the A/D assembly set JU3 & JU4 jumpers to enable.

4) Tune the filter by placing the JU2 in the 2.8 Hz position, then in the 1.8 Hz position to determine which position provides the best stability for the scale. Leave the JU2 jumper lin the desired position.

5) Determine the amount of jitter, i.e., “number of graduations of instability” of the scale.

6) Set parameter 15 (filter cutoff point) equal to 1 graduation more than the maximum jitter.

7) Adjust parameter 8 (digital filter fate) for the best stability.

8) Set parameter 7 (display averaging) to average out any remaining jitter, but don’t set it so high that the display becomes too slow for the operation. Parameter 7 range is from 1 to 255 with values in approximately 1/10th sec increments.

Adjust the digital filter (parameter 8 & 15) to achieve the best suitability. Parameter 15 should not be set to anything less than 4 if the analog low pass filter is in use. Lower values of parameter 15 may allow printing before scale motion has truly stopped.

The tuning of parameter 8 & 15 is also an experimental process. A good starting point for most cases is to set parameter 8 at .1, and parameter 15 at 6. The smaller parameter 8 is made the more dampening will take place, and the larger parameter 15 is made, the lower the frequency at which the dampening will start to take effect. There is some small interaction between these two. For example, changing parameter 8 will change the effect of parameter 15 slightly, so experiment with these until the optimum filtering is obtained. In general, not much is gained by making the parameter 8 smaller than .01 or parameter 15 greater than 10.

If tuning these two parameters does not remove the remaining vibrations, the analog filter may have to be adjusted for greater filtering by moving the jumper, or the digital averaging (parameter 7) may have to be increased.

## 4.0 OPERATION PROCEDURE (WEIGH MODE)

Operation of the M5000 is made simple enough through clearly defined keyboard functions and status identification legends.

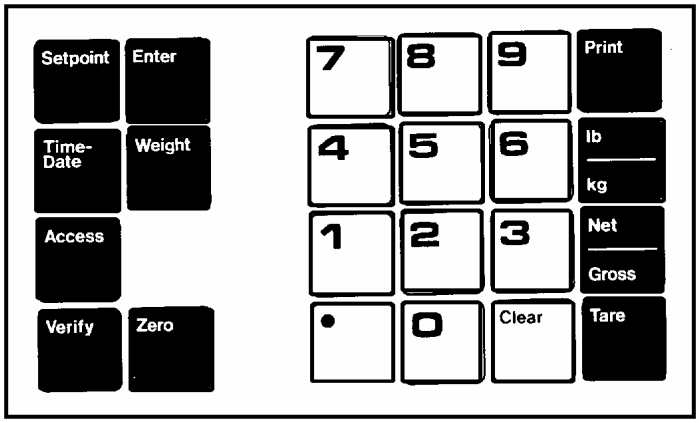



**FIGURE 4-1 KEYBOARD FUNCTIONS**

## 4.1 KEYBOARD FUNCTION

The keyboard functions are summarized in Table 4-1.

| | | |
|---|---|---|
| 1 | Setpoint: | Access program to read and/or adjust setpoint values. |
| 2 | Time-Date: | Access program to read and/or set time and date. |
| 3 | Access: | Used to set time and date.<br>Used to access a specific setup parameter to display the current value only. It cannot be changed in the operation mode. |
| 4 | Verify: | Initiates checking program for verifying all display segments and legends |
| 5 | Enter: | Inputs keyboard entered data for setpoints, time and date, and calibration. |
| 6 | Weight: | Returns scale to normal weighing mode. |
| 7 | Zero: | Initiates scale zero adjustment. |
| 8 | 0-9: | Used to enter setpoint values, time and date, calibration/setup parameters, and tare weights. |
| 9 | Clear: | Clears erroneous keyboard entries. |
| 10 | Print: | Initiates output sequence to remote printer. |
| 11 | lb/kg: | Mode selection (toggle) - selects weight unit to be used..pounds, kilograms or other programmed units. |
| 12 | Net/Gross: | Mode selection (toggle) - selects weighing mode. |
| 13 | Tare: | Inputs displayed or keyboard tare. |

## 4.2 IDENTIFICATION LEGENDS

| | | |
|---|---|---|
| 1 | NET: | NET weight displayed ... top display. |
| 2 | GROSS: | GROSS weight displayed... top display |
| 3 | TIME: | TIME displayed...topdisplay. |
| 4 | lb: | Weight units, pounds. |
| | { kg: | Weight units, kilogram. |
| | *: | Weight units, kilogram |
| 5 | ZERO; | Center of zero indication. |
| 6 | ERROR: | Invalid keyboard entry (3 seconds with a single “beep” |
| 7 | ERROR, PRINTER: | Indicates print complete signal not received from printer. |
| 8 | ERROR, SCALE: | Indicates scale error or failure. Specific failure identification via code on upper display. |
| 9 | SETUP, ENTER DATA: | Used in calibrate mode to prompt operator. |
| 10 | SETUP, ENTER MODE | Used in calibrate mode to prompt operator. |
| 11 | TARE: | TARE weight displayed ... lower display. |
| 12 | DATE: | DATE displayed ... lower display. |
| 13 | KEYBOARD: | Keyboard entry displayed...lower display. |
| 14 | MEMORY: | Information displayed from memory... lower display. |

**Table 4-2 Identification Legends**

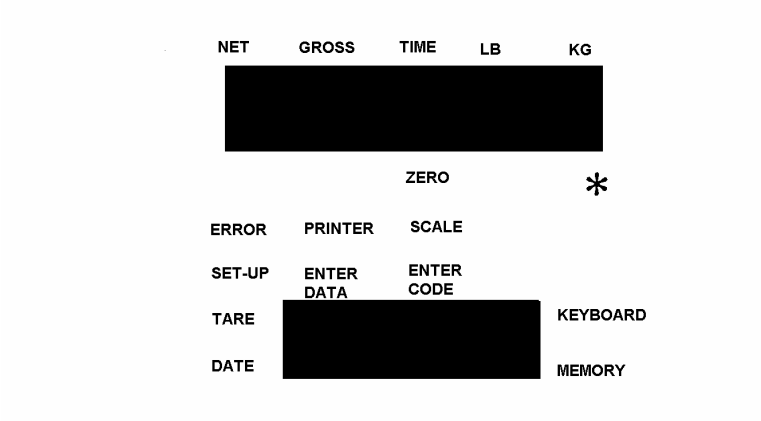



**Figure 4-2 Display Legends**

## 4.3 TIME AND DATE

The M5000 has a standard time and date program that can both display and output time and date information. The time is std 12 HR AM/PM format while the date is selectable U.S., Canadian, or European. The M5000 MUST BE IN THE WEIGHT MODE TO DISPLAY OR ENTER TIME AND DATE VALUES.

### 4.3.1 Time and Date Setup Parameters

The three parameters listed below effect Time and Date output. Refer to Section 3.4.4 for details.

| ACCESS CODE | PARAMETER |
|---|---|
| 20 | Time and Date |
| 21 | Time and Date Format Selection |
| 22 | Time and Date Printing Selection |

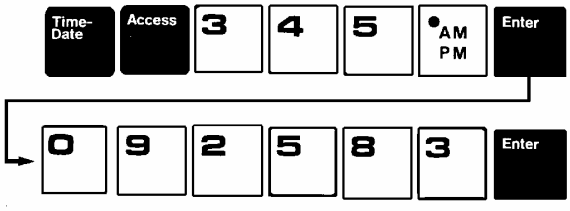



**Figure 4-3 Procedure for Entering Time and Date 03:45 pm September 25, 1983**

### 4.3.2 Setting Time and Date:

Time and date is set through the keyboard. The following procedure applies:

EXAMPLE: Time and date desired 03:45 PM Sept 25, 1983

SCALE IN WEIGHT MODE.

1. Push TIME AND DATE key.

2. Push ACCESS key within 3 seconds after time and date was actuated.
   The TIME legend (gross weight display) will be flashing.

3. Key in hours and minutes, and AM or PM.
   0345
   Actuation of the decimal pushbutton toggles the display between A and P (AM/PM).

4. Push ENTER
   The DATE legend (tare display) will be flashing.

5. Key in date in the order of format chosen.

   092583 US -- our example
   830925 Canadian
   250983 European

6. Push ENTER

7. Weight display will appear in 3 seconds.

#### 4.3.3 Display Time and Date

Actuating the time and date key displays current time and date for 3 seconds before returning to weight display.

## 4.4 TARE OPERATION/PRINT FORMATS

Figure 4.4 represents abbreviations printed with weight values. Figure 4.5 is a representative sample of standard printed formats.

IMPORTANT REMINDERS WITH .. G-T-N OUTPUT:

1. Parameter #30 determines if G-T-N is printed on a single line or 3 lines.
   (See page 27).

2. Expanded weight print (parameter #32) cannot be used if G-T-N is printed on a single line.

3. Time and Date cannot be printed on the same line as weight if G-T-N is printed on a single line.

| | |
|---|---|
| lb - Pounds | G - Gross Weight |
| kg - Kilograms | T - Tare Weight |
| N - Net Weight | TH - Hand Entered Tare |

Note: Abbreviations are not printed on the same line as weight if G-T-N is printed on a single line

**Figure 4-4 Printed Abbreviations**

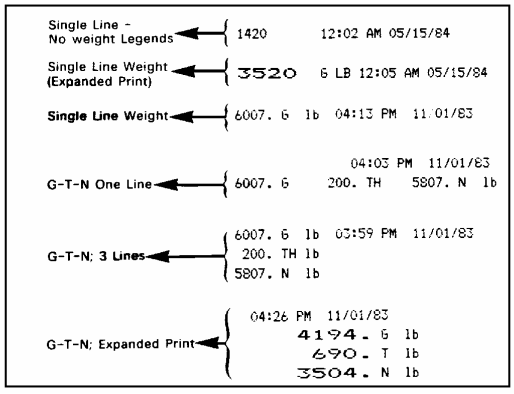



**Figure 4-5 Printed Output Formats**

#### 4.4.1 Pushbutton Tare

An object on the scale can be tared to zero by actuating the TARE button. The current tare weight is continuously displayed in the tare display. Actuation of NET/GROSS button toggles the main weight display between Net and Gross while continually displaying the tare weight.

### 4.4.2 Keyboard Tare

An operator entered tare can be accomplished by selecting a value through the keyboard and then actuating the tare pushbutton. Entered tare will be rounded to the nearest grade size. If a wrong value is entered, press the clear button and re-enter the tare information. (See Figure 4-6). The symbol, “TH” following the tare weight if printed indicates hand entered tare.


**Figure 4-6 Keyboard Entry of Tare Value 1275**

### 4.4.3 Remote Tare

An auto tare weight can be initiated externally via the J4 printer port. See Section 5.2 for details.

### 4.4.4 Chain Tare

A “chain” tare for filling/dispensing operations can be accomplished as follows:

1. Place empty container on scale.
2. Push TARE - net weight to zero.
3. Fill to cutoff.
4. Push TARE - net weight to zero.
5. Fill to cutoff.
   Etc.

### 4.4.5 Stored Tare

Parameter 35 must be enabled in order to store tares. A maximum of eight tare values can be stored in the M5000 for future recall. The eight tare memory locations are the same ones used for the set-point program. Because of this, memory locations 1 thru 8 can be used for either tare location or setpoint location, but not both simultaneously.

To store a tare value, follow the procedure listed below:

1. Press the setpoint pushbutton.

2. Press the numeric key buttons 1 thru 8 to designate the tare memory location to be used.

3. Press the enter button (current tare value will be displayed).

4. Key in the desired tare value via the M5000 keyboard.

5. Press enter pushbutton (new tare value is stored).

To display a stored tare value, follow the procedure listed below:

1. Actuate the setpoint button.

2. Key in the stored tare location number via the numeric key pad on the M5000 (1-8)

3. Press enter. The current stored tare value for that memory location is now being displayed. To enter the tare, simply press the tare pushbutton. The M5000 returns to the weigh mode and the stored tare value will be displayed in the continuous tare output display.

#### 4.4.6 Clear Tare

The displayed tare weight can be cleared to zero by one of two methods.

1 AUTO TARE - Access Code #27

Selectable setup. If enabled, M5000 will automatically clear tare when the weight had been removed from the scale.

2. MANUAL TARE CLEAR

Actuation of the CLEAR button followed by actuation of the TARE button will clear the tare display to zero.

## 4.5 CALCULATED NET WEIGHT OPTION

#### 4.5.1 Calculated Net Weight Print Only

The calculated net weight option is a desirable feature for dump and receiving scales when the vehicle does not exit the scale between the first and second weighments. The calculated net weight option is enabled by entering value 2 or 5 for parameter 30. (See Section 3.4.4). Operation of the calculated net weight option is as follows:

1. Truck pulls onto scale. Operator actuates the M5000 print button. The weight of the truck is printed followed by numeral 1 designating first weighment. Time and Date, if enabled, is printed to the right of this.

2. Without leaving the scale, the truck is either filled (shipping), or dumped (receiving).

3. Upon completion of filling or dumping, the printer button is actuated by the operator again. The indicated weight is printed followed by a numeral 2 indicating second weighment. If enabled, the current time and date is again printed. The difference between the weighments 1 and 2, is automatically calculated and printed on the next line followed by N, depicting net weight.

```
559.(1)     lb   11:36   AM   11/04/83
874.(2)     lb   11:36   AM   11/04/83   SHIPPING
314. N      lb

1078,(1)    lb   11:45   AM   11/04/83
784, (2)    lb   11:45   AM   11/04/83   RECEIVING
294.  N     lb
```

#### 4.5.2 Calculated net weight option with normal weight print capability.

An additional optoin (#5) has been added to parameter 30 (print format). With this parameter selected, the instrument will perform the normal calculated net sequence with the option of printing the current weight on the scale without entering the calculated net sequence. If the print button on the printer is pressed (in other words, the print command originates from the remote keyboard port), the instrument will print the current displayed weight. This holds true unless the instrument was in the middle of a calculated net sequence (weight #1 had been printed already), then pushing the print button on the printer will finish up the sequence normally. Print commands from anywhere but the remote keyboard port (front panel or computer port) will cause the instrument to enter the calculated net sequence, which operates identical to entering in a code of 2 for parameter 30. If option 5 has been entered for parameter 30, and the instrument is not in the middle of a calculated net sequence, then the net gross button and tare buttons are

operational. That means that tare weights can be entered and net weights printed by pushing the print button on the printer.

## 4.6 ALTERNATE DISPLAY UNITS (LB/KG/*)

**Setup (in setup mode)**

Parameter 19 defines a display unit that will replace either pounds or kilograms in the instrument. If the instrument was calibrated in pounds, this factor will replace kilograms, and vice versa. The number that is entered for this parameter represents the number of calibrated units per the new unit. That is, if the instrument was calibrated in pounds and an alternate display unit was to be used that was tons, with 2,000 pounds per ton, the number 2,000 would be entered for this parameter. The range of numbers that can be entered are limited only by the display capacity. This parameter can be less tan 1. Entering a 0 will disable the alternate display units.

Common examples (scale calibrated in lbs):

| ALTERNATE UNIT | CONVERSION FACTOR | ACTUAL WEIGHT ON SCALE | DISPLAY READS |
|---|---|---|---|
| Gallons | 1.8 lbs/gal | 2,500 lbs | 2,500 lb or 1389* |
| Drums | 435 lbs/drum | 1,740 lbs | 1,740 lb or 4* |
| Tons | 2000 lbs/tons | 10,000 lbs | 10,000 lb or 5* |

Operation: Alternate action of the lb/kg switch toggles the weight display between the alternate display unit and either lb or kg, depending on what the scale was calibrated in. If calibrated in lbs, kg will be eliminated and vice versa.

When an alternate display unit is displayed, the asterisk (*) legend is illuminated. Alternate display units may not be acceptable for legal-for-trade applications.

## 4.7 ACCUMULATION

### 4.7.1 General Description

The M5000 has as a standard feature a single register weight accumulator with overflow indication. The accumulator will work with all variations of parameter 30 if it is enabled (by setting parameter 38 equal to 1). The following is what weights will be added to the accumulator under various printing conditions:

1. Single weight printout. The printed weight will be added to the accumulator (whether gross or net).

2. Gross/tare/net. The net weight will be added to the accumulator.

3. Calculated net. The net weight will be added to the accumulator.

If the accumulator is enabled, then printing will not be allowed if the instrument is switched to units other than what it was calibrated in. That is if the instrument was calibrated in pounds and is currently displaying kilograms, the prints will not be allowed, as these numbers cannot accurately be added to the accumulator.

When the accumulator overflows internally, the following sequence will occur. Starting with the weight that caused the accumulator to overflow, the GTN indication will be replaced with the letters XX, indicating overflow of the accumulator. Until the accumulator contents are printed out and cleared (using the total print). When printed, the accumulator will contain an accurate total for all weights that do not have XX printed next to them. This means the accumulator never really overflows, but will no longer accept accumulations when it is near overflowing. Although the accumulator can internally store up to 250,000 graduations, one other restriction applies concerning printing the accumulator out. The printout is limited to 7 digits, which means that if the graduation size x 250,000 requires more than 7 digits, the printed weight will be missing the upper most digit. This can occur only if the graduation size is

greater than 20 pounds. No indication is given on the printout when this occurs. The accumulator is backed up by a battery and will retain its contents in a power failure.**4.7.2 Operation**

The weight displayed on the M5000 gross/net display is added to the accumulated register upon each actuation of the M5000 print button. The maximum number of graduations that can be accumulated is 250,000. To print and clear the total in the accumulator, pins 9 & 4 of the J1 connector (see Table 5-2) must be tied together and shorted via a momentary contact closure to pin 5. A momentary contact pushbutton can be supplied by Masstron or by others. When the contact is madce, the accumulator total is outputed via the J1 printer output connector and cleared.

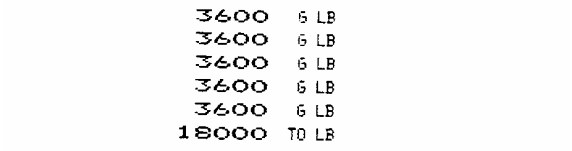



**Figure 4.7 (Sample Total Printout)**

## 4.8 CONSECUTIVE NUMBERING

A consecutive numbering feature can be enabled by setting parameter 38 equal to 2. Whenever parameter 38 is changed, the consecutive number (and the accumulator) will be cleared. The consecutive numbering feature works as follows: For every print transaction, the consecutive number will be printed out and then incremented by 1. A print transaction consists of either a single weight printout, a gross tare net printout, or a calculated net printout. The consecutive number has 4 digits, and will automatically roll over to zero when it reaches 9999. The consecutive number cannot be preset, but can be cleared by changing parameter 38, or issuing a total print using pin 4 on J-1. The consecutive number will be printed in the following locations:

1. Single weight print. To the right of the weight and the time and date. (If expanded print is enabled, and time and date is being printed on the same line, the consecutive numbering will not fit on this line. In this case, time and date will have to be printed on the preceding line parameter 22-#2

   **2560 6 LB 01:23 AM 05/15/84 0003** ←

2. Gross/tare/net single line. The consecutive number will be printed on the preceding line to the right of the preceding line to the right of the time and date.

   **01:26 AM 05/15/84 0007** ←
   **2780 6 820 T 1960 N LB**

3. Gross/tare/net multiple line. The consecutive number will be printed to the right of the time and date and gross weight.

   **2780 6 LB 01:43 AM 05/15/84 0013** ←
   **800 THLB**
   **1980 N LB**

4. Calculated net. The consecutive number will be printed to the right of the net weight.

   **1900 (1) LB 01:46 AM 05/15/84**
   **2440 (2) LB 01:46 AM 05/15/84**
   **540 N LB 0016** ←

# 5.0 DATA I/O

The M5000 has three standards output ports via five connectors on the rear panel (see Table 5-1). The following sections elaborate on each port.

| CONNECTOR | DESCRIPTION | COMMUNICATION | BAUD RATES |
|---|---|---|---|
| | | | |
| J1 | Printer Port<br>and Digital I/O | Serial 20 ma ASCII | 300, 1200,<br>4800 |
| J2 | Bi-Directional<br>Computer Port | Serial 20 ma ASCII<br>or RS232 | 300, 1200,<br>4800 |
| J3 | Load Cell Connector | ------ | ------- |
| J4 | Continuous Data Port | Serial 20ma ASCII | 4800 |
| J5 | Continuous Data Port | Serial 20ma ASCII | 4800 |
| J6 | Continuous Data Port | Serial 20ma ASCII | 4800 |
| J12 | Display/Keyboard<br>Interface<br>(Remote electronics<br>only) | | |

**Table 5-1 Standard Serial Output Ports**

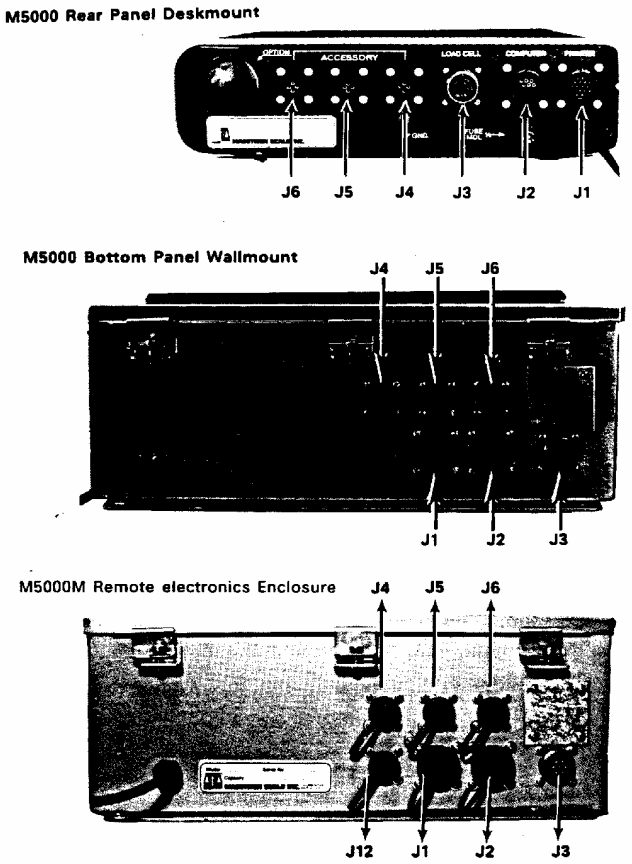



**Figure 5-1**

## 5.1 PRINTER PORT (J1)

Connector J1 is a Serial ASCII Port to be used with Masstron printers. The weight, time and date, and scale I.D., if selected, are transmitted through this port upon actuation of the M5000 PRINT button. The maximum number of characters transmitted is 40 plus terminating characters. The ASCII bytes are no parity. The baud rate is selectable at 300, 1200 or 4800 via jumper JU1 on the DPU board. (See Figure 5-2). Table 5-2 shows the J1 pin out assignment. JU9 determines if the printer port is active or passive.

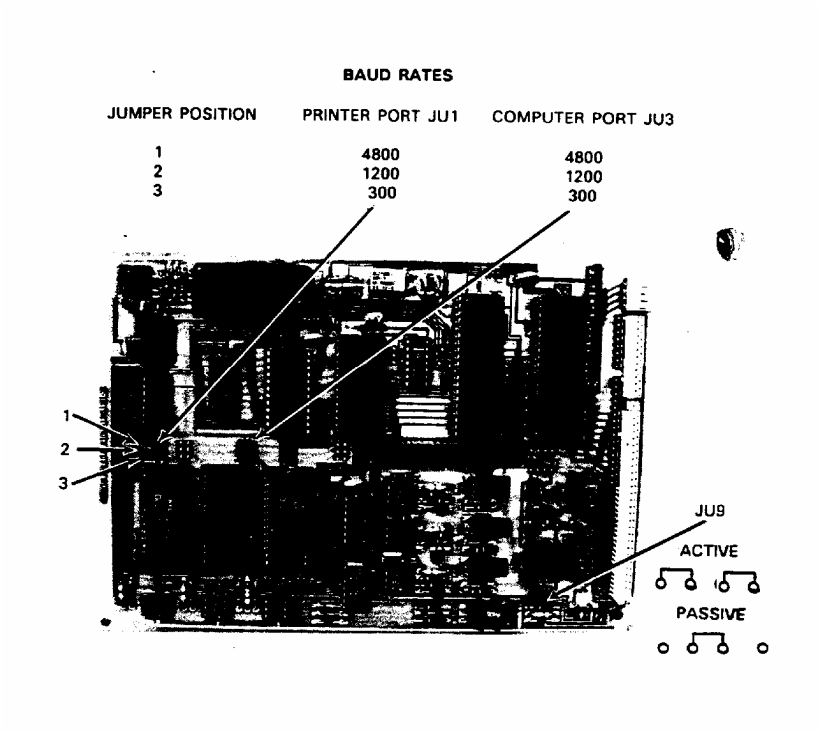



**Figure 5-2 Baud Rate Select Jumpers**

**DPU PCB**

## 5.2 REMOTE KEYBOARD INPUT (J1) (DIGITAL I/O)

Connector J1 can also be used as a means to operate the M5000 remotely. The following functions can be accessed through J1:

- Auto Tare
- Digital Zero
- Net/Gross
- Print
- Print Inhibit
- Blank Display
- Hold Display
- Accumulator Print and Clear
- Setpoint 7 and 8 (5VTTL)
- Motion Output

See Table 5-2 for the remote pin assignments.

| PIN # | ASSIGNMENT |
|---|---|
| 1 | +5 Volts |
| 2 | + Transmit (Printer) |
| 3 | - Transmit |
| 4 | Accumlulator Print and Clear/Consecutive # Clear |
| 5 | Control Line Common |
| 6 | 5 Volt Common |
| 7 | Auto Tare |
| 8 | Digital Zero |
| 9 | Print |
| 10 | Net/Gross |
| 11 | Blank/Display |
| 12 | Print Complete/Print Inhibit |
| 13 | Hold Display |
| 14 | Setpoint Output (5 Volt TTL) wt $\geq$ Sp = 0 Volts |
| 15 | Setpoint 8 Output (5 Volt TTL) wt $\geq$ Sp8 = 0 Volts |
| 16 | Motion Output (5 Volt TTL)<br>Motion = +5 V<br>No Motion = 0V |

Note - All inputs are true low

**Table 5-2 Pin Assignments - Connector J1**

### 5.2.1 J-1 Pin Assignment Descriptions

**PIN 4 ACCUMULATION**

If this pin is held to ground when a print request is processed, the current contents of the accumulator will be printed, and the accumulator will be cleared. This will occur whether or not the accumulator is enabled, thus allowing clearing of the consecutive numbers. Total printing is not inhibited by an interlocks (i.e., motion, negative, etc.)

**PIN 12 PRINT COMPLETE AND PRINT INHIBIT**

This pin serves as a printer busy (to determine print complete) and also serves as a print inhibit. If this pin is held to ground, all prints will be inhibited, including total printing.

**IN 13 HOLD**

If this pin is held to ground, the display will be immediately frozen. Any error conditions or interlocks that were in effect at the time the hold took place will remain frozen. That is if the scale was in motion and print on motion is inhibited, then printing will be inhibited while in the hold state. The same is true for negative printing and other interlocks. While in the hold state, all other M5000 functions remain operationable (computer port, keyboard, etc.). Although nothing done in these ports will affect the status of the display until the hold is released, data returned on the computer port will be identical to what is shown on the display.

**PRINT 14 SETPOINT 7 OUTPUT**

This is a TTL level output pin which will reflect the state of setpoint number 7. If the current displayed weight is equal to or greater than setpoint 7, then this point will be at 0 volts.

**PIN 15**

Same as Pin 14 except with setpoint 8.

**PIN 16 MOTION OUTPUT**

This pin indicates the status of the print motion detector (Parameter 3). If in motion, this pin will be at 5v, and if no motion it will be at 0v.

## 5.3 BI-DIRECTIONAL COMPUTER PORT (J2)

The M5000 Bi-directional Computer Port can operate either as a 20mA current loop, or as a limited RS232 Port. The particular mode it is operating in is determined by the location of several jumpers on the data processing unit printed circuit board. Refer to Figure 5.3 for the location of these jumpers.

If the computer port is selected as a 20mA current loop port, then a regulating circuit will automatically control the current while in the marking state to roughly 20mA. Depending on supply voltage, the current may vary from 15 to 30mA. The off state or spacing current will be less than 3mA. If selected, active 20mA and internal 24V supply will source the current. Computer ports from various instruments can be daisy chained by selecting one of the instruments active and the rest as passive. A maximum of 6 instruments can be daisy chained in this manner.

If selected RS232, then the port will provide and accept EIA level signals for the serial communications. In addition, a clear to send control lline is provided, which can be used to inhibt the transmission of data by raising the line high. If RS232 is selected the troubleshooting LED's on the computer port transmission lines will not provide meaningful information. The J2 pin assignments change when the RS232 mode is selected. Refer to Table 5-4 for these assignments.

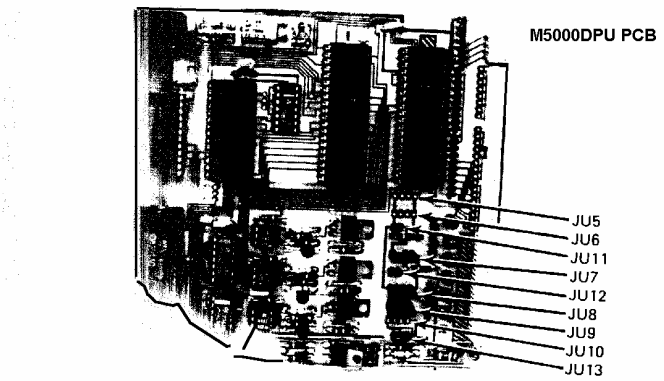



**Figure 5-3 Computer Port Active/Passive Selection**

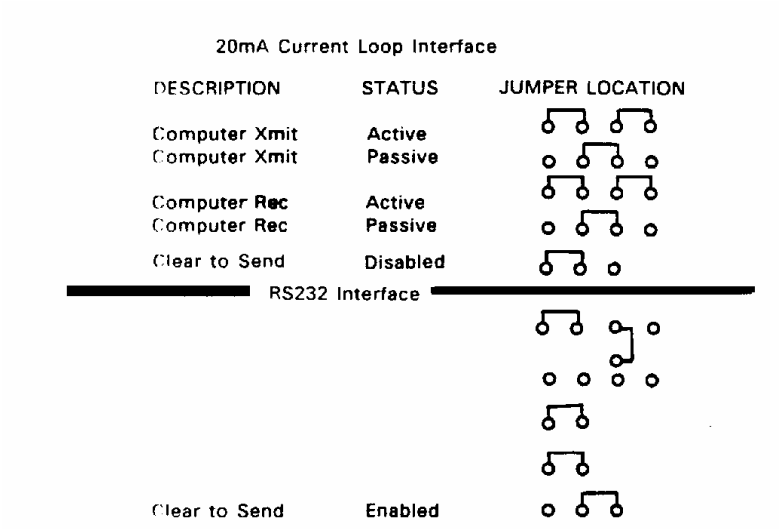
Transmission is on demand from the computer input port. The format of this information is basically ASCII, with no parity. The only exception to this rule is when status information is requested, and then it is in binary.

The specific format can be obtained in a separate manual. (Contact Masstron).

COMPUTER TO DPU - The computer transmits commands to the DPU over this port in ASCII, no parity.

The bi-directional computer port is selectable active/passive or RS232 via jumpers JU7 or JU8 (see Figure 5-3).

| Pin # | Assignment 20ma | Assignment RS232 |
|---|---|---|
| 1 | +5 Volts | (RS232 Common) |
| 2 | + Transmit (source) | (RS232 Xmit) |
| 3 | - Transmit (sink) | (RS232 Recv) |
| 4 | + Receive (source) | (RS232 CTS) |
| 5 | - Receive (sink) | |
| 6 | 5 Volt Common | |




## 5.4 CONTINUOUS DATA OPTION PORTS (J4, J5, J6)

The option port continuously transmits weight data to connectors J4, J5 and J6 at 4800 baud. The three connectors are serially daisy chained in order to transmit the same data via 20ma Serial ASCII communications. This port is for options such as: remote displays, scoreboards, analog output modules, and setpoint modules. Table 5-5 shows the pin out assignment for the option's port.

Because of the daisy chain nature of the 20ma serial communications, it is required that a jumper be disconnected in order to plug an option in J5 or J6. Connector J4 is setup ahead of time to accept one option without disconnecting any jumpers. If a jumper should need to be disconnected to plug an option into J5 or J6, open the instrument enclosure up and looking at the rear of J5 or J6, open the jumper which ties pins 2 and 3 together. Once this jumper has been opened, the serial loop has been broken and neither of the options plugged into the other ports nor the front panel display will function until an option is plugged into the connector across which the jumper has been opened. If an optional accessory is removed from J5 or J6, that respective jumper needs to be replaced for the M5000 to function.

KEYBOARD TO DPU. Commands are given over this port to the DPU in ASCII (no parity). These commands are very similar to the computer port.

**SCALE IDENTIFICATION CHARACTER**

The M5000 is capable of transmitting a single ID character. A total of 127 different characters can be transmitted. The ID characters can be found on Table 5-6.

The scale ID, if desired, must be selected in the setup/calibrate mode with parameter #33. Once the ID parameter (33) has been accessed, a code of 000-127 can be entered for a specific identification character. For example:

| CODE | ID CHARACTER TRANSMITTED |
|---|---|
| 065 | A |
| 097 | a |

NOTE: Before re-entering the weigh mode, be sure to save the data via the C00 parameter (See section 3.4.4).

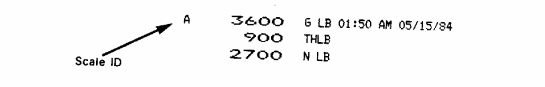



**Figure 5-4 Sample Printout with Scale ID Character "A"**

| Pin # | Assignment |
|---|---|
| 1 | + 5 Volts |
| 2 | + Transmit (source) |
| 3 | - Transmit (sink) |
| 4 | 5 Volt Common |

**Table 5-5 J4, J5, J6 Pin Out Assignments**

**Table 5-6 ASCII Character table for M5000 Scale ID 127 Selectable Codes for Parameter #33**

| CODE | ID CHAR | CODE | ID CHAR | CODE | ID CHAR | CODE | ID CHAR |
|---|---|---|---|---|---|---|---|
| 000 | NUL | 032 | SP | 064 | @ | 096 | \ |
| 001 | SOH | 033 | ! | 065 | A | 097 | a |
| 002 | STX | 034 | “ | 066 | B | 098 | b |
| 003 | ETX | 035 | # | 067 | C | 099 | c |
| 004 | EOT | 036 | $ | 068 | D | 100 | d |
| 005 | ENQ | 037 | % | 069 | E | 101 | e |
| 006 | ACK | 038 | & | 070 | F | 102 | f |
| 007 | BEL | 039 | ‘ | 071 | G | 103 | g |
| 008 | BS | 040 | ( | 072 | H | 104 | h |
| 009 | HT | 041 | ) | 073 | I | 105 | i |
| 010 | LF | 042 | * | 074 | J | 106 | j |
| 011 | BT | 043 | + | 075 | K | 107 | k |
| 012 | FF | 044 | ´ | 076 | L | 108 | l |
| 013 | CR | 045 | _ | 077 | M | 109 | m |
| 014 | SO | 046 | . | 078 | N | 110 | n |
| 015 | SI | 047 | / | 079 | O | 111 | o |
| 016 | DLE | 048 | 0 | 080 | P | 112 | p |
| 017 | DC1 | 049 | 1 | 081 | Q | 113 | q |
| 018 | DC2 | 050 | 2 | 082 | R | 114 | r |
| 019 | DC3 | 051 | 3 | 083 | S | 115 | s |
| 020 | DC4 | 052 | 4 | 084 | T | 116 | t |
| 021 | NAK | 053 | 5 | 085 | U | 117 | u |
| 022 | SYN | 054 | 6 | 086 | V | 118 | v |
| 023 | ETB | 055 | 7 | 087 | W | 119 | w |
| 024 | CAN | 056 | 8 | 088 | X | 120 | x |
| 025 | EM | 057 | 9 | 089 | Y | 121 | y |
| 026 | SUB | 058 | : | 090 | Z | 122 | z |
| 027 | ESC | 059 | ; | 091 | [ | 123 | { |
| 028 | FS | 060 | < | 092 | ` | 124 | \| |
| 029 | GS | 061 | = | 093 | ] | 125 | } |
| 030 | RS | 062 | > | 094 | ^ | 126 | ~ |
| 031 | us | 063 | ? | 095 | - | 127 | DEL |

# 6.0 TROUBLESHOOTING/ERROR CODES

## 6.1 POWER SUPPLIES

The status of all the M5000 power supplies are indicated by a series of LED's located on the power supply board (see Figure 6.1). All LED's should be lit in an approximate uniform brightness under normal operating conditions. If they are not lit or one is substantially dimmer than the others, this indicates either a faulty power supply, or something is loading down.

The power supply assignments are as follows:

1. Excitation - This is a 15V power supply that powers the load cells.

2. -12V, +12V - These two power supplies supply the A/D converter.

3. 5V LED - This supply powers the LED legends and digits in the display unit.

4. 5V Logic Supply - This supply powers the keyboard display, and data processing unit microprocessors and logic.

5. 5V analog - This supply powers the 5V logic and microprocessor in the A/D converter.

6. 24V - This supply powers the serial current loops.

## 6.2 CURRENT LOOP LED'S

Located on the processing board are a number of LED's which indicates the status and operating condition of the various transmit and receive ports in the system (see Figure 6.2). There are 3 transmit and 3 receive ports, with each having an LED wired in series to the port to indicate current flowing. These LED's will be lit when an external device is connected to the port. The LED will flicker when data is transmitted over the port. The assignment of the LED's are as follows:

1. **Display Transmit - (Disp. Xmit)**

   This LED monitors the status of the current loop over which the continuous data is transmitted. The data is transmitted over this port once per display update. This port connects the internal display of the instrument, and any external options, such as remote displays, setpoint controllers, etc. If any of these devices are malfunctioning, it will affect this port and the internal display of the instrument. The normal operating mode of the LED is to be lit with a slight flicker once per display update.

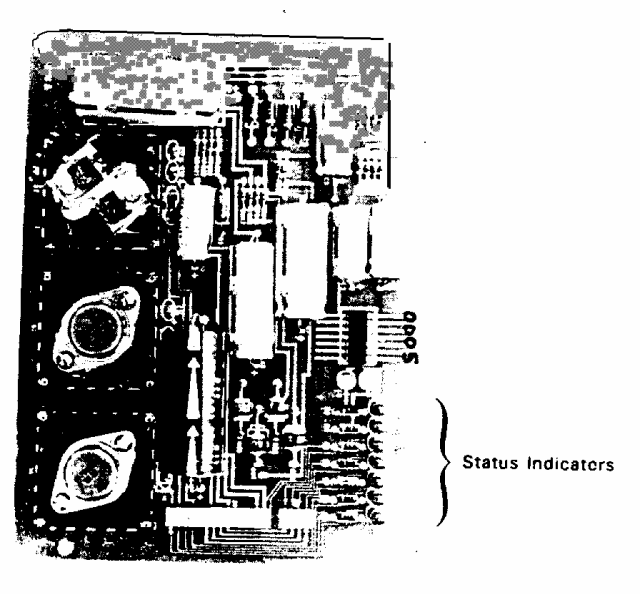



**Figure 6-1 Power Supply Board**

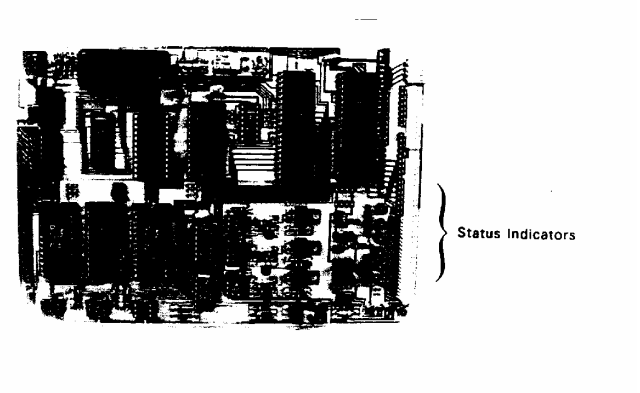



**Figure 6-2 M5000 DPU Board**

2. **Display Receive** - (Disp. Rec.)

This LED monitors the status of the command port normally connected to the internal keyboard of the instrument. The normal mode of the LED is to be lit with a slight flicker when a keyboard command is executed. A good test of this port is to depress the front panel zero button and watch for a light.

3. **Computer Transmit -** (Comp. Xmit)

This LED monitors the status of the computer port where data is transmitted from the instrument to the computer. The normal mode of this LED will be off unless an external device is connected to the port. If an external device is connected, the light will bel it and will flicker whenever data has been requested via the computer receive port.

4. **Computer Receive -** (Comp. Rec.)

This LED monitors the status of the computer port over which the instrument receives data from an external device. The normal mode of this LED will be off unless an external device is connected to this port, in which case the LED will be on and will flicker slightly whenver data is tranmitted to the instrument.

5. **Printer -** (Ptr. Xmit)

This LED monitors the status of the printer port. If a printer is connected to the instrument, this LED shouuld be lit and should flicker whenever a print command is executed and accepted.

6. **Analog to Digital Receiver -** (Anlg. Rec.)

This LED monitors the status of the port which connects the A/D converter to the data processing unit. The normal mode of the LED will be lit with a slight flicker once every 1/10th of a second (or at the end of each A/D data conversion).

## 6.3 TRACKING DOWN A PROBLEM WITH THE INSTRUMENT

The following points describe potential error conditions of the instrument and what to check for to find their cause.

Symptom 1. The display shows a weight but does not change.

This can be caused by a failure of the keyboard display driver board, or a loss of data transmission from the data processing unit. Normally, if data transmission is lost, the display will revert to an Error 6 after a 1 minute time out. Check the current loop LED's and the display transmit port for normal operation. Also the display update rate may be set wrong.

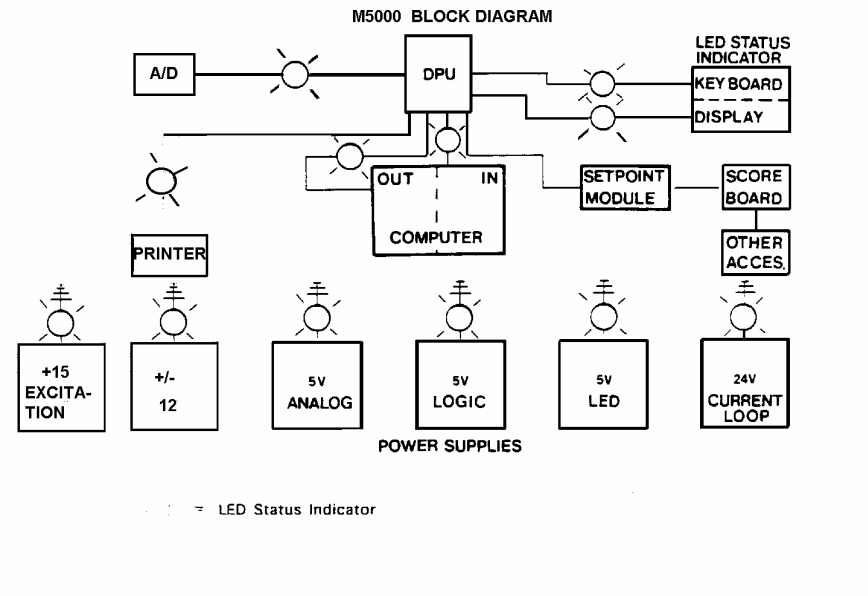



**Figure 6-3**

Symptom 2. Keys operate, but the error light flashes when a command is executed.

This condition can be caused by a normal rejection of the command due to interlocks that were setup at the calibration time (i.e., print inhibit on negative weight, etc.), or a failure of the display receive port between the keyboard display and the data processing unit. Check the display receive and display transmit LED's for normal operation.

Symptom 3. Keys do not operate.

This can be caused by a failure of the keyboard display driver board. Check the board for normal operation. Also key disabled in setup,

Symptom 4. Display is blank, and all legends are out.

This can be caused by a failure of the keyboard deisplay driver board, or its associate power supplies. If the beeper sounds when a key is depressed, check the 5V LED power supply for normal operation. If the keys do not operate, check the keyboard display driver board for a failure or its associated power supply.

Symptom 5. Display shows non-meaningful information.

This can be caused by a failure of the display driver board. Check it for normal operation.

Symptom 6. Scale error legend is lit.

This condition will also be associated with another legend being lit or the main display showing error code to indicate what the problem is. Check the legends or the display for the proper error code.

Symptom 7. Main weight display shows dashes and a number.

This indicates an error condition in the operation of the instrument. The error codes are as follows:

Error Code 1 - This indicates an A/D conversion error. This means the A/D converter was unable to conver the input signal to a digital reading. This can be caused by a failure of the A/D converter, a disconnected load cell cable, or a failure of the excitation power.

Error Code 2 - This indicates a digital check error in the data processing unit. The data processing unit during a normal integrity check has found an error, typically a corruption of the data stored in its memory. Attempt a power-down and power-up to correct the problem, and/or recalibrate the scale.

Error Code 3 - Memory Write Error. This indicates the data processing unit has failed attempting to write data to memory, typically during calibration. Power the instrument down and back-up in an attempt to correct this problem. If necessary, recalibrate the scale.

Error Code 4 - Load Cell Power Supply Failure. This indicates that the excitation supply has failed as detected by the A/D converter. Check the power supply for correct operation.

Error Code 5 - Analog Check Error. This indicates the A/D converter has failed on internal self-check. Check the A/D converter for normal operation.

Error Code 6 - DPU Communication Failure. This indicates that the data processing unit has not transmitted data to the keyboard display unit for more than 1 minute. Check display transmit current loops for normal operation.

Error Code 7 - A/D Communication Failure. This indicates that the analog to digital converter has failed to properly transmit data to the data processing unit. Check the A/D current loop and the A/D converter for normal operation.

Error Code 8 - Calibration Data Has Not Been Saved. This error will occur if a calibration code of 0 was not entered as the last step during the calibration process. Return to the calibration mode and save the data.

# 7.0 SETPOINT OPTION

The M5000 comes standard with an eight setpoint program. The setpoint can be accessed and selected through the front keyboard for operation ease. The following is a brief description of installation and operation of the setpoint feature in the M5000. For detailed information, refer to the MD3015 setpoint module service manual. 5 volt TTL outputs can be obtained with Setpoints 7 and 8 only via the J-1 connector. See section 5.2 for pin assignments. The MD3016 setpoint option can pull the outputs from 5 VOLTS to RATED output by inserting up to two solid state relays of various ratings.

## 7.1 SETPOINT INSTALLATION

The Model MD3015 setpoint module must be connected to the M5000 via serial option ports J4, J5, or J6. If J5 or J6 are used, the jumper on that port must be opened for operation. The M5000 transmits continuously through these ports' weight data, setpoint coincidences, and all other pertinent data required by the setpoint module. Operating characteristics of the setpoints are controlled via internal switches in the setpoint module. Refer to the MD3015 service manual for specifics.

## 7.2 SETPOINT SETUP AND OPERATION

To enter a setpoint, follow the procedure listed below:

1. Press setpoint push button.

2. Press numeric key buttons 1 thru 8, relating to the setpoint you desire to set.

3. Press the enter push button (current value will be displayed).

4. Key in desired setpoint value via M5000 keyboard.

5. Press enter push button (new value is entered).

To display a setpoint, follow the procedure listed below:

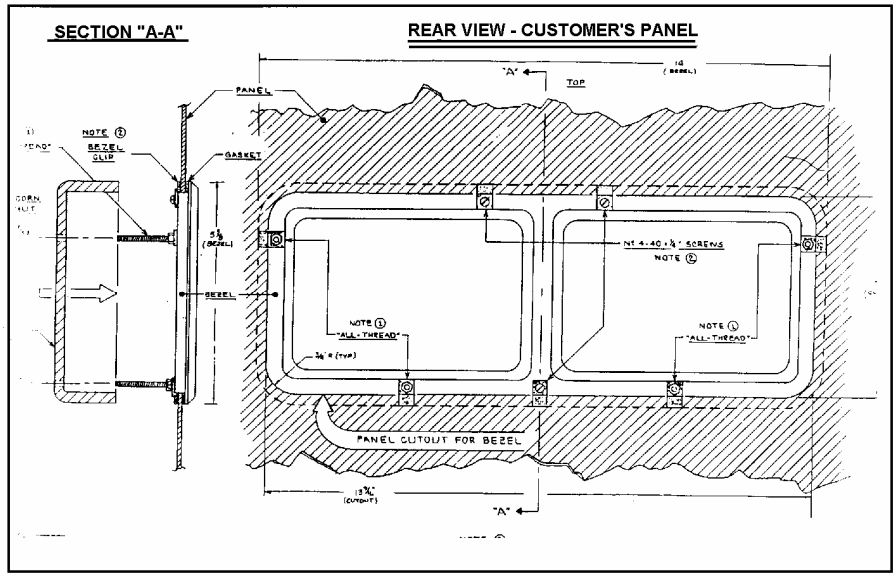
1. Activate the setpoint push button.

2. Key in the setpoint number via the numeric key pad on the M5000.

3. Press enter. The current setpoint value for that setpoint is now being displayed. To exit the setpoint display, press the weight push button.

## 8.0 SPARE PARTS LIST

| | PART NUMBER | DESCRIPTION |
|---|---|---|
| | MA11106 | Display Driver PCB |
| | MA11108 | Power Supply PCB |
| | MA11286 | DPU (Digital Processing Unit) PCB |
| | MN10069 | A/D Module |
| | MA11105 | Display PCB |
| | MZ1101000007 | Fuse |
| M5000 Connectors | | |
| -Printer Port | | |
| M5000 DG | MZ0503000082 | 16 Pin Connector |
| M5000 WM | MZ0505000040 | Solder Pins |
| M5000 M | MZ0503000085 | Strain Relief |
| M5000 WS | MZ0503000082 | 16 Pin Connector |
| M5000 S | MZ0505000040 | Solder Pins |
| | MZ0503000089 | Sealed Strain Relief |
| -Options Port | | |
| M5000 DG | MZ0503000083 | 4 Pin Connector |
| M5000 WM | MZ0505000039 | Solder Pins |
| M5000 M | MZ0503000084 | Strain Relief |
| M5000 WS | MZ0503000083 | 4 Pin Connector |
| M5000 S | MZ0505000039 | Solder Pins |
| | MZ0503000088 | Sealed Strain Relief |
| -Computer Port | | |
| M5000 DG | MZ0503000087 | 14 Pin Connector |
| M5000 WM | MZ0505000039 | Solder Pins |
| M5000 M | MZ0503000085 | Strain Relief |
| M5000 WS | MZ0503000087 | 14 Pin Connector |
| M5000 S | MZ0505000039 | Solder Pins |
| | MZ0503000089 | Sealed Strain Relief |
| Load Cell Connector | MZ0503000010 | 7 Pin Connector |
| | MZ0503000001 | Strain Relief |
| | MZ0503000008 | Rubber Boot |


SECTION "A-A"
REAR VIEW - CUSTOMER'S PANEL
PANEL
NOTE ②
BEZEL CLIP
GASKET
BEZEL
NOTE ①
"ALL-THREAD"
NOTE ③
"ALL-THREAD"
NOTE ②
TOP
"A"
PANEL CUTOUT FOR BEZEL

# ADDENDUM TO M5000 MANUAL

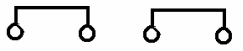
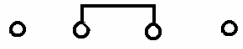
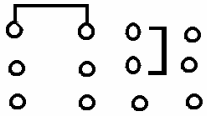
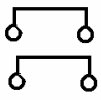
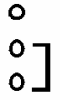
**FOR NEW STYLE DPU BOARDS MC11354**

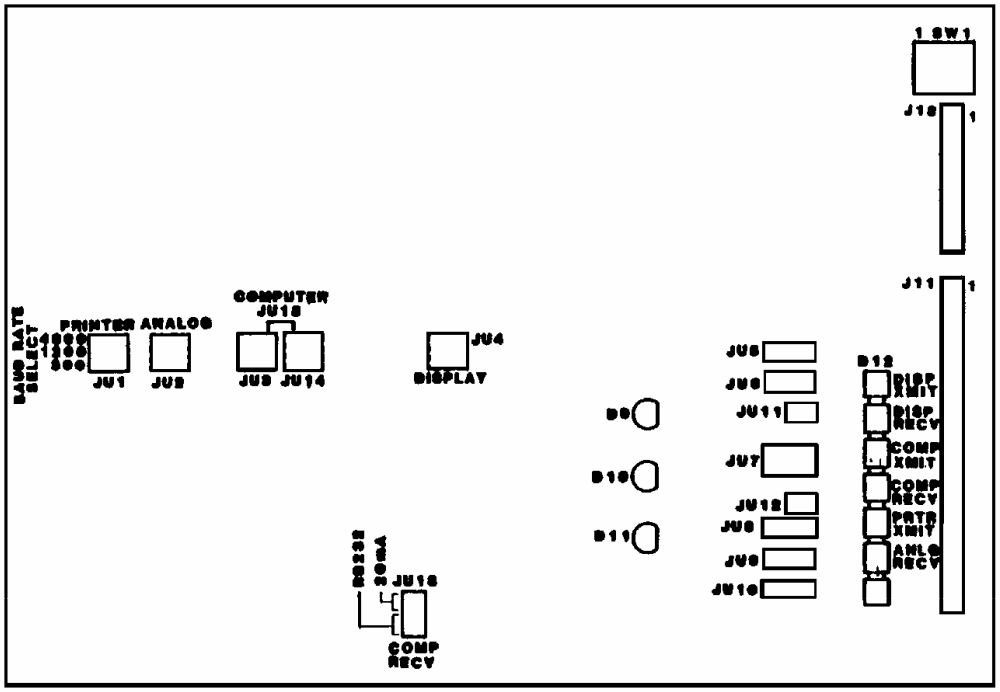
With recent changes to the M5000 DPU boards, the jumper assignments for the computer port have changed slightly. The jumper assignments for the printer port and baud rate selection remain the same.

The change to the board has been made to correct the polarity of the computer port's clear to send line. In addition, the status LED's for the computer port now function whether the port is configured 20mA or RS232.

The jumper assignments are as follows:

**20MA CURRENT LOOP INTERFACE**

| JUMPER | DESCRIPTION | STATUS | JUMPER LOCATION |
|---|---|---|---|
| | 20Ma CURRENT LOOP INTERFACE | | |
| JU7 | Computer Xmit | Active |  |
| JU7 | Computer Xmit | Passive |  |
| JU8 | Computer Rec | Active |  |
| JU8 | Computer Rec | Passive |  |
| JU13 | 20mA | |  |
| | RS 232 INTERFACE | | |
| JU7 | | |  |
| JU8 | | | |
| JU11 | | | |
| JU12 | Clear to Send | Enabled |  |
| JU12 | Clear to Send | Disabled | |
| JU12 | RS232 | |  |

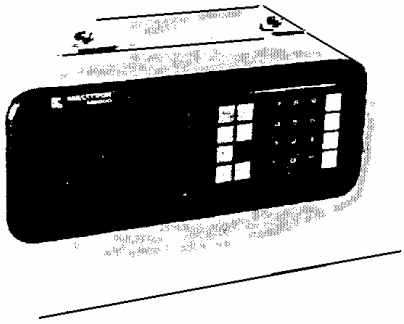

1 SW1
J10
1
J11
1
BAUD RATE SELECT
PRINTER
ANALOG
COMPUTER
JU16
JU1
JU2
JU3
JU14
JU4
DISPLAY
D9
D10
D11
JU5
JU6
JU11
JU7
JU12
JU8
JU9
JU10
D12
DISP XMIT
DISP RECV
COMP XMIT
COMP RECV
PRTR XMIT
ANLG RECV
RS232
20mA
JU15
COMP RECV

| MODEL | GENERAL DESCRIPTION |
|---|---|
| M5000 DG | -Desk top, self-contained<br>-Mild steel chassis, aluminum cover - enamel painted<br>-Cast aluminum bezel with baked epoxy powder coat finish |

Desk DG

| | |
|---|---|
| M5000 WM | -Wall mounted, self-contained<br>-NEMA XII construction<br>-Mild steel - enamel painted<br>-Cast aluminum bezel with baked epoxy powder coat finish |
| M5000 WS | -Wall Mounted, self-contained<br>-NEMA IV construction<br>-304 stainless steel<br>-Cast aluminum bezel with baked epoxy powder coat finish |

Wall - WM
- WS



NOTE: Keyboard overlay and display window are "hard coat" finished for added protection in harsh chemical and industrial environments.

**Figure 1-1 M5000**

**Configurations**