8510

Stainless Steel Multi-Purpose DigiTOL® Indicator

Technical Manual and Parts Catalog

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:

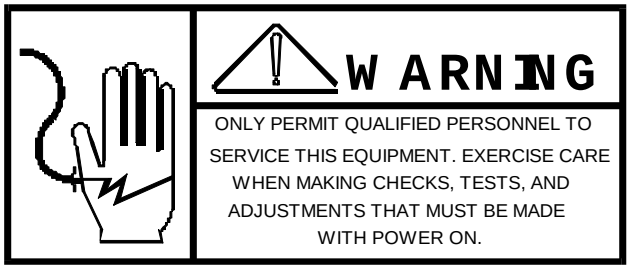
METTLER TOLEDO
Training Center
P.O. Box 1705
Columbus, Ohio 43216
(614) 438-4400

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.

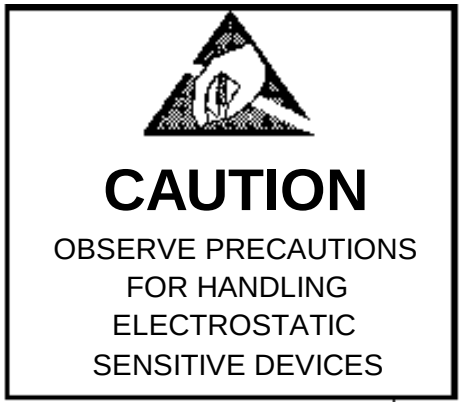
- **ALWAYS** take proper precautions when handling static sensitive devices.



- **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 Toledo Scale Model 8510 (Factory numbers 8510-1001, and 8510-1011) provides fast, accurate weight display in NEMA 4X industrial housing. The 8510 features a highly readable six-digit display along with an LED analog display for basic over/under indication.

The Model 8510 is a 10,000 maximum displayed increment, legal-for-trade digital indicator that is compatible with all Toledo Scale DigiTOL ® Bench and Portable scale bases and DigiTOL ® Power Module. This model IS NOT compatible with analog load cells. Weight or setup information is displayed on a 6-digit, 7-segment fluorescent display, with 0.5" high digits. Operator input is via a 5 position membrane keyboard.

RS-232C serial output is provided for Toledo © industrial printers, Models 8806, 8855 (with RS-232C option only), 8843, and 8860. The 8510 can accept remote print, tare, clear, and zero commands via the RS-232C serial port.

The 8510 features selectable units of measure (e.g., pounds, pounds and ounces, and kilograms). The display is updated approximately 10 times per second. A softswitch selectable digital filter is available to provide a more stable reading in the presence of vibration.

The 8510 can be configured with five zones to designate under, low, accept, high, and over status. Zone tolerances are programmed through the keyboard to provide maximum flexibility in establishing acceptable target weights.

The 8510 provides TTL level outputs for external LEDs to display over, under, and accept status. A TTL level input is provided for selecting a target value remotely (duplicates operation of the TARGET key). All TTL input and outputs are low true logic.

WARNING

The TTL Status Outputs are designed for use with exterior LED displays only.
Use of the TTL outputs for any other purpose can result in a HAZARDOUS CONDITION.

All exterior metal components of the 8510 are stainless steel and meet NEMA 4X hosedown specifications.

The 8510 has received NTEP (National Type Evaluation Program) certification and may be used in legal-for-trade applications in the U.S. (COC number 89-145).

2.0 SYSTEM DESCRIPTION

The 8510 consists of three major blocks. They are:

2.1 DISPLAY PCB

Receives weight data or error codes from the load cell.

Displays the weight and classification (or error code) on a six digit, vacuum fluorescent display with 0.5" high digits. Transmits information for an optional printer to the Power Supply PCB. Interprets and reacts to keyboard entries or serial ASCII input.

2.2 POWER SUPPLY PCB

Provides:

+10 VDC for the regulated +5 VDC supply on the Display PCB
3.2 VAC filament voltage for the fluorescent display
-30 VDC supply for the fluorescent display
+20 VDC supply for the Digital Load Cell

Converts serial TTL data to RS-232C for the optional printer or serial device.

Buffers the TTL status outputs and TTL target input for external LED display and remote target selection.

2.3 DIGITOL ©

The load cell converts the analog weight into a digital message that is transmitted to the Display PCB.

The load cell also transmits error messages to the Display PCB to indicate malfunctions.

3.0 SPECIFICATIONS

3.1 ELECTRICAL AND PHYSICAL SPECIFICATIONS

3.1.1 ENVIRONMENT

The 8510 will operate over a temperature range of -10º to 45º C, (14º to 113º F) at 10% to 95% relative humidity, non-condensing.

Storage temperature for the 8510 is from -40º to 70º C (-40º to 158º F) at 10% to 95% relative humidity, non-condensing.

HAZARDOUS AREAS

DO NOT use the Model 8510 in locations classified as HAZARDOUS by the National Electrical Code (NEC) because of combustible or explosive atmospheres.

3.1.2 POWER REQUIREMENTS

The 8510 requires 10 watts, (10 VA) of power. No ON/OFF power switch is provided.

Factory Number	Voltage Requirements
8510-1001	120 VAC at 60 Hz
8510-1011	220/240 VAC at 50 Hz

The 8510 requires clean AC power with a true earth ground for reliable operation. The power line for the 8510 must not be shared with equipment that generates line noise (such as motors, relays, heaters, etc.) If adverse power conditions exist, a power line conditioner may be required.

The 8510 meets the NIST (National Institute of Standards and Technology) H-44 and the Canadian Gazette, part 1 line voltage variation specifications.

Line Voltage Variation Specification	**AC Line Voltage**			**Line Frequency in Hz**		
	Minimum	**Nominal**	**Maximum**	**Minimum**	**Nominal**	**Maximum**
NIST H-44	100	120	130	59.5	60	60.5
Canadian	108	120	132	58.8	60	61.2

Table 3-1 Voltage

3.1.3 STANDARDS COMPLIANCE

The Model 8510 is listed with UL to meet specifications 114, Office Appliances and Equipment and 746,Polymeric Materials.

The Model 8510 is certified by CSA to meet standard C22.2 No. 143-1975, Office Machines.

The Model 8510 has received NTEP (National Type Evaluation Program) Certificate of Conformance number 89-145 and may be used in legal-for-trade applications as a class III or III L device.

3.1.4 CONDUCTED AND RADIATED EMISSIONS

The Model 8510 meets or exceeds the FCC docket 80-284 for radiated and conducted emissions requirements.

3.1.5 RADIO FREQUENCY INTERFERENCE

The 8510 meets U.S.A., Canadian, VDE 0871 class B, and U.K. requirement for RFI susceptibility as listed with a maximum of one display increment of change.

U.S.A		**CANADIAN**		
Frequency	**Field Strength**	**Frequency**	**Power**	**Distance**
27 MHz	3 volts/meter	27 MHz	4 watts	2 meters
169 MHz	3 volts/meter	464 Mhz	4 watts	2 meters
464 MHz	3 volts/meters			

VDE 0871 Class B		**U.K.**	
Frequency	**Field Strength**	**Frequency**	**Field Strength**
27 MHz	3 volts/meter	27 MHz	10 volts/meter
144 MHz	3 volts/meter	169 MHz	10 volts/meter
169 MHz	3 volts/meter	464 MHz	10 volts/meter

Table 3-2 Radio Frequencies

3.1.6 DIMENSIONS

The 8510 weight display enclosure for all models is 7” (178 mm) wide by 8.75” (222 mm) high (including bottom bracket and connectors) by 3” (76 mm) deep.

3.1.7 WATER PENETRATION

The 8510 meets NEMA 4X hosedown requirements.

3.2 PRINTER INTERFACE

The 8510 is capable of transmitting and receiving RS-232C ASCII data. When a print command is received from the PRINT key, the RS-232C input, or due to the auto print feature, the 8510 will output a message according to the printer output setup. Scale motion will disable the print until motion has ceased. Printer output is disabled when the 8510 is under gross zero, in the expanded weight display mode, or if zero has not been captured after powerup. The baud rate is selectable between 300, 1200, 2400, 4800, and 9600 baud in the printer setup.

Data is output in a 10 bit ASCII format (1 start bit, 7 data bits, selectable parity bit, and 1 stop bit). Data can be output in demand format or Toledo continuous format.

Printer output is through connector J-3. Terminal strip TB-2 has both input and output connections. Both J-4 and TB-2 are located on the Power Supply PCB (see Figure 2 in Section 4.3). Refer to Section 6.3 for data format, connector pinout, and interfacing information.

The 8510 can respond to single character ASCII characters input to the serial port. Zero, print, clear, and tare or target functions can be initiated by means of a single upper case ASCII character transmitted into the RS-232C input from a remote keyboard or host computer. Refer to Section 6.4 for more information about ASCII input.

4.0 INSTALLATION INSTRUCTIONS

4.1 PRELIMINARY INSPECTION

Inspect the shipping container and scale for loose or damaged parts. If any damage is found, immediately notify the freight carrier.

When the 8510 shipping carton is opened, the following items should be included:

Technical Manual

Ferrite Ring

Capacity and Class Labels

Quality Feedback Card

Model 8510 Indicator

Plastic Bag with 12 Screws

Remove the indicator from the carton and remove the three screws securing the back panel. Verify that all internal harnesses are firmly seated in the correct connector.

4.2. INTERCONNECTIONS

Terminate the DigiTOL ® load cell cable at terminal strip TB-1. Refer to section 6.1 for interconnect data and cable installation instructions.

If desired, install the optional Printer Interface KOP, part number 129052 00A at connector J-3. Refer to section 6.3 for wiring information in Table 6-3 and printer cable installation instructions.

Plug the power cord into the appropriate power source as described in section 3.1.2.

4.3 JUMPER DESCRIPTION

Display PCB jumper programming. Default settings are shown in parenthesis. Refer to Figure 4.1 for Display PCB jumper locations.

Display Comman, W1 (OUT)

IN - Select comma as decimal point in weight display

OUT - Select decimal point in weight display

ROM Select, W2 (1-2)

Must be shorting pin 1 to 2

ROM Enable, W3 (IN)

Must be in.

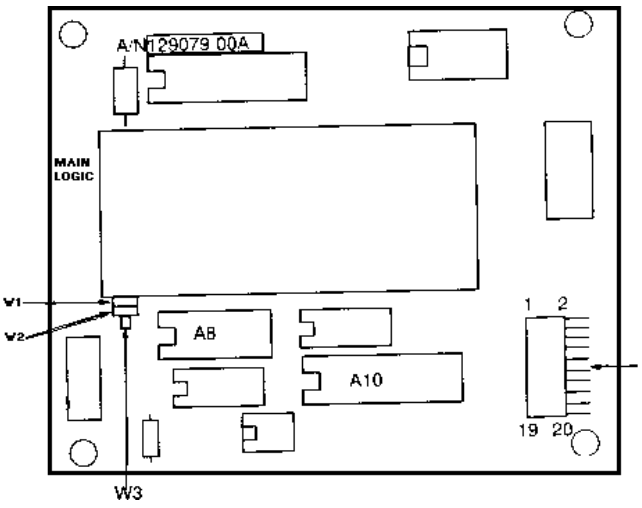


Figure 4.1 Display PCB

Power Supply PCB jumper programming. Default settings are shown in parenthesis. Refer to Figure 4.2 for Power Supply PCB jumper locations.

Calibration, W1 (IN)

IN - Enable calibration setup
OUT - Disable calibration and setup.

Clamp, W2 (OUT)

IN - Connect internal TTL output noise suppressors
OUT - Disconnect internal TTL output noise suppressors

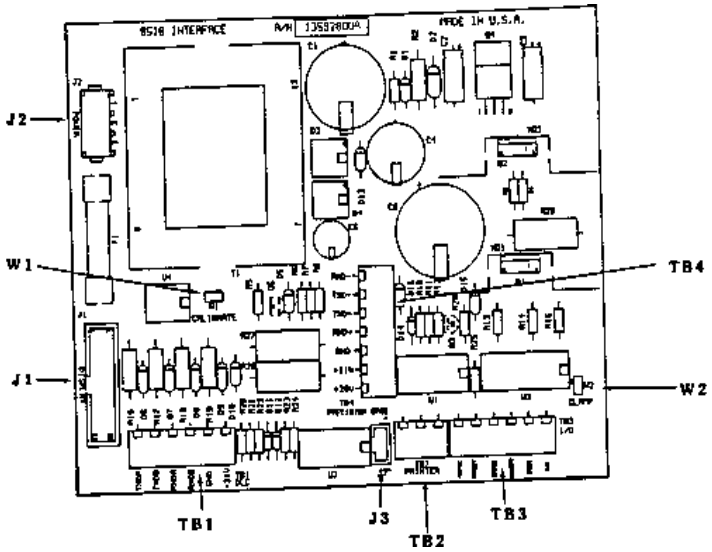


Figure 4.2 Power Supply PCB

4.4 PROGRAMMING AND CALIBRATION

CAUTION!
OBSERVE PRECAUTIONS FOR HANDLING
ELECTROSTATIC SENSITIVE DEVICES

WARNING!
ONLY PERMIT QUALIFIED PERSONNEL TO SERVICE
THIS EQUIPMENT. EXERCISE CARE WHEN MAKING CHECKS,
TESTS AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON.

Place the 8510 into the SETUP Mode.

Press and release both the ZERO key and the PRINT key simultaneously. The display must now show [F0 0].

NOTES: If the display does not show [F0 0 remove the rear cover of the display enclosure and confirm that the CAL jumper W1, on the Power Supply PCB (see Figure 4.2 in section 4.3), is shorting the two gold pins together. If W1 is not in, insert jumper W1 and repeat the previous step. If the display does not respond with the [F0 0 prompt, refer to the troubleshooting section of this manual.

If the display shows [F12 0], reprogram step [F12.1] to a "0", exit setup then reenter setup.

The following front panel keys perform the specified functions when in the programming mode.

PRINT - Pressing this key will accept the displayed section for a particular step and proceed to the next prompt.

ZERO - Pressing this key will allow the programmer to backup to the previous step.

TARE/TARGET - Pressing this key will display the next selection of a menu or toggle 0 and 1 if choice is on or off

CLEAR - Pressing this key will advance to the end of the setup sequence, [CALOFF].

From this point forward [FX X] will show the displayed prompt and the indented paragraphs will explain the SETUP function and selections.

[F0 0] SPAN ADJUST FEATURE
This feature allows fine trimming of the calibration. Span adjust is allowed only AFTER calibration has been performed, and only in the units in which the scale was calibrated. Enter a zero for this prompt if calibration has yet to be performed, or span adjust is not desired. Enter a one if span adjust is desired.

Example: A 5 lb weight is placed on a calibrated scale and results in a display of 5.004 lb. Rather than repeat an entire calibration procedure, the operator may "adjust" the 5.004 lb reading to the correct 5.000 lb reading via the following procedure:

Press the ZERO key to zero the scale, then place a known test weight on the scale. The amount of weight used MUST be less than or equal to the programmed scale capacity.

Enter the SETUP mode by pressing, then releasing, the ZERO and PRINT keys simultaneously.

Press the TARE key until the display shows [FO 1], then press the PRINT key to enter the selection. If [FO 0] is selected, the display will advance to step F! and the span adjust step will be bypassed.

[000. 000]
If [FO 1] is selected, the display will show all 0's. A decimal point will be displayed if used. The leftmost 0 will be blinking. At this point the operator must enter the actual amount of test weight that is on the scale. The weight display will adjust calibration and display this weight correctly.

Press the TARE key to move the blinking cursor one digit to the right.

Press the ZERO key to increment the blinking digit by one, if desired.

Press the CLEAR key if it is necessary to reenter the test weight.

[005.000]
Press the PRINT key to accept the test weight entered. The display then counts down from 15 to 0 while scale readings are being taken. Pressing the CLEAR at any time during the countdown aborts the span adjust.

When the countdown reaches 0 an attempt is made to calculate the span calibration.

If the weight is negative, overcapacity, or the display is in the expand mode [F10 1] then an E35 error code is displayed to show that span adjustment was not performed. If a span adjust is attempted that results in a corrected weight reading that is less than 50%, or more than 200% of the original weight reading, then an E35 error code is displayed to show that the span adjust was not performed. Press any key to clear the E35 display and proceed to the end of SETUP.

The display will proceed to [CALOFF] if span adjust is successfully completed.

If the PRINT key is pressed with the display showing [000.000] then span adjust is aborted and the display will advance to the first SETUP step F1.

NOTE: The span adjust feature is not available when using lb/oz display format, [F2 2].

[F1 0] SELECT INDICATOR OR OVER/UNDER MODE
This programming step selects the operating mode of the 8510. The indicator mode is used for straight weighing with tare. If the indicator mode is programmed, the status LED display and status printout are disabled. The Over/Under mode makes it possible to enable target weight storage, with a status LED display and status message printout.

TARE key - Display the next selection, if desired.

PRINT key - Accept the displayed selection.

Number	Model Selection
0	Single Cell Indicator
1	Single Cell Over/Under
2	Not Used
3	Not Used
4	DigitTOL ® Power Module Indicator
5	DigitTOL © Power Module Over/Under

NOTE: If DigiTOL ® Power Module mode is selected (Setup step [F1 4] or [F1 5] then lb-oz calibration unit is disabled.

[F2 0] CALIBRATION UNITS
Selects the units to be used for the default weight display and during span adjust and calibration.

TARE key - Display the next selection, if desired.

PRINT key - Accept the displayed section.

Number	Units
0	lb
1	kg
2	lb-oz

[F3 1] "UNITS" KEY PROGRAMMING
An alternate unit of measure can be selected via the keyboard during normal operation. The UNITS key is used to switch from the default calibration units to the alternate units selected at this point in the setup program. Example: If lb/kg switching is selected, then each time the UNITS key is pressed the display will toggle between lb and kg. The effect of this step is related to how F2 is programmed. Only certain combinations of F2 and F3 are valid.

TARE key - Display the next selection, if desired.

PRINT key - Accept the displayed selection.

Number	Units Key Function	F2 Programming
0	Units key disabled	Any Position
1	lb/kg switching	F2 = 0 or 1
2	lb-oz/kg switching	F2 = 2

[F4 2] DISPLAY ENABLE/DISABLE
TARE key - Display next selection, if desired.

PRINT key - Accept displayed selection.

Number	Weight Display	LED Display
0	OFF	ON
1	ON	ON
2	ON	OFF

NOTE: If [F4 0] then F5 will be skipped.

[F5 0] DISPLAY UNITS
This step controls how weight will be displayed when a target weight has been entered. If no target is entered then weight will display in units calibrated.

TARE key - Toggle 0 / 1, if desired.

PRINT key - Accept displayed selection.

Number	Display Units
0	Display weight in units calibrated
1	Display weight as percentage of target (Displays between -999.9% to +999.9%)

[F6 2] AUTOZERO MAINTENANCE (AZM)
The AZM window options, 0.5 d and 1.0 d (if selected) determine the active window (the difference between the current reading and the last captured zero), over which AZM will correct for small changes in gross zero. Weight variations that do not exceed the AZM window will be compensated for at the rate of 0.2d per second, unless the resultant captured zero is higher or lower by more than the pushbutton zero range (+/- 2% or +/1 20% as programmed in step F7) from the initial zero captured during calibration.

Number	Autozero Maintenance Mode
0	No AZM
1	AZM within 0.5 d window
2	AZM within 1.0 d window

[F7 1] ZERO KEY ENABLE
A front panel pushbutton provides rezeroing of the scale over a selectable range of either +/-2% or +/-20% of programmed scale capacity. The ZERO key is operational only with no motion and in the gross mode.

TARE key - Display next selection, if desired.

PRINT key - Accept displayed selection.

Number	% of Scale Capacity
0	Disable ZERO key
1	+/1 2%
2	+/- 20%

[F8 0] MOTION SENSITIVITY WINDOW
This step sets up a zone within which the weight reading can change without tripping the “weight in motion” detector.

The “weight in motion” detector requires either 3 successive weight readings (with digital filter disabled, [F9 0} or 5 successive weight readings (with digital filter enabled, [F9 1, 2, or 3] within the motion sensitivity window for a “no motion” signal. When motion is detected the 8510 inhibits the zero, tare, and print functions.

TARE key - Toggle 0 / 1, if desired.

PRINT key - Accept displayed selection

Number	Sensitivity Window
0	+ / -d Motion sensitivity
1	+ /- 3d Motion sensitivity

[F9 1] FILTER SENSITIVITY SELECTION
This selection is made available to filter out vibration and create a more stable (non-fluctuating) display. The heavier the filtering used, the slower the weight display will update. This function affects the weight in motion detector as described in the preceding SETUP step [F8 X].

TARE key - Display next selection, if desired.

PRINT key - Accept displayed selection.

Number	Filtering Mode
0	Filtering Disabled
1	Light Filtering
2	Medium Filtering
3	Heavy Filtering

[F10 00 EXPANDED WEIGHT DISPLAY
For calibration or troubleshooting purposes, expanded weight display can be selected. Once SETUP has been exited, the weight display will show between 0 and 30000 depending on the capacity and amount of weight on the scale. All keys on the keyboard are disabled except for the ZERO and TARE combination required to enter SETUP.

TARE key - Toggle 0 / 1, if desired.

PRINT key - Accept displayed selection.

Number	Weight Display
0	Normal display mode
1	Expanded display mode enable

[F11 0] NET WEIGHT DISPLAY
TARE key - Toggle 0 / 1, if desired
PRINT key - Accept displayed selection.

Number	Weight Display
0	Gross weight will be displayed when a target weight has been entered
1	Weight difference from target weight will be displayed

[F12] ZONE PROGRAMMING GROUP

TARE key - To skip SETUP group F12.

PRINT key - To enter the Zone Programming Group.

This section allows the customer to program the zone widths for the Over/Under LED display. Refer to Figure 4.3 and section 5.4 for explanation of zone edges.

	UNDER WEIGHT	LOW WEIGHT	TARGET WEIGHT	HIGH WEIGHT	OVER WEIGHT
	[F12.5] 0-15 d	[F12.4] 0-15 d	[F12.53 0-15 d	[F12.2] 0-15 d	
UNDER ZONE	LOW ZONE	ACCEPT LOW ZONE	ACCEPT HIGH ZONE	HIGH ZONE	OVER ZONE
RED KED	AMBER LED	GREEN LED		AMBER LED	RED LED

Figure 4.3 LED Display Zone Edges

[12.1 0] SETUP ENTRY POINT

A Selectable setup entry point is provided to allow the operator to change zone widths easily without having to step through the entire SETUP. This protects the operator from inadvertent programming changes to the setup parameters. If setup entry point F12 is selected, [F12.1 1]. The operator will not be able to access any other setup steps except the F12 group. In order to calibrate or program the scale, select setup entry point F0, [F12.1 0].

TARE key - Toggle 0 / 1, if desired.

PRINT key - Accept the displayed selection.

Number	Setup Entry Point
0	Enter setup at step F0
1	Enter setup at step F12 (zone width programming only)

[12.2 1] HIGH ZONE WIDTH

TARE key - Display the next High Accept zone width (0 d to 15 d).

PRINT key - Accept the displayed value.

[12.3 1] HIGH ACCEPT ZONE WIDTH

TARE key - Display the next High Accept zone width (0 d to 15 d)

PRINT key - Accept the displayed value

[12.4 1] LOW ACCEPT ZONE WIDTH

TARE key - Display the next Low Accept zone width (0 d to 15 d).

PRINT key - Accept the displayed value.

[12.5 1] LOW ZONE WIDTH

TARE key - Display the next Low zone width (0 d to 15 d).

PRINT key - Accept the displayed value.

NOTE: If in over/under mode [f1 1] or [f1 5], steps f13 and f14 will be skipped.

[F13 1] TARE ENABLE

TARE key - Toggle 0 / 1, if desired.

PRINT key - Accept the displayed selection.

Number	Tare Function
0	Tare disabled
1	Tare enabled

[F14 0] AUTO CLEAR TARE

If auto clear tare is enabled, tare will be automatically cleared when the scale returns to within 0.5 d of gross zero after having settled on a no motion weight greater than 10 d above net zero.

TARE key - Toggle 0 / 1, if desired.

PRINT key - Accept the displayed selection.

Number	Tare Cleared
0	Disable Auto Clear Tare
1	Enable Auto Clear Tare

[F15] SERIAL PORT PROGRAMMING

TARE key - To skip SETUP group F15.

PRINT KEY - To enter the Serial Port Programming Group.

[F15.1 1] DEMAND OR CONTINUOUS FORMAT MODE SELECTION
Toledo Scale continuous format mode is a specialized data output used to communicate with remote displays or for real time computer interfacing applications. The Toledo Scale continuous format data packet is transmitted every time a scale update occurs.

The demand mode is used for interfacing to Toledo ® printers or for simple computer interfacing.
TARE key - Toggle 0 / 1, if desired.
PRINT key - Accept the displayed selection.

Number	FORMAT MODE
0	Toledo ® continuous format mode
1	Demand mode

NOTES: The continuous format mode is for use with lb or kg units only. If lb-oz units is selected (SETUP step [F3 3] or if percentage of target weight is to be displayed (SETUP step [F5 1], then the continuous mode must not be selected.

If Toledo ® continuous format mode is selected, print SETUP steps F15.5, F15.6, F15.8, are skipped.

[F15.2] BAUD RATE SELECTION

[9600]
Baud rate options for the serial data output are: 300, 1200, 2400, 4800, and 9600 baud. If continuous format is selected [F15.1 0] then the selections are limited to 2400, 4800, and 9600 baud.

TARE key - Display the next selection, if desired.

PRINT key - Accept the displayed selection.

[F15.3 2] PARITY BIT SELECTION
A parity bit can be selected to detect errors associated with transmission of ASCII data. Select the parity bit to match what the receiving device requires. Most Toledo Scale products use even parity, [F15.3 2].

TARE key - Display the next selection, if desired.

PRINT key - Accept the displayed selection.

Number	Parity Selection
0	Parity bit always a “0”
1	Odd parity bit
2	Even parity bit

[F15.4 0] CHECKSUM AND STX SELECTION
Checksum is an error detection scheme that checks the integrity of the entire string of data that is transmitted. Checksum is defined as the 2's complement of the sum of the 7 low order bits of all characters transmitted, beginning with the STX character to the last character before the checks.

STX is an ASCII start of text character that normally precedes a transmission. If the continuous format mode is selected, [F15.1 0] then the STX character will always be transmitted even if checksum is disabled.

TARE key - Toggle 0 / 1, if desired.

PRINT key - Accept the displayed selection.

Number	Checksum and STX Transmission
0	No checksum transmission in demand or continuous mode. No STX transmission in demand mode
1	Checksum and STX transmission in both demand mode and continuous modes

[F15.5 1] LINE FORMAT SELECTION
This step controls what weight data will be printed, if it will be printed all on one line, or if each field will be printed on its own line.

TARE key - Display the next selection, if desired.

PRINT key - Accept the displayed selection.

Number	Data Printed	Line Format
0	Displayed weight only	Single line
1	Gross, tare, net	Single line
2	Gross, tare, net	Multiple line

NOTE: If Over/Under mode is selected [F1 1] or [F1 5], and net weight display is disabled, then displayed weight only single line is format assumed, [F15.5 0]

[F15.6 0] DOUBLE WIDTH PRINT ENABLE
This step controls if ASCII (SO), shift-out, and ASCII (SI), shift-in, characters are to be inserted in the data transmission to produce double width printout.

TARE key - Toggle 0 / 1, if desired.

PRINT key - Accept the displayed selection.

Number	Wide Print
0	Normal print
1	Double width print enable

[F15.7 0] AUTOPRINT ENABLE
This step enables the autoprint function. The sequence of operation for autoprint is as follows. A weight of 5 or more increments is placed on the scale. After the scale reading is stable, (no motion), a print will be initiated. The weight must then return to a stable zero, (net or gross), before the autoprint sequence will repeat.

NOTE: If autoprint is enabled the PRINT key is disabled.

TARE key - Toggle 0 / 1, if desired.

PRINT key - Accept the displayed selection.

Number	Autoprint
0	Demand print only
1	Auto print enable

[F15.8 0] PRINT WEIGHT CLASSIFICATIONS
This step controls if the status of the LED's will be printed after the weight field. The messages printed will be "Under", "Low", "Accept", "High", and "Over" . Weight classifications will be printed only if the 8510 is in the Over/Under mode, [F1 1] or [F1 5].

TARE key - Toggle 0 / 1, if desired.

PRINT key - Accept the displayed selection.

Number	Print Weight Classifications
0	No weight classification printed
1	Print weight classifications

[F16 0] ASCII INPUT ENABLE
The printer port can accept ASCII character inputs to remotely control the functions of the scale. These commands are received into the printer port TB-2, pin 3. Refer to section 6.4. Table 9 for commands that are supported by the 8510:

TARE key - Toggle 0 / 1, if desired.

PRINT key - Accept the displayed selection.

Number	ASCII Input Control
0	Disable ASCII input commands
1	Enable ASCII Input commands

[17 0] DISPLAY INDIVIDUAL CELL RAW COUNTS (DIGITOL ® POWER MODULE MODE ONLY)
This step allows the display of raw count output for each load cell connected to a DigiTOL ® Power Module or Model 2157 floor scale, (Setup step [F1 4] or [F1 5].

Verification of the initial load cell raw count output is necessary to determine that each load cell is carrying its even share of the load. Before performing this test, make certain that the scale is level, that is has repeatability, and that platform rocking does not exist. The procedure for correcting these conditions may be found in the technical manual for the scale base. All load cells must be within 1000 counts of each other. If required, shim to obtain this. Refer to the scale base technical manual for shimming instructions.

NOTE: When the DigiTOL ® Power Module is used to convert a vessel such as a tank or hopper into a scale, the load cells may not receive even loading due to the construction of the vessel. This variance may be reflected in uneven initial raw count outputs that cannot be shimmed out.

TARE key - Toggle 0 / 1, if desired.
PRINT key - Accept the displayed selection.

Number	Raw Counts Display
0	Disabled
1	Enabled

When this step is entered the display shows [CELL 1] momentarily then displays the load cell's raw count output.

TARE key - Display the Next Load Cell Counts.

CLEAR key - Exit Raw Count Display Mode.

Continue pressing the TARE key until the initial raw count of each cell load cell has been displayed. It is recommended that these raw count outputs be recorded to aid in diagnosing problems that may occur in the future.

[18 0] TARE INTERLOCKS (REQUIRED FOR LEGAL-FOR-TRADE APPLICATIONS)
Tare interlocks restrict certain weighing operations to satisfy legal-for-trade requirements. When tare interlocks are enabled, the following restrictions apply.

Tare can be cleared at Gross Zero.

Tare can only be entered in the Gross weighing mode.

The Units cursor will not blink when the scale is "in motion".

Upon powerup the display will show [E E E] for weights above zero and will display [-E E E] for weights below zero. Off zero weights must be manually captured by pressing the ZERO key before weights will be displayed.

TARE key - Toggle 0 / 1, if desired.

PRINT key - Accept the displayed selection.

Number	Raw Counts Display
0	Disabled
1	Enabled

[F19 0] ENABLE MOTION BLANKING
This step is provided to allow the 8510 to blank the weight display anytime the scale is in a “motion” condition.

TARE key - Toggle 0 / 1, if desired.

PRINT key - Accept the displayed selection.

Number	Motion Blanking
0	Disabled
1	Enabled

[CAL] SCALE CONFIGURATION AND CALIBRATION

TARE key - Skip the Calibration Group and advance to [CALOFF], if desired.

PRINT key - Enter the Calibration Group.

[C1] SCALE CAPACITY

[100]

The display shows the current capacity. Refer to Tables 4-1, 4-2, and 4-3 for a list of valid capacity selections.

ENTER key - To accept display selection and advance to step [C2].

CLEAR key - To erase old capacity selection and allow new capacity selection.

[00000X] ENTER NEW SCALE CAPACITY
When the CLEAR key is pressed the display will show all zeros [00000X] with the right most or least significant digit (X) flashing.

ZERO key - To increment the flashing digit to the next possible selection. Invalid selections such as (9) are skipped.

TARE/TARGET key - To accept the selected value for the flashing digit and step to the next significant digit, one digit to the left.

CLEAR key - To zero display and start over at [00000X].

PRINT key - To accept displayed value and advance to setup step [C2].

[C2] INCREMENT SIZE

[0.02]

The display shows the stored value or defaults to the first legal value. Refer to Tables 4-1, 4-2, and 4-3 for a list of valid increment size selections.

TARE key - Select the next valid increment size, if desired.

PRINT key - Accept the displayed increment size and advance to the beginning of the calibration sequence.

Increment Size lb, kg	Displayed Divisions (Capacity Selections)						
	1000	2000	3000	4000	5000	6000	10000
0.001	+1	2	3	4	5	6	10
0.002	2	4	6	8	10	12	20
0.005	5	10	15	20	25	30	50
0.01	10	20	30	40	50	60	100
0.02	20	40	60	80	100	120	200
0.05	50	100	150	200	250	300	500
0.1	100	200	300	400	500	600	1000
0.2	200	400	600	800	1000	N.A.	N.A.
0.5	500	1000	N.A.	N.A.	N.A.	N.A.	N.A.
1	*1000	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

Table 4-1 Model 8510 DigiTOL ® Bench/Portable lb and kg Capacity Selections (Setup Step [F1 0] or [F1 1), (Setup Step [F2 0] or [F2 1])

lb-oz Capacity Selections					
18.75 lb	37.50 lb	93.75 lb	187.5 lb	375.0 lb	750.0 lb
0.1oz	0.2 oz	0.5 oz	1 oz	2 oz	4 oz
Increment Size					

Table 4-2 Model 8510 DigitTOL ® Bench/Portable lb-oz Capacity Selections (Setup Step [F1 0] or [F1 1], (Setup Step [F2 2])

Increment Size lb, kg	Displayed Divisions (Capacity Selections)						
	1000	2000	3000	4000	5000	6000	10000
0.05	N A.	N.A.	N.A.	N.A.	250	N.A.	*500
0.1	N.A.	200	N.A.	N.A.	500	600	1000
0.2	200	N.A.	600	800	1000	1200	2000
0.5	500	1000	1500	2000	2500	3000	5000
1	1000	2000	3000	4000	5000	6000	10000
2	2000	4000	6000	8000	10000	12000	20000
5	5000	1000	15000	20000	25000	30000	50000
10	10000	20000	30000	40000	50000	60000	100000
20	20000	40000	60000	80000	100000	120000	200000
50	40000	100000	150000	200000	25000	300000	N.A.

Table 4-3 Model 8510 DigitTOL ® Power Module lb and kg Capacity Selections (Setup Step [F1 4] or [F1 5], (Setup Step [F2 0] or [F2 1])

(*) Units switching is disabled for these selections
(N.A.) Not Applicable

[C3 0] SELECT NUMBER OF LOAD CELLS/PERFORM SHIFT ADJUST
This selection allows the number of load cells connected to the DigiTOL ® Power Module to be entered and shift adjust to be performed. The Model 2157 uses four load cells.

NOTE: This prompt occurs only if DigiTOL ® Power Module mode is selected (Setup Step [F1 4] or [F1 5].

TARE key - Display the next selection, if desired.

PRINT key - Accept the displayed selection.

Number	Action
0	Skip This Step
1	Select Number of Load Cells and Perform Shift Adjust
2	Set Shift Adjust Values = 1

If shift adjust values equal to a 1 is selected, [C3 2] then any previously stored shift adjust values will be removed and cause the load cell outputs to be used without any trim built into the values. It acts as if the load cells are simply wired in parallel as a conventional analog J-box without any trim resistors. This feature would be utilized when using the 8510 and the DigitTOL ® Power Module with a tank or hopper scale where a shift test is not practical.

If select number of load cells and perform shift adjust is selected, [C3 1] the following sequence will occur:

The 8510 will prompt you to add and remove test weights in order to adjust for errors in the weight readings from one load cell to another. If the 8510 detects motion during a count down, the sequence is restarted.

[X LCS]
Number of Load Cells Connected. X is equal to the total number of load cells connected to DigiTOL ® Power Module.

TARE key - Increment the number of cells displayed, if desired.

PRINT key - Accept the displayed value and advance to shift adjust.

After the number of load cells connected to the 8510 has been selected, the 8510 enters the shift adjust procedure listed next.

SHIFT ADJUST PROCEDURE

[E SCL] EMPTY SCALE
First the scale will ask you to [E SCL] or empty the scale. Make sure there is nothing on the scale platform and press the PRINT key to continue.

[15] COUNT DOWN
The 8510 will count down from 15 to 0 while the initial zero weight is recorded.

[CELL X] ADD LOAD TO CELL NUMBER X

NOTE: Load cell #1 is the cell to the left of the J-Box (viewed from the top of the deck). Cells 2, 3 and 4 are located as shown below.

.
.

Place the test weight over the load cell number displayed and press the PRINT key.

[15] COUNT DOWN
The 8510 will count down from 15 to 0 while the weight reading is recorded.

The [CELL X] step followed by the [15] count down step is repeated until all load cells selected in step [X LCS] (number of load cells connected) have been shift compensated.

Upon completion of the shift adjust step the display will advance to [E SCL} for calibration.

CALIBRATION SEQUENCE
Once the scale capacity and increment size have been selected the 8510 then enters the calibration sequence. The 8510 will prompt you to add and remove test weights in order to adjust the scale calibration.

[E SCL] EMPTY SCALE
First the scale will ask you to [E SCL] or empty the scale. Make sure there is nothing on the scale platter and press the PRINT key to continue.

[**15 CAL] COUNT DOWN**
The 8510 will count down from 15 to 0 while the initial zero weight is recorded.

[Add Ld] ADD LOAD
Place the test weight on the scale platform. Ideally, the test weight used should be as close as possible to full scale capacity. The test weight used cannot exceed the programmed full scale capacity or else an error code E34 will be displayed.

Press the PRINT key to continue.

[000.000]
The display will show all 0's with a decimal point if used. The leftmost 0 will be blinking. At this point the operator must enter the actual amount of test weight that is on the scale. The test weight value is entered one digit at a time using the TARE and ZERO keys as described below.

Press the TARE key to move the blinking cursor one digit to the right, if needed.

Press the ZERO key to increment the blinking digit by one, if needed.

Press the CLEAR key to reset all digits to zero if it is necessary to reenter the test weight.

Continue to enter the test weight value until the display shows the correct value for the test weight used, including a decimal point if used.

Press the PRINT key to accept the test weight entered and advance to the next step. If a test weight value of zero is entered an error code E32 will be displayed.

[15 CAL] COUNT DOWN
The 8510 will count down from 15 to 0 while the span value is recorded.

[CAL d] CALIBRATION DONE (DISPLAYED MOMENTARILY)

[CALOFF] PROGRAMMING AND CALIBRATION COMPLETE
Press and release the ZERO and PRINT key simultaneously to exit SETUP.

NOTE: To make the setup parameters NON-ACCESSIBLE from the keyboard remove jumper W1 from the Power Supply PCB. Replace the back cover and gasket of the display enclosure. Make certain ALL 12 grommet screws are firmly in place to ensure a water tight seal.

5.0 OPERATING INSTRUCTIONS

5.1 DISPLAY

The 8510 utilizes a highly readable, vacuum fluorescent display. It consists of six 0.5" high digits with decimal points or commas. Over capacity is indicated by blanking of the display. To the right of the weight display are five LEDs that are used to indicate the status of the weight on the scale as compared to a stored target weight. These LEDs are used in the Over/Under mode only [F1 1] or [F1 5].

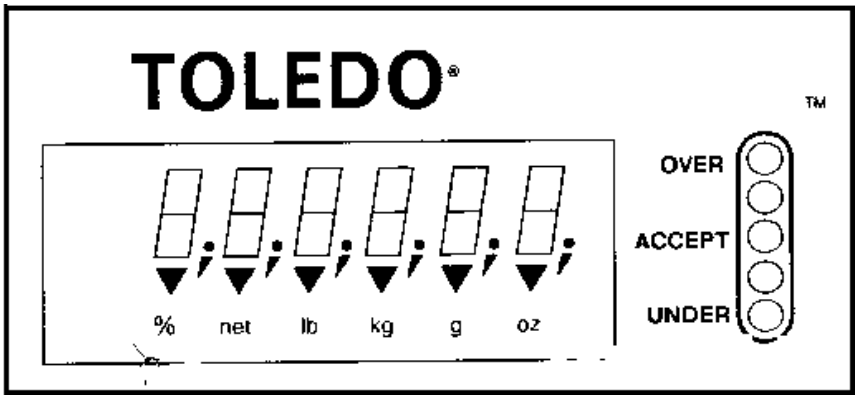


Figure 5.1 Display

The 8510 cannot display a negative six digit net weight since it only has six display digits. If a negative six digit net weight occurs, the display will alternately show the weight value then a minus in the leftmost display digit. The correct weight will be transmitted by the printer port.

The 8510 provides five status LEDs in the Over/Under mode. The status LEDs display the difference between the current weight on the scale and a stored target weight.

The 8510 has legends to indicate the weighing units that the scale is displaying and also to indicate if the scale is displaying a net weight or a percentage of a target weight.

Legend	Description
lb	Shows the weight displayed is in pound units
kg	Shows the weight displayed is in kilogram units
lb oz	Both the lb and the oz legends are illuminated to show the weight displayed is in pounds and ounces units
%	Shows the value displayed is a percentage of the stored target weight
net	Shows the value displayed is a net weight

Table 5-1 Display Legends

5.2 KEYBOARD FUNCTIONS

Figure 5.2 Keyboard

5.2.1 ZERO KEY

The ZERO key provides rezoning of the scale over a range of either a ± 2 or ± 20 of programmed scale capacity (selected in SETUP step F7). The ZERO key will only be effective while there is “no motion” with the scale in the gross weighing mode.

5.2.2. TARE/TARGET KEY

5.2.2.1 OVER/UNDER MODE

If configured as over/under mode (SETUP step [F1 1] or [F 5], the TARE/TARGET key serves to enter the target weight. Pressing the TARE/TARGET key when the indicated weight is not at zero and with “no motion” will store the weight value on the scale as a target weight and the accept LED will be illuminated.

When the item is removed the under LED will then be illuminated. The scale will light the proper LED to indicate the classification of the current weight as compared to the stored weight.

If net display is selected (SETUP step [F11 1] then the weight difference from the stored target weight will be displayed. If net weight display is disabled (SETUP step [F11 0], then gross weight will be displayed.

5.2.2.2 INDICATOR MODE

If configured as indicator mode (SETUP step [F1 0] or [F1 4], the TARE/TARGET key functions as a TARE key. Pressing the TARE/TARGET key when the indicated weight is not a zero and with “no motion” will store the weight as a tare weight.

The stored tare weight is subtracted from the gross weight value and displayed as a net weight. The NET cursor is also turned on.

If the current weight is less than the stored tare weight, the net weight will be displayed as a negative weight.

If the tare operation results in a six digit negative weight, the display will alternately display the weight (with no minus sign) and a single minus sign followed by five blanks.

Pressing TARE/TARGET key at gross zero has the same effect as pressing the CLEAR key.

5.2.3 CLEAR KEY

The CLEAR key is used to remove tare or target weights that have been entered on the scale.

Pressing the CLEAR key in the over/under mode (SETUP step [F1 1] or [F1 5], will clear the stored target weight and disable the LED display.

Pressing the CLEAR key in indicator mode (SETUP step [F1 0] or [F1 5], will clear the stored tare weight.

Auto clear tare enabled (SETUP step {F14 1], will clear the stored tare weight when the scale returns to gross zero with “no motion” after having settled to no motion on a weight greater than 10 d above net zero.

5.2.4 UNITS KEY

The UNITS key will switch from the calibration units selected to the valid alternate units mode. Example: If lb is selected as calibration units, [F2 0], and the UNITS key is configured to lb/kg switching, [F3 1], then pressing the UNITS key will switch the display between lb weighing and kg weighing.

NOTE: If Over/Under mode is selected, [F1 1] or [F1 5], the UNITS key will only switch Units if there is no target weight stored. If a target weight is stored and Units are to switched, press the CLEAR key to clear the target weight before pressing the UNITS key.

5.2.5 PRINT KEY

The PRINT key will initiate a data transmission of the selected format and baud rate (SETUP Group F15) if the following conditions are met:

Scale must not be under gross zero

Scale must not be in the expanded weight mode [F10 1]

Scale must have had zero capture after powerup

Scale must be in a “no motion” condition

NOTE: If the scale was unable to print because of “motion” then as soon as the scale is no longer “in motion” it will transmit the data.

5.3 INITIAL POWERUP SEQUENCE

When power is first applied to the Model 8510, the following sequence occurs.

All eights, [888888], will be displayed for verification that all weight display segments are working.

The program part number is displayed next, [133598]. While the program part number is being displayed the 8510 attempts to establish communication with the load cell.

Next the revision level of the software is shown in the rightmost display digit. The letter “L” is displayed in the leftmost display digit. A sample display would be [L 2] which indicates the 2 or second revision of the software. This number will increase as modifications are made to the 8510 program.

After the display test and software part number and revision level displays, the 8510 performs a ROM test, RAM test, and NOVRAM test. Error codes for these conditions or for communication problems with the load cell, will be displayed if any of these tests fail.

If all the internal tests are passed, the scale will display weight in gross mode. Remove all items from the scale and verify that the scale is at gross zero. If the 8510 is not at gross zero, then press the ZERO key. If zero cannot be captured, the scale may need to be recalibrated.

NOTE: Demand mode printer output will be disabled upon powerup until gross zero is captured by means of AZM function or by pressing the ZERO key. Continuous format output is not affected by zero capture and will resume immediately after the powerup sequence is completed.

5.4 ZONE WIDTH PROGRAMMING

If the Model 8510 is used in the Over/Under mode, (SETUP step [F1 1] or [F1 5], the zone width edges must be determined and programmed into the 8510 memory before the status LEDs display will be usable.

To calculate the parameters entered into the zone programming group, (SETUP steps F12.2, F12.3, F12.4, and F12.5), divide the desired zone width by the increment size, programmed in calibration step C2. The High Accept zone width must be subtracted from the Over Zone Width and the Low Accept zone width must be subtracted from the Under Zone width for the calculation to be correct.

Example Zone Width Programming:

The Model 8510 is programmed for a scale capacity of 100 lb by 0.02 lb increment size. The end user requests the following zone edges:

Over Weight	=	0.52 lb or more above the target weight
Highest High Accept weight	=	0.50 lb above the target weight
Highest Accept weight	=	0.30 lb above the target weight
Lowest Accept weight	=	0.20 lb below the target weight
Lowest Low Accept weight	=	0.40 lb below the target weight
Under weight	=	0.42 lb or more below the target weight

Over zone edge is equal to 10 divisions, (0.5 lb - 0.3 lb) ÷ 0.02 lb

High Accept zone edge is equal to 15 divisions, 0.3 lb ÷ 0.02 lb

Low Accept zone edge is equal to 10 divisions, 0.2 lb ÷ 0.02 lb

Under zone edge is equal to 10 divisions, (0.4 lb - 0.2 lb) ÷ 0.02 lb

6.0 INPUT AND OUTPUT CONNECTORS AND INTERFACING

6.1 LOAD CELL CONNECTION

Before any load cell connections are made, the type of load cell to be connected must be determined. The model 8510 is designed to be used with Toledo ® DigiTOL ® load cell bases only. DO NOT USE ANALOG LOAD CELL BASES WITH THE 8510 INDICATOR OR DAMAGE WILL RESULT.

CAUTION!

DO NOT CONNECT OR DISCONNECT A LOAD CELL TO THE 8510 WITH POWER ON OR DAMAGE TO THE 8510 AND THE LOAD CELL MAY RESULT. ALWAYS WAIT AT LEAST 30 SECONDS AFTER POWER IS REMOVED BEFORE CONNECTING OR DISCONNECTING A LOAD CELL FROM THE 8510.

The Models 1997, 2097, and 2197 DigiTOL ® scale bases supply an integral load cell cable for connection to the indicator.

The Models 1996, 2096 and 2196 DigiTOL ® scale bases supply a 9 pin DE-9 female connector to mate to the 10 ft interconnect cable, part number 130115 00A, that is shipped with the base. The interconnect cable supplied has a DE-9 male connector for connection to the base. If a longer cable is required, use bulk cable, part number 510624-370, to fabricate a longer cable. Do not exceed a maximum cable length of 50 ft.

The indicator end of the supplied interconnect cable is terminated with individual, color coded wires to connect to the TB-1 terminal strip on the 8510 Power Supply PCB, part number 135928 00A. Refer to Table 6-1 or Table 6-2 for wiring data.

There are two different types of termination used on the Model 8510. Early production units utilized a four position terminal strip for load cell connections while the latest units utilize a six position terminal strip. Refer to the following charts for termination of both the four and six position terminal blocks.

Terminate the orange shield wire at the ground stud located next to the cable grip bushing. Terminate the load cell cable wires as described in the following load cell cable termination tables. Individually fold back and tape all wires which are not terminated at TB-1 to prevent shorting.

TB-1 Pin	Wire Color	Wire Function	Models 1996 2096 2096	Models 1997 2097 2097	DigiTOL ® Power Module Model 2157	
					Carbon Steel TB5	Stainless Steel J-1
1	Green	+20 VDC	5	Green	6	E
2	Red	RxD A	1	Red	3	A
3	Black	TxD A	8	Black	1	H
4	Blue	Ground	7	Blue	5	G

Table 6-1 Four Position TB-1 Termination

CAUTION!

DO NOT connect the white wire in the load cell cable when terminating Scale Base Models 1996, 1907, 2096, 2097, 2196 or 2197 to the 8510 DigiTOL ® Indicator. **DAMAGE TO THE LOAD CELL MAY RESULT if the white wire is terminated!**

Local Cell Termination for 135928 00A Power Supply PCB (6 Pin TB1)						
TB-1 Pin	Wire Color	Wire Function	Models 1996 2096 2096	Models 1997 2097 2097	DigiTOL ® Power Module Model 2157	
					Carbon Steel TB5	Stainless Steel J-1
1	Black	TxD A	8	Black	1	H
2	Yellow	TxD B	6	Yellow	2	F
3	Red	RxD A	1	Red	3	A
4	White	RxD B	Not Used	Not Used	4	D
5	Blue	Ground	7	Blue	5	G
6	Green	+ 20 VDC	5	Green	6	E

Table 6-2 Six Position TB-1 Termination

CAUTION!

DO NOT connect the white wire in the load cell cable when terminating Scale Base Models 1996, 1907, 2096, 2097, 2196 or 2197 to the 8510 DigiTOL ® Indicator. **DAMAGE TO THE LOAD CELL MAY RESULT if the white wire is terminated!**

Load Cell Interconnect Cable Installation

1. Disconnect power from the unit.

2. Remove fhs 3 screws from the rear cover of the indicator housing.

3.Remove and discard the nylon grip bushing plug, part number 129038 00A, from the unused grip bushing located on the bottom middle of the display enclosure.

4. Strip approximately nine inches of sheathing back from the load cell cable and prepare as shown in Figure 6.1. Solder a wire with a loop connector to the shield to be terminated to the ground stud.

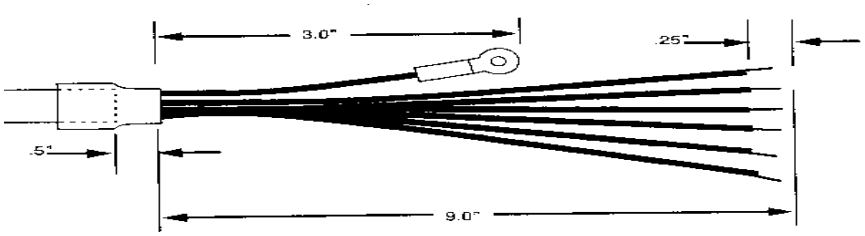


Figure 6.1 Cable Preparation

5. Insert the open (individual wire) end of the interconnect cable through the grip bushing from the outside of the enclosure.

6. In areas of high RFI concentration, this step must be completed. If no RFI is present, this step is optional. Wrap the load cell cable through the ferrite ring (included with 8510) four times as shown in Figure 6.2.

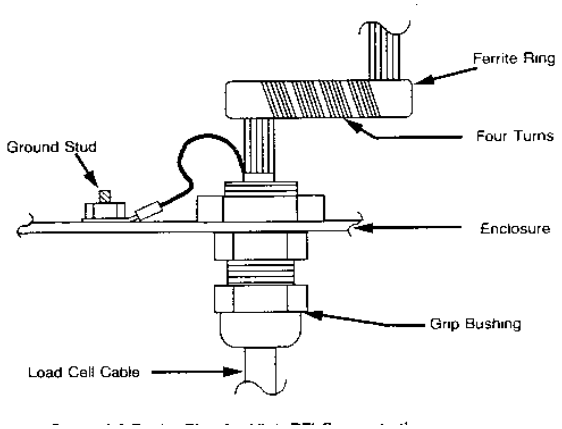


Figure 6.2 Ferrite Ring for High RFI Concentration

7. Terminate the interconnect cable wires at TB-1, (see Figure 4.2 in Section 4.3 for location), as described in Table 6-1 or Table 6-2. Terminate the shield wire at the ground stud located on the inside bottom left of the display enclosure. Individually fold back and tape all wires which are not terminated at TB-1 to prevent shorting.

6.2 STATUS TTL INPUT AND OUTPUT

A low true TTL input is provided to permit external operation of the target function, ground the target input to actuate the TARGET Key function. Three low true TTL outputs are provided to drive external lamps or LED's for indicating Over, Accept, and Under status. The status outputs float high at +5 VDC when turned off and are pulled to ground when turned on. The outputs are capable of sinking up to 20 mA of current. Refer to Figure 4.2 in section 4.3 for the location of TB-3. Refer to Table 6-3 for TB-3 wiring data.

Function	8510 TB-3
+5 VDC	1
Target (Input)	2
Under (Output)	3
Accept (Output)	4
Over (Output)	5
Ground	6

Table 6-3 Status Outputs

WARNING!
The TTL Status Outputs are designed for use with exterior LED displays only. Use of the TTL outputs for any other purpose can result in a **HAZARDOUS CONDITION**.

The TTL status outputs are open collector in design, which means they can be used with either the +5 VDC supplied on pin 1 of connector TB-3 or with an external DC power supply of up to +28 VDC.

The TTL status outputs are provided with clamping diodes to protect the output circuitry when driving inductive loads with the supplied +5 VDC. These clamping diodes are enabled by placing jumper W-2 on the Power Supply in. Refer to Figure 4.2 in section 4.3 for jumper W2 location.

If an external DC supply is used with the Status LED outputs, any inductive loads MUST be externally suppressed by means of reverse biased diodes connected across the load and jumper W-w must be removed.

CAUTION!

If an external DC supply is utilized with the TTL Status outputs the clamping jumper W-2 MUST be removed from the Power Supply PCB. If Jumper W-2 is not removed when an external DC supply is used, damage to PCB's could result.

If driving external LEDs with the built in +5 VDC supply, use 330 ohm resistors in series with the external LEDs to limit current to less than 20 mA. Refer to figure 6.3 for an example wiring diagram of the status TTL input and outputs used with a remote TARGET key and external status LED display.

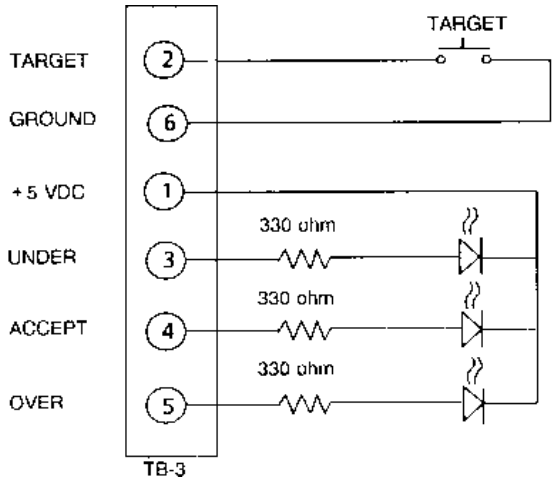


Figure 6.3 Status TTL Input and Output Example

6.3 PRINTER INTERFACE SPECIFICATIONS

The 8510 is capable of transmitting and receiving RS-232C ASCII data. When a print command is received from the PRINT key, the RS-232C input, or due to the auto print feature, the 8510 will output a message according to the printer output setup. Scale motion will disable the print until motion has ceased. Printer output is disabled when the 8510 is under gross zero, in the expand weight display mode, or if zero has not been captured after powerup.

The data is output in a 10 bit ASCII format: 1 start bit, 7 data bits, 1 parity bit (selectable to even, odd, or always a 0 by SETUP step [F15.3), and 1 stop bit.

The baud rate is selectable between 300, 1200, 2400, 4800, or 9600 by SETUP step [F15.2].

A checksum character is selectable by SETUP step F15.4. This parameter also determines if the STX (Start of Text) character is transmitted in the demand mode.

Autoprint can be enabled in either the demand or continuous modes (selected by SETUP step [F15.7 1]. The displayed weight must return to within ± 0.5 d of zero (gross or net), before another autoprint will be performed. The first "no motion" weight greater than or equal to 5 d will initiate a print as though the PRINT key had been pressed.

6.3.1 Printer Interconnect

The 8510 requires a printer interface cable KOP (kit of parts, part number 129052 00A) to connect to the Models 8806, 8843, 8855 (RS-232C version only), and 8860 Toledo Scale printers. Refer to technical manuals TM 008806 100, TM 008843 100, TM 008855 100, and TM 008860 100 for information about printer setup and programming. Refer to Table 6-4 for connector pinout.

Model 8510			8806	8843	8855	8860
Function	**J-3**	**TB-2**	**J-7**			**J-7**
GROUND	1	1	7	7	7	7
TRANSMIT	2	2	3	3	3	3
RECEIVE	NC	3	NC	NC	NC	NC

Table 6-4 Printer Interconnect

The TB-2 connector is provided for use with bidirectional serial communication. Refer to Figure 4.2 in Section 4.3 for J-3 and TB-2 location.

The 8855 strip printer requires the installation of a special interface cable. This cable will have an interface PCB attached to the printer end. The existing Interface PCB must be replaced with the new RS232-C Interface PCB.

8855 RS-232C Interface Kit

Part Number A129618 00A

Factory Number 0900-0244

NOTE: The 8510 must be programmed for 300 baud to operate with the 8855.

The 8860 printer requires a direct connection with the 8510. The adapter plug, part number 12801900A, that is supplied with the 8860 printer, MUST NOT be used.

WARNING!
DISCONNECT ALL POWER TO THIS UNIT
BEFORE REMOVING THE FUSE OR SERVICING.

CAUTION!
OBSERVE PRECAUTIONS FOR HANDLING
ELECTROSTATIC SENSITIVE DEVICES

6.3.2.1 Remove the 12 screws from the rear cover of the indicator housing.

6.3.2.2 Remove the grip bushing retaining nut located bottom right of the display enclosure, this grip bushing will contain a nylon plus to seal the bushing. Remove and discard the existing cable grip bushing assembly.

6.3.2.3 Remove the grip bushing nut, from the end of the printer cable assembly and insert the three position connector end of the printer cable, from the bottom, into the hole which contained the grip bushing in step 6.3.2.2., taking the place of the grip bushing assembly just discarded. Screw the nut onto the grip bushing and tighten the nut securely.

6.3.2.4 Place the printer cable ground ring terminal on the ground stud beside the grip bushing and secure into place with the existing #8 X 32 nut. Tighten the nut securely.

6.3.2.5 Plug the three position connector end of the printer cable into J-3 on the Power Supply PCB. Refer to Figure 4.2 in section 4.3 for connector J-3 location.

6.3.2.6 Attach the indicator cover with the 12 screws and tighten the screws to 9.6 in-lb.

6.3.2.7 Attach other end of printer cable to the printer and apply power.

6.3.3 Demand Format Data Ouput

When a print command is received from the PRINT key, the ASCII remote input, or due to the auto print feature, the 8510 will output a message according to display and print setup. Scale motion will disable the print until motion has ceased. Printing is disabled when the scale is below gross zero or if expanded display is enabled.

The status of LEDs will be printed after the weight field if Over/Under mode and print weight classifications are selected (SETUP steps [F1 1] or [F1 5], and [F18 1]).

Explanations of the symbols and abbreviations used in the data format charts follow:

DEMAND FORMAT NOTES:

1 <STX> ASCII Start of Text Character, Hex value 02, Selected by SETUP step [F15.4 1], Checksum-STX enable.

2 <SO>/<SI> ASCII Shift Out and Shift In characters, Hex value 0E / 0F, Selected by SETUP step [F15.6 1], for expanded print).

3 <Display> This field contains the displayed weight or percentage of target as programmed in SETUP. The field lis right justified and is padded with spaces to 7 places, or 8 places lif a decimal point is used. MSD (Most Significant Digit) is either a space for positive weights, or a minus for negative weights.

4 <SP> ASCII space, Hex value 20.

5 <Units> Display units (LB, kg, or %) as programmed in SETUP step F2, F5 and selected by UNITS key.

6 <Status> Represents the status of the LED display UNDER, LOW, ACCEPT, HIGH, and OVER. Enabled by SETUP step [F15.7 1], this field is printed only if a target weight has been stored.

7 <CR> ASCII carriage return, Hex value 0D.

8 <CKS> Checksum character, 2's complement of the 7 low order bits of the binary sum of all characters on a line, preceding the checksum. Enabled by SETUP step [F15.4 1].

9 <LF> ASCII Line Feed, Hex value 0A.

A <Pounds> This field is used with lb/oz units weighing. The pound field is right justified and is padded with spaces to 2 or 3 places, depending on programmed scale capacity. The MSD (Most Significant Digit) is either a space for positive weights, or a minus for negative weights.

B <Ounces> This field is used with lb/oz units weighing. The ounce field is right justified and is padded with spaces to 2 or 4 places plus a decimal point, depending on programmed scale capacity.

6.3.3.1 Single Line, Displayed Weight Only (SETUP step [F15.5 0]

6.3.3.1.1 Single Line, Displayed Weight Only (SETUP step [F15.5 0]

DATA	STX	SO	MSD	-	-	-	-	-	LSD	SP	UNITS	SP	STATUS	SI	CR	CKS	LF
NOTES	1	2	3							4	5	4	6	2	7	8	9

6.3.3.1.2 Single Line Net Weight (lb, kg)

DATA	STX	SO	MSD	-	-	-	-	LSD	SP	UNITS	SP	N	E	T	S	STATUS	SI	CR	CKS	LF
NOTES	1	2	3						4	5	4	4				6	2	7	8	9

6.3.3.1.3 Single Line Gross Weight (lb/oz)

DATA	STX	SO	MSD	LSD	SP	L	B	SP	MSD	-	-	LSD	SP	O	Z	SP	STATUS	SI	CR	CKS	LF
NOTES	1	2	A 4					4	B 4							4	6	2	7	8	9

6.3.3.1.4 Single Line Net Weight (lb/oz)

DATA	STX	SO	MSD	LSD	SP	L	B	SP	MSD	-	-	LSD	SP	O	Z	SP	N	E	T	SP	STATUS	SI	CR	CKS	LF
NOTES	1	2	A 4					4	B 4							4				4	6	2	7	8	9

Figure 6.4 Single Line, Displayed Weight Format

6.3.3.2 Single Line, Gross, Tare, Net (SETUP step [F15.5 1]

Gross, tare, and net data is output in sequence when a print is initiated and the display shows net weight. This format is available only in the indicator mode (SETUP step [F1 0] or [F1 4].

If a tare weight has not been entered then the data output will use the same format as single line gross weight (refer to Section 6.3.3.1.1).

6.3.3.2.1 Single Line Gross, Tare, Net (lb/kg)

DATA	STX	MSD	-	-	-	-	-	LSD	SP	UNITS	SP	MSD	-	-	-	-	LSD	SP	UNITS	SP	T	R	SP
NOTES	1	3							4	5	4	3						4	5	4			4

Single Line Gross, Tare, Net (lb/kg continued

DATA	SO	MSD	-	-	-	-	LSD	SP	UNITS	SP	N	E	T	SI	CR	CKS	LF
NOTES	1	3						4	5	4				2	7	8	9

6.3.3.2.2 Single Line Gross, Tare, Net (lb/oz)

DATA	STX	MSD	LSD	SP	L	B	SP	MSD	-	-	LSD	SP	O	Z	SP	SP	MSD	LSD	SP	L	B	SP	MSD	-	-	LSD	SP	O	Z
NOTES	1	A		4			4	B				4			4		A		4			4	B				4		

Single Line Gross, Tare, Net (lb/oz) continued

DATA	SP	T	R	SP	SO	MSD	LSD	SP	L	B	SP	MSD	Z	-	-	LSD	SP	O	Z	SP	N	E	T	SI	CR	CKS	LF
NOTES	4			4	2	A		4			4	B					4			4				2	7	8	9

6.3.3.3 Multiline Gross, Tare, Net (SETUP step [F15.5 2]

Gross, tare, and net data is output in sequence when a print is initiated and the display shows net weight. If a tare weight has not been entered, then the data output will use the same format as singleline gross weight (refer to Section 6.3.3.1.1).

6.3.3.3.1 Multiline Gross, Tare, Net (lb, kg)

GROSS

DATA	STX	MSD	-	-	-	-	-	LSD	SP	UNITS	CR	CKS	LF
NOTES	3								4	5	7	8	9

TARE

DATA	MSD	-	-	-	-	-	LSD	SP	UNITS	SP	T	R	CR	CKS	LF
NOTES	3							4	5	4			7	8	9

NET

DATA	SO	MSD	-	-	-	-	-	LSD	S	UNITS	SP	N	E	T	SI	CR	CKS	LF
NOTES	2	3							4	5	4				2	7	8	9

6.3.3.3.2 Multiline Gross, Tare, Net (lb/oz)

GROSS

DATA	MTX	MSD	LSD	SP	L	B	SP	MSD	-	-	LSD	SP	O	Z	CR	CKS	LF
NOTES	2	A		4			4	B				4			7	8	9

TARE

DATA	MSD	LSD	SP	L	B	SP	MSD	-	-	LSD	SP	O	Z	SP	T	R	CR	CKS	LF
NOTES	A		4		4	B					4			4			7	8	9

NET

DATA	SO	MSD	LSD	SP	L	B	SP	MSD	-	-	LSD	SP	O	Z	SP	N	E	T	SI	CR	CKS	LF
NOTES	S	A		4		4	B					4			4				2	7	8	9

6.3.4 Continuous Data Format

The continuous data format is available only when lb or kg units are being displayed. The baud rate selections are limited to 2400, 4800, and 9600. The data is formatted as a 17 or 18 byte packet, transmitted in a 10-bit ASCII format (1 start bit, 7 data bits, 1 parity bit, and 1 stop bit), after every A/D update.

DATA	STX	SWA	SWB	SWC	MSD	-	-	-	-	LSD	MSD	-	-	-	-	LSD	CR	CKS
NOTES	1	2		3							4						5	6

Figure 6.7 Continuous Data Format

CONTINUOUS DATA FORMAT NOTES:

1. <STX> ASCII Start of Text Character, Hex value 02.

2. <SWA>, <SWB>, <SWC> Status Word A, B,C. Refer to Status Word A, B, C definitions iln Tables 6-5, 66-6, and 6-7.

3. Displayed weight. Six digits, no decimal point or sign.

4. Tare weight, Six digits, no decimal point or sign.

5. <CR> ASCII Carriage Return, Hex value 0D.

6. <CKS> Checksum Character, 2's complement of the 7 low order bits of the binary sum of all characters on a line, preceding the checksum. Enabled by SETUP step [F15.4 1].

Bit Functions	Selection	Bit Numbers							
		7	6	5	4	3	2	1	0
Decimal Point	X0		0	1			0	0	1
	X		0	1			0	1	0
	.X	P	0	1			0	1	1
	.XX	A	0	1			1	0	0
	.XXX	R	0	1			1	0	1
Increment Size	X1	I	0	1	0	1			
	X2	T	0	1	1	0			
	X5	Y	0	1	1	1			

Table 6-5 Status Word A Bit Definition

Function	Bit
GROSS/NET NET = 1	0
NEGATIVE = 1	1
OVERCAPACITY = 1	2
MOTION = 1	3
lb/kg kg = 1	4
ALWAYS A 1	5
POWERUP = 1	6
PARITY BIT	7

Table 6-6 Status Word B Bit Definitions

Function	Bit
ALWAYS A 0	0
ALWAYS A 0	1
ALWAYS A 0	2
PRINT REQUEST = 1	3
EXPANDED MODE = 1	4
ALWAYS A 1	5
ALWAYS A 0	6
PARITY BIT	7

Table 6-7 Status Word C Bit Definitions

6.4 ASCII DATA INPUT

The Model 8510 is capable of performing certain functions when a particular uppercase ASCII character is transmitted to it. This will only function when ASCII input is enabled, (SETUP step [F16 1]). Refer to Table 6-8 for ASCII characters the 8510 will respond to, along with the operator key equivalent.

The parity and baud rate of the data input must match the printer output as programmed in the serial port programming group [F15]. The data format also matches the output data format of 1 start bit, 7 data bits, 1 parity bit, and 1 stop bit.

NOTE: If autoprint is enabled, the Print function is disabled.

ASCII CHARACTER	OPERATOR KEY EQUIVALENT
P<CR>	PRINT key
T<CR>	TARE/TARGET key
C<CR>	CLEAR key
Z<CR>	ZERO key

Table 6-8 ASCII Input Commands

NOTES: The <CR> character is optional with the 8510 ASCII input commands.
THE ASCII CHARACTERS MUST BE UPPERCASE.

7.0 TROUBLESHOOTING AND ADJUSTMENTS

WARNING!

DISCONNECT ALL POWER TO THIS UNIT
BEFORE REMOVING THE FUSE OR SERVICING.

CAUTION!

OBSERVE PRECAUTIONS FOR HANDLING
ELECTROSTATIC SENSITIVE DEVICES

7.1 POWER SUPPLY CHECKS

DC voltage checks, MUST be made before any PCB's are replaced. Refer to Table 7-1 for test points and voltage readings. All power supply voltages listed in Table 7-1 originated on the Power Supply PCB. Refer to Figure 4.2 in Section 4.3 for location of connector test point.

Voltage	Function	Acceptable Voltage Range	Maximum Ripple	Test Point	
				+ LEAD	- LEAD
+20 VDC	DLC SUPPLY	+17.2 TO +23.6	0.1 VAC	TB1-6	TB1-5
+5 VDC	DC LOGIC	+4.9 TO + 5.2	0.05 VAC	TB3-1	TB3-6
-30 VDC	DISPLAY	-25.4 TO -30.6	1 VAC	J1-2	J1-7
+10 VDC	RAW +5 VDC	+ 7.6 TO +10.4	0.125 VAC	j1-5	j1-7
3.2 VAC	FILAMENT	2.3 TO 3.4		J1-1	J1-3

Table 7-1 Power Supply Voltages

7.2 ERROR CODES

If an error code occurs during operation, cycle the AC power off, wait 30 seconds, and then turn the power back on. If the error persists then refer to Table 7-2 for descriptions of error codes and suggested methods of correcting the error condition.

Error Code	Description	Suggested Corrective Action
E1	PROGRAM MEMORY FATAL ERROR	1. CHECK DC SUPPLY VOLTAGES 2. REPLACE DISPLAY PCB
E2	INTERNAL RAM MEMORY FATAL ERROR	1. CHECK DC SUPPLY VOTAGES 2. REPLACE DISPLAY PCB
E3	NOVRAM MEMORY ERROR	1. CHECK DC SUPPLY VOLTAGES 2. REPROGRAM, RECALIBRATE 3. REPLACE DISPLAY PCB
E8	COMMUNICATION LOSS WITH DLC	1. CHECK DC SUPPLY VOLTAGES 2. CHECK INTERCONNECT HARNESSES FOR LOAD CELL AND PCB'S 3. REPLACE LOAD CELL 4. REPLACE DISPLAY PCB
E9	DLC OUT OF RANGE, UNDER CAPACITY	1. CHECK FOR MECHANICAL BIND 2. CHECK DC SUPPLY VOLTAGES 3. REPLACE LOAD CELL 4. REPLACE DISPLAY PCB
E10	DLC MEMORY VERIFY FATAL ERROR	1. CHECK DC SUPPLY VOLTAGES 2. REPLACE LOAD CELL
E11	DLC ROM ERROR	1. CHECK DC SUPPLY VOLTAGES 2. REPLACE LOAD CELL
E13	DLC EEPROM ERROR	1. CHECK DC SUPLY VOLTAGES 2. RECALIBRATE SCALE 3. REPLACE LOAD CELL
E16	MATH ERROR	PRESS CLEAR KEY TO CLEAR ERROR. CHECK PROGRAM AND RECALIBRATE
E32	INSUFFICIENT TEST USED FOR CALIBRATION	RECALIBRATE WITH AT LEAST 50% OF PROGRAMMED SCALE CAPACITY
E34	TEST WEIGHT OVER CAP	CHECK CAPACITY PROGRAMMING. USE TEST WEIGHT LESS THAN CAPACITY
E35	CALIBRATION ERROR	RECALIBRATE. SHIFT ADJUST CAN'T COMPENSATE MORE THAN 100%

Table 7-2 Error Codes

8.0 SPARE PARTS AND ACCESSORIES

PART NUMBER	DESCRIPTION
*135928 00A	Power Supply PCB (See Note 1)
*136040 00A	Display PCB
*134022 00A	Keyboard Assembly
*095920 00A	Fuse, 0.25 A S.B. (See Note 2)
R03777 00A	Gromomet Screw
*129052 00A 0900-0237	Printer Output KOP Part Number Factory Number

*May have an alpha prefix

NOTES: 1. Use Power Supply PCB part number *135945 00A for General Export and 220 to 240 VAC applications, factory number 8510-1011.

2. Use fuse part number *95919 00A, 1/8A 250V S.B. for General Export and 220 to 240 VAC applications, factory number 8510-1011.