WEIGH-TRONIX

WI-105 Indicator
Service Manual

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Specifications

Power requirements:
Standard: 95-265 AC/DC, 8VA typical
Optional: 12 VDC, 8VA typical

Excitation: 10 VDC supports up to four 350-ohm weight sensors

Operational keys:
ZERO, TARE, PRINT, TRIPS (cutoff)

Display:
5½ digits (199999)
Seven segment bright red LED 0.56" high

Display update rate: Five times per second

Display resolution: up to 50,000 divisions

Capacity selections:
199,999 with decimal located from zero to five places

Minimum signal / increment:
Sensitivity 0.5 µV per increment

Increment selections:
1, 2, 5, 10, 20, 50, 100

Analog to digital:
24 bit sigma delta, 8,000,000 internal counts

Operating environment:
85% non-condensing humidity
-10 to 50° C (14 to 122° F)

Serial outputs: RS-232 with optional RS-485
Capabilities: continuous output
output on demand via print button
output on demand via serial request.

Trip value range:	-199999 to 199999
Hysterisis range:	0 to 255 (default 1)
Switching delay range:	0 to 255 seconds (default 0)
Trip logic:	HIGH or LOW alarm and NO or NC contacts
Electromechanical relays:	250VAC, 30VDC, 2A, PF=1, change over contacts
Solid-state relays:	400VAC or DC, 0.5A, PF=1 normally open contacts only.

Safety

WARNING

This equipment is supplied by voltage which can cause an electric shock injury. Before removing the instrument from it's housing, switch the instrument off, isolate it from the power supply and make sure that it cannot be connected inadvertently by other persons.

This instrument may only be used when housed within another enclosure, e.g. rack, panel or other housing. Full electrical safety requirements (note: high voltages within instrument) will only be met by enclosure in a suitable housing.

If the housing is removed, do not apply power to the instrument unless specifically instructed to do so in these instructions. When working on live equipment, exercise great care, use insulated tools and test equipment, and do not work alone.

When fitting option boards, always put the circuit boards back in the housing with the backplate securely fastened before powering up the instrument.

When handling circuit boards, ensure that full antistatic precautions are observed.

Replace the fuse with one of an equivalent type or rating.

Do not clean the instrument while the instrument is powered up. Harsh abrasives, solvents, scouring cleaners and alkaline cleaning solutions, such as washing soda, must not be used. Under no circumstances should you attempt to wipe the inside of the instrument. The outside of the instrument may be wiped down with a dry clean cloth only.

Introduction

The Manuals

The documentation for this product consists of this service instruction manual, and a simple user guide for normal operations. This service manual must be used in conjunction with the user manual.

All the instructions to setup and calibrate the WI-105 are contained herein, as well as instructions required to fit optional boards and components.

The WI-105

For normal load cell weighing operation, ensure that the WI-105 ASCIIbus feature is set to either “off” or “out”. Setting it to “In” turns the WI-105 into a ASCIIbus serial input remote indicator, and all load cell menu functions are ignored.

The Weigh-Tronix WI-105 is a precision digital weight indicator using the latest technology to ensure fast and accurate weight readings.

The WI-105 has a 5 1/2 digit (-199999 to 199999 counts) bright red LED display. It is designed for mV inputs from load cells, strain gauges & strain pressure transmitters. This compact panel mount instrument has an industry standard DIN 48 x 96 housing.

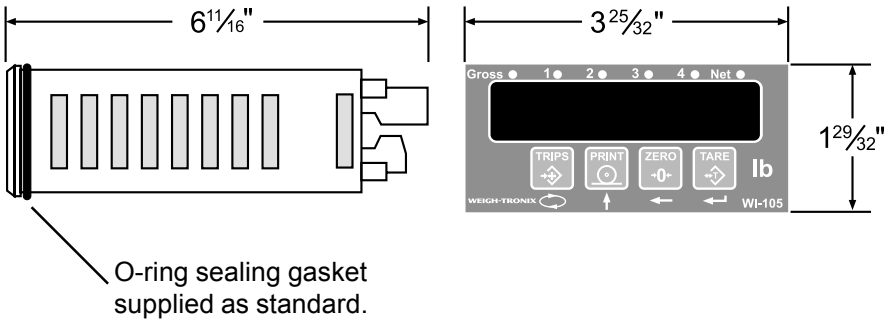
The stable load cell excitation voltage includes sense feedback to compensate for cable loss. The precision differential instrumentation op amp front end input ensures high stability and accuracy.

The powerful communications feature allows the WI-105 to transmit ASCII data out, or receive ASCII data from another WI-105 so that the receiving WI-105 can act as a remote indicator.

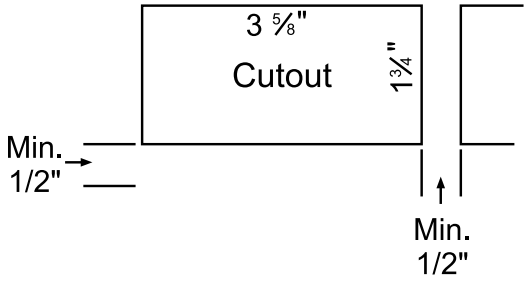
Options include programmable voltage or current analog output, four trip points, peak / valley (max / min) hold, RS-585 option instead of RS-232, and 12 VDC power supply option.

Installation

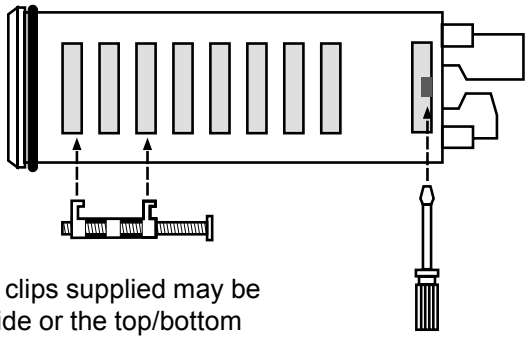
Overall Dimensions



Panel Cutout



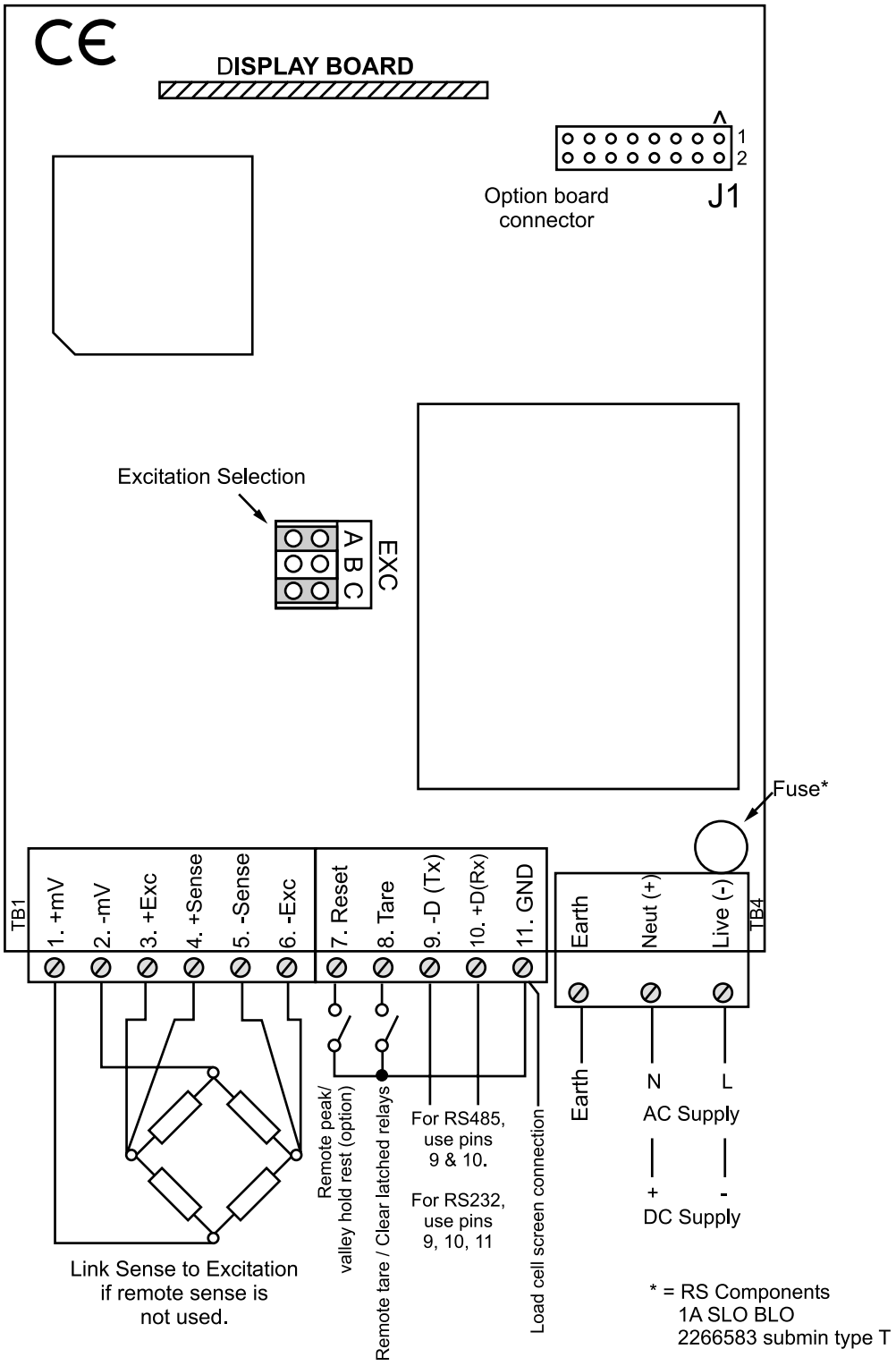
Fastening Clips



The fastening clips supplied may be fitted on the side or the top/bottom of the instrument. Ensure that the clip and screw is mounted as shown here. **Do not overtighten the screws.**

To gain access to the PCB, switch power off and remove terminals from the back of the instrument. Observe safety precautions. Use a screwdriver to pry off the backplate.

Wiring, Links, and Fuse Replacement

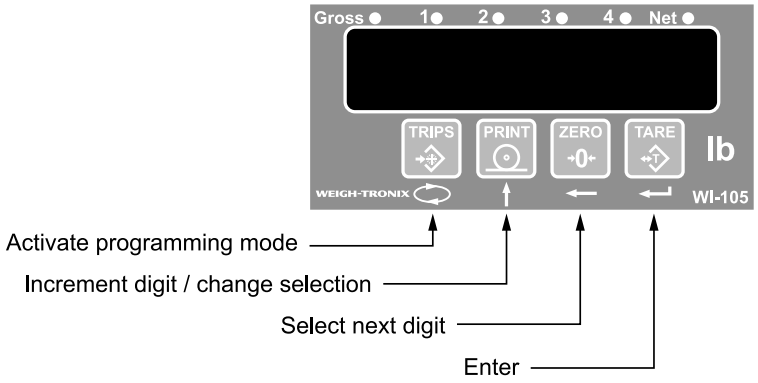


Attention

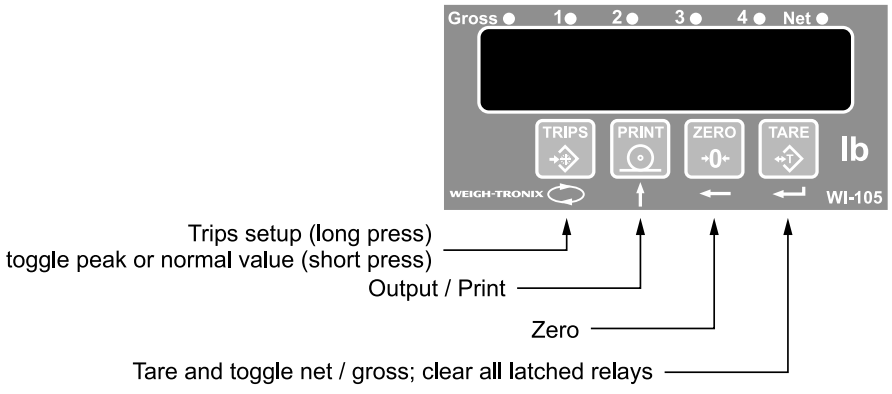
Be sure all cabling has adequate strain relief.

Display and Controls

Keypad During Configuration Mode



Keypad During Normal DisplayMode



Cold Start / Restoring Factory Settings

The instrument may be reinitialized at any time, with factory default settings restored. To achieve this, switch the instrument off. Press and keep pressing the right two most keys while powering up the instrument. Release the keys when ***COLD*** appears on the display.

Entering Service Mode

To enter service mode, press and hold the **TRIPS** key for 3 to 5 seconds. The display will then show ***PASS*** (passcode), or ***AL 1*** (trip menu if trip option is installed). To enter the passcode, press the front panel keys in succession from right to left. ***SER*** (service menu) will be displayed.See *Configuration menu* for more information.

Firmware Revision Number

The firmware revision number is displayed as a four digit number on power-up. This information could be useful for any possible trouble shooting purposes.

Setup and Calibration

This instrument offers an easy and straightforward way to precalibrate and field calibrate the load cell system. Follow the steps below:

Step 1: Selecting Excitation Voltage

There is only one user selectable link, the excitation link. The default setting is for 10V excitation, which is suitable for most applications. Note that the precalibration feature only works with the 10V excitation.

Three load cell excitation voltages are available: 10V, 5V and 3.3V.

Select the required excitation according to the following criteria:

10 volts for up to 4 x 350 Ω load cells (factory default)
10 volts for up to 8 x 1000 Ω load cells
5 volts for up to 8 x 350 Ω load cells
5 volts for Ex (barriered) applications up to 2 load cells
3.3 volts for Ex (barriered) applications up to 4 load cells

10V Excitation:

(Default for most applications)

5V Excitation

3.3V Excitation

Step 2: Setting Instrument Sensitivity

The sensitivity setting must be set in the configuration menu (use the configuration menu to assist you, as well as the examples on the following page). Enter the load cell system sensitivity to two decimal places (maximum 3.00 mV/V).

See example 1 and 2 in Step 3.

Step 3: Precalibration

The load cell can be pre-calibrated by entering the zero (“SF 1”) and load cell full scale capacity (“SF 2”) in the configuration menu. The load cell system zero value can normally be left at 0 for the precalibration. The load cell full scale capacity is then entered.

Example 1

For a 1 x 50.00 lb capacity load cell with a 1.6mV/V sensitivity.
Program the instrument as follows:
- Go to the “Ser” and “Pre.C” menu.
- After “Volt” appears, set “1.60” for 1.6 mV/V sensitivity.
- Set decimal point to “oo.oo” (two decimal places).
- Set load cell “SF.1” to “00.00”.
- Set load cell full scale capacity “SF.2” to “50.00”.

The instrument now has been pre-calibrated.

Example 2

For a 3 x 1000 lb capacity load cell system with 2mV/V each. Program the instrument as follows:

- Go to the ***Ser*** and ***Pre.C*** menu.

- After ***Volt*** appears, set ***2.00*** for mV/V sensitivity.

- Set decimal point to ***0000*** (no decimal places).

- Set ***SF.1*** to ***0***.

- Set ***SF.2*** to ***3000*** (as there are 3 x 1000 lb load cells).

Precalibration of the cell sensitivity and SF2 as shown above allows the instrument to achieve reasonable accuracies without test weight calibration (applicable to 6-wire systems only). This is especially useful when test weight calibration is not possible. Note this holds true only if the 10V excitation link is used.

Step 4: Field Calibration of Deadweight (back-balance)

Make sure that steps 1, 2 & 3 have been completed before proceeding with step 4.

The following procedure off sets the deadweight from the weighing system (which is normally the bin / hopper / scale weight), and returns the display reading to show zero with the bin empty.

Make sure that the bin/hopper is empty. Use the configuration menu to go to ***Ser***, followed by ***b.bal***. Press **ENTER** (TARE) key. The display will flash ***b.bal*** indicating the instrument is performing a back-balance. The instrument will perform a back-balance for a few seconds and will then automatically exit configuration mode. The instrument display should then read zero.

Step 5: Field Calibration of Span (Using Test Weight)

Make sure step 4 above has been completed before proceeding with step 5.

The following procedure allows the weighing system to be accurately calibrated using test weights.

Place the test weights on the bin / hopper / scale. The instrument should read the weight of the test weights. If the reading is not of sufficient accuracy, then use the configuration menu to go to ***Ser***, followed by ***SPAN*** and press enter. The instrument now prompts you to enter the weight of the test weights. Then press enter. The display will flash ***SPAN*** for a few seconds, indicating that the instrument is performing a span calibration. The instrument automatically exits configuration mode after a few seconds, and the instrument display should then read the correct test weight value.

Step 6: Store Away Service Parameters for Future Use

Once steps 1-5 above have been completed, the instrument automatically alters the precalibration parameters ***SF.1*** and ***SF.2*** in the ***Pre.C*** submenu (entered in step 3 above). The new ***SF.1*** parameter should resemble the deadweight of the system, while the new ***SF.2*** parameter should resemble the system capacity. These altered values are part of the calibration procedure and these parameters fully characterize the weighing system.

DO NOT change these parameters. It is suggested that these parameters be noted for future use, especially if the instrument is replaced. These parameters can be reentered into the new instrument, with the result that reasonable accuracies can still be obtained without redoing a field calibration. This is especially useful when minimum downtime is critical, and to avoid wastage if failure occurs when the bin/hopper still contains materials. It is till recommended that complete field calibration is done when the situation permits.

Step 7: Protecting Service Parameters

The keypad lock is used to prevent unauthorized access to the configuration menu. The sub-menu called ***CODE*** appears at the end of the configuration sequence. Three levels of keypad lockout are available:

Level 0 - Full access to configuration menu.
Level 1 - User only has access to alarm setpoint values, and a keycode is required to access the rest of the configuration menu.
Level 2 - Total configuration menu lockout. Keypad sequence required to enter configuration mode.

The factory default is “Level 0”.

To enter the configuration mode with Level 1 or 2 enabled:

Configuration entry

When the word ***PASS*** appears on the display, press all four front panel keys in succession from right to left.

Default Settings

The instrument is supplied with the factory default settings shown below. If a cold start is performed on the instrument, the instrument will return to its factory default settings.

Cell sensitivity	: 2.00 mV/V
Decimal point position	: 1
SF1	: 0
SF2	: 20000
Filter	: 1.0
Increment	:0
Alarm trip setting (all trips)	: 199999
Alarm configuration (all trips)	: High & normally open
Alarm hysteresis (all trips)	: 1
Alarm delay (all trips)	: 0
Alarm latching (all trips)	: off
Analog output mode	: 4-20mA
Analog output zero	: 0
Analog output full scale	:20,000
Serial communications address	: 0
Serial communications baud	: 9600
7 data, odd parity, 1 stop	
Serial communications protocol	: (ASCII=off)
Tare function status	: On
Peak / valley hold status	: Off
Hold mode	: Peak (Valley off)
Keypad lock level	: Level 1

*Default for the **PRINT** key is OFF. To enable, set ASCII to **out** and change address to something other than **0**. Leaving it at **0** will send continuously.*

Configuration Menu

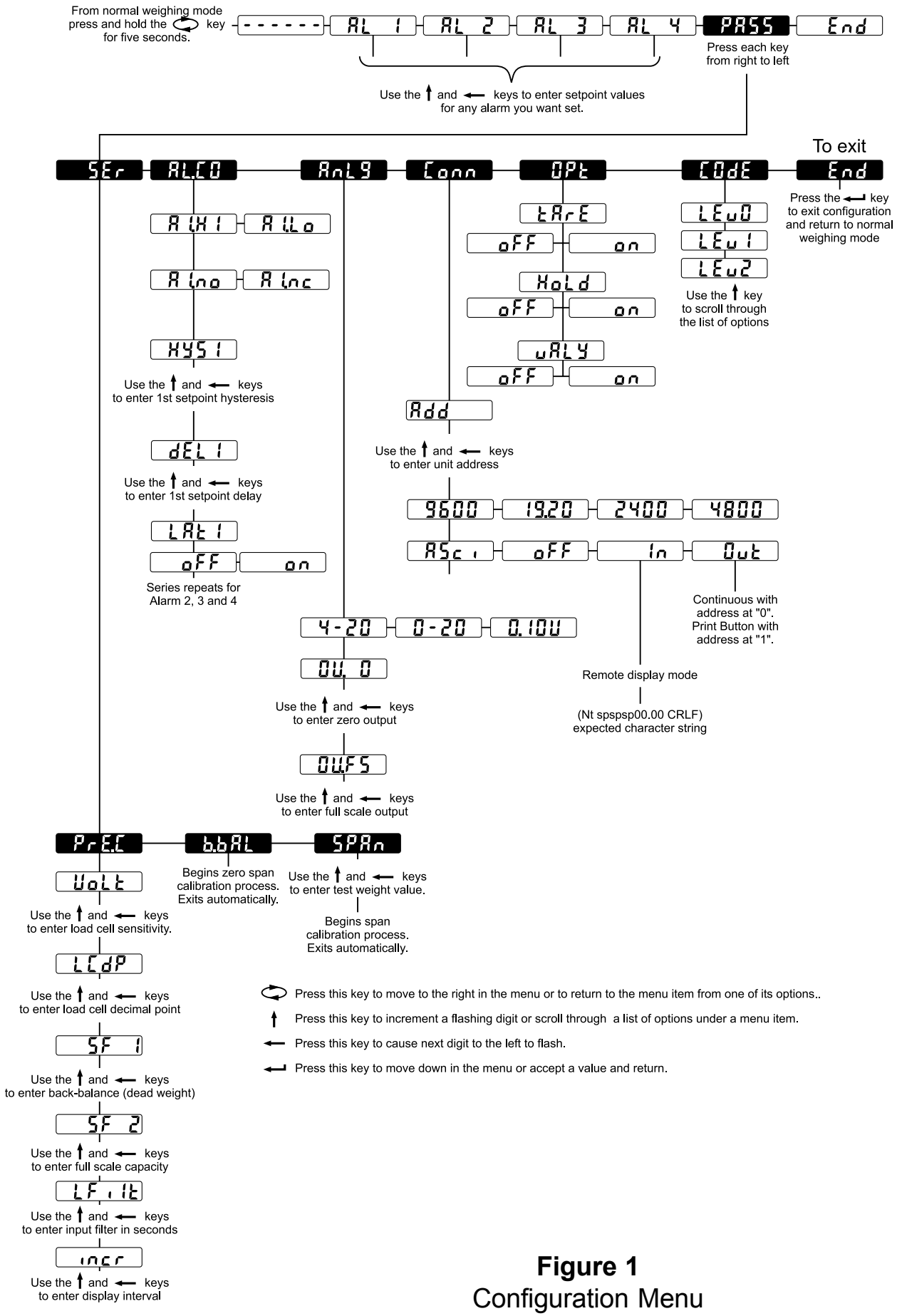


Figure 1
Configuration Menu

Passcode = press the four front panel keys from right to left then press the **TRIPS** *key.*

Below are the displays you will see while navigating the configuration menu shown in Figure 1. Following that is the menu itself. Your unit may not have all options installed so you will not see all the items listed below or in the menu itself. Ignore references to those options you do not have installed.

Menu

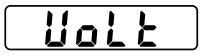
If this message appears, enter the passcode followed by the **TRIPS** key. See note at left.

Menu

Service menu for input selection and calibration.

Menu

Sub-menu for precalibration settings.

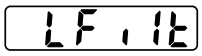


Load cell sensitivity. Input range 0.00 to 3.00mV/V (enter the sensitivity to two decimal points.)

Load cell (display) decimal point selection (non-floating point)

Manually entered back-balance (dead weight) value (enter as positive value).

Manually entered load cell full scale capacity (e.g. enter 1000 for a 1000 lb load cell system)



Load cell input filter with a range of 0 to 10.0 seconds. Typical operational values are less than 2.0.

Display interval. Value range is 0-100. e.g. “10” would give a dummy zero.

Menu

Field calibration of dead weight (back-balance) Press enter button to start process.

During calibration of back-balance, display flashes for a few seconds, menu exits automatically.

SPAn Menu

SPAn — Single point span calibration of load cell. Set to test weight value and press enter.

During span calibration using test weights, display flashes. Menu exits automatically.

Conn Menu

Conn — Communications menu (RS-232/RS-485).

Add — Unit address (default 0)

2400
4800
9600
19.2 — Available baud rates

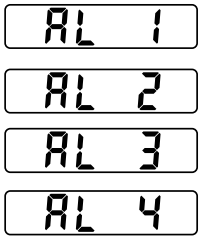
AScI — Protocol selection and serial interface function.
oFF — Off = Not used
Out — Out = ASCIIBus output
In — In = ASCIIbus input.
Out

CodE Menu

CodE — Keypad lock settings

LEv0
LEv1
LEv2 — Key lock security level. Level 0 = none, Level 1 - edit trip values, Level 2 = full

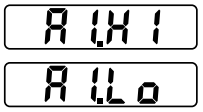
End — Press enter to exit configuration mode.



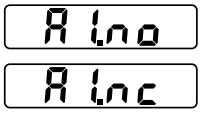
Alarm 1-4 setpoint values.

AL.CO Menu

Alarm configuration menu (1st alarm only shown).

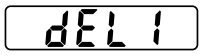


1st Alarm setpoint select HIGH/LOW alarm

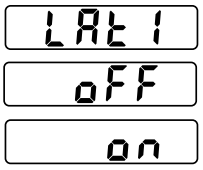


1st Alarm setpoint normally OPEN/CLOSED contact.

1st alarm setpoint hysteresis.



1st alarm setpoint delay.

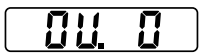


Alarm latching. Off = not latching, On = alarm latches. Clear latch by pressing the **TARE** key or via the remote tare button.

AnL9 Menu

Analog output menu.

Output selection (0-10V, 0-20mA, 4-20mA).



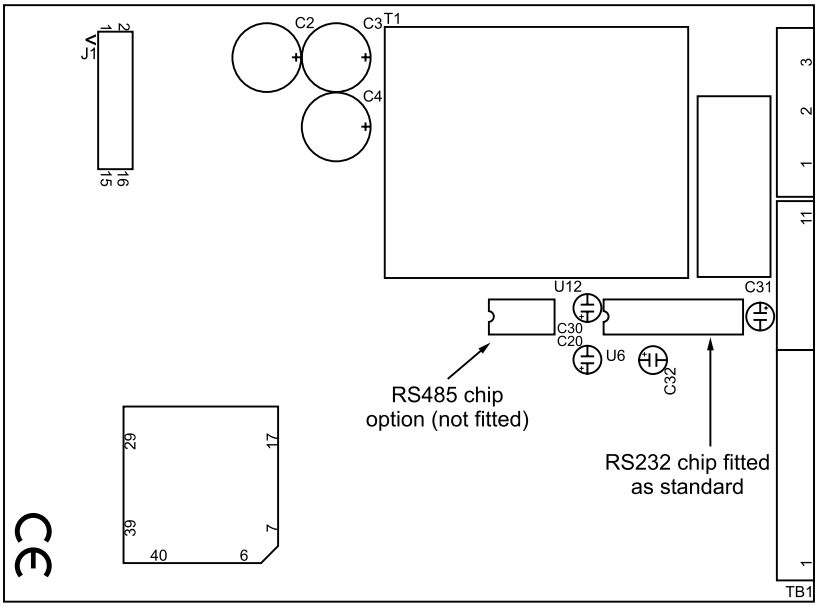
Output zero selection.

Output full scale selection.

OPt Menu

OPt	Option menu for Tare feature and Peak/Valley Hold.
tArE	Tare feature select (auto-zero / auto-tare).
oFF on	Turn the Tare feature on or off This does not disable the remote tare.
HoLd	Peak / valley hold feature (min. / max. hold).
oFF on	Turn the peak / valley hold feature on or off.
uALY	Peak / valley hold selector.
oFF on	If “off”, peak hold mode. If “on”, valley hold mode.
888888	Startup / test mode message
nnnnnn	Overload condition. Reduce weight on the system.

RS-485 Communications Option

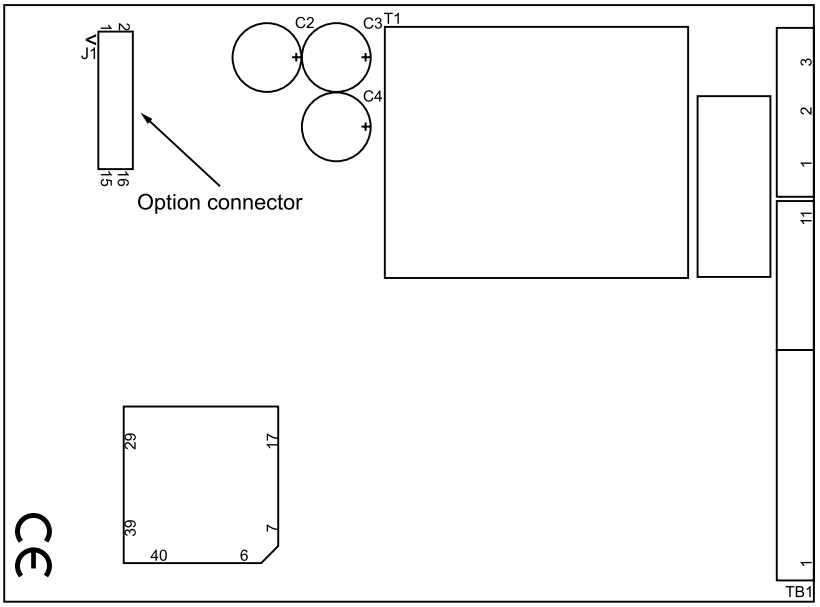


RS-232 communications is standard on the WI-105. However, if RS-485 is preferred, then the following steps must be taken.

- Switch power off and isolate.
- Carefully remove circuit board from it's housing (see installation section).
- Carefully remove RS-232 chip from it's socket (see diagram above).
- Fit Maim chip "MAX487E CPA" into the RS-485 socket shown above (watch for correct chip orientation).
- Carefully replace PCB into it's housing.

To refit the RS-232 chip, ensure that the chip is an Analog Devices "ADM202EAN" or SIPEX "SP202ECP".

Analog Output Option



The analog output option is a separate circuit board that is fitted in the upper slot of the instrument housing. The upper board and terminals are clearly numbered 13-28 to differentiate them from the lower terminals.

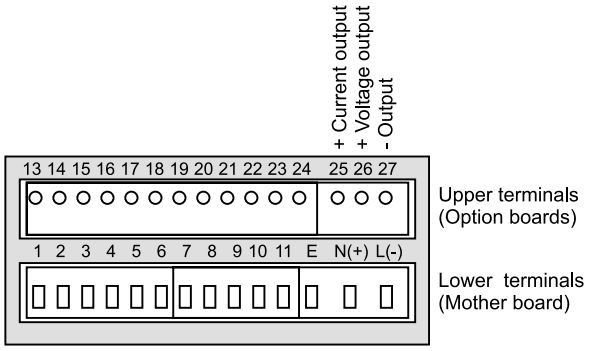
The analog output board simply connects to the WI-105 motherboard via the option connector.

To fit analog output board, use the following procedure:

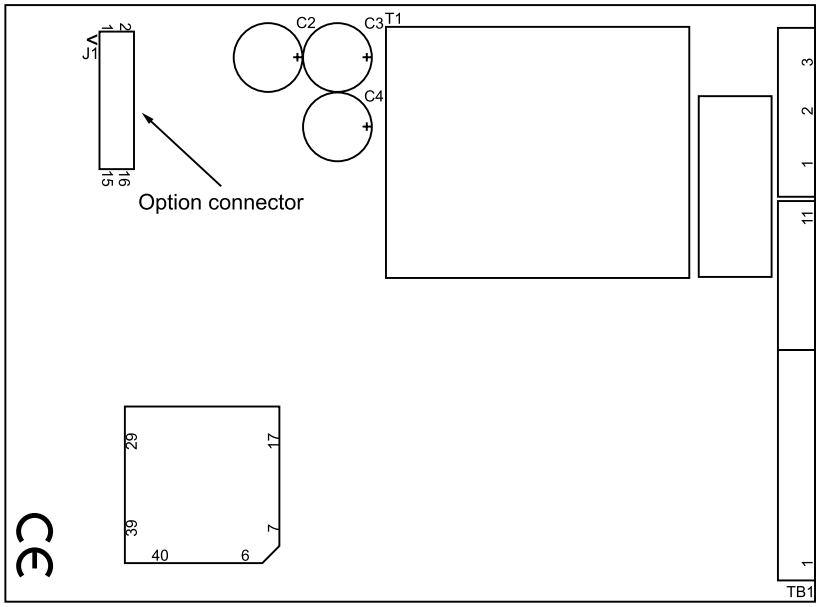
- Switch power off and isolate.
- Carefully remove circuit board from it's housing (see installation section).
- Match the option board connector and the motherboard connector (the options board will be inverted over the motherboard) and connect the two boards together.
- Carefully replace PCB back into it's housing.
- The analog output menu will automatically appear when power is restored ("plug-n-play").

Both analog output option and trips option is available on one instrument. Refer to the appropriate sections of the manual for wiring information.

Analog output connection diagram:



Four Trip Relays Option



The trip relay option is a separate circuit board that is fitted in the upper slot of the instrument housing. The upper board and terminals are clearly numbered 13-28 to differentiate them from the lower terminals.

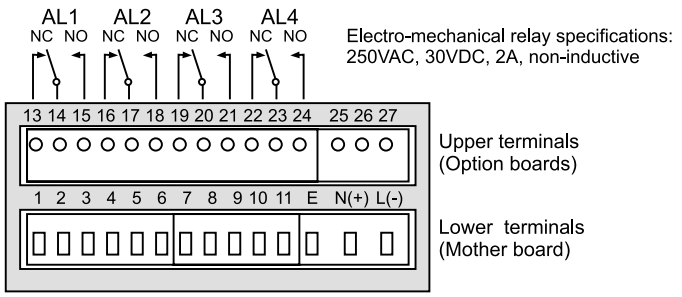
The relay option board simply connects to the WI-105 motherboard via the option connector.

To fit this option board, use the following procedure:

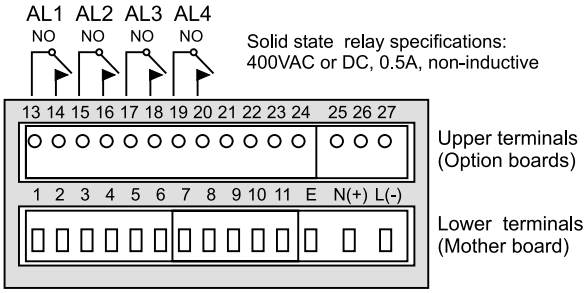
- Switch power off and isolate
- Carefully remove circuit board from it's housing (see installation section).
- Match the option board connector and the motherboard connector (the option board will be inverted over the motherboard) and connect the two boards together.
- Carefully replace PCBs back into the housing.
- The alarm / relay menu will automatically appear when power is restored ("plug-in-play").

Both analogue output option and trips option is available on one instrument. Refer to the appropriate sections of the manual for wiring information.

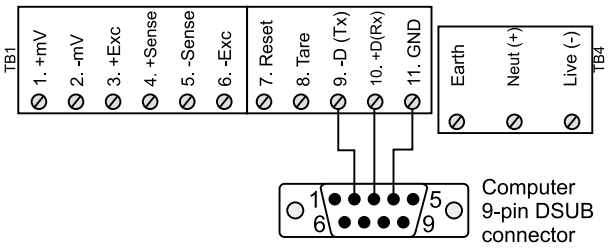
Connection diagram for electromechanical relay card:



Connection diagram for solid-state relay card:



Appendix A: RS-232 Connection to Computer



WI-105	Computer (9-pin)
Pin 9 (Tx)	Pin 2 (Tx)
Pin 10 (Rx)	Pin 3 (Rx)
Pin 11 (Gnd)	Pin 5 (Gnd)

Appendix B: ASCIIbus Protocol

The powerful ASCIIbus communications feature allows the WI-105 to transmit ASCII data out, or receive ASCII data in from another WI-105 so that the receiving WI-105 can act as a remote indicator.

ASCII output (transmit) function is enabled in the “Conn” (connection) sub-menu by selecting “ASCI” to “Out”. In this mode, the WI-105 can interface to remote printers, third party systems etc. Output will follow the display reading (Gross or Net). This also means that if the peak-hold option has been ordered & activated, the communications output will also peak-hold.

ASCII input (WI-105 acting as a remote indicator) function is enabled in the “Conn” (connection) sub-menu by selecting “ASCI” to “In”. In this mode, the WI-105 will act as a serial input indicator and will show the incoming data / weight on the display. Note that all load cell menu functions are ignored.

Using address “00”.
The WI-105 will continuously transmit data approx. 5 times a second.

Using address “01” to “99”.
If any of these addresses are selected, the instrument will only transmit data on demand by either momentarily pressing the “output” key, or by transmitting the unit’s serial address (two bytes) to the WI-105.

Communication Settings

Note that the decimal point position in the protocol will follow the decimal point position configured for the display.

If there is no reply during a serial request, wait 50 msecs before resending.

Line Settings : 7 Data Bits, Odd Parity, 1 Stop Bit.
Baud Rate: Selectable 2400, 4800, 9600, 19200.
Data ASCII characters: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 or _ (space)
Other characters: G, N, .(dp), +, -, CR, LF

Output string formats are (fixed length protocol):
If address = 0: W S D D D D D D P CR LF
If address <> 0, print key: W S D D D D D D P CR LF
If address <> 0, serial requets: A A W S D D D D D D P CR LF

where : W = display mode. G = gross, N = net.
: A A = Instrument address. ASCII 00 to 99.
: S = sign (polarity) (ASCII "+" or "-").
: D = data (leading zeros padded with _ = ASCII space).
: P = decimal point
: CR = ASCII carriage return.
: LF = ASCII line feed.

Appendix C: List of Error Messages

Error messages will be shown on the display.

"Err 1": This message appears if an EEPROM fault occurs. This will occur if a motherboard or option board EEPROM chip has failed, or if an option board has been incorrectly factory configured.

Appendix D: Circuit board links

There is only one user selectable link, the excitation link. The default settings for 10V excitation, which is suitable for most applications. Note that the precalibration feature only works with the 10V excitation.

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05/08/01 105_S.P65 PN 29771-0014A e2 Printed in USA