Technical Reference MANUAL

W-4510 WEIGH SCALE WITH GEN 2000® ELECTRONICS MODEL W-4510 WITH FREQUENCY OUTPUT
W-4510 Weigh Scale
with GEN2000® Electronics

Model W-4510
with
frequency output

Manual part number 31559-US
Version 1.0
Preface

Revision history

Table 1: Revision history

<table>
<thead>
<tr>
<th>Manual version</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Initial release. Formerly 241818.</td>
<td>051201</td>
</tr>
</tbody>
</table>

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GEN2000 ® is a registered trademark of the Ohmart/VEGA Corporation.


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WARNING

Use this equipment only in the manner that this manual describes. If you do not use the equipment per Ohmart/VEGA specifications, the unit is not CE compliant, and may be damaged or cause personal injury.
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Explanation of symbols

Table 2 lists the symbols that the manual and instrument use.

Table 2: Explanation of symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiation notice</td>
<td>In the manual, information concerning radioactive materials or radiation safety information is found in the accompanying text. Caution! The text next to this symbol contains the warning of potential damage to equipment or people. Attention! Le texte apparaissant près de ce symbole vous informe d’un danger possible pour l’équipement ou pour l’usager.</td>
</tr>
<tr>
<td>AC current or voltage</td>
<td>On the instrument, a terminal to which or from which an alternating (sine wave) current or voltage may be applied or supplied.</td>
</tr>
<tr>
<td>DC current or voltage</td>
<td>On the instrument, a terminal to which or from which a direct current voltage may be applied or supplied.</td>
</tr>
<tr>
<td>Potentially hazardous voltages</td>
<td>On the instrument, a terminal on which potentially hazardous voltage exists.</td>
</tr>
</tbody>
</table>
Your comments

Ohmart values your opinion! Please fill out this page so that we can continually improve our technical documentation.


Date: ______________

Customer Order Number: ___________________

How we can contact you (optional if you prefer to remain anonymous):

Name: ______________

Title: ______________

Company: ______________

Address: 

____________________

____________________

Did you find errors in this manual? If so, specify the error and page number.

Did you find this manual understandable, usable, and well organized? Please make suggestions for improvement.

Was information you needed or would find helpful not in this manual? Please specify.

Please send this page to:

Ohmart Corporation
Director of Engineering
4241 Allendorf Drive
Cincinnati, OH 45209-1599
Preface

Notes
Chapter 1: Introduction

Nuclear materials notice

This equipment contains radioactive source material that emits gamma radiation. Gamma radiation is a form of high-energy electromagnetic radiation. Only persons with a specific license from the U.S. NRC (or other regulating body) may perform the following to the source holder:

- Dismantle
- Install
- Maintain
- Relocate
- Repair
- Test

Ohmart Field Service engineers have the specific license to install and commission nuclear gauges, and can instruct you in the safe operation of your density gauge. To contact Ohmart Field Service, call 513-272-0131. Users outside the U.S. and Canada may contact their local representative for parts and service.

Note: Special instructions concerning your source holder are found in the envelope that was shipped with the source holder and the “Radiation Safety for U.S. General and Specific Licensees, Canadian and International Users” and the “Radiation Safety Manual Reference Addendum” CD. Please refer to this document for radiation safety information.
Introduction

Unpacking the equipment

**CAUTION!**

Make sure that you are familiar with radiation safety practices in accordance with your U.S. Agreement State, U.S. NRC, or your country's applicable regulations before unpacking the equipment.

- Unpack the unit in a clean, dry area
- Inspect the shipment for completeness, by checking against the packing slip
- Inspect the shipment for damage during shipment or storage
- If the detector is included as a separate package in the shipment, inspect the assembly for damage that may have occurred during shipment or storage
- If there was damage to the unit during shipment, file a claim against the carrier and report the damage in detail. Any claim on the Ohmart Corporation for shortages, errors in shipment, etc., must be made within 30 days of receipt of the shipment
- If you need to return the equipment, see the section "Returning equipment for repair to Ohmart" in the "Diagnostics and Repair" chapter
- After you unpack the equipment, inspect each source holder in the shipment to assure that the operating handle is in the OFF position. In the event that you find the handle in the ON position, place it in the OFF position immediately and secure it.

**Note:** Most source holder models accept a lock. Call Ohmart Field Service immediately for further instructions, at 513-272-0131, if the source holder has one of the following conditions:

- Does accept a lock and there is no lock on it
- The lock is not secured
- You are unable to secure the lock
- The operating handle does not properly move into the off position
Storing the equipment

Storing the source holder
If you must store the source holder, adhere to the following guidelines:

- Store in a clean, dry area.
- Verify that the source holder shutter is in the OFF or CLOSED position.
- Check the current local regulations (U.S. NRC, Agreement State, or other) to determine if this area must have any restrictions.

Storing the detector
If you must store the detector, adhere to the following guidelines:

- Avoid storage at temperatures below freezing.
- Store the detector indoors in an area that has temperature-control between 50 °F and 95 °F (10 °C and 35 °C) and less than 50% relative humidity.
- Store equipment in dry conditions until installation.
Specifications

<table>
<thead>
<tr>
<th>System</th>
<th>Accuracy</th>
<th>±1% of span typical</th>
<th>Accuracy depends on specific application parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Sources</td>
<td>Cesium-137</td>
<td>0.66MeV gamma radiation emitter, 30.2 year half life</td>
<td></td>
</tr>
<tr>
<td>Power Requirements*</td>
<td>AC</td>
<td>115VAC ±10% 50 or 60Hz, at 65 Watts maximum power consumption</td>
<td></td>
</tr>
<tr>
<td>Wiring</td>
<td>#14–#22AWG (1.63–0.643mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signal Cable</td>
<td>Maximum length</td>
<td>5,000 feet (1,500 meters)</td>
<td></td>
</tr>
<tr>
<td>Source Housing</td>
<td>Indicator</td>
<td>On/Off light indicator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Calibration absorber</td>
<td>Self-contained calibration absorber</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Material</td>
<td>Steel construction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weight</td>
<td>450lbs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Paint</td>
<td>Epoxy Powder Coat</td>
<td></td>
</tr>
<tr>
<td>Source Housing</td>
<td>Enclosure rating</td>
<td>NEMA 4X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ambient temperature</td>
<td>–40°F to 140°F (–40°C to 60°C)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Humidity</td>
<td>0–95%, non-condensing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Material</td>
<td>Aluminum</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weight</td>
<td>≅100lbs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Paint</td>
<td>Epoxy Powder Coat</td>
<td></td>
</tr>
<tr>
<td>Input</td>
<td>Signal input channels</td>
<td>Two digital (frequency) 0–32kHz opto-isolated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Analog inputs</td>
<td>Voltage or current, 0–0.1VDC into 1megaohm, 0–1.0VDC into 1megaohm, 0–10VDC into 1megaohm, 0–1.0mA into 10kohm, 1–5mA into 2kohm, 4–20mA into 500ohm, 10–50mA into 200ohm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TTL Logic level input channels</td>
<td>Six TTL input channels, voltage-free contacts from relay or switch, contact loading 5V at 5milliamperes, maintain contact for one second (minimum)</td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td>Relay</td>
<td>4 SPDT (4 form C) contacts: 2A–120VAC, 2A–28VDC, 1A 250VAC, CSA version ratings: 0.6A–125VAC, 0.6A–110VDC, 2.0A at 30VDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TTL logic level</td>
<td>Five open-collector transistor type capable of sinking 300mA (max) and 30V (max) resistive load, or 20V (max) inductive load and one configurable to be isolated. If using a TTL for a totalizer, the max rate is 10 pulses per second.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Analog channels</td>
<td>Two 0–20mA into 0–1,000ohms, or 4–20mA into 0–1,000ohms, 0–100mVDC into 20kohms (min). Both sides of output are isolated from input and ground. Ground either side. Meets ISA Standard 50.1: Type 4, Class U isolated current loop transmitters.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Serial ports</td>
<td>Serial ports for local display and keypad, remote displays, and host interface. Two full and two partial RS-232C ports, or one partial RS-232C port and one partial RS-422/485 port, and individual settings from 300 baud–19,200 baud.</td>
<td></td>
</tr>
<tr>
<td>Signal Processing capabilities</td>
<td>Capabilities include: Linearization, display process measurement in product units, generate high and low process alarms, filtering digital or classic RC time constant, source decay compensation, and temperature compensation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronics</td>
<td>On-board memory</td>
<td>EEPROM and battery-backed RAM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Real-time clock</td>
<td>Maintains time, date, and source decay compensation. Y2K compliant</td>
<td></td>
</tr>
<tr>
<td>Diagnostics</td>
<td>LED indication</td>
<td>+5V, Memory Corruption, CPU Active, Auxiliary, and High Voltage</td>
<td></td>
</tr>
</tbody>
</table>
Typical applications

Belt loading
The W-4510 Weigh Scale can measure the belt loading (weight per linear distance) of product on the belt. This signal can combine in the DCS/PLC with the belt speed to calculate the mass flow (weight per unit time). This is essential for blending operations, as in OSB or MDF/particleboard application to match the amount of resin to the weight of wood present.

Loading rate
The W-4510 Weigh Scale can measure the loading rate of product on the belt. This uses a tachometer directly connected to the W-4510 to measure the belt speed. The output signal data calibrates directly to the mass flow units (weight per unit time).
Where to find help

If you need help finding information, check the Index and Table of Contents within this manual. Also, refer to the Smart Pro Reference manual for information on calibration and operation with the Smart Pro.

Ohmart Customer Service

Ohmart Customer Service has Field Service Engineers located across the U.S. for on-site service to the U.S. and Canada. In many cases, a Field Service Engineer is at your plant for the start up of your gauge. In addition, Field Service Engineers regularly assist customers over the phone.

If you have a question or need help, call Customer Service during office hours. If your problem is an emergency (for example, line shut down because of Ohmart equipment), you can reach us 24-hours a day.

Table 4: Contact information

<table>
<thead>
<tr>
<th>Information</th>
<th>Phone</th>
<th>FAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ohmart Phone</td>
<td>513-272-0131</td>
<td>513-272-0133</td>
</tr>
<tr>
<td>Ohmart Field Service E-mail</td>
<td><a href="mailto:fieldservice@ohmartvega.com">fieldservice@ohmartvega.com</a></td>
<td></td>
</tr>
</tbody>
</table>

In addition, Ohmart provides field service for customers outside the U.S. and Canada. Customers outside the U.S. and Canada can contact their local Ohmart representative for parts and service.

When calling with a question, if possible, please have the following information ready:

- Ohmart Customer Order (C.O.) Number—Locate on the engraved label on the source holder
- Sensor serial number—Locate on the sensor housing inside the external housing
System overview

The W-4510 Weigh Scale detector uses Ohmart’s GEN2000 electronics. The W-4510 Weigh Scale system consists of three main components:

- Source holder
- W-4510 Weigh Scale detector assembly (includes GEN2000 sensor and GEN2000 power supply and communications)
- Smart Pro or Smart Pro Pac electronics

![Diagram of system overview](image)

Figure 1: System overview

The following statements describe the source holder:

- A cast or welded steel and lead enclosure that houses a radiation-emitting source capsule
- Directs the radiation in a narrow collimated beam through the process material
- Shields the radiation elsewhere
- A shutter on the source holder either completely shields the radiation (source off) or allows it to pass through the process (source on)
- Self-contained calibration absorber for performing a Two-point calibration on an empty belt.
The following statements describe the functions of the W-4510 Weigh Scale detector assembly:

- Mounts opposite the source holder
- Inside the housing is a scintillation material
- The scintillation material produces light in proportion to the intensity of its exposure to radiation
- A photomultiplier tube detects the scintillator’s light and converts it into voltage pulses
- The microprocessor receives these voltage pulses after amplification and conditioning by the photomultiplier tube
- The microprocessor and associated electronics convert the pulses into a calibratable output to the Smart Pro electronics
- The Smart Pro electronics receives and reads the input and converts it into process units
- Several outputs are available on the Smart Pro, including a 4–20mA output of the process variable. Refer to the Smart Pro Reference manual for more information.
Principles of operation

Ohmart's W-4510 Weigh Scale is a nuclear gauge that mounts outside the conveyor footprint. The detector receives a narrow beam of radiation, through the process material, from the source holder.

The amount of radiation that the detector senses is in proportion to the amount of the material's mass. Since the radiation source and detector are always the same distance apart, the only possible change in signal is directly a measure of the loading belt. A belt with a light load allows more radiation to pass through to the detector. A belt with a heavier load allows less radiation to pass through to the detector.

The Smart Pro calibrates the W-4510 Weigh Scale output and associates the digitized detector readings, known as counts (the detector frequency output), with the loading of the belt, in engineering units. The output range of the Smart Pro with the W-4510 Weigh Scale are two 4–20mA current loop signals, in proportion to either the loading (pounds per linear foot), or weight transfer rate (pounds per hour). In addition to the analog outputs, there are up to four process relays available to convey totalization or other configurable alarm conditions.
Communicating with the gauge

Use either a Smart Pro or Smart Pro Pac to enable the following:

- Initial setup
- Calibration
- Operation

Smart Pro software

The Smart Pro software is accessible through the Smart Pro wall mount or rack mount units. You can use step-by-step method of screen selection for pre-programmed routines or direct access to screens.

Step-by-step method

The step-by-step method takes you from the Main menus to the sub-menus by moving the cursor to your choice and pressing SELECT and ENTER. You can press the NEXT SCREEN and PREVIOUS SCREEN to take you back and forth between menus.

Direct access method

Use direct access to bypass the step-by-step progression of screens and go directly to your chosen screen. You enter the screen number in the number field in the left hand corner and press ENTER. For more information concerning function and data entry keys, refer to page 27.

Smart listing

The Smart Listing is a table of RAM addresses that lists the data that is stored at each address.

This listing contains the software settings that configure each system for individual and unique applications. You do not normally need this list, since all necessary information for normal operation is accessible through user-friendly screens.

The top line of the listing’s label is Filename. It displays the following information:

- Shop order name
- Shop order number
- Date of printout
- Time of printout
The first column down the left side is the base number. The base number represents the address. The first row across the top is the displacement from the base (incremental value). Each address location is itemized by adding the displacement to the base.

Address location = base + displacement

For example, find 40 going down the first column and follow it across to the 12 located in the top row. This represents address location 52 (40+12) and contains data 17196.

The LOW process value used to calibrate the gauge at the factory is at address location 153 (140+13). In this sample, that data value is 8427.

Sample Smart Listing

Table 5: Sample Smart Listing

<table>
<thead>
<tr>
<th>Filename: A.B.C., Inc. (BJCX-0020-12133)</th>
<th>ADDR</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>8191</td>
<td>16688</td>
<td>.</td>
<td>10</td>
<td>11</td>
<td>.</td>
<td>1668</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>20</td>
<td>534</td>
<td>37121</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>5500</td>
<td>1644</td>
<td>110</td>
<td>1991</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>21760</td>
</tr>
<tr>
<td>40</td>
<td>16896</td>
<td>16946</td>
<td>16996</td>
<td>.</td>
<td>17046</td>
<td>.</td>
<td>17096</td>
<td>.</td>
<td>17146</td>
<td>.</td>
<td>17196</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>60</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>80</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>100</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>120</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>140</td>
<td>11103</td>
<td>11103</td>
<td>1807</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>500</td>
<td>8427</td>
</tr>
<tr>
<td>160</td>
<td>.</td>
<td>6500</td>
<td>7657</td>
<td>7410</td>
<td>.</td>
<td>1</td>
<td>60</td>
<td>110</td>
<td>8427</td>
<td>5920</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>109</td>
<td>9000</td>
</tr>
</tbody>
</table>

Note: This example shows only a partial listing. The actual listing has 20 displacement fields. In addition, a dot (.) represents the zeros (0) in this example, to enhance readability.
Chapter 2: Installation

Location considerations

When you ordered the W-4510 Weigh Scale, the source was sized for optimal performance. Notify Ohmart prior to installation of the gauge if the location of the gauge is different from the original order location. Proper location of the density gauge can sometimes mean the difference between satisfactory and unsatisfactory operation.

Note: Try to locate the source holder in such a place that process material will not coat it. This ensures the continuing proper operation of the source ON/OFF mechanism. Many regulatory agencies (for example, the U.S. NRC) require periodic testing of the ON/OFF mechanism. Refer to the “Radiation Safety for U.S. General and Specific Licensees, Canadian and International Users” and the “Radiation Safety Manual Reference Addendum” CD that came with the source holder and the appropriate current regulations for details.

Avoid source cross-talk

When multiple adjacent conveyors have nuclear gauges, you must consider the orientation of the source beams so that each detector senses radiation only from its appropriate source. The best orientation, in this case, is for the source holders to be on the inside with radiation beams pointing away from each other.

Blending applications

Place the scale on a flat or trough conveyor. The scale can also accommodate any conveyor inclination angle. However, you must determine the exact location of the scale when ordering the scale and adhere to the original location as ordered. A changing profile causes unwanted measurement error. Some rotary feed systems tend to cause loading variations with time.

Prevent process accumulation

Prevent process material or dirt from accumulating between the source and the detector. Such accumulation can cause the gauge to indicate a higher weight than actual.
Installation

Re-cal considerations
The W-4510 Weigh Scale requires periodic recalibration. Ensure that you have adequate room to access the source housing during the calibration procedures. You must actuate the self-contained absorbers.

Restrict air gap access
Restrict access to the area between the source holder and the side of the conveyor belt. Cover this area to prevent personnel from placing themselves and foreign material in the gap. Ohmart personnel can recommend the appropriate restrictions at the commission of your system.
Weigh scale assembly

Figure 3: W-4510 assembly

Note

The handle on the source holder operates a rotating shutter. When installing or removing the assembly, you must turn the handle to the closed or Off position and lock the handle with the combination lock that Ohmart provides.
Installation

Source on/off lights
To power the On/Off lights, wire the 110VAC to the source housing.

Note: The diagram that follows shows the typical outline. Ohmart supplies certified drawings for the W-4510 weigh scale. If the diagram and directions in this manual differ from the certified drawings, follow the certified drawings.

Figure 4: Typical W-4510 detector outline
Figure 5: Typical W-4510 source holder outline
Securing the weigh scale assembly

The source weight is 450lbs. You should not stand the source holder upright without external supports.

Mounting the electronics console

Smart Pro mounting

Figure 6 illustrates a typical Smart Pro mounting diagram.
Figure 6: Typical Smart Pro dimensions
Installation

Pro Pac mounting

Notes:
Humidity: 0 to 95% noncondensing.
Ambient temperature range, 0 degC (32 degF) to 50 degC (122 degF).
Vibration free mounting required.
Cabinet is designed as DIN-3U and must be mounted in an ordinary (non-hazardous) location.
Weight with electronics is approximately 9kg (20lbs).
Power requirements: (specify at order) 115VAC or 230VAC +/- 10%, 50 or 60 Hz, single phase 60W, maximum.

Access cover to terminal strips for wiring.
Clearance of 610mm (24") recommended for wiring access.

Figure 7: Typical Pro Pac dimensions
Rack mount computerized electronics

Figure 8 illustrates the rack mount display/interface.

The rack mount display/interface includes the following components:

- On/Off switch with circuit breaker and pilot light
- CPU board
- I/O termination board
- Case
- Power supply board
- Hinged front panel
- Processor select circuit board
- Key pad assembly
- LCD display interface circuit board
- Operator display/interface
- Display window
- Data entry keys
- Function keys
Installation

- Access keys and indicators

On/Off switch with circuit breaker and pilot light

A/C power enters the power supply board, from the back panel I/O board, after passing through On/Off switch. There are two types of switches to use, depending on the power source. They are:

- 110VAC
- 220VAC

CPU board

The CPU board enables communication to and from the field equipment. The CPU board is the main controller of the Smart Pro or Pro Pac and should be jumpered in the isolated configuration (refer to page 45 for details on read/write protect on JP-17). This provides isolation at the wall or rack mount display/interface side for analog output #1 (density) and from analog output #2 (position). Figure 9 illustrates the CPU board.

![Figure 9: Simplified CPU board](image)

The software PROMS contain the program for operating the Smart Pro or Pro Pac. Install them at locations U24 and U25 on the CPU board. Optional EEPROM chips install into location U26.

The battery-backed RAM chip installs at location U27. This is a non-volatile memory when the battery is functioning. The estimated battery life is 10 years.
I/O termination board
The I/O termination board provides AC power termination along the interconnecting termination points for the field unit. Its location is at the back of the case. Analog outputs and the optional DCS interface box terminate on this board.

Case
The case is the enclosure for the wall or rack mount display/interface.

Power supply
The power supply converts incoming A/C power into ±15VDC and +5VDC. The wall or rack mount display/interface uses these three DC voltages. Ohmart/VEGA hardwires the power supply board to accept either 110VAC or 220VAC.

Hinged front panel
The hinged front panel provides access to the inside of the wall or rack mount display/interface.

Processor select circuit board
On the rack mount unit only, the processor select circuit board controls the select keys (A-B-C-D) that correspond to the possible four field units. The operator presses a select key to access one of the four field systems.

Key pad assembly
The keypad assembly contains both the basic keypad (data and function keys) and the processor select keys. It connects to the processor select circuit board.

LCD display interface circuit board
The LCD display interface circuit board receives information from the processor select circuit board and converts it into a format that the LCD display uses for viewing.

Operator display/interface
The front of the rack mount display/interface has four main areas. These areas are:

- Liquid crystal display (LCD) window that can be multiple windows if there is more than one field unit
- Data entry keys
- Special function keys
- Access keys and indicators
Display window

The display window presents screens of information to the operator. Each screen of information displays on the LCD that is back-lit and consists of four rows, each row being 20 characters long. Refer to Figure 10 for an illustration of the display window.

Each area of information on the screen is a field. Some fields are for display only and are not changeable. However, fields that display a blinking cursor are data fields that the operator can change to a new value.

The upper left-hand corner of each screen displays the current screen number that can range from 000 to 999. Not all possible screen numbers are valid. If you enter an invalid screen number, a “MENU DOES NOT EXISTS” message displays.

The upper right-hand corner displays the Alarm signal. This displays as an “A”. This field displays on every screen except password.

The cursor underlines its current location.

Each screen has display fields and sometimes data fields. The display fields are not selectable or adjustable. Data fields enable the operator to enter data. Use SELECT to move to the beginning of a data field.

Security access level can effect whether you can enter data into a specific data field. For example, alarms can be set at the supervisor security level but not at the operator security level. If you attempt to enter an item that requires a higher security level, the “ACCESS DENIED” message displays or the screen remains blank.
Data entry keys

Data entry keys are numbers 0–9, the hyphen, and the decimal point. Use these keys to enter numeric data.

The labels on the 10 numeric keys represent the most frequently used operations.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERVALS (key 2) is not available.</td>
</tr>
</tbody>
</table>

The tasks for the remaining labels are accessible with the correct security access level by pressing the number key and ENTER. For example, to select the calibration screen press the number 8 key and ENTER. The calibration screen displays.

Figure 9 illustrates the data entry/function keys.
Figure 10: Data entry/function keys
Function keys
The eight function keys enable the operator to perform the following:

- Move through screens
- Enter and change values easily
- Toggle between various modes of operation

Many of these keys perform different functions depending on the mode that is active at the time. Table 6 lists the functions for each function key.

<table>
<thead>
<tr>
<th>Function Key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Next Screen</td>
<td>• Selects the next screen in a functional sequence</td>
</tr>
<tr>
<td></td>
<td>• Selects the next character in an alphabetical sequence</td>
</tr>
<tr>
<td>Previous Screen</td>
<td>• Select the previous screen in a functional sequence</td>
</tr>
<tr>
<td></td>
<td>• Selects the previous character in an alphabetical sequence</td>
</tr>
<tr>
<td>Auto Manual</td>
<td>• Selects automatic mode</td>
</tr>
<tr>
<td></td>
<td>• Selects manual mode</td>
</tr>
<tr>
<td>Yes No</td>
<td>• Selects Yes to complete an operation</td>
</tr>
<tr>
<td></td>
<td>• Selects No to cancel or abort an operation</td>
</tr>
<tr>
<td>Enter</td>
<td>Final entry of entire screen of information</td>
</tr>
<tr>
<td>Delete</td>
<td>Deletes character left of the cursor</td>
</tr>
<tr>
<td>Select</td>
<td>Selects a field on the display by moving the cursor to that location</td>
</tr>
<tr>
<td>Help</td>
<td>Goes to an on-line help screen, if one exists, for that field. Press once to get into HELP, press again to exit HELP and return to the original screen</td>
</tr>
</tbody>
</table>

Note: In Screens 525, HELP advances the Parameter # “n”.
Screen 527, HELP advances the PR code “n”.
Screen 528, HELP advances the Curve # “n”.

Table 6: Function key descriptions
The Pro Pac can communicate with up to four field units. Each display window represents a different field unit with labels A, B, C, and D. If one or more field units connect to a rack mount unit, select the desired field unit by pressing the key with the corresponding letter. A red indicator lights up for the active display window.
Wiring the equipment

Ohmart provides detailed Interconnect drawings for the W-4510 Weigh Scale.

**Note:** If the instructions on the drawing differ from the instructions in this manual, use the drawing. It may contain special instructions specific to your order.

Use the drawing notes and the steps that follow to make the input and output connections. Make the connections at the removable terminal strips mounted on the CPU board. Access the CPU board by removing the explosion-proof housing cap.

**Note:** Not all connections are required for operation. See Table 6 for terminal names and positions.

---

**Figure 12: Typical interconnect diagram**
### Table 7: Terminal names and descriptions

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L1</td>
<td>AC power input</td>
</tr>
<tr>
<td>2</td>
<td>L2</td>
<td>AC power input</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Not used</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Not used</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Not used</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Not used</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Not used</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Frequency output</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Frequency output</td>
</tr>
<tr>
<td>10</td>
<td>B</td>
<td>Digital Tachometer +5V</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>Not used</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>Not used</td>
</tr>
<tr>
<td>13</td>
<td>D</td>
<td>Digital Tachometer Signal</td>
</tr>
<tr>
<td>14</td>
<td>E</td>
<td>Digital Tachometer Signal</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>Not used</td>
</tr>
<tr>
<td>16</td>
<td></td>
<td>Not used</td>
</tr>
<tr>
<td>17</td>
<td>A</td>
<td>Digital Tachometer Ground</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>Not used</td>
</tr>
</tbody>
</table>
Figure 13: W-4510 terminal illustration
Installation

Smart Pro and Pro Pac connections

The measurement signal from pins 6 and 7 go to an Ohmart Smart Pro or Pro Pac. The measurement signal is 0–100kHz, maximum, true digital, and satisfies RS-422 and RS-423.

See the tables below for interconnect information.

<table>
<thead>
<tr>
<th>Table 8: W-4510 interconnect to Smart Pro or Pro Pac—Measure signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>From W-4510 Weigh Scale</td>
</tr>
<tr>
<td>Pin 8</td>
</tr>
<tr>
<td>Pin 9</td>
</tr>
<tr>
<td>Shield wire</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 9: W-4510 interconnect to Smart Pro or Pro Pac—tachometer signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>From W-4510 Weigh Scale</td>
</tr>
<tr>
<td>Pin 13</td>
</tr>
<tr>
<td>Pin 14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 10: Tachometer interconnect to Smart Pro or Pro Pac—line down signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>From W-4510 Tachometer</td>
</tr>
<tr>
<td>Contact D</td>
</tr>
<tr>
<td>Contact E</td>
</tr>
</tbody>
</table>
Figure 14: Typical interconnect diagram for Smart Pro
Figure 15: Typical interconnect diagram for Pro Pac
Power

Use the certified interconnect drawings for power requirements.

CAUTION!

DO NOT APPLY POWER until a thorough check of all the wiring is complete!

Connect the sensor part of the W-4510 to a voltage supply that is not at risk for inadvertent turn off. The power supply should be clean and transient-free. For example, a good power supply is a lighting panel. Apply power to the measuring assembly and console continuously. This keeps the equipment warm and dry. Warm-up time from a cold start can take up to 24 hours.

Switch for CE compliance

For CE compliance, install a power line switch no more than one meter from the operator control station.

Conduit

Conduit runs must be continuous and you must provide protection to prevent conduit moisture condensation from dripping into any of the housings or junction boxes. Use sealant in the conduit, or arrange the runs so that they are below the entries to the housings and use weep holes where permitted.

You must use a conduit seal-off in the proximity of the housing when the location is in a hazardous area. Requirements for the actual distance must be in accordance with local code.

If you use only one conduit hub, plug the other conduit hub to prevent the entry of dirt and moisture.
Auxiliary and optional equipment

Tachometer

The tachometer monitors the conveyor belt or screw speed. Use the tachometer when the belt or screw speed variation exceeds $\pm 1\%$. Mount the tachometer correctly to maintain the proper speed. The digital tachometer provides 1,200 pulses per revolution. The shaft revolutions per minute (RPM) must be between 5 and 1,000 when line speed is at its maximum. Use a step-up or step-down arrangement if the shaft RPM is not within this range.

The drive shaft (or idler roller) must have positive contact with the conveyor to ensure accurate correlation of the speed. For accurate operation, select one of the following four locations on the conveyor for driving the tachometer:

1. The tail pulley
2. The idler take-up roller where the conveyor has adequate tension and wrap-around to prevent slippage
3. The idler roller where there is adequate contact with the conveyor, even when the conveyor is lightly loaded
4. The pulley in contact with the underside of the conveyor. Only use this location if the first three locations are inconvenient or impossible.

Ohmart does not recommend the following locations for the positioning of the tachometer:

- Idler or pulley that is in contact with the side of the conveyor handling material. Material build-up on the idler can cause a decrease in speed. This decrease in speed introduces an error into the system.
- Head pulley when there is a possibility of slippage. This slippage is prevalent on conveyors that are too long, inclined, or heavily loaded.

Be careful when you make the mechanical connections from the idler to the tachometer. Correct mechanical connections prevent any eccentricity of the gears or couplings causing output signal variations. Ohmart provides a coupling adapter for each tachometer flexible coupling. The three holes that you use for mounting the adapter are intentionally oversized to permit necessary adjustments for centering on the shaft.

The installation drawings illustrate the dimensions of the tachometer and several methods of coupling it to the conveyor.

Refer to the interconnect drawing on page 29 for general wiring information. Refer to the certified drawings that Ohmart supplies for specific wiring details.
Line down contacts

Use line down contact when the belt speed is constant and does not vary and no digital tachometer is supplied. Contact must be isolated (dry) and have a burden of 15VDC at 10mA. Close the contacts when the line is not running.
Commissioning the gauge

The process of commissioning the gauge includes the following:

- Taking appropriate radiation field tests by a specifically licensed person
- Checking the pre-programmed setup parameters
- Calibrating on process
- Verifying the working of the gauge

Ohmart Field Service Engineers typically commission the gauge. It is necessary to remove the source holder lock the first time the gauge takes measurements in the field. Only persons with a specific license from the U.S. NRC, Agreement State, or other appropriate nuclear regulatory body may remove the source holder lock.

Note: Users outside the U.S. must comply with the appropriate nuclear regulatory body regulations in matters pertaining to licensing and handling the equipment.

Can you remove the source holder lock?

If you are in doubt whether you have permission to remove the source holder lock...Do not!

The license sets limits on what the user can do with the gauge. Licenses fall into two categories:

1. General
2. Specific

It is up to the user to review the license to determine if they have the appropriate permission to perform any of the following tasks to the source holder:

- Disassemble
- Install
- Relocate
- Repair
- Test
- Unlock
You can remove the source lock if installation of the gauge is in the U.S. and you have the specific license to remove the source holder lock. Confirm that your license specifically states that you have the permission to perform this operation and then contact Ohmart Field Service Radiation Safety for the combination.

Do not remove the lock if the gauge has a general license tag, installation is in the U.S., and you do not have the specific license that gives you permission to remove the lock. You can verify whether the gauge is a general license gauge by checking the source holder for the general license tag. If it is not there, it is not a general license device.

If you do not have permission to remove the source holder lock, an Ohmart Field Service Engineer or another person with this specific license must remove it for you.
Installation

Field service commissioning cal checklist

In many U.S. installations, an Ohmart Field Service Engineer commissions the gauge. To reduce service time and costs, use this checklist to ensure the gauge is ready for commission before the Field Service Engineer arrives:

- Mount the source holder and detector per the Ohmart certified drawings.
- Allow access for future maintenance.
- Make all wiring connections per the certified drawings and the “Wiring the Equipment” section in this manual. Tie in the wiring from the Smart Pro analog output to the DCS/PLC/chart recorder.
- Ensure that the AC power to the W-4510 Weigh Scale is a regulated transient-free power source. UPS type power is the best.
- If using DC power, verify that the ripple is less than 100mV.

Note

The equipment warranty is void if there is damage to the W-4510 Weigh Scale due to incorrect wiring not checked by the Ohmart Field Service Engineer.

- Have process ready for calibration.
- When possible, it is best to have process available near both the low and high end of the measurement span. A density change of at least 0.1SpG is a common requirement.
- When possible, have the material that you use for periodic recalibration of the gauge available. Frequently this is water.
- If you cannot meet any of these process conditions, you can still calibrate the gauge. However, it is not as accurate.
- Do not remove the lock on the source holder. Notify Ohmart Field Service if there is damage to the lock or it is missing.
Chapter 3: Setup

All of the setup options for the W-4510 are available through one of four setup menus. The setup screens number from 14–17. You can access the screens directly by entering the screen number or from the main menu.

Detailed screen description

Setup menus

<table>
<thead>
<tr>
<th>014 SETUP 1 OF 4</th>
<th>015 SETUP 2 OF 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>SET TIME OR DATE</td>
<td>SET/CAL ANALOG OUTPUTS</td>
</tr>
<tr>
<td>UP/DOWN LOAD MEMORY</td>
<td>SET GAGE MEAS SPAN</td>
</tr>
<tr>
<td>CHANGE PASSWORD</td>
<td>SET MEASURE UNITS</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>016 SETUP 3 OF 4</td>
<td>017 SETUP 4 OF 4</td>
</tr>
<tr>
<td>COMM PORT SETUP</td>
<td>INPUT CHAN#1</td>
</tr>
<tr>
<td>TEMP COMP SETUP</td>
<td>INPUT CHAN#2</td>
</tr>
<tr>
<td>SET OPERATOR SCREEN</td>
<td>OUTPUT CHANNEL</td>
</tr>
</tbody>
</table>

Figure 16: Setup screens 1–4
Setup

Time and date

Figure 17: Time and date screen

Time
Current time in HH:MM:SS that is set in the real time clock. The time is always in the 24-hour military format.

Date
Current date in MM/DD/YY (month, day, year) format. The date reverts to 00/00/00 on failure.

Procedure 1: Change time and date

1. From 007 TIME/DATE screen, select CHANGE TIME and press ENTER
2. From 025 SET TIME screen, enter the new time in military time format (e.g., 13:01:01) and press ENTER
3. Press PREVIOUS SCREEN to return to 007 TIME/DATE screen
4. From 007 TIME/DATE screen, press SELECT to choose CHANGE DATE
5. From 026 SET DATE screen, enter new date in month, day, year format (e.g., 03/10/01) and press ENTER
6. Go to screen 310 MEMORY BACKUP
7. From 310 MEMORY BACKUP screen, select UPPER RAM TRANSFERS and press ENTER
8. From 314 UPPER RAM XFERS screen, select RAM TO UPPER RAM and press ENTER
9. In 316 RAM TO UPPER RAM screen, press 1 and press ENTER to activate the transfer.
Memory functions

W-4510 configurations save in three different memory areas. These areas are:

1. Lower RAM (active)
2. Upper Ram (with battery-backup)
3. EEPROM (non-volatile)

Lower RAM is the memory that the gauge uses during operation. If you make changes to the gauge configuration or calibration that you want to save, then you must save these changes to the EEPROM. If you do not save to the Upper RAM and EEPROM, the new information is not available after powering off. When you save to the EEPROM you save the configuration and calibration changes that you want to keep and this information loads down to the Upper RAM and Lower (active) RAM at power up.
Upper Ram transfers

The upper RAM can hold a copy of the active gauge configuration. This is useful when making a copy of the non-volatile EEPROM. Use this screen to make transfers to and from upper RAM. Enter a one to initiate the transfer. The transfer completes almost instantaneously.

Procedure 2: Transfer to upper RAM

1. From 310 MEMORY BACKUP screen, select UPPER RAM TRANSFERS and press ENTER
2. From 314 UPPER RAM XFERS screen, select RAM TO UPPER RAM and press ENTER
3. In 316 RAM TO UPPER RAM TRANSFER screen, press 1 and press ENTER to activate the transfer

Procedure 3: Transfer to RAM

1. From 310 MEMORY BACKUP screen, select UPPER RAM TRANSFERS and press ENTER
2. From 314 UPPER RAM XFERS screen, press SELECT to choose UPPER RAM TO RAM and press ENTER
3. In 318 UPPER RAM TO RAM TRANSFER screen, press 1 and press ENTER to activate the transfer
EEPROM transfers

The EEPROM holds a non-volatile copy of the complete gauge configuration. The configuration loads from the EEPROM when you turn on the gauge. Use the EEPROM transfer screen to make transfers to and from the EEPROM.

Procedure 4: Upload to EEPROM

1. Connect the write protect jumper JP17

2. From the 310 MEMORY BACKUP screen, press SELECT to choose EEPROM TRANSFERS

3. Screen 311 displays with the message, "CAUTION, PRESS HELP KEY FOR EEPROM MESSAGE" If you press HELP, the following message displays

   “770 MAKE SURE THERE IS AN EEPROM IN U26 BEFORE USING THIS FEATURE. PRESS HELP.”

   Press HELP to return to screen 311 and press ENTER to continue

4. From 100 EEPROM SERVICE screen, select one of the following options:
   - SELECT COPY RAM TO EEPROM
   - COPY EEPROM TO RAM
   - GET EEPROM CHKSUM

5. If you choose SELECT COPY RAM TO EEPROM, screen 102 RAM TO EEPROM screen displays. Enter 1 and press ENTER to initiate the transfer. If a zero displays, the transfer was successful. If a one displays, the transfer was unsuccessful

   If the transfer was unsuccessful, verify that the jumper on JP17 is in place. It is necessary to place the jumper on JP17 to enable any uploading to the EEPROM

6. If you choose COPY EEPROM TO RAM, screen 104 EEPROM TO RAM screen displays. Enter 1 and press ENTER to initiate the transfer

7. If you choose GET EEPROM CHKSUM, screen 106 EEPROM CHECKSUM screen displays. Enter 1 and press ENTER to generate a new checksum

8. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.
Setup

Upload and download configuration program

Use the SmartPro Upload/Download to download Smart Pro configurations for storage as a computer file. In addition, you can use this program to upload an existing file to Smart Pro to restore a saved configuration.

![SmartPro Upload/Download Application](image)

*Figure 20: SmartPro upload and download application*

The communication cable connects to the circuit board mounted on the Smart Pro housing.

![Communication cable](image)

*Figure 21: Communication cable*

**Note:**
1. Use heat shrink on ends as required.
2. Length is determined by C.O.
Password functions

The default passwords are:

Table 11: Access levels and passwords

<table>
<thead>
<tr>
<th>Access Level</th>
<th>Password</th>
<th>Access and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0—Operator Access</td>
<td>No password</td>
<td>No editing and limits access to most of the gauges screens</td>
</tr>
<tr>
<td>1—Supervisor Access</td>
<td>0011</td>
<td>Access to most of the gauge screens (i.e., setup &amp; calibration) but no direct editing of parameters in any of the functional blocks (e.g., FreqIn Block at address 520)</td>
</tr>
<tr>
<td>2—Installation Access</td>
<td>0022</td>
<td>Complete access to all gauge parameters and functions</td>
</tr>
</tbody>
</table>

Procedure 5: Input password

1. From the 092 screen, type screen number **052** and press ENTER
2. On the **052** screen, type the password to the access level you need
3. Press ENTER

Procedure 6: Change password

1. From the **092** screen, type screen number **053** and press ENTER
2. From **053 CHANGE PASSWORD** screen, press SELECT to choose the access level for the password you want to change and press ENTER
3. From **054 LEVEL 1 PASSWORD**, enter new 4-digit password and press ENTER
4. From **055 LEVEL 2 PASSWORD**, enter new 4-digit password and press ENTER
5. Save to EEPROM
6. Connect write protect jumper, JP17 and save to EEPROM
7. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.
Analog output setup

There are two analog output channels. You must span and calibrate the channels before they can transmit a meaningful signal. The analog output span can be set independent from the measurement span of this gauge. Setting the span is simply a matter of defining what process values that correspond to the 4 and 20mA or 0 and 20mA levels.

The Smart Pro or Pro PAC CPU board mounts on the door of the Smart Pro. The jumpers are clearly labeled. See Figure 24 for details on jumper and test points.
Setup

Input: Channel #1—Always frequency

Input Channel #2—Notes 1 & 2

<table>
<thead>
<tr>
<th>From Digital Tach. or 2nd Sensor</th>
<th>From Ohmart Temp. Comp.</th>
<th>Frequency</th>
<th>Current</th>
<th>Analog</th>
<th>Voltage, Full Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0–1mA</td>
<td>1–5mA</td>
<td>0–20mA</td>
<td>4–20mA</td>
</tr>
<tr>
<td>JP6</td>
<td>N/A</td>
<td>7–8</td>
<td>5–6</td>
<td>5–6</td>
<td>5–6</td>
</tr>
<tr>
<td>JP8</td>
<td>N/A</td>
<td>9–10</td>
<td>1–2</td>
<td>3–4</td>
<td>5–6</td>
</tr>
<tr>
<td>JP9</td>
<td>3–4, 5–6</td>
<td>1–2, 7–8</td>
<td>1–2, 7–8</td>
<td>1–2, 7–8</td>
<td>1–2, 7–8</td>
</tr>
</tbody>
</table>

Notes:
1. Input #1 for frequency input only
2. N/A—Not applicable
3. NR—Not required

Figure 24: Smart Pro/Pro Pac CPU board jumper and test information
Table 12: Smart Pro CPU board jumper information

<table>
<thead>
<tr>
<th>JPR#</th>
<th>Process Section</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>JP1</td>
<td>Analog Output 1</td>
<td>mV select</td>
</tr>
<tr>
<td>JP2</td>
<td>Analog Output 2</td>
<td>mV select</td>
</tr>
<tr>
<td>JP3</td>
<td>Analog Output 1 &amp; 2</td>
<td>−15VDC select</td>
</tr>
<tr>
<td>JP4</td>
<td>Analog Output 1 &amp; 2</td>
<td>15VDC common select</td>
</tr>
<tr>
<td>JP5</td>
<td>Analog Output 1 &amp; 2</td>
<td>+15VDC select</td>
</tr>
<tr>
<td>JP6</td>
<td>Analog Input 2</td>
<td>Shunt select</td>
</tr>
<tr>
<td>JP7</td>
<td>Analog Input 2</td>
<td>Analog/Frequency select</td>
</tr>
<tr>
<td>JP8</td>
<td>Analog Input 2</td>
<td>Gain select</td>
</tr>
<tr>
<td>JP9</td>
<td>Analog Input 2</td>
<td>Analog/Frequency select</td>
</tr>
<tr>
<td>JP10</td>
<td>Communications</td>
<td>RS232/RS422 select</td>
</tr>
<tr>
<td>JP11</td>
<td>Communications</td>
<td>RS232/RS422 select</td>
</tr>
<tr>
<td>JP12</td>
<td>TTL Output 1</td>
<td>Isolated/Non-isolated select</td>
</tr>
<tr>
<td>JP13</td>
<td>Memory U24</td>
<td>+VCC Pin 28/32 select</td>
</tr>
<tr>
<td>JP14</td>
<td>Memory U25</td>
<td>+VCC Pin 28/32 select</td>
</tr>
<tr>
<td>JP15</td>
<td>Memory U24</td>
<td>EPROM configuration</td>
</tr>
<tr>
<td>JP16</td>
<td>Memory U25</td>
<td>EPROM configuration</td>
</tr>
<tr>
<td>JP17</td>
<td>Memory U26</td>
<td>EEPROM configuration</td>
</tr>
<tr>
<td>JP18</td>
<td>Memory U27</td>
<td>RAM configuration</td>
</tr>
<tr>
<td>JP19</td>
<td>Processor</td>
<td>Test</td>
</tr>
<tr>
<td>JP20</td>
<td>Reset U35</td>
<td>SVDC monitor &amp; reset signal generator</td>
</tr>
<tr>
<td>JP21</td>
<td>CPU Section</td>
<td>CPU reset</td>
</tr>
</tbody>
</table>

Figure 25: Simplified Smart Pro circuit board
Table 13: Smart Pro CPU board test point information

<table>
<thead>
<tr>
<th>TP#</th>
<th>Section</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP1</td>
<td>Analog output #1</td>
<td>Voltage signal</td>
</tr>
<tr>
<td>TP2</td>
<td>AC/DC power</td>
<td>+5VDC</td>
</tr>
<tr>
<td>TP3</td>
<td>AC/DC power</td>
<td>+5VDC common</td>
</tr>
<tr>
<td>TP4</td>
<td>AC/DC power</td>
<td>–15VDC</td>
</tr>
<tr>
<td>TP5</td>
<td>AC/DC power</td>
<td>+15VDC</td>
</tr>
<tr>
<td>TP6</td>
<td>AC/DC power</td>
<td>15VDC common</td>
</tr>
<tr>
<td>TP7</td>
<td>Analog output #2</td>
<td>Voltage signal</td>
</tr>
<tr>
<td>TP8</td>
<td>Analog output #2</td>
<td>Voltage signal</td>
</tr>
</tbody>
</table>

Procedure 7: Select output type

1. From the **063 SELECT OUTPUT TYPE**, select either of the following options;
   - **4–20 or 0–20 Channel #1**
   - **4–20 or 0–20 Channel #2**
   Press ENTER
   Note: If you require a voltage output, choose 0–20 on screen 63 and connect a jumper for Channel #1 to JP1 and Channel #2 to JP2

2. Connect the write protect jumper JP17

3. Save to EEPROM

4. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.
Setup

Calibrate the analog output by setting the mid-point (12mA) to a reference meter or DCS/PLC reading. This reconciles any small voltage differences between this gauge and the primary measurement control system.

Procedure 8: Setup analog output Channel #1

1. From 065 ANALOG OUTPUTS screen, select SET ANALOG OUTPUT SPAN and press ENTER
2. From 060 ANALOG OUTPUT SPAN screen, select SET OUT CHAN#1 SPAN and press ENTER
3. From 078 TYPE OF ANALOG OUTPUT UNITS TO USE screen, select either
   - USE STANDARD UNITS
   - USE RATE UNITS
   Press ENTER
4. If you select USE STANDARD UNITS perform the following steps:
   - From 240 SET ANALOG OUTPUT SPAN screen, select SET LOW LIMIT and press ENTER
   - From 242 SET LOW LIMIT screen, enter the new setting and press ENTER
   - Return to screen 240 by pressing PREVIOUS SCREEN
   - From 240 screen, press SELECT to choose SET HIGH LIMIT and press ENTER
   - From 244 SET HIGH LIMIT screen, enter the new setting and press ENTER
5. If you select USE RATE UNITS perform the following steps:
   - From 240 SET ANALOG OUTPUT SPAN screen, select SET LOW LIMIT and press ENTER
   - From 243 SET LOW LIMIT screen, enter the new setting and press ENTER
   - Return to screen 240 by pressing PREVIOUS SCREEN
   - From 240 screen, press SELECT to choose SET HIGH LIMIT and press ENTER
   - From 245 SET HIGH LIMIT screen, enter the new setting and press ENTER
6. Connect the write protect jumper JP17
7. Save to EEPROM
8. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.
**Procedure 9: Setup analog output Channel #2**

1. From **065 ANALOG OUTPUTS** screen, select **SET ANALOG OUTPUT SPAN** and press ENTER

2. From **060 ANALOG OUTPUT SPAN** screen, select **SET OUT CHAN#2 SPAN** and press ENTER

3. From **062 TYPE OF ANALOG OUTPUT UNITS TO USE** screen, select either
   - **USE STANDARD UNITS**
   - **USE RATE UNITS**
   Press ENTER

4. If you select **USE STANDARD UNITS** perform the following steps:
   - From **064 SET ANALOG OUTPUT #2 SPAN**, select **SET LOW LIMIT** and press ENTER
   - From **066 SET LOW LIMIT** screen, enter the new setting and press ENTER
   - Return to screen **064** by pressing **PREVIOUS SCREEN**
   - From screen 064, press SELECT to choose **SET HIGH LIMIT** AND press ENTER
   - From **068 SET HIGH LIMIT**, enter the new setting and press ENTER

5. If you select **USE RATE UNITS** perform the following steps:
   - From **064 SET ANALOG OUTPUT #2 SPAN** screen, select **SET LOW LIMIT** and press ENTER
   - From **067 SET LOW LIMIT** screen, enter the new setting and press ENTER
   - Return to screen **064** by pressing **PREVIOUS SCREEN**
   - From **064** screen, press SELECT to choose **SET HIGH LIMIT** and press ENTER
   - From **069 SET HIGH LIMIT** screen, enter the new setting and press ENTER

6. Connect the write protect jumper JP17

7. Save to EEPROM

8. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.
Measurement span setup

Figure 26: Set gauge span screens

The Process span is the anticipated lowest and highest weight (Min and Max Weight) for the gauge to measure. Calibrate the W-4510 within these settings. These define the endpoints for the calibration and the linearizer curve. This does not define the span for the output current loop (see current loop span, page 104).

Ohmart enters these parameters at their factory based on information received at the time of the order. If the values are correct, no change is necessary.

Note: The Min and Max weight values for the process span are essential to proper calibration of the system. You must enter the Min and Max density values before you can perform an initial calibration. If you change the values for the process span Min or Max densities, you must perform a new initial calibration procedure.

You must modify the span setting if you move the W-4510 from its intended location or are measuring on a different span. In any case, it is a good practice to verify that the setting is correct before performing an initial calibration.
Procedure 10: Setup gauge span—Channel #1

1. From 098 SET GAGE SPAN screen, select SET MINIMUM READING and press ENTER

2. From 096 MIN SPAN SETTING screen press HELP
   
   Screen 799 displays “CHANGING SPAN LIMITS REQUIRES GAGE RECALIBRATION. PRESS HELP.” Press HELP to return to screen 096 and press ENTER

3. From 096 MIN SPAN SETTING screen, press select and type in the new minimum span setting and press ENTER

4. Press PREVIOUS SCREEN to return to screen 098

5. From 098 SET GAGE SPAN screen, select SET MAXIMUM READING and press ENTER

6. From 097 MAX SPAN SETTING screen, press select to get to the NEW SETTING area and type in the new max span setting and press ENTER

7. Connect the write protect jumper JP17

8. Save to EEPROM

9. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.
Procedure 11: Setup gauge span—Channel #2

1. From the **MAIN MENU 1 OF 2** screen, press SELECT to choose **CALIBRATE SYSTEM** and press ENTER

2. From **018 CAL MENU 1 OF 2** screen, select **SET PRODUCT CODE** and press ENTER

3. From **003 PRODUCT CODE SELECTION SCREEN**, type 9 and press ENTER

4. Return to the **MAIN MENU 2 OF 2** by pressing PREVIOUS SCREEN and NEXT SCREEN

5. From **MAIN MENU 2 OF 2**, select **SETUP GAGE** and press ENTER

6. Screen **014 SETUP 1 OF 4** displays, press NEXT SCREEN

7. From **014 SETUP 2 OF 4** screen, press SELECT to choose **SET GAGE MEAS SPAN** and press ENTER

8. From **098 SET GAGE SPAN** screen, select **SET MINIMUM READING** and press ENTER

9. From **096 MIN SPAN SETTING** screen press HELP
   
   Screen 799 displays "CHANGING SPAN LIMITS REQUIRES GAGE RECALIBRATION. PRESS HELP." Press HELP to return to screen 096 and press ENTER

10. From **096 MIN SPAN SETTING** screen, press select and type in the new minimum span setting
    
    Press ENTER

11. Press **PREVIOUS SCREEN** to return to screen 098

12. From **098 SET GAGE SPAN** screen, select **SET MAXIMUM READING** and press ENTER

13. From **097 MAXSPAN SETTING** screen, press select to get to the **NEW SETTING** area and type in the new max span setting
    
    Press ENTER

14. Connect the write protect jumper JP17

15. Save to EEPROM

*Continued on next page*
Procedure 10: Setup gauge span—Channel #2 (continued)

16. Press PREVIOUS SCREEN to return to the MAIN MENU

17. On the Main Menu screen, press select to position the cursor in the top left corner and type 316 and press ENTER

18. From 316 RAM TO UPPER RAM TRANSFER screen, press 1 to activate the transfer

19. Screen 316 displays, type 003 in the menu number area and press ENTER

20. From 003 PRODUCT CODE SELECTION SCREEN, type 0 and press ENTER to return to product code 0

21. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.

Measurement units setup

009 SELECT UNITS
SELECT CHAN#1 UNITS
SELECT CHAN#2 UNITS

Figure 27: Measurement units setup screen

The measurement units for both the channels are set at screen 009. Under screen 9, the weight and rate units list separately for Channel #1. The units for the second channel are limited to speed and custom.

Custom units

If the engineering units required are not in the standard list, you can program a custom unit. Please contact Ohmart for your specific needs.
Procedure 12: Setup units of measurement for Channel #1 and #2

1. From 009 SELECT UNITS screen, choose SELECT CHAN#1 UNITS and press ENTER.

2. From 085 CHANGE UNITS screen, select one of the following units of measure:
   - DENSITY
   - LENGTH
   - WEIGHT
   - MOISTURE
   - RATE
   - CUSTOM

3. For example, if you choose LENGTH, on screen 041 you can choose from the following measurements:
   - Inches
   - CMS
   - %Full
   - Feet
   - Meters
   - Custom

   If you choose RATE, on screen 044 you can choose from the following measurements:
   - TON/HR
   - LBS/HR
   - LBS/MIN
   - GAL/MIN
   - LTR/MIN
   - Custom

4. Press SELECT to scroll through to the correct unit measurement and press ENTER to select

Continued on next page
Procedure 11: Setup units of measurement for Channel #1 and #2 (continued)

5. From 009 SELECT UNITS screen, choose SELECT CHAN#2 UNITS and press ENTER.

6. From 087 CHANGE UNITS screen, select one of the following units of measure:
   - SPEED
   - TEMPERATURE
   - CUSTOM

7. For example, If you choose SPEED, on screen 088 you can choose from the following measurements:
   - FT/MIN
   - MTR/MIN
   - RPM
   - Custom

   If you choose TEMPERATURE, on screen 089 you can choose from the following measurements:
   - DEG C
   - DEG F
   - Custom

   IF you choose CUSTOM, from 220 SETUP CUSTOM, you can select any of the following functions:
   - CHANGE UNITS TEXT, in screen 221 NEW UNITS, type in new units and select YES and press ENTER to save data
   - CHANGE CONV. FACTOR, in screen 222 NEW FACTOR, type in new factor and select YES and press ENTER to save data
   - CHANGE CONV. EXPNT, in screen 223 CONV. EXPONENT, type in new exponent and select YES and press ENTER to save data


9. Save to EEPROM.

10. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.
Setup

Comm port setup

<table>
<thead>
<tr>
<th>230 COMM PORT SETUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT BAUDRATE</td>
</tr>
<tr>
<td>9600  4800  2400</td>
</tr>
<tr>
<td>1200  300  19200</td>
</tr>
</tbody>
</table>

Figure 28: Comm port setup screen

The communications port on this instrument is configurable for either RS232 or RS485.

Note: The W-4510 application does not generally use the serial communicator.
1. From 230 COMM PORT SETUP screen, press SELECT to move to one of the following baud rates:
   - 9600 (default)
   - 1200
   - 4800
   - 300
   - 2400
   - 19200
   Press ENTER to select

2. Screen 231 COMM PORT SETUP displays the prompt, “HOW MANY DATA BITS?”
   Select either of the following:
   - 8-bits (default)
   - 7-bits
   Press ENTER

3. Screen 232 COMM PORT SETUP displays the prompt, “SELECT PARITY.”
   Select one of the following:
   - NONE (default)
   - ODD
   - EVEN
   Press ENTER

4. Screen 233 COMM PORT SETUP displays, “HOW MANY STOP BITS?”
   Select from either of the following:
   - 2-BITS
   - 1-BIT (default)
   Press ENTER

5. Connect the write protect jumper JP17

6. Screen 234 COMM PORT SETUP displays, “SAVE IN EEPROM?”
   Select YES or NO and press ENTER

7. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.
Setup

Temperature compensation setup

024 AUX INPUT SETUP
SET TEMP COEF.
SET REF TEMP

Figure 29: Temp comp setup screen

Note: Scale applications do not use this screen. It is present here for completeness and clarification purposes only.
Operator

The operator screen is by definition screen 000. This screen normally appears on the display. The information that displays on this screen is configurable to read different parameters. The default screen setting is for screen 0 to point to screen 092 and display the Rate, Weight, and Total.

<table>
<thead>
<tr>
<th>090 SELECT OP SCRN</th>
<th>092 Ohmart WeighART</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT SCREEN 91..95</td>
<td>RATE = 00000 LBS/MIN</td>
</tr>
<tr>
<td>OLD 00000</td>
<td>NEW 000000</td>
</tr>
<tr>
<td>WT. = 00000 LBS</td>
<td></td>
</tr>
<tr>
<td>TOT = 000000 TONS</td>
<td></td>
</tr>
</tbody>
</table>

Figure 30: Operator setup screens

Procedure 14: Setup operator screen

1. From 016 SETUP 3 of 4 screen, press SELECT to choose SET OPERATOR SCREEN and press enter
2. In 090 SELECT OP SCRIN screen, type in new default screen number and press ENTER
3. Connect the write protect jumper JP17
4. Save to EEPROM
5. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.
Input channel setup

The screens at 520 and 521 give direct access to the parameters controlling the two input channels. There is no need to access these screens for basic gauge operation. The calibration functions automatically update these values as necessary.

Note: Personnel that are unfamiliar with the system should not access these screens. Changing values at these address locations can adversely effect the operation of the gauge.

Each of the screens (520 and 521) hold 50 items numbered 0 to 49. Please refer to the tables in Appendix I, page 130 for a complete listing of each item. Refer to Figure 24 for jumper configurations for the frequency input Channel #1.

<table>
<thead>
<tr>
<th>520 FREQIN CHAN#1</th>
<th>521 FREQIN CHAN#2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITEM  000 NEXT  000</td>
<td>ITEM  000 NEXT  000</td>
</tr>
<tr>
<td>CURRENT VAL  000000 NEW VAL  000000</td>
<td>CURRENT VAL  000000 NEW VAL  000000</td>
</tr>
</tbody>
</table>

Figure 31: Input channel setup screens

520 Frequency input channel #1, primary sensor signal (frequency only)

This memory block processes frequency input parameters such as:
- Signal type (direct/inverse)
- Source decay counts
- Raw, filtered, normalized, and calibrated counts
- Gain factors

521 Frequency input Channel #2, tachometer/speed input

This memory block processes frequency input signals from Channel #2 similar to Channel #1. Channel #2 input is limited to optional equipment, such as, the tachometer.

It is possible, in limited application needing two sensors, for the raw count signal at Channel #2 to come from a secondary sensor. The counts add to those coming into Channel #1 from the primary sensor to obtain a total raw count, before signal processing. You cannot use this feature to process two separate measurements. Refer to Figure 24 for jumper configurations for the Frequency input Channel #2.

Tachometer   jumper configuration for frequency
Speed input   jumper configuration for 0–10V or 4–20mA input
Output channel setup

The screen at 522 gives direct access to the parameters controlling the two output channels. There is no need to access this screen for basic gauge operation. The calibration functions automatically update the values as required.

Note: Personnel that are unfamiliar with the system should not access these screens. Changing values at these address locations can adversely effect the operation of the gauge.

Screen 522 holds 16 items numbered 0 to 7 (for Channel #1) and 8 to 15 (for Channel #2). Please refer to the tables in Appendix I, page 132 for a complete listing of each item.
Setup

Product codes

Product codes are a convenient method of grouping variables that are associated with a unique product. Channels #1 and #2 use unique product codes. You can store the set of parameters listed in the table in Appendix I into each Product Code Table.

Channel #1 product codes

Channel #1 handles the process sensor input and uses product codes 0–8. Use access level 0 to display the product code tables and level 1 to setup or change values in the table.

Channel #2 product code

Channel #2 handles optional sensor input (e.g., tachometer) and uses product code 9. Use access level 0 to display the product code table and level 1 to setup or change values to the table.

Directly select the product code from screen 3 or through the calibration loop on screen 18. Use screen 527 to setup the product code by performing the following procedure.
Note: The W-4510 does not generally use more than one product code.

Procedure 15: Setup product code

1. From screen **052 ENTER PASSWORD**, enter the correct password for access level 1 and press ENTER
2. Go to screen **527 PR CODE**
   
   **Note:** Screen 527 is the most important part of the computer memory. Be very careful when entering information at this level
3. Press HELP to go to the desired product code number
4. Enter the new value for each item number. Use the AUTO/MAN to scroll forward one at a time through the item numbers. Use the YES/NO to scroll backward
   
   **Warning**
   
   Do not scroll backwards past zero (0)
5. Connect the write protect jumper JP17
6. Save to EEPROM
7. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.
Get linearizer data points

The linearizer curve corrects for the inherent non-linear response of a nuclear gauge. The value that you enter in the linearizer curve automatically compensates for the non-linear response and then provides an accurate measurement. Since the linearizer curve stores as one of the many parameters in the product code, it automatically applies to the calibration and measurement process through the re-cal of each product code.

Before starting this procedure:

- Have the process full to maximum
- Prepare to write the datapoints on the Linearizer curve chart on page 70
- Prepare to take process off the conveyor in increments of 10%
Procedure 16: Take datapoints for linearizer curve

1. Gain access to security level 1 by entering the correct password on screen 52.
2. Be certain the correct product code has been selected.
3. Go directly to screen **168 START COLLECT** and press ENTER to begin the data collect.
4. At the end of the time period, take a reading of Avg. Counts. Turn to the chart on the following page, and enter that reading across from Full (100%).
5. Empty approximately 10% of the process go to screen **168 START COLLECT** again and press ENTER. Get a reading of Avg. Counts. Enter this number on the chart across from 90%. Enter the exact percent of the process in the Actual column if it differs from 90%.
6. Continue until the chart is AVG COUNT section of the chart is complete.
7. Note: Obtain optimal results by using 11 readings (100%, nine intermediate values, and 0%). If 11 readings are not possible to obtain, the minimal number of readings necessary is five (100%, three intermediate values, and 0%). In either case, the exact number of the intermediate values must be known.
8. Call Ohmart Field Service (513) 272-0131 with the chart entry points. They can calculate the 41 data points for you. Prepare to write down these points in the third column of the chart.
9. If Password has expired, regain entry to level 1.
10. Go to screen **528 CURVE #**. This is located in the core of the computer memory. Take great care when working with information at this level.
11. Press HELP to secure the linearizer curve number of interest.
12. Enter the **NEW VALUES** (from Ohmart) for each **ITEM NO**.
   - Use AUTO/MAN key to scroll forward one at a time through datapoints 0–40.
   - Use the YES/NO key to scroll backward one at a time through the ITEM NO.s. Do not go back past 0.
13. Continue past Item 40 (entry value=10000) to Item 41. Enter a 1 to indicate in software that a linearizer curve is needed for this application.
14. Connect write protect jumper, JP17 and save to EEPROM.
15. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.
### Table 14: Linearizer curve chart

<table>
<thead>
<tr>
<th>Actual Process Condition</th>
<th>Screen #168 Reading in AVG COUNT</th>
<th>Data Points (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full (100%)</td>
<td></td>
<td>0=00000</td>
</tr>
<tr>
<td>90%</td>
<td></td>
<td>1=</td>
</tr>
<tr>
<td>80%</td>
<td></td>
<td>2=</td>
</tr>
<tr>
<td>70%</td>
<td></td>
<td>3=</td>
</tr>
<tr>
<td>60%</td>
<td></td>
<td>4=</td>
</tr>
<tr>
<td>50%</td>
<td></td>
<td>5=</td>
</tr>
<tr>
<td>40%</td>
<td></td>
<td>6=</td>
</tr>
<tr>
<td>30%</td>
<td></td>
<td>7=</td>
</tr>
<tr>
<td>20%</td>
<td></td>
<td>8=</td>
</tr>
<tr>
<td>10%</td>
<td></td>
<td>9=</td>
</tr>
<tr>
<td>Empty (0%)</td>
<td></td>
<td>10=</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11=</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12=</td>
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<td>13=</td>
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<td>38=</td>
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<td></td>
<td>39=</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40=10,000</td>
</tr>
</tbody>
</table>

(*) Break points of curve - no decimals used
Data Collect Setup

| 193 SETUP DATA COLLECT METHOD FOR CHANNEL #1 | 194 DATA COLLECT TO BE BASED ON, TIMED AVERAGE START/STOP PRESSES |

Figure 33: Data collect setup screens

Data collection interval

The Data coll interval function is the time in seconds that the system takes to collect a process sample measurement. The gauge uses this interval time to collect data for the following functions:

- Initial calibration
- Linearizer curve
- Standardization
Measurement cutoff

Some belt scale applications have the belt scale running empty for prolonged periods. If there is a buildup of product sticking to the belt, the gauge measures and totalizes this product when the not actually receiving the product. The measurement cutoff feature turns the measurement off in the frequency input block when the measurement drops below a setpoint. The Measurement Cutoff Setpoint is entered in Standardize Compensated Counts.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>The setpoint is entered as counts above the zero point. The gauge keeps track of the zero point, you enter the counts. For example, if the cutoff should trigger at 20 counts above the cutoff, enter 20 in the setpoint location.</td>
</tr>
</tbody>
</table>

Some applications have a large noise factor or very light loading. This makes it hard to distinguish between an empty belt and a low product. The Cutoff Time Constant feature provides for those cases requiring filtering of the raw counts used to trigger the cutoff function. This filtering is independent of the measurement process and does not affect the measurement in any way. As the Cutoff Time Constant is raised, the noise factor is reduced and the cutoff response time is increased. A Cutoff Time Constant entry is required if using the Measurement Cutoff feature. An entry of 1 gives the fastest response just as in the normal measurement time constant entry. The Measurement Cutoff function will not operate with an entry of zero for the Cutoff Time Constant.

| Note: The cutoff time constant should be set as low as possible while still getting reliable cutoff indications. |

When the measurement is actually cut off, there are two indications of the condition. The measurement processing in the frequency Input block will be zeroed from the normalized count location on and the Cutoff Flag will contain a one. The Cutoff Flag will be zero with the channel is in normal operation. You can use the Cutoff Flag to set an alarm, indicate an “end of batch”, and so forth.

Refer to page 130 for the Frequency Input Block locations.
Filtering

This feature enables change to the response time of the system by increasing or decreasing the averaging time that the gauge uses to filter the noise in the signal. An increased time for averaging enables the accumulation of a greater number of readings and therefore produces a greater statistical accuracy. However, this is at the expense of response time to changes in the process.

**Type (RC exponential or rectangular window)**

The W-4510 offers a choice of signal filters such as

- Linear
- RC exponential
- Rectangular window

The W-4510 transmitter has a sample rate of about one sample/second, but process variables generally change measurably on the order of minutes. Electrical and source noise occur on the order of seconds, so they can be filtered out with a low pass filter, leaving only the change in the process variable in the signal.

**RC exponential**

RC exponential filtering simulates the traditional Resistance/Capacitance filtering. It provides an infinite impulse, in which all of the previous samples contribute less and less to the average, but all contribute somewhat. The most recent samples are weighted most heavily in computing the average. Compared to rectangular window filtering, RC exponential filtering provides a quicker response to step changes in the process but has a larger noise band.

**Rectangular window filtering**

Rectangular window filtering computes an average based only on a specified (finite) number of samples. All samples are weighted equally in the average. Although it provides a slower step response (since the most recent measurements are weighted the same as those further back in time), it produces a less noisy signal. Generally, rectangular window linear averaging by itself produces results similar to combining RC exponential filtering with the fast cutoff feature.

**Diagnostic RC filter**

The measurement channel has either a rectangular or diagnostic RC filter. When you point this filter to a specific address, it will display the filtered counts. For example, you can point to address 2814 (raw counts) and 2810 (seconds). Screen 2812 then displays the filter count number.
Setup

Damping

The type of filter you choose determines the damping function.

With the RC exponential method, the damping entry is equivalent to a time constant; that is, the amount of time (in seconds) that it takes for the gauge reading to achieve 63.2% of a step change in process. A range of integer values from 1–600 seconds is possible for this time constant entry.

With the rectangular window filtering, the damping entry determines how many samples to use when calculating the average, responding to 100% of a process step change. The maximum damping entry is 100 with this type of filtering.

Fast response cutoff

Fast response cutoff temporarily bypasses the RC or digital filtering when the change in process exceeds this value (in engineering units) between successive samples. This enables the W-4510 to respond immediately to large step changes while filtering the smaller variations in the signal caused by noise and normal process variations. To turn off the fast cutoff filter, set the value to zero.
Selecting the filter type

Select the filter type at Item No. 18 in the Product Code Table on screen 527 (see the table, on page 136, in Appendix I).

Note
Rectangular window is the default filtering type.

Selecting a filter type, damping, and fast cutoff

Procedure 17: Selecting a filter type, damping, and fast cutoff

1. From 527 PR CODE screen, enter one of the following for a filter type (item 18):
   - 0 for RC exponential
   - 1 for rectangular window
   Press ENTER

2. From 018 CAL MENU 1 OF 2, press SELECT to choose SET TIME CONSTANT and press ENTER

3. From 035 TIME CONSTANT screen, enter the new value for the time constant and press ENTER

4. From 035 TIME CONSTANT screen, select ENTER FAST CUTOFF VALUE and press ENTER

5. From 049 ENTER DIGITAL FILTER CUTOFF VALUE screen, select CHANNEL #1 FILTER and press ENTER

6. From 050 ENTER CHANNEL#1 FILTER CUTOFF VALUE, enter the new value and press ENTER

7. Press PREVIOUS SCREEN to return to screen 049

8. From 049 ENTER DIGITAL FILTER CUTOFF VALUE screen, select CHANNEL #2 FILTER and press ENTER

9. From 051 ENTER CHANNEL#2 FILTER CUTOFF VALUE screen, enter the new value and press ENTER

10. Note: To turn off Fast cutoff, enter 0 as the value.

17. Connect write protect jumper, JP17 and save to EEPROM

18. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.
Adaptive filter

After the measurement channel comes out of the cutoff condition, the output of the measurement filter is set to the first reading seen. Because of the normal fluctuations from measurement noise and the nature of radioactive decay, this first reading may not be precisely representative of the process conditions. To minimize this effect, you can activate an adaptive filter that improves the performance of the gauge. This adaptive filter is set up in screen 529, addresses 90 through 96.

Procedure 18: Setting up an adaptive filter

1. From 529 APP CODE ACCESS screen, address 90, type 1 and press ENTER to enable the adaptive filter.
2. From 529 APP CODE ACCESS screen, address 91, type the minimum value to set the time constant when coming of fast cutoff (default minimum value is set to a value of one) and press ENTER.
3. From 529 APP CODE ACCESS screen, address 92, type the maximum value to increment the time constant (set same as normal time constant up to a value of 100 seconds, the default value is set to 30 seconds) and press ENTER.
4. From 529 APP CODE ACCESS screen, address 93, type how many seconds to maintain each time constant before bumping to the new value (default value is set to 10 seconds) and press ENTER.
5. From 529 APP CODE ACCESS screen, address 94, Enter how much to step up the time constant (default value is five seconds) and press ENTER.
6. To view the current time constant value of the adaptive filter, go to 529 APP CODE ACCESS screen, address 95.
7. Connect write protect jumper, JP17 and save to EEPROM.
8. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.

529 APP CODE ACCESS screen, address 95 and 96 are diagnostic locations. Address 95 is the current time constant with the adaptive filter. Address 96 is the maximum time constant minus the current time constant. When this number gets to zero, the adaptive filtering is complete until the detection of the next cutoff condition.
Totalizer menu

The totalizer features are:

- Consists of two up-counters that are associated with a particular measurement. The totalizer can indicate tons, pounds, kilograms, or other units where summing is necessary.
- Takes lbs/ft from Channel #1 and multiplies that number by the belt speed from Channel #2. It then calculates the mass rate. The totalizer gives a pulse output for each predetermined weight interval (i.e., 1 pulse per 100 pounds). Contact Ohmart/VEGA Field Service to help configure this feature.
- Begins on the CAL menu 2 of 2. Direct access is on screen 4 where two separate totalizers are available.
- Can be PRESET or RESET
  - Presetting involves setting in a count that produces an indication or closes a contact when it reaches that count
  - Resetting the totalizer returns the upper counter to zero.
- HOLD and RESET/HOLD are available options. NORMAL is necessary to revoke the HOLD and begin count again.
Setup

Procedure 19: Setup totalizer #1

1. From **004 TOTALIZER MENU**, select **TOTALIZER #1**
2. From **030 TOTALIZER #1** screen, select one of the following:
   - **RESET**
   - **PRESET**
   - **HOLD**
   - **REST/HOLD**
   And press ENTER
3. If you chose **PRESET**, from the **115 TOTALIZER #1 ENTER PRESET VALUE** screen, enter the new value of totalizer #1 and press ENTER
4. Connect the write protect jumper JP17
5. Save to EEPROM
6. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.

Procedure 20: Setup totalizer #2

1. From **004 TOTALIZER MENU** screen, select **TOTALIZER #2**
2. From **031 TOTALIZER #2** screen, select one of the following:
   - **RESET**
   - **PRESET**
   - **HOLD**
   - **REST/HOLD**
   And press ENTER
3. If you chose **PRESET**, from the **116 TOTALIZER #2 ENTER PRESET VALUE** screen, enter the new value of totalizer #2 and press ENTER
4. Connect the write protect jumper JP17
5. Save to EEPROM
6. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.
Procedure 21: Setup totalizer #1&2 total units

1. From 004 TOTALIZER MENU screen, press select to choose SELECT TOTAL UNITS

2. From 117 SELECT TOTAL UNITS FOR TOTALIZER screen, select TOTALIZER #1 UNITS

3. From 118 TOTALS #1 UNITS, select one of the following units of measurement:
   - LBS
   - TON
   - KGMS
   And press ENTER

4. From 117 SELECT TOTAL UNITS FOR TOTALIZER screen, select TOTALIZER #2 UNITS

5. From 119 TOTALS #2 UNITS, select one of the following units of measurement:
   - LBS
   - TON
   - KGMS
   And press ENTER

6. Connect the write protect jumper JP17

7. Save to EEPROM

8. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.
Setup

Minus sign configuration

This feature enables the Smart Pro or Pro Pac to display negative numbers on screen 092.

The base address for the minus sign feature is 529, items 2815.

Table 15: Screen 092 minus sign configuration

<table>
<thead>
<tr>
<th>Item#</th>
<th>Parameter Name</th>
<th>Parameter description</th>
</tr>
</thead>
</table>
| 2815  | Sign Config    | 1=Do not show minus sign on screen 92  
|       |                | 0=Show minus sign on screen 92 if sensor counts are greater than the empty belt counts |
Chapter 4: Calibration

Use the Smart Pro or Smart Pro Pac (the software in both operates identically) to calibrate the W-4510 Weigh Scale. Refer to the Smart Pro Electronics Reference for instructions to use the Smart Pro software. To perform the calibration, you must be familiar with the Smart Pro topics:

- Navigating through the Smart Pro screens
- Security access level
- Product Code
- Saving to upper RAM
- Saving to EEPROM

This section provides a summary of the calibration procedure for a standard density. Refer to the Smart Pro Electronics Reference and the Smart Pro Mini Guide to Fast Startups for more details.

Smart Pro Note: The instructions in this manual are compatible with Smart Pro firmware 4500.08 or later.
Process calibration

Calibration establishes reference points that relate the detector output to actual (or known) values of the process. When you first receive the scale there is no calibration and the sensor does not read the weight.

There are three different types of calibrations:

1. **Channel #1 Initial Cal**—Perform an initial calibration with a static load to get a close calibration (this is not an easily reproducible calibration)

2. **Channel #1 Periodic Cal**—This is a quick and reproducible calibration. It always ends with the same calibration, without moving the product around

3. **Channel #2 Cal**.

Calibration main menus

All of the calibration functions for the gauge are available under the Cal Menu.

![Cal menu screens](image)

**Product code screen**

The product code groups together a set of parameters that are associated with a unique product. There are nine Product codes available for use.

Product codes 0 through 8 are available for Channel #1 that handles the process sensor input, and product code 9 is for Channel #2 that is for optional sensor input.

You can view Product Code Tables from access level 0, however, access level 1 enables you to setup or change values in the table. The table in Appendix 1 lists the set of 25 parameters. Procedures for changing the product code screen are available on page 66 of this manual.
Initial calibration overview

Before you can use the gauge, a relationship between the detector signal and the actual process values must be determined. The initial calibration determines this relationship by collecting data and measuring the actual process value. The initial calibration of the gauge includes following steps.

1. Verifying the correct measurement units
2. Verifying the proper measurement span entries
3. Determining the linearization
4. Collecting data for the zero and span
5. Calculating the calibration
6. Resetting the absorber value
7. Saving the calibration information to EEPROM

Figure 39: Graphical representation of the calibration curve
Calibration

Step 1: Verifying the proper measurement units
You can configure the W-4510 weigh scale to measure different variables. With proper installation, it can measure the following:

- Weight/Length
- Weight/Area
- Weight/Volume
- Weight/Time

Procedure 22: Verify units of measurement

1. From the Main screen 092, verify that the units of measurement are correct.
2. If the units are incorrect, perform the procedure on page 58 to correct the settings of the units of measurement.

Step 2: Verifying the proper measurement span entries
From Setup menu 2 of 4 use the SELECT and ENTER keys to progress through these functions.

Procedure 23: Verify proper measurement span entries

1. From the 015 SETUP MENU 2 of 4 screen, select SET GAGE MEAS SPAN
2. From the 098 SET GAGE SPAN menu, select SET MINIMUM READING
3. In the 096 MIN SPAN SETTING screen, verify the Low Span setting is correct and then Press PREVIOUS SCREEN to return to 098 screen
   Note: If the Low span setting is incorrect, go to the procedure on page 55 to correct the span setting
7. From the 098 SET GAGE SPAN menu, select SET MAXIMUM READING
8. In the 097 SET MAX SPAN SETTING screen, verify the high process value (the value that corresponds to the maximum process loading condition) in process units
10. Note: If the Low span setting is incorrect, go to the procedure on page 55 to correct the span setting.
Step 3: Determine the linearization

Nuclear Measurements are inherently non-linear. The heavier the loading, the more the measurement becomes non-linear. Since the gauge calibrates near the ends of the measurement span, the gauge reads correctly there. However, you must load the correct linearization curve into the Smart Pro before the gauge reads the correct weight in the middle of the span. This curve depends on the following components:

- Measurement span
- Geometry of the source and detector

Procedure 24: Verify the curve is loaded into Smart Pro

1. From the **052 ENTER PASSWORD** screen, enter the password for the appropriate access level
2. Go to screen **528 CURVE #**, to view the current values from 1-40
3. Enter the item number and press ENTER to view the specific data point.
4. Check items 0 to 40. If the data is between 0 and 10,000 (0–100%) in increments of 250, then Linearization is not present
5. Several loadings between 0–100% must be run on the belt or simulated in a static condition to derive data for this curve. Upon completing the data collection, provide Ohmart with the collected data points. Ohmart calculates the curve and supplies 41 linearization points.
Calibration

**Step 4: Collecting data for the zero and span**

This step sets the upper and lower detector signal limits that are associated with the endpoints of the calibration. These endpoints display graphically as Cal_lo and Cal_hi. You do not have to collect data at the endpoints of the calibration, but in general the closer to the ends the better.

Perform this procedure one time only for the initial calibration. Calibrations that follow the initial cal use the self-contained absorber.

**Calibrate zero—low on process channel #1**

![Figure 40: Cal Lo on process screen](image)

Before starting this procedure:

- Have the process at zero
- Have the actual process value for the empty belt
Procedure 25: Collect data for zero Channel #1—low on process

1. For the zero, run an empty belt

2. From the MAIN MENU 1 OF 2 screen, press SELECT to choose CALIBRATE SYSTEM and press ENTER

3. From 018 CAL MENU 1 OF 2 screen, press SELECT to choose CALIBRATE GAGE and press ENTER

4. From 008 CALIBRATE GAGE screen, press ENTER at SELECT CHANNEL

   Note: Verify that you are using the correct product code (0-8 for Channel #1 or 9 for Channel #2)

5. From 146 CAL CHANNELS screen, select CAL CHANNEL #1 and press ENTER

6. From 149 CAL CHANNEL #1 screen, press SELECT to choose MORE CAL FUNCTIONS and press ENTER

7. From 150 CAL CHANNEL #1 screen, press SELECT to choose MORE CAL FUNCTIONS and press ENTER

8. From 151 CAL CHANNEL #1 screen, press SELECT to choose MORE CAL FUNCTIONS and press ENTER

9. From 152 CAL CHANNEL #1 screen, press SELECT to choose CAL LO ON PROCESS and press ENTER

10. From 210 CALIBRATE LOW ON PROCESS screen, press SELECT to choose either YES or NO (ABORT)

11. From 211 CAL TIME LEFT, press ENTER when the countdown reaches 0

12. From 212 ENTER PROD VAL screen, enter the actual value of the process and press ENTER. Screen 212 displays again with the cursor on the YES line. Press ENTER to continue

13. On the 157 SAVE CALIBRATE RESULT IN UPPER RAM? screen, press ENTER on the YES line to save to upper RAM or NO to abort the save

14. If you choose to save the results, the AVG. COUNT stores in memory for later use.

   Do this only when you are sure the results are correct and you are ready to continue

15. Press SELECT to choose the YES and press ENTER to continue

16. Connect the write protect jumper, JP17 and save to EEPROM

17. Disconnect the write protect jumper, JP17.
Calibration

Calibrate high on process—channel #1

047  CALIBRATE HI ON PROCESS.

YES  NO  (ABORT)

Figure 41: Cal Hi on process screen

Before starting this procedure:

☒ Have enough process available to statically load a 6ft length of belt to maximum loading
Procedure 26: Collect data for span Channel #1—high process

1. From the MAIN MENU 1 OF 2 screen, press SELECT to choose CALIBRATE SYSTEM and press ENTER.

2. From 018 CAL MENU 1 OF 2 screen, press SELECT to choose CALIBRATE GAGE and press ENTER.

3. From 008 CALIBRATE GAGE screen, press ENTER at SELECT CHANNEL.
   Note: Verify that you are using the correct product code (0-8 for Channel #1 or 9 for Channel #2).

4. From 146 CAL CHANNELS screen, select CAL CHANNEL #1 and press ENTER.

5. From 149 CAL CHANNEL #1 screen, press SELECT to choose MORE CAL FUNCTIONS and press ENTER.

6. From 150 CAL CHANNEL #1 screen, press SELECT to choose CAL HI ON PROCESS and press ENTER.

7. From 047 CALIBRATE HI ON PROCESS screen, press SELECT to choose either YES or NO.

8. From 027 CAL TIME LEFT AFTER TIMEOUT, press ENTER when the countdown reaches 0 seconds left.
   Note: Stop the conveyor at this point and collect a known length of the material.
   Weigh the material and determine the lbs/ft.

9. From 156 ENTER PROD VAL screen, enter the actual value of the process and press ENTER. Screen 156 displays again with the cursor on the YES line. Press ENTER to continue.

10. On the 157 SAVE CALIBRATE RESULT IN UPPER RAM? Screen, press ENTER on the YES line to save to upper RAM or NO to abort the save.
    If you choose to save the results, the AVG. COUNT stores in memory for later use.

11. Press SELECT to choose the YES and press ENTER to continue.

12. Connect the write protect jumper, JP17 and save to EEPROM.

Step 5: Calculating the calibration

The data collected in the previous section does not immediately impact the calibration parameters the gauge is using. Once you finish collecting the data for both ends of the calibration, calculate the new calibration parameters by using the “Two Point Cal” function from the calibration menu.

Note: It is important to have the proper Linearization curve loaded into the gauge before executing the Two Point Cal function. The gauge may have to extrapolate the endpoints and must have the curve in place to do this.

Two point calibration

```
155 TWO POINT CAL
HAVE YOU DONE A CAL LO
AND CAL HI FIRST?

YES NO
```

Figure 42: Two point calibration screen
Procedure 27: Calculate calibration—Channel #1

1. From **146 CAL CHANNELS** screen, select **CAL CHANNEL #1** and press ENTER
2. From **149 CAL CHANNEL #1** screen, press SELECT to choose **MORE CAL FUNCTIONS** and press ENTER
3. From **150 CAL CHANNEL #1** screen, press SELECT to choose **MORE CAL FUNCTIONS** and press ENTER
4. From **151 CAL CHANNEL #1** screen, press SELECT to choose **MORE CAL FUNCTIONS** and press ENTER
5. From **152 CAL CHANNEL #1** screen, press SELECT to choose **TWO POINT CALIBRATE** and press ENTER
6. From **155 TWO POINT CAL HAVE YOU DONE A CAL LO AND CAL HI FIRST?** screen, select **YES** and press ENTER
7. From **157 SAVE CALIBRATE RESULT IN UPPER RAM?** screen, select **YES** and press ENTER
8. Press PREVIOUS SCREEN until you return to **MAIN MENU**
9. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM
10. Connect the write protect jumper, JP17 and save to EEPROM
11. Disconnect the write protect jumper, JP17.
Step 6: Setting the absorber value

*Procedure 28: Set absorber value*

1. With a moving empty belt, pull out the absorber and perform a simple data collect to determine the value
   
   Make a note of the absorber reading and counts

2. From 159 **ENTER ABSORBER VALUES** screen, select **HIGH ABSORBER VALUE** and press ENTER

3. From 148 **HIGH ABSORBER** screen, enter the new value and press ENTER

4. Screen 148 displays, press ENTER on the **YES** line to save to upper RAM

5. Connect the write protect jumper, JP17 and save to EEPROM

6. Disconnect the write protect jumper, JP17.
Step 7: Saving the calibration information to EEPROM

After completion of step 6, all of the calibration information is in the RAM memory of the Smart Pro. You must copy this data to the non-volatile EEPROM for long-term storage. On all system re-boots, the EEPROM data copies into the RAM memory and becomes the current configuration. Refer to page 46 for information concerning the upload and download configuration program.

Procedure 29: Save calibration information to EEPROM

1. Connect the write protect jumper, JP17 and save to EEPROM
2. From the 310 MEMORY BACKUP screen, press SELECT to choose EEPROM TRANSFERS
3. Screen 311 displays with the message, “CAUTION, PRESS HELP KEY FOR EEPROM MESSAGE” If you press HELP, the following message displays:

   “770 MAKE SURE THERE IS AN EEPROM IN U26 BEFORE USING THIS FEATURE. PRESS HELP.”

   Press HELP to return to screen 311 and press ENTER to continue
4. From 100 EEPROM SERVICE screen, choose SELECT COPY RAM TO EEPROM
5. Screen 102 RAM TO EEPROM screen displays. Enter 1 and press ENTER to initiate the transfer. If a zero displays, the transfer was successful. If a one displays, the transfer was unsuccessful

   If the transfer was unsuccessful, verify that the jumper on JP17 is in place. It is necessary to place the jumper on JP17 to enable any uploading to the EEPROM
6. Disconnect the write protect jumper, JP17.
Periodic calibration—channel #1 functions

Periodic calibration overview

Periodic calibration adjusts the system by resetting one point of the calibration curve to an independently measured or known sample.

The frequency of periodic calibration depends on several factors, including desired accuracy of the reading.

Periodic calibration consists of five steps:

1. Adjustment of zero reading by using the Simple Re-Cal function
2. Checking the absorber value by performing a simple data collect. Cal Hi on absorber if absorber value reads off by an unacceptable amount
3. Empty the belt and perform a simple data collect if the gauge is still not reading the product correctly.
4. Empty the belt and reset the absorber value
5. Save re-cal to EEPROM.

Smart Pro Note: Refer to the “Smart Pro Reference Chapter 3, section Re-Cal / Channel #1 (Category II Functions)” for more information about choosing a method and performing the periodic re-cal.

If the calibration is not accurate after performing a zero and recalibration on absorber, then perform a Cal Hi to verify that the gauge is reading correctly. After the gauge is reading correctly, have the gauge detect an empty belt condition with the absorber in place, for the correct high value for the absorber. The new value should be re-entered at screen 159.
Step 1: Simple cal on low

**Figure 43: Simple re-cal on low screen**

1. From screen 149 **CAL CHANNEL #1**, select **SIMPLE RE-CAL LOW** and press ENTER
2. From screen 141 **START SIMPLE CAL ON EMPTY**, select **YES** and press ENTER to confirm
3. On screen 173 **CAL TIME LEFT**, press ENTER when the counter reaches 0
4. From screen 174 **EVAL DATA COLLECT**, verify that the absorber and process value are correct. If not correct, press SELECT for **NO** to adjust the CAL or **YES** to continue. Press ENTER
5. If you chose YES, screen 175 displays
6. Connect the write protect jumper, JP17 and save to EEPROM
7. On 175 **SAVE CALIBRATE RESULT IN EEPROM** screen, press SELECT to choose **YES** or **NO** and press ENTER
8. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.
Calibration

Step 2: Cal Hi on absorber

181 CAL HI, ABSORBER
CONFIRM
YES  NO (ABORT)

*Figure 44: Cal on absorber screen*

Procedure 31: Cal Hi on absorber—Channel #1

1. From screen 181 CAL Hi screen, select YES and press ENTER to confirm
2. From screen 170 CAL TIME LEFT screen, press ENTER after timeout
3. On screen 171 EVAL DATA COLL., view the absorber value and measured value. Press ENTER on the YES field to adjust the cal or press SELECT and press ENTER to choose NO
4. Connect the write protect jumper, JP17 and save to EEPROM
5. On 172 SAVE CALIBRATE RESULT IN EEPROM screen, press SELECT to choose YES or NO and press ENTER
6. Disconnect the write protect jumper, JP17.
Step 3: Simple data collect

Simple data collect

This function allows the collection of a timed average of the Channel #1 sensor signal. It takes no control action, but enables the user to see the average sensor signal, as it would collect if you perform a calibration step.

Procedure 32: Simple data collect—Channel #1

1. From screen 149 CAL CHANNEL #1, select MORE CAL FUNCTIONS and press ENTER

2. From screen 150 CAL CHANNEL #1, select MORE CAL FUNCTIONS and press ENTER

3. From screen 151 CAL CHANNEL #1, press SELECT to choose SIMPLE DATA COLLECT and press ENTER

4. On screen 168 START COLLECT, press ENTER when the counter reaches 0. Write the average counts on the screen.
Step 4: Absorber value setup

Procedure 33: Absorber value setup—Channel #1

1. From screen **159 ENTER ABSORBER VALUES**, select **HI ABSORBER VALUE** and press ENTER
2. From screen **148 HIGH ABSORBER screen**, enter the new value of the absorber on high and press ENTER and then press ENTER again to confirm
3. Connect the write protect jumper, JP17 and save to EEPROM
4. Disconnect the write protect jumper, JP17.

Step 5: Saving the calibration information to EEPROM

After completion of step 4, all of the calibration information is in the RAM memory of the Smart Pro. You must copy this data to the non-volatile EEPROM for long-term storage. On all system re-boots, the EEPROM data copies into the RAM memory and becomes the current configuration. Refer to page 46 for information concerning the upload and download configuration program. Follow the procedure on page 93 to save the calibration information to the EEPROM.
Calibration—channel #2 functions

Note: Channel #2 is only used for input from an instrument that tracks belt speed. This input is then used to calculate mass rate.

There are two options for speed input to calculate mass rate:

- Tachometer = calibration
- Line down contact feature that is a constant speed, setup through screen 529

Refer to page 36 for further information concerning the tachometer and line down contact features.

Step 1: Collecting data for the zero and span

This step sets the upper and lower detector signal limits that are associated with the endpoints of the calibration. These endpoints display graphically as Cal_lo and Cal_hi. You do not have to collect data at the endpoints of the calibration, but in general the closer to the ends the better.

Perform this procedure one time only for the initial calibration. Calibrations that follow the initial cal use the self-contained absorber.

![Figure 47: Cal Channel #2 function screen](image)

Cal Lo on process

![Figure 48: Cal Lo on process screen](image)
Calibration

Calibrate zero—low on process Channel #2

Before starting this procedure:

- Have the process at zero
- Have the actual process value for the empty belt

Procedure 34: Collect data for zero Channel#2—low on process

1. For the zero, stop the belt.
2. From the MAIN MENU 1 OF 2 screen, press SELECT to choose CALIBRATE SYSTEM and press ENTER
3. From 018 CAL MENU 1 OF 2 screen, press SELECT to choose CALIBRATE GAGE and press ENTER
4. From 008 CALIBRATE GAGE screen, press ENTER at SELECT CHANNEL
   Note: Verify that you are using the correct product code (0-8 for Channel #1 or 9 for Channel #2)
5. From 146 CAL CHANNELS screen, select CAL CHANNEL #2 and press ENTER
6. From 185 CAL CHANNEL #2 screen, select CAL LOW ON PROCESS and press ENTER
7. From 187 CALIBRATE LOW ON PROCESS screen, press SELECT to choose either YES or NO (ABORT)
8. From 188 CAL TIME LEFT, press ENTER when the countdown reaches 0
9. From 191 ENTER PROD VAL screen, enter the actual value of the process and press ENTER. Screen 191 displays again with the cursor on the YES line. Press ENTER to continue
10. On the 157 SAVE CALIBRATE RESULT IN UPPER RAM? screen, press ENTER on the YES line to save to upper RAM or NO to abort the save
11. If you choose to save the results, the AVG. COUNT stores in memory for later use. Do this only when you are sure the results are correct and you are ready to continue
12. Press SELECT to choose the YES and press ENTER to continue
13. Connect the write protect jumper, JP17 and save to EEPROM
Calibrate high on process—Channel #2

Before starting this procedure:

☑ Have enough process available to statically load a 6ft length of belt to maximum loading
Procedure 35: Collect data for span Channel#2—high process

1. From the MAIN MENU 1 OF 2 screen, press SELECT to choose CALIBRATE SYSTEM and press ENTER.
2. From 018 CAL MENU 1 OF 2 screen, press SELECT to choose CALIBRATE GAGE and press ENTER.
3. From 008 CALIBRATE GAGE screen, press ENTER at SELECT CHANNEL. Note: Verify that you are using the correct product code (0-8 for Channel #1 or 9 for Channel #2).
4. From 146 CAL CHANNELS screen, select CAL CHANNEL #2 and press ENTER.
5A. From 185 CAL CHANNEL #2 screen, press SELECT to choose CAL HI ON PROCESS and press ENTER.
5B. Turn off the source, load belt statically, and turn on source. Try to replicate the loading profile.
6. From 200 CALIBRATE HI ON PROCESS screen, press SELECT to choose either YES or NO.
7. From 201 CAL TIME LEFT AFTER TIMEOUT screen, press ENTER when the countdown reaches 0 seconds left. Note: Stop the conveyor at this point and collect a known length of the material. Weigh the material and determine the lbs/ft.
8. From 202 ENTER PROD VAL screen, enter the actual value of the process and press ENTER. Screen 156 displays again with the cursor on the YES line. Press ENTER to continue.
9. On the 157 SAVE CALIBRATE RESULT IN UPPER RAM? screen, press ENTER on the YES line to save to upper RAM or NO to abort the save.
10. If you choose to save the results, the AVG. COUNT stores in memory for later use.
11. Press SELECT to choose the YES and press ENTER to continue.
12. Connect the write protect jumper, JP17 and save to EEPROM.
Step 2: Calculating the calibration

The data collected in the previous section does not immediately impact the calibration parameters the gauge is using. Once you finish collecting the data for both ends of the calibration, calculate the new calibration parameters by using the “Two Point Cal” function from the calibration menu.

Note: It is important to have the proper Linearization curve loaded into the gauge before executing the Two Point Cal function. The gauge may have to extrapolate the endpoints and needs the curve in place to do this.

Procedure 36: Calculate calibration—Channel #2

1. From 146 CAL CHANNELS screen, select CAL CHANNEL #2 and press ENTER
2. From 149 CAL CHANNEL #1 screen, press SELECT to choose CAL CHANNEL #2 and press ENTER
3. From 185 CAL CHANNEL #2 screen, press SELECT to choose TWO POINT CALIBRATE and press ENTER
4. From 192 TWO POINT CAL HAVE YOU DONE A CAL LO AND CAL HI FIRST? screen, select YES and press ENTER
5. From 157 SAVE CALIBRATE RESULT IN UPPER RAM? screen, select YES and press ENTER
6. Press PREVIOUS SCREEN until you return to MAIN MENU
7. Connect the write protect jumper, JP17 and save to EEPROM
8. Disconnect the write protect jumper, JP17.

Step 3: Saving the calibration information to EEPROM

After completion of step 2, all of the calibration information is in the RAM memory of the Smart Pro. You must copy this data to the non-volatile EEPROM for long-term storage. On all system re-boots, the EEPROM data copies into the RAM memory and becomes the current configuration. Refer to page 46 for information concerning the upload and download configuration program. Follow the procedure on page 93 to save the calibration information to the EEPROM.
Current loop (analog output) calibration

Calibrating the current loop adjusts the 4–20mA output to a reference—either the PLC/DCS or a certified ammeter. It forces the 4mA and 20mA outputs to the external reference. The current loop is pre-adjusted at the Ohmart factory with a certified ammeter, so it is usually very close to the outputs required.

Analog output

Output signals are available through two channels. The two channels can control the output that goes to the devices that use the analog output. Some of these devices are:

- Controller
- Indicator
- Chart recorder

Each channel can be set up and calibrated to accommodate one of the following:

- 4–20mA
- 0–20mA
- 0–100mV

Analog output #1 ties to the product code at Item No. 10 and 11 of the Product Code Table. The second analog output is not product dependent.

Select the output range for each channel from screen 63. If voltage is desired, the choice of 0–20 is made on screen 63 and requires hardware jumpering.

The objective of calibrating the analog output is to set the low signal (4mA, 0mA, or 0mV) equal to the actual low process value (or lowest value of interest), and to equate the high signal (20mA or 100mV) to the high process value (or highest value of interest). Refer to Figure 24 for jumper information.

Calibration of the analog output signal

Calibrate the analog output signal by monitoring the current with a DC milliammeter.
Procedure 37: Calibrate the analog output signal—Channel#1

1. Attach the DC milliammeter to terminal block TB4 at pin locations 11 and 12 for analog output #1
2. Attach the DC milliammeter to terminal block TB3 at pins 3 and 4 for analog output #2
3. From the 052 PASSWORD screen, type in the password for Level 1
4. From the 015 SETUP 2 of 4 screen, select SET/CAL ANALOG OUTS and press ENTER
5. From the 065 ANALOG OUTPUTS screen, press SELECT to choose the CAL ANALOG OUTPUTS and press ENTER
6. From the 061 CAL OUTPUT CHANNEL screen, select CAL OUTPUT CHAN #1 and press ENTER
7. From screen 070 CAL ANALOG OUTS press ENTER to select OUTPUT ##% OF RANGE
8. From screen 077 SEL ADJUST RATE, press SELECT to choose either of the following options:
   - COARSE ADJUSTMENT
   - FINE ADJUSTMENT
   and press ENTER to continue
9. From 071 ADJUST OUT screen, select either of the following options:
   - INCREASE OUTPUT
   - DECREASE OUTPUT
   and press ENTER
10. Depending on the step 6 selection either screen 073 or 074 displays.
    - From 073 CAL ANALOG OUT screen, press ENTER to stop increasing output
    - From 074 CAL ANALOG OUT screen, press ENTER to stop decreasing output
11. From 075 CAL ANALOG OUT screen, press ENTER on YES to exit setup mode
12. Connect the write protect jumper, JP17 and save to EEPROM
13. From 076 SAVE CALIBRATE RESULT IN EEPROM screen, press ENTER on YES line to Save to the EEPROM
Calibration

Procedure 38: Calibrate the analog output signal—Channel#2

1. Attach the DC milliammeter to terminal block TB4 at pin locations 11 and 12 for analog output #1
2. Attach the DC milliammeter to terminal block TB3 at pins 3 and 4 for analog output #2
3. From the 052 PASSWORD screen, type in the password for Level 1
4. From the 015 SETUP 2 of 4 screen, select SET/CAL ANALOG OUTS and press ENTER
5. From the 065 ANALOG OUTPUTS screen, press SELECT to choose the CAL ANALOG OUTPUTS and press ENTER
6. From the 061 CAL OUTPUT CHANNEL screen, select CAL OUTPUT CHAN #2 and press ENTER
7. From screen 070 CAL ANALOG OUTS press ENTER to select OUTPUT ##% OF RANGE
8. From screen 077 SEL ADJUST RATE, press SELECT to choose either of the following options:
   - COARSE ADJUSTMENT
   - FINE ADJUSTMENT
   and press ENTER to continue
9. From 071 ADJUST OUT screen, select either of the following options:
   - INCREASE OUTPUT
   - DECREASE OUTPUT
   and press ENTER
10. Depending on the step 6 selection either screen 073 or 074 displays.
    - From 073 CAL ANALOG OUT screen, press ENTER to stop increasing output
    - From 074 CAL ANALOG OUT screen, press ENTER to stop decreasing output
11. From 075 CAL ANALOG OUT screen, press ENTER on YES to exit setup mode
12. Connect the write protect jumper, JP17
13. From 076 SAVE CALIBRATE RESULT IN EEPROM screen, press ENTER on YES line to Save to the EEPROM
Table 16: Calibration records

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<th>Screen, item</th>
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</table>
Calibration

Notes
Chapter 5: Diagnostics and repair

Communication diagnostics

Bi-level input

The following table lists the bi-level inputs, terminals, and addresses. It also lists the LED differences between the newer revision D boards and their older counterparts. All addresses are reached through screen 529.

Note: The Pro Pac information is for each of the four sets of terminals.

Table 17: Bi-level inputs, terminals, grounds, addresses, and LEDs

<table>
<thead>
<tr>
<th>Input #</th>
<th>Smart Pro Terminal</th>
<th>Smart Pro Active, Ground</th>
<th>Pro Pac Terminal</th>
<th>Pro Pac Active, Ground</th>
<th>Address from Screen 529</th>
<th>Older board (Revision C or older)</th>
<th>New board (Revision D or newer)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TB4</td>
<td>8, 9</td>
<td>TB2</td>
<td>4, 5</td>
<td>1102</td>
<td>LED 37</td>
<td>LED 30</td>
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<td>2</td>
<td>TB5</td>
<td>1, 2</td>
<td>TB2</td>
<td>6, 5</td>
<td>1101</td>
<td>LED 36</td>
<td>LED 29</td>
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<td>TB5</td>
<td>3, 4</td>
<td>TB2</td>
<td>7, 8</td>
<td>1100</td>
<td>LED 35</td>
<td>LED 28</td>
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<td>5, 6</td>
<td>TB2</td>
<td>9, 8</td>
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<td>LED 34</td>
<td>LED 27</td>
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<td>TB2</td>
<td>10, 11</td>
<td>1098</td>
<td>LED 33</td>
<td>LED 26</td>
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<td>6</td>
<td>TB5</td>
<td>8, 9</td>
<td>TB2</td>
<td>12, 11</td>
<td>1097</td>
<td>LED 32</td>
<td>LED 25</td>
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</table>

An open circuit has a no light and the address equals zero. A closed circuit has a light and an address of one. Figure 50 is an example of a bi-level input with an open circuit.

Figure 50: Example of a bi-level input open circuit
The following Smart Pro and Pro Pac troubleshooting flow charts may be useful in diagnosing many communication problems.

Figure 51: Smart Pro power supply flow chart – part 1
Figure 52: Smart Pro power supply flow chart – part 2
Diagnostics and repair

**TTL/Relay Flow Chart**

Start

- Does U-21 measure +5VDC from 4-8?
  - Yes
  - Are outputs in Table #1 correct?
    - Yes
    - Replace CPU board
    - No
    - Are signals at I/O TB numbers (see Table #2) correct?
      - Yes
      - Replace I/O board
      - No
      - Replace I/O board
  - No
    - Refer to power supply flow chart

- Are signals at I/O cable correct?
  - Yes
  - Replace I/O board
  - No
  - Replace I/O board

External wiring or field device problem

End

**Table #1 – CPU Board**

<table>
<thead>
<tr>
<th>Relay</th>
<th>Integrated Circuits</th>
</tr>
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<tbody>
<tr>
<td>#1</td>
<td>D22</td>
</tr>
<tr>
<td>#2</td>
<td>D23</td>
</tr>
<tr>
<td>#3</td>
<td>D25</td>
</tr>
<tr>
<td>#4</td>
<td>D26</td>
</tr>
</tbody>
</table>

- TTL (O.C.)
  - #1: U13-5 to U13-4
  - #4: U13-5 to U13-4
  - #5: U23-3 to 4
  - #6: U23-5 to 4

**Table #2 – I/O Board**

<table>
<thead>
<tr>
<th>Relays:</th>
<th>TB#</th>
<th>COM</th>
<th>N.C.</th>
<th>N.O.</th>
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<tr>
<td></td>
<td>2</td>
<td>-10</td>
<td>-11</td>
<td>-12</td>
</tr>
</tbody>
</table>

Bi-Level Input:
- RLY #1: U11-4, -5
- RLY #2: N/A
- RLY #3: N/A
- RLY #4: N/A
- TTL #5: N/A
- TTL #6: N/A

Active low energizes relay

- Screen 550
- Screen 554
- Screen 565
- Screen 567

**Figure 53: Smart Pro TTL/Relay flow chart**
**Frequency Input**

Start

Is correct signal present at TB4-1 for input 1 and/or TB4-5 for input 2?  

Yes  

Is same signal present at U5-3 for input 1 and/or U7-3 for input 2?  

Yes  

Does +5VDC measure across (8-5) at U5 for Input 1 and/or U7 for input 2?  

Yes  

Replace CPU board

No  

Problem with sensor or external wiring

Yes  

Check jumpers and I/O signal cable

No  

Refer to power supply flow chart

End

_Figure 54: Smart Pro frequency input_
Diagnostics and repair

Figure 55: Smart Pro analog output (mA/mV) flow chart

Start

#1

Does U2 side of R5 measure +15VDC to U2-8? No
	Refer to power supply flow chart

Yes

Does U2 (8-4) measure -15VDC? No
	Refer to power supply flow chart

Yes

If mA selected, JP1 not installed
	Set output equal to 50%

If mV selected, JP1 installed

Does TB4(11-12) measure 12mA or 50mV? No
	Check I/O signal cable or replace CPU

Yes

External wiring or controller problem

#2

Start

Does U15 side of R32 measure +15VDC to U15-8? No
	Refer to power supply flow chart

Yes

Does U15 (8-4) measure -15VDC? No
	Refer to power supply flow chart

Yes

If mA selected, JP2 not installed
	Set output equal to 50%

If mV selected, JP2 installed

Does TB3(6-7) measure 12mA or 50mV? No
	Check I/O signal cable or replace CPU

Yes

External wiring or controller problem

Figure 55: Smart Pro analog output (mA/mV) flow chart
Analog Input-2

Start

Yes

Is signal present at Input 2 TB4 (5-6)?

No

Problem with external wiring or transmitter

Yes

Is frequency okay at U7-3 for input 2?

No

Check jumpers and I/O signal cable

Yes

Does +15VDC measure across (4-9) at U6 for input 2?

No

Refer to power supply flow chart

Yes

Does -15VDC measure across (11-9) at U6 for input 2?

No

Refer to power supply flow chart

Yes

Replace CPU board

End

Figure 56: Smart Pro analog input-2 flow chart
**Diagnostics and repair**

**Frequency Input**

1. Start
2. Is correct signal present at TB1-4 for input and/or TB1-7 for input 2?
   - Yes: Check CPU jumpers and I/O signal cable. Ok?
     - Yes: Have power supply levels been checked?
       - Yes: Replace CPU
       - No: Refer to power supply flow chart
   - No: Problem with sensor or external wiring

**Figure 57: PRO PAC Frequency input**
Analog Input-2

Start

Is signal present at Input 2 TB1 (7-8)?

Yes

Check jumpers, I/O signal cable OK?

Yes

Have power supply levels been checked?

Yes

Replace CPU

End

No

No

Problem with external wiring or transmitter

No

Correct

No

Refer to power supply flow chart

Yes

No

Yes

No

Yes

No

Figure 58: Pro Pac Analog Input-2
TTL/Relay Flow Chart

Start

Have power supply levels been checked?

Refer to power supply flow chart

Are signals at I/O TB numbers (see Table #1) correct?

Check I/O signal cable and CPU

Replace I/O board

External wiring or field device problem

End

Table #1 – I/O Board

<table>
<thead>
<tr>
<th>Relays</th>
<th>TB#</th>
<th>COM</th>
<th>N.C.</th>
<th>N.O.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>-1</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TTL (O.C.)</th>
<th>TB#</th>
<th>Non-isolated</th>
<th>Isolated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>4-11</td>
<td>4-5</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>4-6</td>
<td>N/A</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>5-6</td>
<td>N/A</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>7-9</td>
<td>N/A</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>8-9</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Figure 59: PRO PAC TTL/Relay flow chart
Figure 60: PRO PAC Analog Output (mA/mV) flow chart
Figure 61: PRO PAC AC voltage and power supply flow chart
Hardware diagnostics

The following figure may be helpful in finding test points, fuses, jumpers, and connectors on the CPU circuit board.

Power Supply Board

Figure 62: CPU board simplified component layout
Diagnostics and repair

**Table 18: Power supply board test points and labels**

<table>
<thead>
<tr>
<th>Power Supply Test point label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Not used</td>
</tr>
<tr>
<td>H2</td>
<td>Not used</td>
</tr>
<tr>
<td>TP1</td>
<td>Isolated ground</td>
</tr>
<tr>
<td>TP2</td>
<td>Loop current test point 200mV/mA loop current. Referenced to isolated ground.</td>
</tr>
</tbody>
</table>

**Table 19: CPU board test points and labels**

<table>
<thead>
<tr>
<th>CPU Test point label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>Raw input signal coming from preamp.</td>
</tr>
<tr>
<td>GND</td>
<td>Logic ground</td>
</tr>
<tr>
<td>U5 pin8</td>
<td>+5V power supply test points referenced to Logic ground.</td>
</tr>
</tbody>
</table>

**Jumpers**

The W-4510 Weigh Scale uses jumpers J1–J4 on the CPU board as division values for the output frequency to the Smart Pro.

<table>
<thead>
<tr>
<th>Jumper division values</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1 Divide by 20</td>
</tr>
<tr>
<td>J2 Divide by 10</td>
</tr>
<tr>
<td>J3 Divide by 5</td>
</tr>
<tr>
<td>J4 Divide by 2</td>
</tr>
<tr>
<td>None Divide by 1</td>
</tr>
</tbody>
</table>

If the W-4510 Weigh Scale does not have a jumper, the division value is one, and the output frequency does not change.

**LED indicators**

Check the basic functioning of the Ohmart electronics at the instrument with LED indicators on the CPU board. They are visible when you remove the explosion proof housing cap.

See the tables on page 123 for a summary of the LED indications.

---

**Figure 63: GEN2000 LED indicators**

---
### LED summary table

**Table 21: Power supply board LED summary table**

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
<th>Normal condition</th>
<th>Error condition</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>+6V</td>
<td>+6V DC voltage level to electronics</td>
<td>ON</td>
<td>OFF—Electronics are not receiving +6VDC voltage required for functioning</td>
<td>Verify +6V on test points. Check fuse on Power Supply board. Check power input terminals 1, 2.</td>
</tr>
</tbody>
</table>

| +24V  | Not used                          |                  |                                                                                 |                                                                                |
|       | Relay                             | Not used         |                                                                                 |                                                                                |

**Table 22: CPU board LED summary table**

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
<th>Normal condition</th>
<th>Error condition</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mem</td>
<td>Not used</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>HART</td>
<td>Not used</td>
<td>ON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>Central processing unit on CPU board “heartbeat”</td>
<td>Blinks at rate of 1 time/sec.</td>
<td>LED does not blink. CPU not functioning.</td>
<td>Check power input. Replace CPU board.</td>
</tr>
<tr>
<td>Aux</td>
<td>Auxiliary input frequency signal indicator</td>
<td>Blinks if auxiliary input present. OFF— if no auxiliary input present.</td>
<td>None</td>
<td>Check auxiliary input wiring terminals 11 &amp; 12 with a meter for frequency signal. Check auxiliary input equipment.</td>
</tr>
<tr>
<td>HV</td>
<td>Not used</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Field</td>
<td>Radiation field indicator</td>
<td>Cycles in proportion to radiation field intensity at detector. ON for 10 sec. for each mR/hr, then off for two seconds. (Can use LED 5 that blinks 1 time/sec to time LED 9 for field indicator.)</td>
<td>None</td>
<td>A 1 mR/hr (2.580 nC/kg/hr) field is usually required for a measurement. Check for closed source shutter, buildup, and insulation.</td>
</tr>
</tbody>
</table>
Diagnostics and repair

Maintenance and repair

Periodic maintenance schedule

The W-4510 Weigh Scale requires very little maintenance because it contains no moving parts. We suggest the following schedule to prevent problems and to comply with radiation regulations:

Table 23: Maintenance schedule

<table>
<thead>
<tr>
<th>Description</th>
<th>Frequency</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-cal</td>
<td>As required by process conditions, usually at least once a month</td>
<td>Smart Pro Calibration chapter</td>
</tr>
<tr>
<td>Source holder shutter check</td>
<td>Every six months unless otherwise required by applicable nuclear regulatory agency</td>
<td>Radiation safety instructions shipped separately with source holder and following instructions</td>
</tr>
<tr>
<td>Source wipe</td>
<td>Every three years unless otherwise required by applicable nuclear regulatory agency</td>
<td>Radiation safety instructions shipped separately with source holder and following instructions</td>
</tr>
</tbody>
</table>

Spare parts

Spare parts are available directly from Ohmart Parts and Repairs Department for U.S. and Canada installations. Installations in other countries can purchase spare parts through their local Ohmart representative.

Table 24: Spare part numbers

<table>
<thead>
<tr>
<th>Description</th>
<th>Ohmart part number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gauge Frame:</strong></td>
<td></td>
</tr>
<tr>
<td>Heater Control</td>
<td>235117</td>
</tr>
<tr>
<td>Lamp, Bayonet-type, 120VAC, 3W</td>
<td>232480</td>
</tr>
<tr>
<td><strong>GEN2000 Electronics:</strong></td>
<td></td>
</tr>
<tr>
<td>Power supply board</td>
<td>239747</td>
</tr>
<tr>
<td>W-4510 Weigh Scale CPU board</td>
<td>239623</td>
</tr>
<tr>
<td>125 mA fuse on power supply</td>
<td>238661</td>
</tr>
<tr>
<td>2A fuse on power supply</td>
<td>240539</td>
</tr>
<tr>
<td><strong>Smart Pro:</strong></td>
<td></td>
</tr>
<tr>
<td>CPU circuit board</td>
<td>235142</td>
</tr>
<tr>
<td>Power supply, +5VDC, ±15VDC</td>
<td>237475</td>
</tr>
<tr>
<td>Interface circuit board</td>
<td>217283</td>
</tr>
<tr>
<td>Door Assembly (includes display and keypad)</td>
<td>205876</td>
</tr>
<tr>
<td>Fuse, 1 ¼ Amp, 250V, slow-blow (on I/O board)</td>
<td>214022</td>
</tr>
</tbody>
</table>
Field repair procedures

Very few parts are field repairable, but you can replace entire assemblies or boards. The following parts are replaceable:

- GEN2000 CPU circuit board
- GEN2000 Power supply circuit board

Use great care to prevent damage to the electrical components of the gauge. Ohmart recommends appropriate electrostatic discharge procedures.

CAUTION!

NEVER open the black injection-molded plastic housing that contains the sensor scintillator and photomultiplier tube components. They are sealed and tested at the factory to prevent radiation and light from leaking into the housing. No part in the sensor housing is field repairable. Opening the housing may permanently damage the sensor.
Diagnostics and repair

Requesting field service

To request field service within the U.S. and Canada; call 513-272-0131 from 8:00 A.M. to 5:00 P.M. Monday through Friday. For emergency service after hours, call 513-272-0131 and follow the voice mail instructions.

Returning equipment for repair to Ohmart

When calling Ohmart to arrange repair service, be ready with the following information:

- Product model that is being returned for repair
- Description of the problem
- Ohmart Customer Order (C.O.) Number
- Purchase order number for the repair service
- Shipping address
- Billing address
- Date needed
- Method of shipment
- Tax information
Returning equipment for repair

Procedure 39: Returning equipment for repair

1. Call Ohmart Nuclear Products Repair at 513-272-0131 between Monday and Friday, 8:00 A.M. to 5:00 P.M. United States Eastern Standard Time
2. Ohmart assigns the job a material return authorization (MRA) number
3. Indicate the MRA on the repair service purchase order
4. Clearly mark the shipping package with the MRA number
5. Send the confirming purchase order and the equipment to:
   Ohmart Corporation
   Attention: Repair Department
   4241 Allendorf Drive
   Cincinnati, OH 45209-1599 USA

Note: You must first contact Ohmart and receive a material return authorization number (MRA) before returning any equipment to Ohmart. Ohmart reserves the right to refuse any shipment not marked with the MRA number.
Diagnostics and repair

Notes
Appendix I: Parameter blocks

Screen 520 Frequency Input Block

```
520 FREQIN CHAN#1
ITEM 000 NEXT=000
CURRENT VAL       NEW VAL
000000           000000
```

Figure 64: Frequency input Channel #1 screen

```
521 FREQIN CHAN#2
ITEM 000 NEXT=000
CURRENT VAL       NEW VAL
000000           000000
```

Figure 65: Frequency input Channel #2 screen

The base address for screen 520 FREQIN CHAN#1 is 529, item 128.
The base address for screen 521 FREQIN CHAN #2 is 529, item 178.
### Table 25: Screen 520 OR 521 Frequency input block

<table>
<thead>
<tr>
<th>Item#</th>
<th>Parameter Name</th>
<th>Parameter Description</th>
</tr>
</thead>
</table>
| 0     | SIGNAL TYPE    | 0=off, 1=type 1 input, 2=type 2 input, 3=type 1 test mode, 4=type 2 test mode  
Type 1, counts are inversely proportional to process variable  
Type 2, counts directly proportional to process variable |
| 1     | Status Location| Shows countdown for timed calibrations |
| 2     | SPARE LOCATION |                       |
| 3     | SPARE LOCATION |                       |
| 4     | TEMPERATURE COMPENSATION CHANNEL POINTER | Base address of temp. comp. channel block |
| 5     | TACH/FLOWMETER CHANNEL POINTER | Base address of tach or flow channel block |
| 6     | RAW COUNTS     | Counts per second from counter |
| 7     | AMPLIFIED RAW COUNTS | Location 6 multiplied by location 29 |
| 8     | DECAY COMPENSATED COUNTS | Source decay comp. using decay factor at location 27 |
| 9     | STANDARDIZE COMPENSATED COUNTS | Compensation per current standardize counts at location 25 |
| 10    | NORMALIZED COUNTS | Counts input converted to 0–10,000 count range |
| 11    | PRODUCT        | Linearized and converted to process units, e.g., SGU, lbs/ft, etc |
| 12    | FILTERED PRODUCT | Filtered per time constant in product code table |
| 13    | TEMPERATURE COMPENSATED PRODUCT | Compensated to reference temperature using process temperature and temperature coefficient |
| 14    | FINAL PRODUCT  | Final customer process units for display |
| 15    | DRY SOLIDS     | For slurries only, 0 for all others |
| 16    | RATE           | Weight per unit time when tach/flow channel enabled |
| 17    | PRODUCT MULTIPLIER |                       |
| 18    | PRODUCT DIVIDER | (Product Multiplier/Divider)—On slurries (type 2 density measurements) used as a scale factor for DRY SOLIDS. Used as scale factor to get FINAL PRODUCT on all other applications |
| 19    | RATE MULTIPLIER | Scaling for rate customer units |
| 20    | RATE DIVIDER   | Scaling for rate customer units |
| 21    | REFERENCE TEMPERATURE |                       |
| 22    | MEASUREMENT CUTOFF SETPOINT | Standardize compensated counts where measurement cuts off |
| 23    | CUTOFF TIME CONSTANT | XXXXX seconds for cutoff filtering |
| 24    | CUTOFF FLAG    | 1 if measurement is cut off, 0 if not |
| 25    | STANDARDIZE AVERAGE COUNTS | From last standardize—standardize gain=location 26/location 25 |
| 26    | CAL. LOW AVG. COUNTS | Starting counts from original calibration |
| 27    | DECAY FACTOR   | Decay gain=65536/65536—decay factor |
| 28    | DECAY REFERENCE | Source type code for decay rate |
| 29    | RAW GAIN       | Entry=gain factor for location 7 |
| 30    | FUNCTION CODE  | Enter 0 to 9 for selected function code |
| 31    | START/[STOP]   | Enter 1 to Start a selected function. Enter second 1 to Stop function in Start/Stop mode. Location zeroes automatically |
### Table 15: Screen 520 OR 521 Frequency input block (continued)

<table>
<thead>
<tr>
<th>Item#</th>
<th>Parameter Name</th>
<th>Parameter Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>LOW SAMPLE INPUT</td>
<td>Enter actual value of Low Process sample collected for Standardize and Calibrate Low procedures</td>
</tr>
<tr>
<td>33</td>
<td>HIGH SAMPLE INPUT</td>
<td>Enter actual value of High Process sample collected for Calibrate High procedure</td>
</tr>
<tr>
<td>34</td>
<td>LOW OUTPUT</td>
<td>Indicates time remaining during Low data collection and shows Cal. Check value when data collection complete</td>
</tr>
<tr>
<td>35</td>
<td>HIGH OUTPUT</td>
<td>Indicates time remaining during High data collection and shows Cal. Check value when data collection complete</td>
</tr>
<tr>
<td>36</td>
<td>DURATION TYPE</td>
<td>Enter 1=timed, 2=Start/Stop, 3=tach pulses, 4=tach/10, and 5=tach/100</td>
</tr>
<tr>
<td>37</td>
<td>DURATION</td>
<td>Enter 1 to 65535 seconds, tach pulses, tach pulses/10, or tach pulses/100. No entry needed for STDZ</td>
</tr>
<tr>
<td>38</td>
<td>CALIBRATE LOW DATE</td>
<td>Date that current standardize or calibrate low was performed</td>
</tr>
<tr>
<td>39</td>
<td>STDZ/CAL. LOW AVERAGE COUNTS</td>
<td>Raw count average from data collection during most recent Standardize or Cal. Low procedure</td>
</tr>
<tr>
<td>40</td>
<td>CAL. HIGH AVERAGE COUNTS</td>
<td>Raw count average from data collection during most recent Calibrate High procedure</td>
</tr>
<tr>
<td>41</td>
<td>ALARM LIMIT</td>
<td>Enter 0 to 65535% of change from last standardize that should cause an alarm. Enter 0 to turn off alarm function</td>
</tr>
<tr>
<td>42</td>
<td>TOTALIZER</td>
<td>Accumulated total weight over the duration of the most recent Cal. High data collection. Use for Cal High on bulk total</td>
</tr>
<tr>
<td>43</td>
<td>TOTALIZER SCALING</td>
<td>Converts Rate data to a total. Rate divides by this factor before adding into total</td>
</tr>
<tr>
<td>44</td>
<td>STDZ HISTORY #1 DATE</td>
<td>Date of Stdz. or Cal Low before current</td>
</tr>
<tr>
<td>45</td>
<td>STDZ HISTORY #1 COUNTS</td>
<td>Standardize counts for that date</td>
</tr>
<tr>
<td>46</td>
<td>STDZ HISTORY #2 DATE</td>
<td>Date of Stdz. or Cal Low before History 1</td>
</tr>
<tr>
<td>47</td>
<td>STDZ HISTORY #2 COUNTS</td>
<td>Standardize counts for that date</td>
</tr>
<tr>
<td>48</td>
<td>STDZ HISTORY #3 DATE</td>
<td>Date of Stdz. or Cal Low before History 2</td>
</tr>
<tr>
<td>49</td>
<td>STDZ HISTORY #3 COUNTS</td>
<td>Standardize counts for that date</td>
</tr>
</tbody>
</table>
Appendix I: Parameter blocks

Screen 522 Frequency Output Block

![Figure 66: Frequency output channel screen](image)

The base address for screen 522 FREQOT CHANNEL is 529, item 1024.

<table>
<thead>
<tr>
<th>Table 26: Screen 522 Frequency Output block Channel #1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item#</strong></td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 27: Screen 522 Frequency Output block Channel #2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item#</strong></td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>13</td>
</tr>
<tr>
<td>14</td>
</tr>
<tr>
<td>15</td>
</tr>
</tbody>
</table>
Screen 524 Auto Zero Log

The data from the last group of auto zeros log here. Each data item logs and stores in a 20 element array. The history index is used by the firmware to know where to place the next set of data in the array. Screen 524 displays the contents of the data arrays.

Only the counts and the date and time of the last complete data collect logs.

<table>
<thead>
<tr>
<th>Item#</th>
<th>Parameter Name</th>
<th>Parameter description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2729</td>
<td>History Index</td>
<td>Index that places data into the arrays</td>
</tr>
<tr>
<td>2730</td>
<td>Cycles Count</td>
<td>How many auto zeros occurred during the last auto zero period</td>
</tr>
<tr>
<td>2750</td>
<td>Counts Avg</td>
<td>The sensor counts recorded during the last data collect of the last auto zero period</td>
</tr>
<tr>
<td>2770</td>
<td>MonthDay</td>
<td>The month and day of the last auto zero period in a MMDD format</td>
</tr>
<tr>
<td>2790</td>
<td>HoursMinutes</td>
<td>The hours and minutes of the last auto zero period in HHMM format</td>
</tr>
</tbody>
</table>
Screen 525 Totalizer Block

![Figure 67: Totalizer screen](image)

The base address for screen 525 TOTALS CHAN #1 is 529, item 1072.

**Table 29: Screen 525 Totalizer block #1**

<table>
<thead>
<tr>
<th>Item#</th>
<th>Parameter Name</th>
<th>Parameter description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>STATUS</td>
<td>0=normal counting, 1=Reset, 2=Hold, 3=Reset/Hold</td>
</tr>
<tr>
<td>1</td>
<td>DATA POINTER</td>
<td>Location of Rate data to totalize</td>
</tr>
<tr>
<td>2</td>
<td>REFERENCE</td>
<td>Time and weight conversion from Rate to Total</td>
</tr>
<tr>
<td>3</td>
<td>PRESET LOW ENTRY</td>
<td>Low 4-digits of 8-digit Preset entry</td>
</tr>
<tr>
<td>4</td>
<td>PRESET HIGH ENTRY</td>
<td>High 4-digits of 8-digit Preset entry</td>
</tr>
<tr>
<td>5</td>
<td>REMOTE TOTALIZER DRIVE</td>
<td>Changes to 1 for each count added into Total. Changes back to 0 in 50milliseconds. 10 counts per second maximum</td>
</tr>
<tr>
<td>6</td>
<td>PRESET ALARM</td>
<td>Equals 1 when 8-digit Total exceeds 8-digit Preset Entry. Raise Preset or Reset Total to clear alarm</td>
</tr>
<tr>
<td>7</td>
<td>LOW TOTAL</td>
<td>Lower 4-digits of 8-digit totalizer</td>
</tr>
<tr>
<td>8</td>
<td>HIGH TOTAL</td>
<td>Upper 4-digits of 8-digit totalizer</td>
</tr>
</tbody>
</table>

**Table 30: Screen 525 Totalizer block #2**

<table>
<thead>
<tr>
<th>Item#</th>
<th>Parameter Name</th>
<th>Parameter description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>STATUS</td>
<td>0=normal counting, 1=Reset, 2=Hold, 3=Reset/Hold</td>
</tr>
<tr>
<td>9</td>
<td>DATA POINTER</td>
<td>Location of Rate data to totalize</td>
</tr>
<tr>
<td>10</td>
<td>REFERENCE</td>
<td>Time and weight conversion from Rate to Total</td>
</tr>
<tr>
<td>11</td>
<td>PRESET LOW ENTRY</td>
<td>Low 4-digits of 8-digit Preset entry</td>
</tr>
<tr>
<td>12</td>
<td>PRESET HIGH ENTRY</td>
<td>High 4-digits of 8-digit Preset entry</td>
</tr>
<tr>
<td>13</td>
<td>REMOTE TOTALIZER DRIVE</td>
<td>Changes to 1 for each count added into Total. Changes back to 0 in 50milliseconds. 10 counts per second maximum</td>
</tr>
<tr>
<td>14</td>
<td>PRESET ALARM</td>
<td>Equals 1 when 8-digit Total exceeds 8-digit Preset Entry. Raise Preset or Reset Total to clear alarm</td>
</tr>
<tr>
<td>15</td>
<td>LOW TOTAL</td>
<td>Lower 4-digits of 8-digit totalizer</td>
</tr>
<tr>
<td>16</td>
<td>HIGH TOTAL</td>
<td>Upper 4-digits of 8-digit totalizer</td>
</tr>
</tbody>
</table>
Screen 527 Product Code Block

The base address for screen 527 PROD CODE TABLE is 529, item 256.

The \( n \) on the top line is a number from 0 to 9. This number is the current Product Code table that you are accessing. The value of \( n \) can be incremented by pressing the HELP key. Note that changing the value of \( n \) does not change the Product Code table selected on Screen #3.
## Appendix I: Parameter blocks

### Table 31: Screen 527 Product code block

<table>
<thead>
<tr>
<th>Item#</th>
<th>Parameter Name</th>
<th>Parameter description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>TIME CONSTANT</td>
<td>When the product code table entry #18 is set to zero, time constant is the time (in XXXXX seconds) that 63% of a step change applied at the input of the digital filter will appear out the output of the filter. When the product code table entry #18 is set to one, time constant defines the number of readings to use to generate a measurement average. (100 readings max)</td>
</tr>
<tr>
<td>1</td>
<td>FAST RESPONSE FILTER ENTRY (Chrontrol)</td>
<td>When the difference between the current gauge reading and the previous gauge reading exceeds the value of this entry, temporarily bypasses the filter</td>
</tr>
<tr>
<td>2</td>
<td>SPAN</td>
<td>Application of gain to get normalized counts after subtraction of cal low reference. Gain=entry/1000</td>
</tr>
<tr>
<td>3</td>
<td>LINEARIZER NUMBER</td>
<td>Which linearizer curve to use (0–9). Normally, the curve number is the same as the product code number. For example, Product Code #0 usually uses Curve #0, Product Code #1 uses Curve #1, etc.</td>
</tr>
<tr>
<td>4</td>
<td>TEMPERATURE COEFFICIENT</td>
<td>When temperature compensation enables. Entry=0.0XXXXXXSGU per degrees C or F</td>
</tr>
<tr>
<td>5</td>
<td>DENSITY TYPE</td>
<td>Enter 0=channel is not density or is straight density in SGU units. Enter 1=channel is a slurry gauge and converts to %Solids and Dry Solids. Enter 2=solutions and gives %Solids conversion</td>
</tr>
<tr>
<td>6</td>
<td>SOLIDS DENSITY</td>
<td>For density types 1 and 2 only</td>
</tr>
<tr>
<td>7</td>
<td>LIQUID DENSITY</td>
<td>For density types 1 and 2 only</td>
</tr>
<tr>
<td>8</td>
<td>STANDARDIZE ABSORBER VALUE</td>
<td>In units of product, frequency input block location 12</td>
</tr>
<tr>
<td>9</td>
<td>CALIBRATE HIGH ABSORBER VALUE</td>
<td>In units of product, frequency input block location 12</td>
</tr>
<tr>
<td>10</td>
<td>FREQUENCY OUTPUT LOW LIMIT</td>
<td>Value of data form the data pointer that gives min. analog output</td>
</tr>
<tr>
<td>11</td>
<td>FREQUENCY OUTPUT HIGH LIMIT</td>
<td>Value of data form the data pointer that gives max. analog output</td>
</tr>
<tr>
<td>12</td>
<td>LOW ALARM LIMIT</td>
<td>Setpoint for triggering a low alert</td>
</tr>
<tr>
<td>13</td>
<td>HIGH ALARM LIMIT</td>
<td>Setpoint for triggering a high alert</td>
</tr>
<tr>
<td>14</td>
<td>LOW-LOW ALARM LIMIT</td>
<td>Setpoint for triggering a low alarm</td>
</tr>
<tr>
<td>15</td>
<td>HIGH-HIGH ALARM LIMIT</td>
<td>Setpoint for triggering a high alarm</td>
</tr>
<tr>
<td>16</td>
<td>NUMBER OF TABLES</td>
<td>Not currently used</td>
</tr>
<tr>
<td>17</td>
<td>COEFFICIENT TYPE</td>
<td>0=Normal (Negative) Temp Coef, 1=Positive Temp Coef</td>
</tr>
<tr>
<td>18</td>
<td>FILTER TYPE</td>
<td>0=RC Simulation Filter, 1=Averaging Filter</td>
</tr>
<tr>
<td>19</td>
<td>SPARE</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>SPARE</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>SPARE</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>SPARE</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>SPARE</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>SPARE</td>
<td></td>
</tr>
</tbody>
</table>
Screen 528 Linearizer Block

The base address for screen 528 LINEAR CURVES is 529, item 512.

The n on the top line is a number from 0 to 9. This number is the current linearizer curve that you are accessing. The value of n can be incremented by pressing the HELP key.

<table>
<thead>
<tr>
<th>Item#</th>
<th>Parameter Name</th>
<th>Parameter description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>CURVE</td>
<td>Start of 40-slope linearizer curve. Uses 41 locations. Curve in normalized units, usually 0 to 10,000. (i.e., 0–100%)</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>The percent of process span that corresponds to 2.5% of the count range</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>The percent of process span that corresponds to 5.0% of the count range</td>
</tr>
<tr>
<td></td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>40</td>
<td>HIGH END POINT OF CURVE</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>CURVE STATUS</td>
<td>0=no curve data entered, 1=40 point curve entered- 41 locations</td>
</tr>
<tr>
<td>42</td>
<td>LOW PRODUCT VALUE</td>
<td>Value of low end of curve in product units. These are Ohmart product units for calibration</td>
</tr>
<tr>
<td>43</td>
<td>HIGH PRODUCT VALUE</td>
<td>Value of high end of curve in product units for calibration purposes</td>
</tr>
<tr>
<td>44</td>
<td>SPARE</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>SPARE</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>SPARE</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>SPARE</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>SPARE</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>SPARE</td>
<td></td>
</tr>
</tbody>
</table>
Appendix II: Auto zero feature

The Auto Zero feature enables the scale to reset at zero automatically.

Two conditions have to happen for an auto zero to occur.

1. Nothing is on the belt but the belt is moving
2. Feed drops off but the line keeps running

Note: Talk to Ohmart/VEGA Field Service before you configure the Auto Zero feature.

The base address for the Auto Zero feature is 529, items 2700 to 2711.
Appendix II: Auto zero feature

<table>
<thead>
<tr>
<th>Item#</th>
<th>Parameter Name</th>
<th>Parameter description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2700</td>
<td>AZ ENABLE</td>
<td>0=AZ Disabled, 1=AZ Enabled</td>
</tr>
<tr>
<td>2701</td>
<td>AZ STATUS</td>
<td>0=AZ not currently running, 1=AZ sample interval active</td>
</tr>
<tr>
<td>2702</td>
<td>AZ CYCLES</td>
<td>If AZ is active, how many AZs done so far</td>
</tr>
<tr>
<td>2703</td>
<td>AZC 1 VECTOR</td>
<td>Address of blending line belt LDC (0=running, 1=not running)</td>
</tr>
<tr>
<td>2704</td>
<td>AZC 2 VECTOR</td>
<td>Address of dry bin belt LDC (0=running, 1=not running)</td>
</tr>
<tr>
<td>2705</td>
<td>AZC 3 VECTOR</td>
<td>Address of undefined LDC (not used)</td>
</tr>
<tr>
<td>2706</td>
<td>AZ PAUSE TIME</td>
<td>Amount of time (in quarter seconds) to wait after dry bin LDC trips before starting AZ counter used to determine when the pause time has elapsed</td>
</tr>
<tr>
<td>2707</td>
<td>AZ TIMER</td>
<td>Time has elapsed</td>
</tr>
<tr>
<td>2708</td>
<td>AZ STATE</td>
<td>Used internally to synchronize AZ function</td>
</tr>
<tr>
<td>2709</td>
<td>AZ SAMPLING</td>
<td>1=wait over, 2=still waiting</td>
</tr>
<tr>
<td>2710</td>
<td>AZ CUTOFF ENABLE</td>
<td>0=Disable, 1=Enable</td>
</tr>
<tr>
<td>2711</td>
<td>AZ CUT OFF VECTOR</td>
<td>2709 for AZ-time out</td>
</tr>
</tbody>
</table>

Item 2701 displays whether the auto zero is enabled or not.

Item 2706 is the wait state to see that all process is cleared (entered in ¼ seconds)

The auto zero feature starts a zero and if it finishes one it will start a new one.

Item 2702 displays how many times it has gone through the auto zero cycle this session. If it gets through at least one auto zero then it will save the average of all cycles completed.

Note: The list of auto zeros are not in chronological order. Look for the oldest entry. Only the last 20 zeros are saved.
Appendix II: Auto zero feature

Procedure 40: Auto Zero feature

1. Connect the write protect jumper JP17

2. From the **529 APP ACCESS CODE** screen, press SELECT to enter item **2700** and press ENTER

3. Press SELECT to move to enter new value **1** to enable or **0** to disable and press ENTER to continue

4. From the **529 APP ACCESS CODE** screen, press SELECT to enter item **2701** and press ENTER

5. Press SELECT to move to enter new value **1** to activate sample interval or **0** to deactivate sample interval and press ENTER to continue

6. From the **529 APP ACCESS CODE** screen, press SELECT to enter item **2702** and press ENTER

   The number of AZs completed so far displays if the AZ is active

7. From the **529 APP ACCESS CODE** screen, press SELECT to enter item **2702** and press ENTER

   The address of blending line belt LDC (0=running, 1=not running)

8. Connect Jumper JP 17

9. From **100 EEPROM SERVICE** screen, choose **SELECT COPY RAM TO EEPROM**

10. Screen **102 RAM TO EEPROM** screen displays. Enter **1** and press ENTER to initiate the transfer. If a zero displays, the transfer was successful. If a one displays, the transfer was unsuccessful

    If the transfer was unsuccessful, verify that the jumper on JP17 is in place. It is necessary to place the jumper on JP17 to enable any uploading to the EEPROM

11. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.
Appendix II: Auto zero feature

Auto zero log

This feature logs the last data from the Auto Zero feature.

Each logged data item stores in a 20-element array. The firmware uses the history index to identify the placement of the next set of data in the array. Use screen 524 to view the contents of the data arrays.

<table>
<thead>
<tr>
<th>Item#</th>
<th>Parameter Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2729</td>
<td>History Index</td>
<td>Index used to place data into the arrays</td>
</tr>
<tr>
<td>2730-2749</td>
<td>Cycles Count</td>
<td>How many AZs done during the last AZ period</td>
</tr>
<tr>
<td>2750-2769</td>
<td>Counts Avg</td>
<td>The sensor counts recorded during the last data collect of the last AZ period</td>
</tr>
<tr>
<td>2770-2789</td>
<td>Month Day</td>
<td>The month and day of the last AZ period in MMDD format</td>
</tr>
<tr>
<td>2790-2809</td>
<td>Hours Minutes</td>
<td>The hours and minutes of the last AZ period in a HHMM format</td>
</tr>
</tbody>
</table>

Note: Only the counts and the date and time of the last completed data collect are logged.

The base address for the Auto Zero feature is 529, items 2729 to 2809.

Table 34: Screen 529 Auto Zero feature
<table>
<thead>
<tr>
<th>Index</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>absorber value</td>
<td>92</td>
</tr>
<tr>
<td>Absorber values</td>
<td>98</td>
</tr>
<tr>
<td>Absorber, Cal Hi</td>
<td>96</td>
</tr>
<tr>
<td>Adaptive filter</td>
<td></td>
</tr>
<tr>
<td>setting</td>
<td>76</td>
</tr>
<tr>
<td>Air gap access</td>
<td>14</td>
</tr>
<tr>
<td>analog output. See current loop output</td>
<td></td>
</tr>
<tr>
<td>Analog output, setup</td>
<td>52</td>
</tr>
<tr>
<td>applications</td>
<td>5</td>
</tr>
<tr>
<td>assembly</td>
<td>15</td>
</tr>
<tr>
<td>Auto zero</td>
<td>133</td>
</tr>
<tr>
<td>Auto Zero, 139, 141</td>
<td></td>
</tr>
<tr>
<td>AZ, 139</td>
<td></td>
</tr>
<tr>
<td>Belt loading</td>
<td>5</td>
</tr>
<tr>
<td>Bi-level inputs</td>
<td></td>
</tr>
<tr>
<td>addresses, terminals, &amp; LEDs</td>
<td>109</td>
</tr>
<tr>
<td>Blending applications</td>
<td>13</td>
</tr>
<tr>
<td>cal analog output channel #1</td>
<td>105</td>
</tr>
<tr>
<td>cal analog output channel#2</td>
<td>106</td>
</tr>
<tr>
<td>Cal hi</td>
<td></td>
</tr>
<tr>
<td>channel #1, 88</td>
<td></td>
</tr>
<tr>
<td>channel #2, 101</td>
<td></td>
</tr>
<tr>
<td>Cal high process</td>
<td>101</td>
</tr>
<tr>
<td>cal lo</td>
<td>87</td>
</tr>
<tr>
<td>cal record</td>
<td>107</td>
</tr>
<tr>
<td>calculate cal</td>
<td>91</td>
</tr>
<tr>
<td>Calibrating the calibration</td>
<td>90</td>
</tr>
<tr>
<td>calibration</td>
<td></td>
</tr>
<tr>
<td>current loop (analog output)</td>
<td>104</td>
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<tr>
<td>process</td>
<td>82</td>
</tr>
<tr>
<td>Channel 2 calibration calcualtation</td>
<td>103</td>
</tr>
<tr>
<td>Channel 2 low on process</td>
<td>100</td>
</tr>
<tr>
<td>Coarse adjustment</td>
<td>105</td>
</tr>
<tr>
<td>Commissioning gauge</td>
<td>40</td>
</tr>
<tr>
<td>Communication cable</td>
<td>46</td>
</tr>
<tr>
<td>Communication ports</td>
<td>61</td>
</tr>
<tr>
<td>conduit</td>
<td>35</td>
</tr>
<tr>
<td>Copy to RAM to EEPROM</td>
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</tr>
<tr>
<td>CPU board</td>
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</tr>
<tr>
<td>jumpers, 122</td>
<td></td>
</tr>
<tr>
<td>LED indicators, 122</td>
<td></td>
</tr>
<tr>
<td>CPU circuit board</td>
<td>125</td>
</tr>
<tr>
<td>current loop</td>
<td></td>
</tr>
<tr>
<td>calibration, 104</td>
<td></td>
</tr>
<tr>
<td>custom units</td>
<td>57</td>
</tr>
<tr>
<td>Customer Order (C.O.) Number</td>
<td>6</td>
</tr>
<tr>
<td>required for repairs</td>
<td>126</td>
</tr>
<tr>
<td>Cutoff flag</td>
<td>72</td>
</tr>
<tr>
<td>Cutoff time constant</td>
<td>72</td>
</tr>
<tr>
<td>Damping</td>
<td>74</td>
</tr>
<tr>
<td>data collect</td>
<td>99</td>
</tr>
<tr>
<td>Data collect for span</td>
<td>99</td>
</tr>
<tr>
<td>data collect, simple</td>
<td>97</td>
</tr>
<tr>
<td>Data collection interval</td>
<td>71</td>
</tr>
<tr>
<td>Data entry keys</td>
<td>25</td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>Detector assembly functions</td>
<td>8</td>
</tr>
<tr>
<td>Diagnostic RC filter</td>
<td>73</td>
</tr>
<tr>
<td>diagnostics, communication</td>
<td>110</td>
</tr>
<tr>
<td>diagnostics, hardware</td>
<td>121</td>
</tr>
<tr>
<td>Direct access</td>
<td>10</td>
</tr>
<tr>
<td>Display rate, weight, total</td>
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<td>24</td>
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<tr>
<td>EEPROM transfers</td>
<td>45</td>
</tr>
<tr>
<td>End of batch</td>
<td></td>
</tr>
<tr>
<td>Fast cutoff</td>
<td></td>
</tr>
<tr>
<td>setting, 75</td>
<td></td>
</tr>
<tr>
<td>Fast response cutoff</td>
<td>74</td>
</tr>
<tr>
<td>Field service. See Ohmart Customer Service</td>
<td></td>
</tr>
<tr>
<td>Filter type</td>
<td></td>
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<tr>
<td>setting, 75</td>
<td></td>
</tr>
<tr>
<td>filtering</td>
<td>73</td>
</tr>
<tr>
<td>damping, 74</td>
<td></td>
</tr>
<tr>
<td>fast response cutoff, 74</td>
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</tr>
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<tr>
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<td></td>
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<td></td>
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<tr>
<td>Adaptive, 76</td>
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<td>frequency input block</td>
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<td>Front panel</td>
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<td>Function keys</td>
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<tr>
<td>general license tag</td>
<td>39</td>
</tr>
<tr>
<td>I/O termination board</td>
<td>23</td>
</tr>
<tr>
<td>Initial calibration</td>
<td>83</td>
</tr>
<tr>
<td>Jumper values</td>
<td>122</td>
</tr>
<tr>
<td>jumpers, 122</td>
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<tr>
<td>Key pad assembly</td>
<td>23</td>
</tr>
<tr>
<td>LCD display interface circuit board</td>
<td>23</td>
</tr>
<tr>
<td>LED indicators</td>
<td>122</td>
</tr>
<tr>
<td>Line down contact</td>
<td>37</td>
</tr>
<tr>
<td>Linearization curve</td>
<td>85</td>
</tr>
<tr>
<td>Loading rate</td>
<td>5</td>
</tr>
<tr>
<td>maintenance schedule</td>
<td>124</td>
</tr>
<tr>
<td>Measurement cut off setpoint</td>
<td>72</td>
</tr>
<tr>
<td>Measurement spans</td>
<td>84</td>
</tr>
<tr>
<td>Measurement units</td>
<td>57, 84</td>
</tr>
<tr>
<td>Memory backup</td>
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<tr>
<td>Memory functions</td>
<td>43</td>
</tr>
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<td>Page Numbers</td>
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<td>----------------------------------------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Menus, Calibration</td>
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<td>Menus, setup</td>
<td>41</td>
</tr>
<tr>
<td>Min and Max weight</td>
<td>54</td>
</tr>
<tr>
<td>Minus sign configuration</td>
<td>80</td>
</tr>
<tr>
<td>MRA</td>
<td>127</td>
</tr>
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