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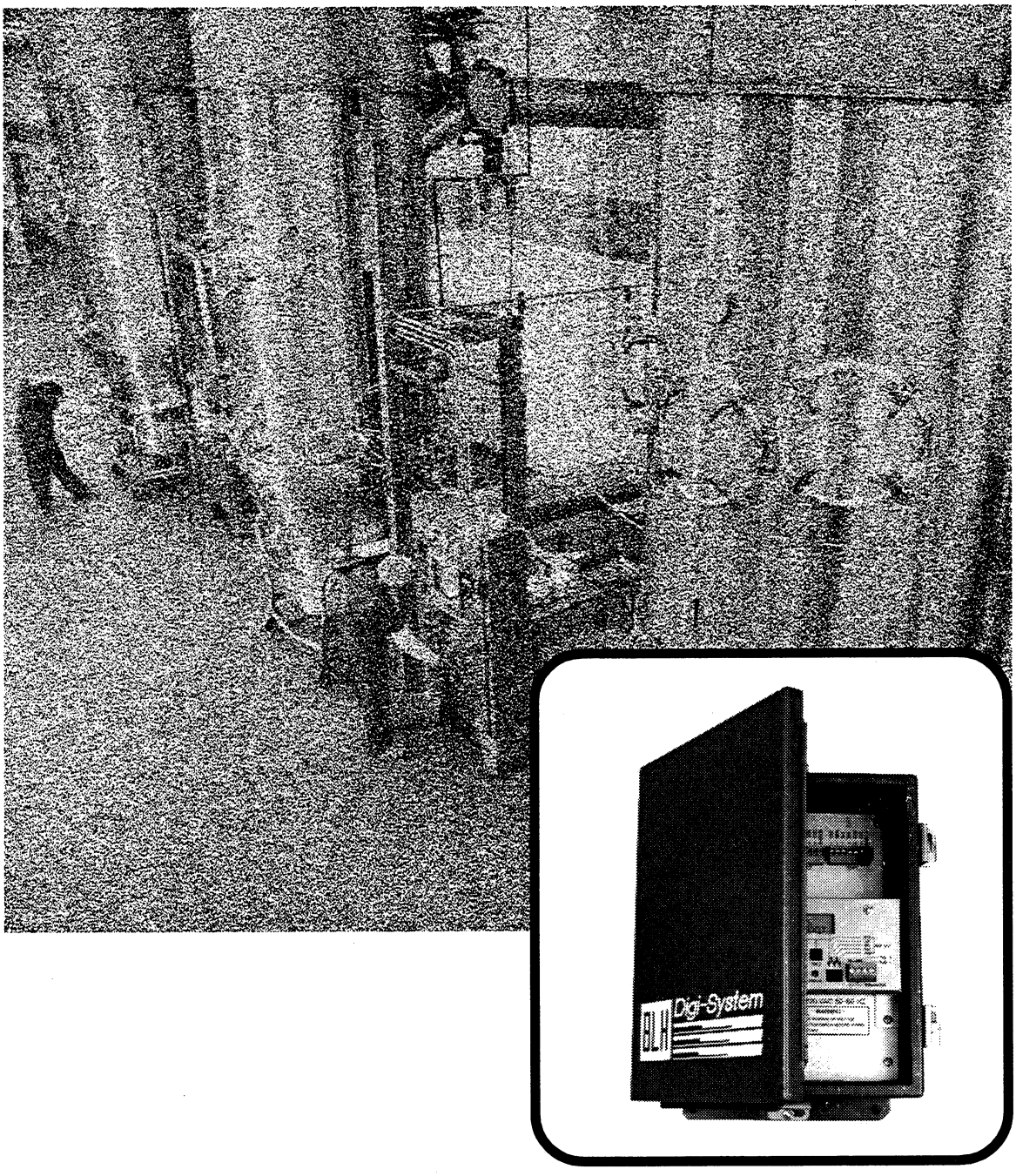

DXp-40 "Expert" Weight Transmitter Operator's Manual

TM008 Rev. G - July, 2001

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Trademark Usage Acknowledgements

SECTION I
General Information

1.1 INTRODUCTION

1.1.1 General Description

The DXp-40 transmitter (Figure 1-1) is a microprocessor based device designed to convert the mV/V signal from up to four individual strain gage type force transducers (load cells) into a digital signal representing force, weight, or percent of span measurement units. Individually regulated, fault protected 10 Vdc excitation is supplied to each transducer. Units operate at either 115 or 230 Vac. Standard DXp-40 transmitters are housed in NEMA 4 enclosures. NEMA 4X or explosion-proof enclosures are available as options. The digital RS-485 serial output port is configured for various baud rate and protocol selections using a series of DIP switches. Entry of calibration data, diagnostic parameters, and filter selections is accomplished using a series of pushbutton switches. Figure 1-2 presents an overall flow diagram for establishing the calibration and system operating parameters which will be discussed in the following chapters. An internal multi-line LCD display is provided for viewing the setup sequence, diagnostic information, and live operation.

Instrument features include an RS 485 serial port with BLH Digi-System network or a simplex output protocol, four A/D converter channels, 10 volt excitation per channel, digital filter, and a NEMA 4 mild steel, painted enclosure. Standard instruments are designed to meet Class I, II, Division 2, Group A-G hazardous location requirements.

1.1.2 On-Line Diagnostics

Weigh system diagnostics can be communicated from the DXp-40 serial port to a host computer. This real time information regarding system performance enables the host process computer to notify an operator and/or re-configure the system to go into degraded mode operation.

1.1.3 Dynamic Digital Filter

The dynamic digital filter uses statistical characterization of process noise to derive optimum filtering settings. Once the noise is characterized, the operator selects the combination of averaging and filter cutoff bands needed to maintain both display stability and fast response time for better set point control.

1.1.4 Digital Calibration

Digital calibration uses a factory calibration curve embedded in firmware to establish a reference between weight (force) and mV/V. This allows an operator to set-up and calibrate a weigh system without the need for deadweights or other time consuming calibration methods. For systems with mechanical interactions, this calibration method can be modified to correct for system non-linearities

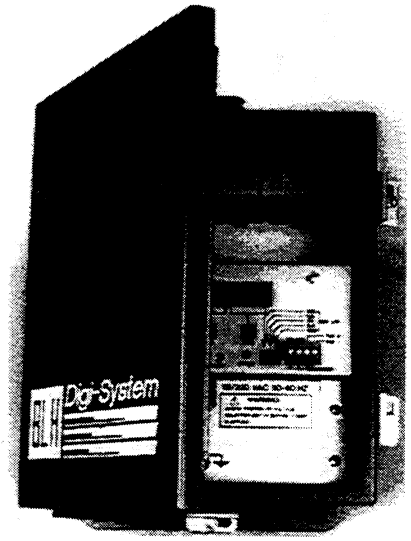

Figure 1-1. DXp-40 Weight Transmitter

1.2 OPTIONS

1.2.1 Mounting Options

For corrosive, hose down, or sanitary environments, a NEMA 4X stainless steel enclosure is available. An explosion proof enclosure is available for Class I, II, Division 1, Group B-G locations. Note: BLH 406 or 408 Intrinsic Safety Barriers must be specified for weigh systems located in a Division I area.

1.2.2 Display Window

To allow viewing of the internal multi-line display at all times, units may be ordered with a front door panel polycarbonate window. Window units also have a brighter vacuum fluorescent type display panel for even greater visibility. See paragraph 1.3 for display specifications and Figure 2-1 for outline dimensions.

1.2.3 Terminal Computer Interface

The terminal/computer interface option provides a simple mnemonic half-duplex ASCII communications protocol via a built-in macro language consisting of 1 to 3 character command strings (reference Table 7-3).

This powerful feature allows direct keyboard control (using easily remembered commands) of DXp-40 operation and recall of weight values (gross, net, tare, zero, balance, etc.)

Easily learned macro language syntax greatly simplifies the writing of a host computer communication interface (customer supplied).

DXp-40 Main Menu Flow Diagram

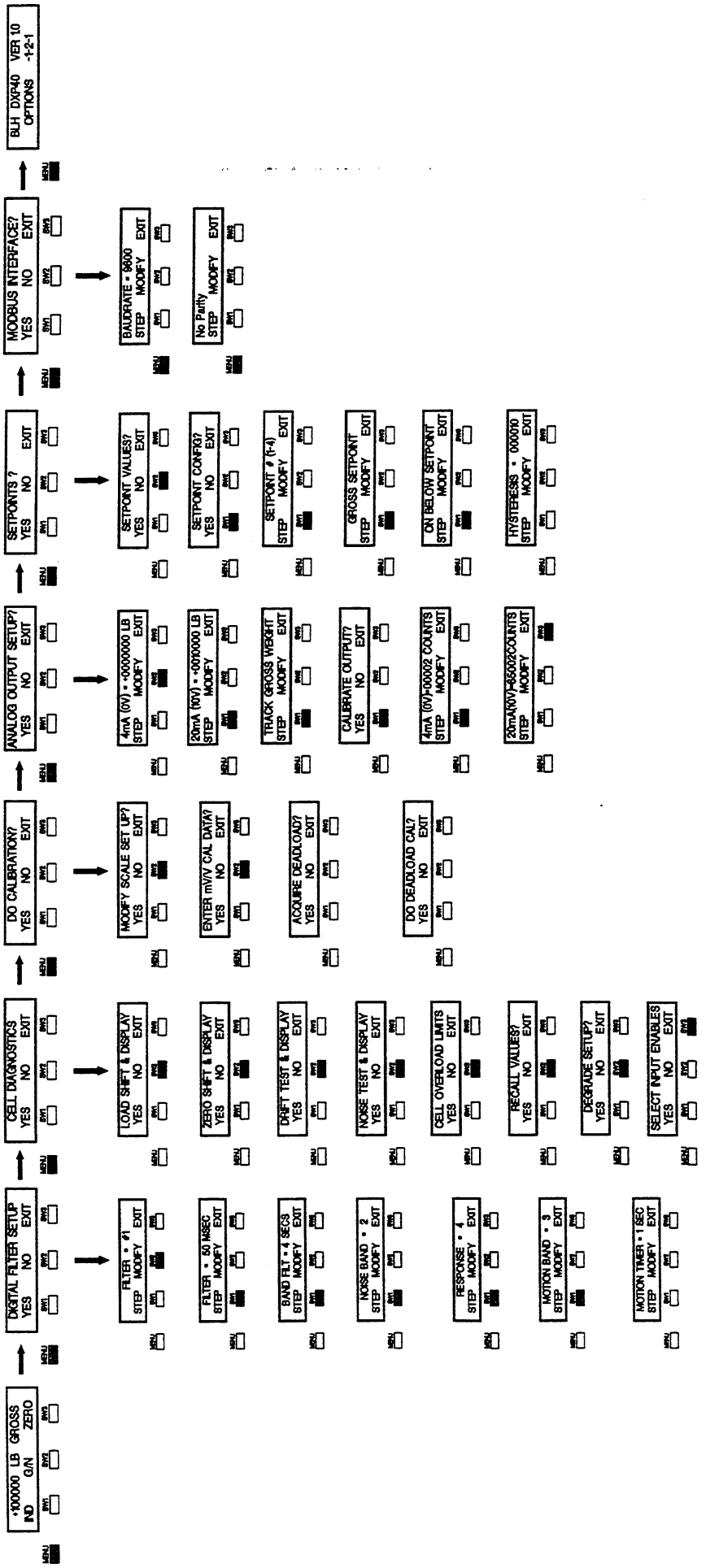

Figure 1-2. DXp-40 Calibration and Configuration

1.2.4 MODBUS RTU Protocol

MODBUS is often recognized as an industry standard method of digital communication protocol between a master or host computer and a slave device. This protocol was originally developed by Modicon to communicate discrete and analog information between PLCs. As implemented in the DXp-40, this protocol efficiently communicates weight and diagnostics information to a MODBUS driver equipped host.

1.2.5 Allen-Bradley Remote I/O Network Interface

The Allen-Bradley Remote I/O interface is a communication link that supports remote, time critical I/O control communications between a master processor and a remote I/O slave. It is typically used to transfer I/O bit images between the master and slave.

The DXp-40 represents a quarter (1/4) Rack of discrete I/O with 32 bits of input and output image files to the scanning PLC. All weight data and status information uses discrete reads and writes to communicate scale information to the PLC in the shortest time possible. Discrete transfers also are used to upload and download non-time critical information such as calibration and lower priority diagnostic data.

1.3 DXp-40 SPECIFICATIONS

Performance

Internal Resolution	4,194,304 total counts
Max. Display Resolution	3,000,000 total counts
Max. Resolution Per Channel	750,000 counts
Conversion Speed	50 msec (20 updates/sec)
Sensitivity (Noise)	0.0011% full scale (max ±16 counts w/o filter)
Full Scale Range	35 mV/channel
Dead Load Range	100%
Input Impedance	10 M-ohms, min. per channel
Load Cell Excitation	10 V 2 x 350 ohm load cells, 65 mA/channel max
Remote Sense	user configurable on each channel
Linearity	± 0.0015% of full scale
Calibration Repeatability	0.3 µV per count
Software Filter (Std.)	50 to 6400 msec
Dynamic Digital Filter (Opt.)	multi-variable up to 64 seconds

Temperature Coefficient

Span/Zero	± 2ppm/°C
Step Response	one conversion
Common Mode Rej.	100 db @ 60 Hz
Normal Mode Rej.	100 db above 35Hz

Environment

Operating Temperature	-10 to 55°C (12 to 131°F)
Storage Temperature	—20 to 85°C (-4 to 185°F)
Humidity	5 to 90% rh, non-condensing
Voltage	117/230 ± 15% 50/60 Hz
Power	12 watts max
Parameter Storage	EEPROM
EMI/RFI	shielded from typical industrial interference

Enclosure

Dimensions	see outline dimensions - Figure 2-1

Internal Display/Operator Interface

High-Contrast LCD or Optional Vacuum Fluorescent	2 columns of 20 characters each
Interface	4 'soft buttons'

Isolated Analog Output

Type	16 bit digital to analog
Voltage	0-10V (25k ohm min load)
Current	4-20 mA (600 ohm max load)

Relay Outputs (optional)

Closed Contact or Solid State	28V ac/dc @ 0.4 amps (max.) 110/220 Vac @1.0 amp

Digital Inputs (optional)

12-24 Vdc Input or TTL Open Collector

Logic '0' (Low)	less than 5.0 Vdc, sink 3 mA (min)
Logic '1' (High)	10 to 28 Vdc

Mechanical Relay

Relay '0'	closed (one side = digital common, the other side = input)
Relay '1'	open (input internally pulled up)

BLH Digi-System Network

Type	RS-485 half duplex (multi-drop)
Baud	9.6K, 28.8K, and 56.7k
Data Format	proprietary

Standard Simplex Data Output (Transmit Only)

Type	RS-485 simplex
Baud	1200 or 9600
Data Format (Selectable)	
ASCII	7 data bits even parity stop bit

Terminal/Computer Interface

Interface Type	RS-485 half duplex
Baud	1200 or 9600
Protocol	duplex command/response format
ASCII	7 data bits even parity stop bit

Special Protocol (optional)

Modbus	RTU protocol - slave

Special Interface (optional)

Allen Bradley Remote I/O	represents 1/4 rack of discrete data also supports block transfer

Weight

NEMA 4/4X	approx. 12.0 lb

1.4 DXp-40 ORDERING INFORMATION DXp-40 [M]-[C]-[P]-[S]-[O]

[M] Mounting

(1)	NEMA 4 painted - standard
(2)	NEMA 4X stainless steel
(3)	NEMA 7 & 9 EX Enclosures for Class I, II, DIV. 1, 2, Grp. B - G
(5)	#2 with Polycarbonate Window and integral VFD display
(8)	#1 & FM/CSA approval (Class I II III, Div 2, Group ABCD FG)
(9)	#2 & FM/CSA approval (Class I II III, Div 2, Group ABCD FG)
(11)	#9 with Polycarbonate Window and integral VFD display

[C] Communication

(1)	RS 485 Network
(2)	#1 and Terminal/Computer Interface, ASCII protocol
(4)	Allen Bradley Remote I/O (Note: RS-485 Deleted)
(5)	#1 and MODBUS™ RTU (may require RS-485 to RS-232 serial conversion)

[P]Process Output

(1)	None
(2)	0-10V/4-20 mA Analog (includes switchable filter) & 4 Inputs/Outputs With Dry Contact Relays (not available with FM approval)
(3)	0-10V/4-20 mA Analog (includes switchable filter) & 4 Inputs/Outputs With Solid State Relays

[S]Software

(7)	Standard Includes: Keypad Calibration Dynamic Digital Filtering On-Line Diagnostics Degrade Mode Software

[O]Calibration

(1)	Default Calibration

Accessories

Conduit Fitting Kit (6 connectors) P/N 465231
Cable Fitting Kit (6 connectors) P/N 465232

1.5 WARRANTY POLICY

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1.6 FIELD ENGINEERING

Improper DXp-40 installation or usage may result in system damage. Please follow instructions carefully. BLH Electronics, Inc. will not accept any liability for faulty installation and/or misuse of this product. Authorized BLH Field Service Engineers are available around the world to install DXp-40 transmitters and/or train factory personnel to do so. The field service department at BLH is the most important tool to assure the best performance from your application. Field service phone numbers are listed below.

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(781) 821-2000
Ask for Field Service

Midwest
(614) 476-6453

Southeast
(803) 851-7470

In Canada, Call
(416) 251-2554
or
(800) 567-6098 Toll Free

SECTION II
Installation

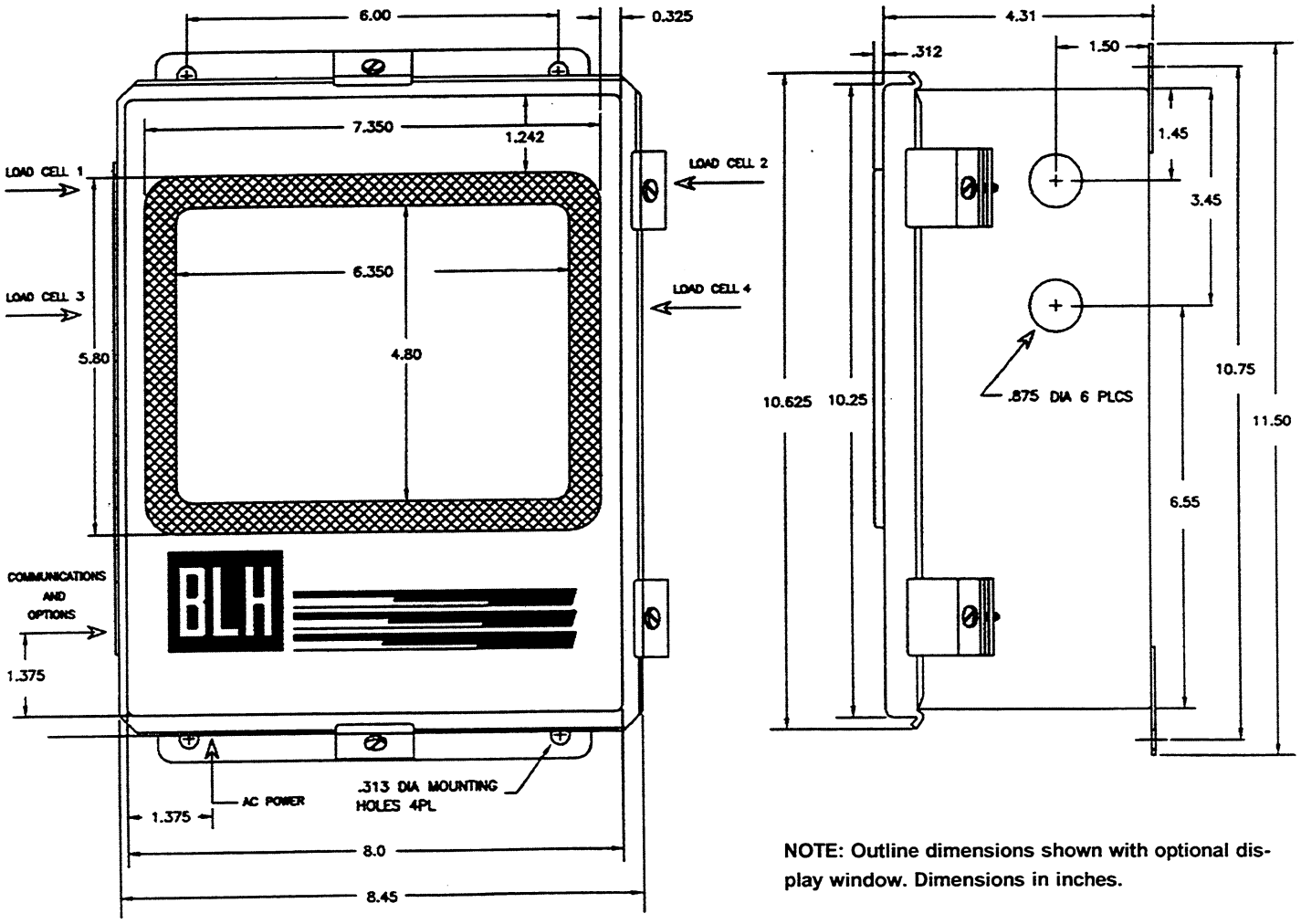
2.1 INTRODUCTION

2.1.1 General

The DXp-40 is designed to be installed within the length of the load cell(s) cable which is normally 35 ft or less. Standard NEMA 4 or optional NEMA 4X enclosures are suitable for outdoor or washdown type environments. Both enclosures are provided with pre-punched holes for installing conduit or cable fittings and holes for mounting to a bracket or wall.

2.2 MOUNTING

The NEMA 4 and NEMA 4X enclosures are equipped with four pre-punched holes for mounting to a wall or bracket. A U-bolt can be used for mounting to a pipe support. The instrument should be installed in a vibration-free location within the normal length of the load cell cables. If conduit is used, drains should be provided to reduce the possibility of condensate entering the enclosure. Outline dimensions for the standard DXp-40 transmitter are presented in Figure 2-1.



NOTE: Outline dimensions shown with optional display window. Dimensions in inches.

Figure 2-1. DXp-40 Outline Dimensions

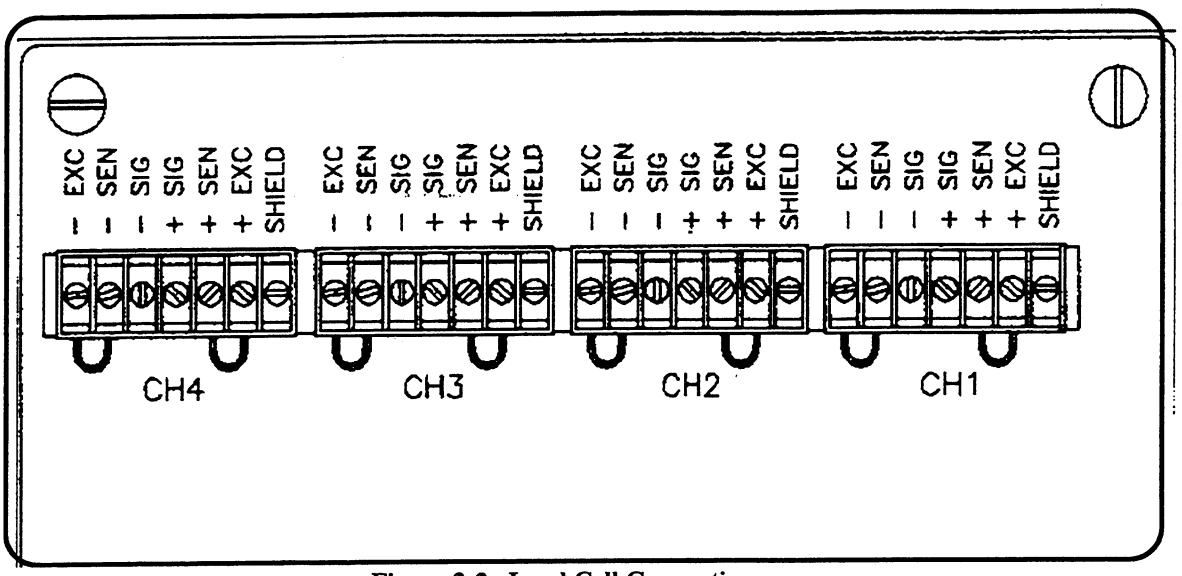


Figure 2-2. Load Cell Connections

2.3 ELECTRICAL

2.3.1 Transducer Inputs

Up to four load cells, one per channel, can be connected to the DXp-40. Connect individual load cells directly to the circuit board connectors as shown in Figure 2-2. Excitation and signal connection locations are clearly marked according to function and standard color code. When remote sensing is not used (most cases), connect -SENSE to -EXCITATION and +SENSE to +EXCITATION. Note: If tension load cells are used, signal leads (red/white) must be reversed.

If a deadweight or substitution method of calibration is being used, the load cell cable can be shortened as required. The leads should be re-tinned before the final connection is made.

NOTE: When tension or universal type load cells are used, it may be necessary to reverse the polarity of the signal leads to obtain a positive signal input to the DXp.

NOTE: All system load cells must be connected during power-up in order to turn on all A/D channel inputs.

2.3.2 Serial Communication

A terminal connector is provided for RS-485 wire connections (Figure 2-3). Multiple DXp transmitters, networked together, are wired in a parallel configuration with a termination jumper installed on the last instrument. A pair of twisted wires (20-24 gauge, Beldon #9501) is all that is required for interconnection. Communication lines should not be run near ac voltage power lines.

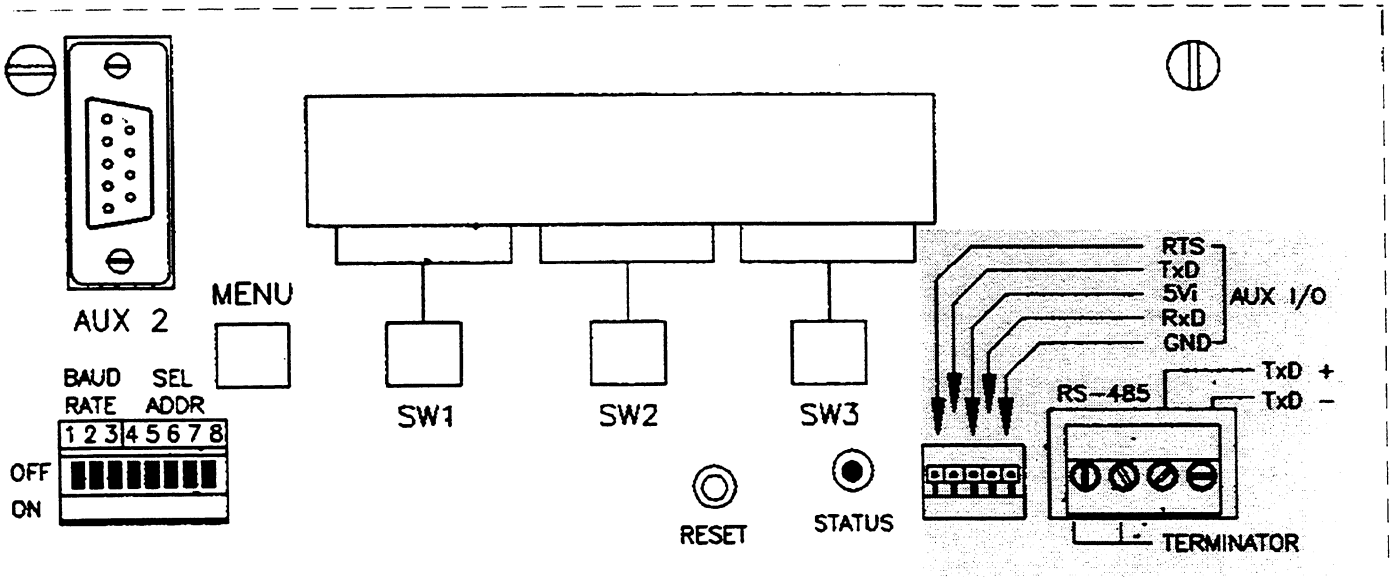


Figure 2-3. Serial Output Connections Connections (Shaded)

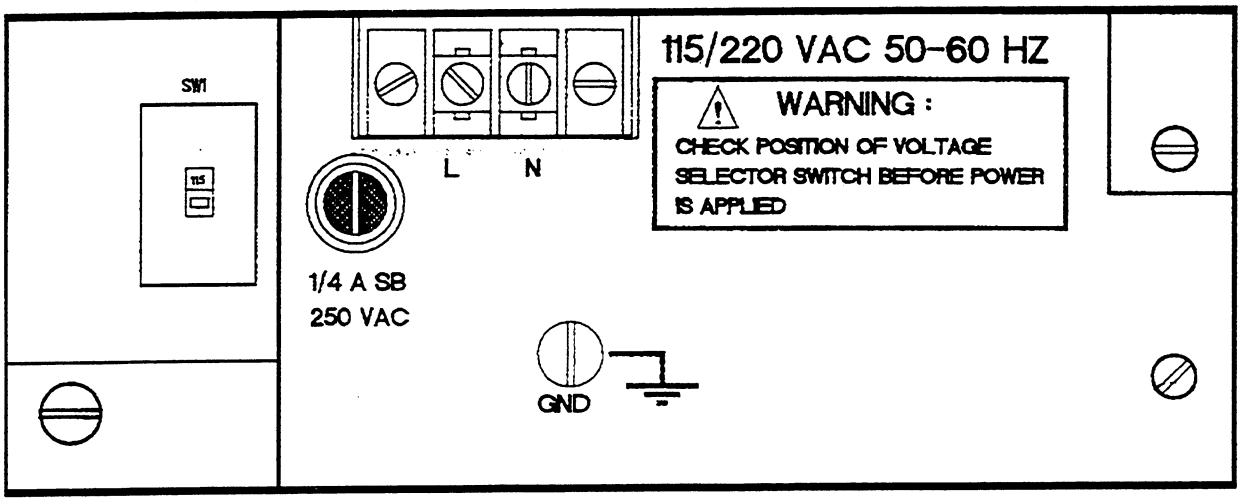


Figure 2-4. Ac Power Connections and Fuse

2.3.3 Mains (AC) Power (Figure 2-4)

A screw terminal is provided for permanent transmitter power connection. All units are shipped from the factory configured for 115 Vac operation. To select 230 Vac operation, change SW1 on the base or 'mother' board (see Figure 2-4) to the 230V setting. The unit will operate within specification at 50 or 60 Hz. Before connecting power to the unit, verify that the proper power selection has been made. The two position terminal block is equipped with a clear plastic cover to prevent operator injury. Cable can be either solid or stranded 12 or 14 gage with a ground conductor.

The transmitter is protected with a 1/4 amp slow blow fuse, located adjacent to the mains terminal block. If the fuse opens, replace it with the same type and current rating.

2.3.4 Auxiliary I/O Ports

The auxiliary I/O port connections are factory test ports and are not useful to an operator.

2.3.5 Optional Analog Output

With the analog option installed, a three position terminal connector is provided for 4-20 mA, 0-10 V, and common connections (Figure 2-5). As with serial communication, the wiring should be routed away from ac power lines and other sources of EMI. The current output is essentially immune to noise and can be transmitted long distances. The voltage output is susceptible to EMI/RFI and should be used only for short distances. Always use twisted pair, shielded cable.

2.3.6 Optional Remote Inputs

If the remote input option is installed, the gross/net, zero, tare, and filter functions can be activated using external push button switches or TTL signals. When using an external TTL device, 5 Vdc must be supplied and the device TTL common connected to the DXp-40 common connector. Inputs are designated as digital (DIG) common and 1-4 (Figure 2-5) and function as defined in the following table:

Input #	Open	Closed
DIG IN 1	Gross	Net
DIG IN 2	-----	Zero
DIG IN 3	-----	Tare
DIG IN 4	Filter 1	Filter 2

2.3.7 Optional Discrete Outputs

Units equipped with optional outputs have either four, dry contact, 28 volt (ac/dc) relays capable of handling 0.4 amps each or four, solid state, 117 Vac triac relays capable of handling 1 amp each. Customer ordering specifications (paragraph 1.4, topic 'P') determine which type of realys are installed. Figure 2-5 shows the relay output wiring configuration. Paragraph 8.2 describes how the relays can be configured for different uses, depending upon the system application. Units are factory set in the normally open configuration.

NOTE: Discrete outputs are not available with mounting options 8 and 9 (see paragraph 1.4).

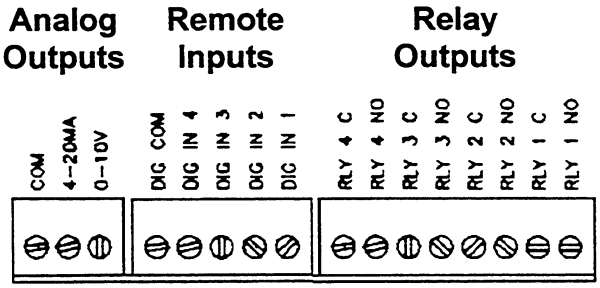


Figure 2-5. Optional I/O Connections

SECTION III
Calibration

3.1 GENERAL

Calibration is the fourth step in the DXp-40 parameter entry menu (Figure 3-1). Setup and calibration is accomplished easily using the internal LCD display and its three switches.

Complete calibration is accomplished in two phases, scale setup and either millivolt per volt or deadload calibration as shown in Figure 3-2. Use the full calibration flow diagram insert on the following page for guidance throughout the calibration procedure.

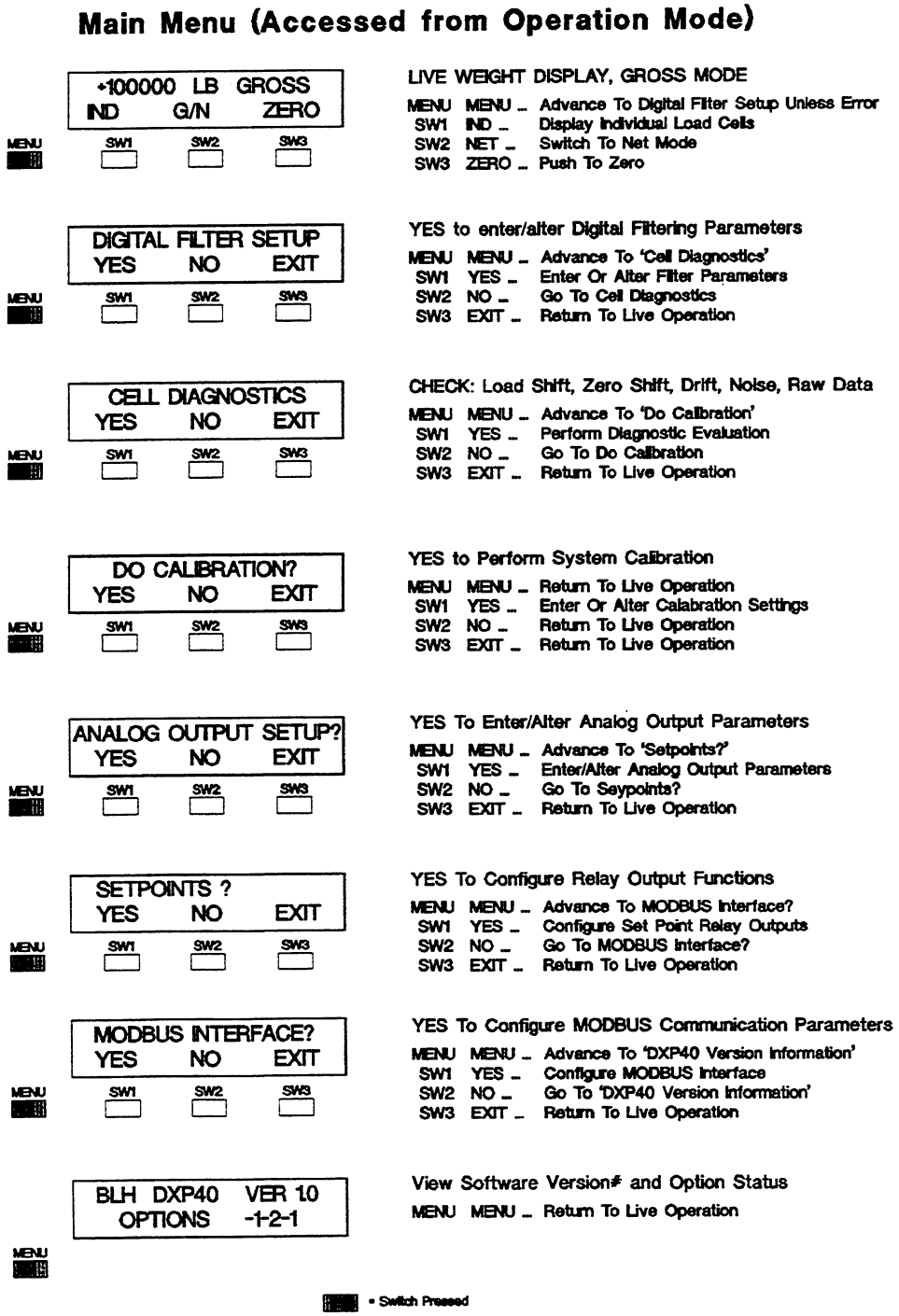


Figure 3-1. DXp-40 Main Menu Showing Calibration Display

3.2 SETUP PARAMETERS

Setup establishes scale operating parameters such as system capacity, decimal point location, display units (pounds, kilograms, tons), total number of load cells, and others. To enter or alter operating parameters, select YES for 'MODIFY SCALE SETUP?' in Figure 3-2 and proceed to Figure 3-3.

3.2.1 Calibration Type

DXp-40 transmitters offer two types of system calibration, digital or deadload. In the past, weigh systems could only be deadload calibrated by placing known quantities of dead weight upon the scale to establish voltage to weight equivalent points. In the DXp-40, however, since each load cell has its own A/D converter with embedded mV/V calibration, calibration can be accomplished simply by entering known mV/V weight values from a load cell calibration sheet. Choose the calibration type to be performed.

3.2.2 Number Of Load Cells

Enter the number of system load cells from 1 to 4.

3.2.3 Display Units

Designate the desired display unit type by entering LB (pounds), KG (kilograms), or TN (tons).

3.2.4 Decimal Point Location

Position the decimal point as desired for weight display and serial printouts.

3.2.5 Capacity

Enter the system total capacity value. A capacity of 10,000 will be 10.000, 100.00, 1000.0, or 10,000 relative to decimal point selection.

3.2.6 Count By

Define the count value of each display increment by selecting 1, 2, 5, or 10 (note that decimals apply).

3.2.7 Zero Band

Choose a zero bandwidth (gross weight zero function) of 2%, 20%, or 100% of system capacity. If OFF is selected, the gross weight ZERO function is not available.

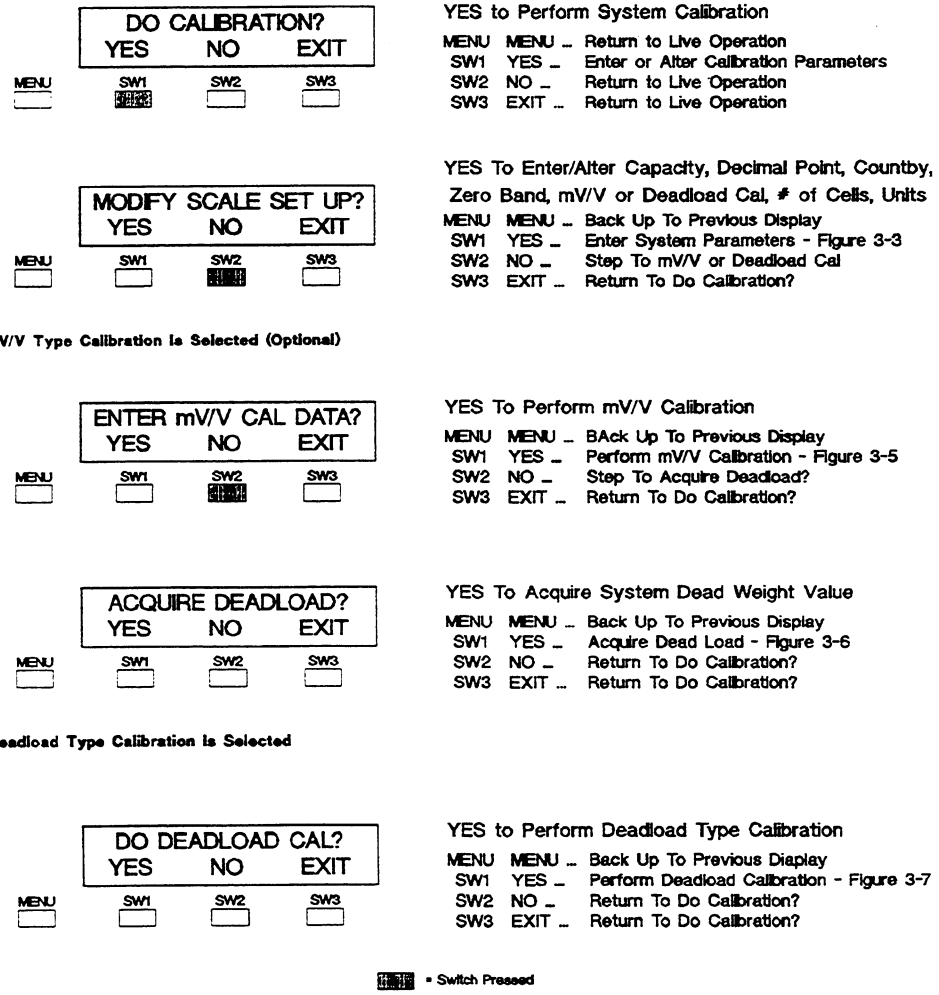


Figure 3-2. DXp-40 Calibration Menu

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