WEB TENSION TECHNOLOGY

BLH

DXt-40 HTU
Web Tension Transmitter
Operator's Manual

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Call (781) 298-2216 for BLH Field Service

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SECTION 1. General Information

1.1 INTRODUCTION

1.1.1 General Description

The DXt-40-HTU transmitter (Figure 1-1) is a micro-processor based device designed to convert the mV/V signal from one or two HTU tension transducers (load cells) into a digital signal representing resultant force and angle, tension, or percent measurement units. Individually regulated, fault protected 10 VDC excitation is supplied to each transducer. Units operate at either 115 or 230 VAC. Standard DXt-40-HTU 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 a simplex output protocol, four AID 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 DXt-40-HTU 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 web tension force and mV/V. This allows an operator to set-up and calibrate a tension system without the need for deadweights or other time consuming calibration methods.

Figure 1-1. DXt-40-HTU 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 DXt-40-HTU operation and recall of tension force values.

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

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 DXt-40-HTU, this protocol efficiently communicates tension and diagnostics information to a MODBUS driver equipped host.

1.2.5 Allen-Bradley Remote 110 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 DXt-40-HTU represents a quarter (1/4) Rack of discrete I/O with 32 bits of input and output image files to the scanning PLC. All web tension data and status information uses discrete reads and writes to communicate scale information to the PLC in the shortest time possible. Block transfers also are used to upload and download non-time critical information.

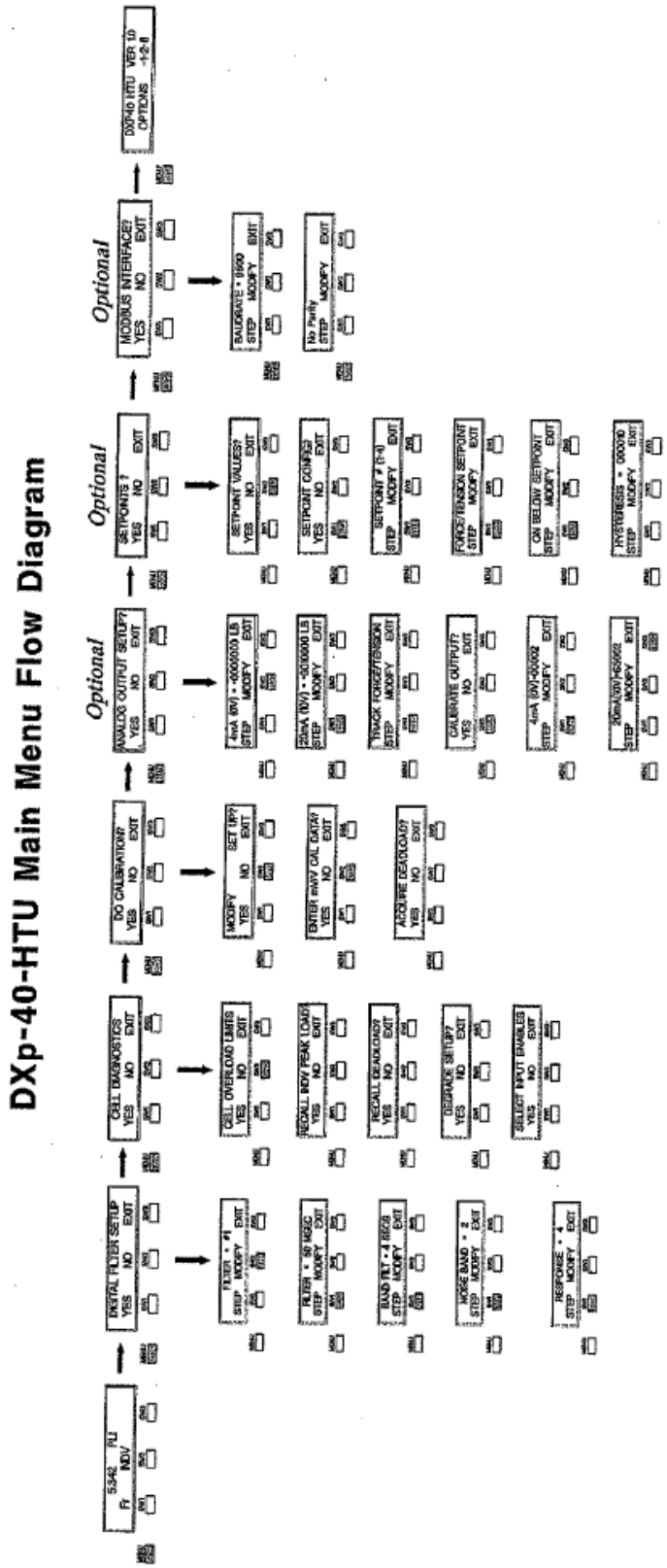

Figure 1-2. DXt-40 Calibration and Configuration.

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1.3 DXt-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	28V ac/dc @ 0.4 amps (max.)
Solid State or	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)

Vishay 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 DXt-40 ORDERING INFORMATION

DXt-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

BLH warrants the products covered hereby to be free from defects in material and workmanship. Vishay's liability under this guarantee shall be limited to repairing or furnishing parts to replace, f.o.b. point of manufacture, any parts which, within three (3) years from date of shipment of said product(s) from Vishay's plant, fail because of defective workmanship or material performed or furnished by Vishay. As a condition hereof, such defects must be brought to Vishay's attention for verification when first discovered, and the material or parts alleged to be defective shall be returned to Vishay if requested. Vishay shall not be liable for transportation or installation charges, for expenses of Buyer for repairs or replacements or for any damages from delay or loss of use for other indirect or consequential damages of any kind. Vishay may use improved designs of the parts to be replaced. This guarantee shall not apply to any material which shall have been repaired or altered outside of Vishay's plant in any way, so as in Vishay's judgment, to affect its strength, performance, or reliability, or to any defect due in any part to misuse, negligence, accident or any cause other than normal and reasonable use, nor shall it apply beyond their normal span of life to any materials whose normal span of life is shorter than the applicable period stated herein. In consideration of the forgoing guarantees, all implied warranties are waived by the Buyer, Vishay does not guarantee quality of

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1.6 FIELD ENGINEERING

Improper DXt-40 installation or usage may result in system damage. Please follow instructions carefully. BLH 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 DXt-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.

Call (Factory Number)

(781) 298-2200

Ask for Field Service

In Canada, Call

(416) 251-2554

or

(800) 567-6098 Toll Free

SECTION 2. Installation

2.1 INTRODUCTION

2.1.1 General

The OXI-40-1-ITU is designed to be installed within the length of the transducer cable. Standard NEMA 4 or optional NEMA 4X enclosures are suitable for outdoor or wash down 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 transducer cable. If conduit is used, drains should be provided to reduce the possibility of condensate entering the enclosure. Outline dimensions for the standard DXt-40-1-ITU transmitter are presented in Figure 2-1.

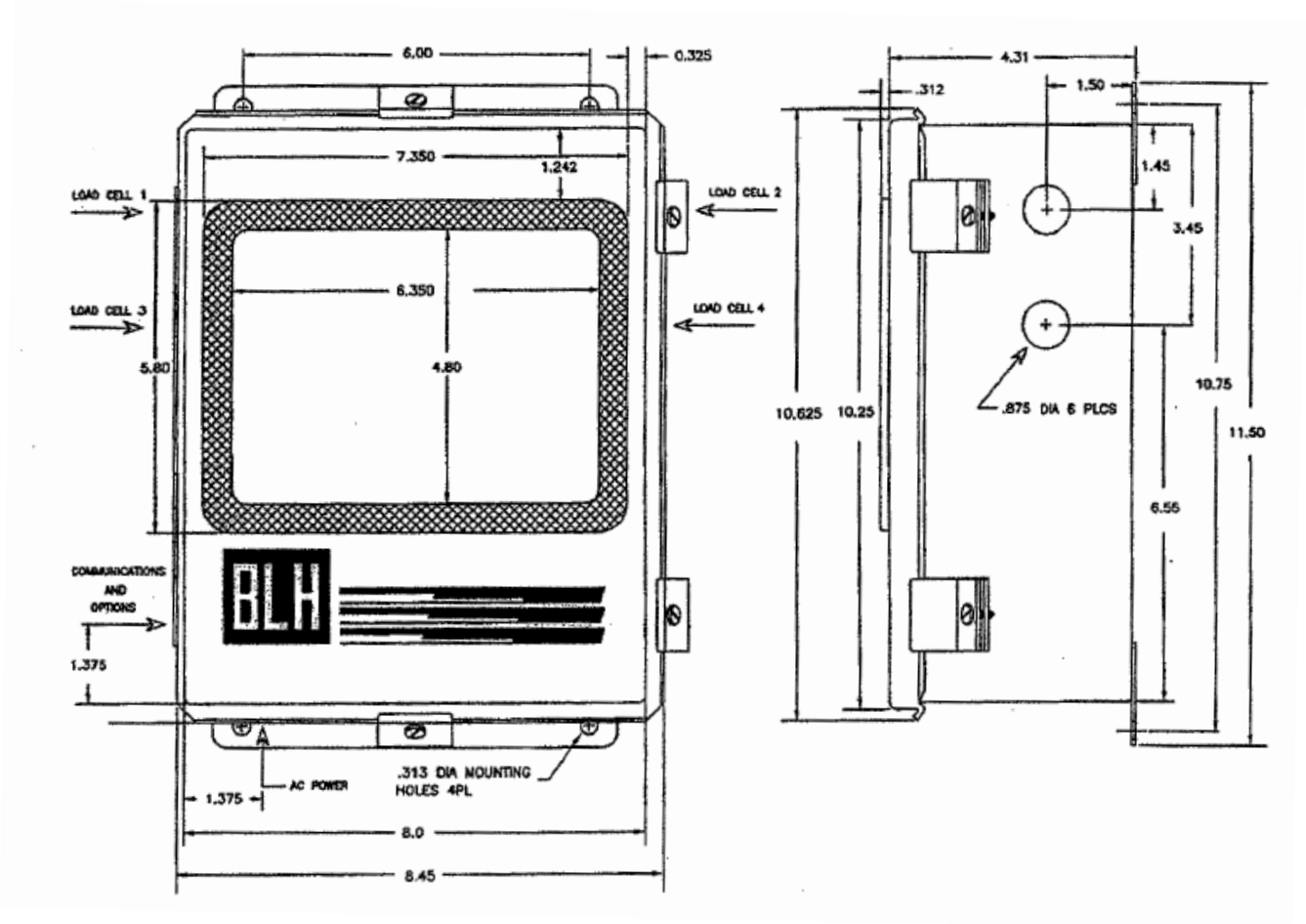


Figure 2-1. DXt Outline Dimensions.

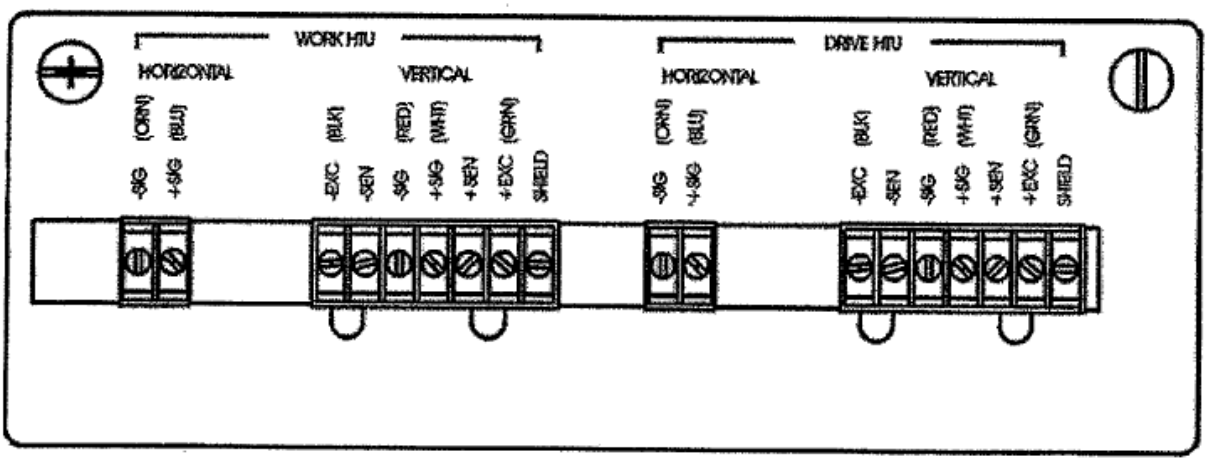


Figure 2-2. Load Cell Connections.

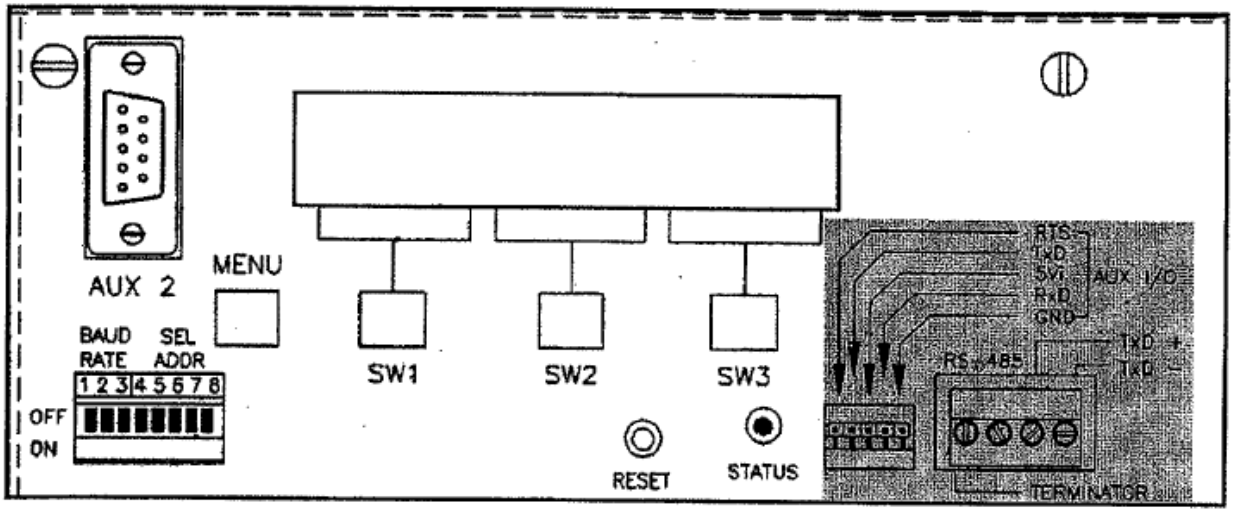


Figure 2-3 Serial Output Connections (Shaded).

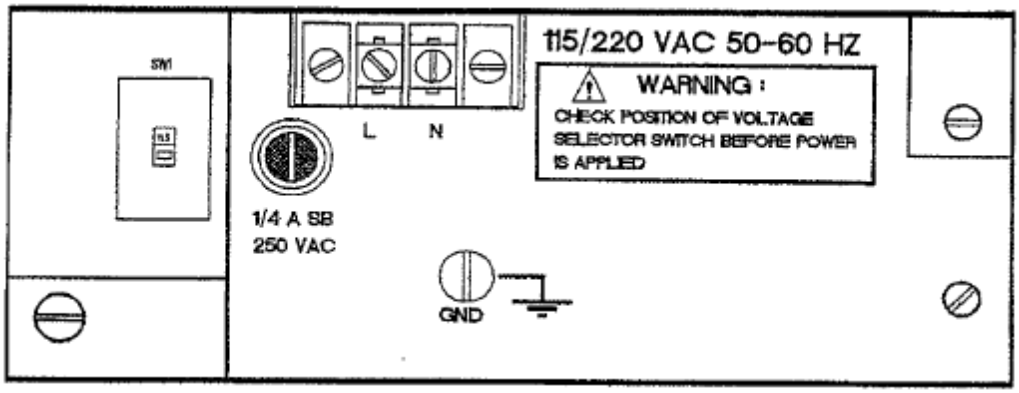


Figure 2-4. Ac Power Connections and Fuse.

2.2.1 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.

2.2.2 Auxiliary I/O Ports

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

2.2.3 Optional Process 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]-2 or -3) determine which type of relays are installed. Figure 2-5a 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.

When option [P]-4 is used, each unit has a single alarm/status solid state, relay output (Figure 2-5b, RLY) capable of handling a one amp load. Paragraph 8.3 describes relay usage. Units are configured for normally open operation.

2.2.4 Optional Analog Outputs

With options [P]-2 or -3 installed (page 1-4), a three position terminal connector is provided for 4-20 mA, 0-10 V, and common connections (Figure 2-5a). 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.

With option [9-4 (page 1-4) installed, four, two position terminal connectors are provided for the 4-20 mA outputs (Figure 2-5b). Again, route all wiring away from ac power lines. Current outputs are essentially immune to noise and can be transmitted long distances. Always use twisted pair, shielded cable.

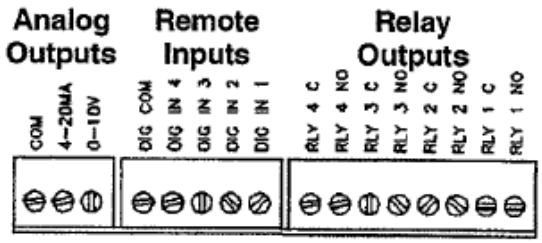


Figure 2-5a. I/O Connections for Process Options P-2, -3

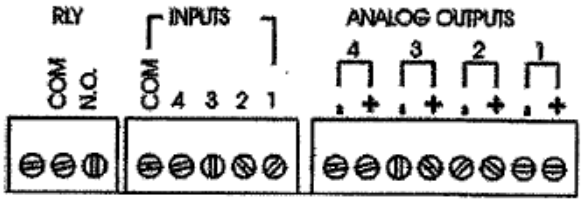


Figure 2-5b. I/0 Connections for Process Option P-4.

SECTION 3. Calibration

3.1 GENERAL

Calibration is the fourth step in the DXt-40-HTU parameter entry menu (figure 3-1). Setup and calibration are accomplished using the internal display and four switches. Complete calibration is accomplished in three phases, system setup, HTU millivolt per volt calibration data entry, and deadload correction.

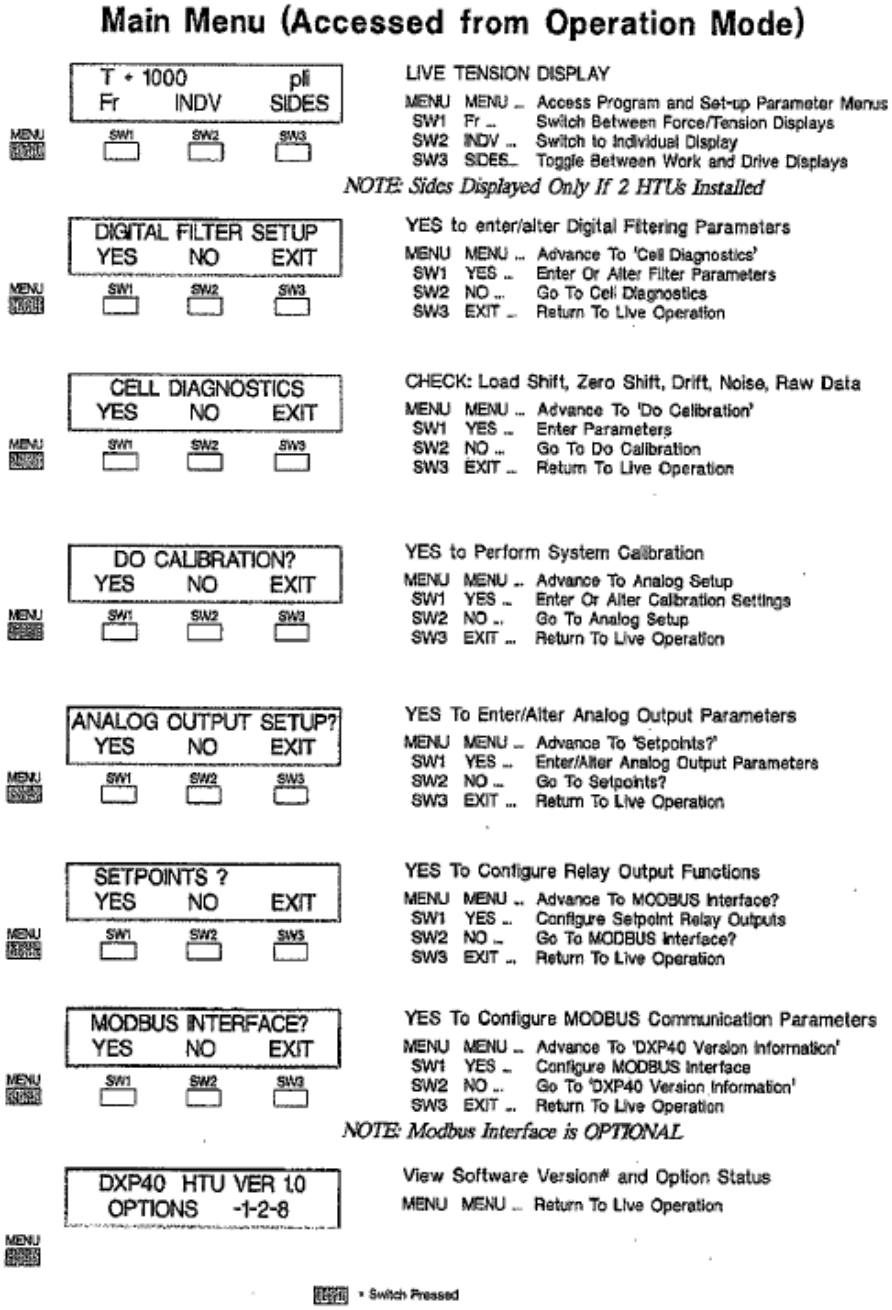


Figure 3-1. DXt-40 Main Menu Showing Calibration Display.

3.2 SETUP PARAMETERS

Setup establishes system operating parameters such as transducer capacity, units of measure, wrap angle and web width. To enter or alter setup parameters, select YES for 'MODIFY SETUP?' in Figure 3-2.

3.2.1 Number of Transducers

Enter the number of HTUs used in the system, 1 or 2.

3.2.2 Invert Horizontal Channel(s)

Select to invert or non-invert the forces from the horizontal channels. Invert the horizontal channels when the normal direction of force is opposite that which would produce a positive output from the HTU Transducer.

3.2.3 Invert Vertical Channel(s)

Select to invert or non-invert the forces from the vertical channels. Select to invert when the normal direction of force is opposite that which would produce a positive output from the HTU Transducer.

3.2.4 Force Units:

Select the desired units for the Force measurements lb (pounds), or N (Newtons).

3.2.5 Tension Units

Select the desired units for the tension measurement. Choose lb or pli (pounds per linear inch) if pounds was selected in the previous menu for force units, or N or N/m (Newtons per meter) if Newtons was selected.

3.2.6 Tension Decimal Point

Enter the location of the decimal point for the HTU tension value. Only three locations to the right of the decimal point allowed.

3.2.7 Web Width

Enter the web width in inches or Newtons depending on previous selections. The web width is used to calculate Tension units in pli or N/m. Note that this entry is applicable only if phi or N/m selected.

3.2.8 Web Width Decimal Point

Enter the location of the decimal point for the web width entered in the previous paragraph.

3.2.9 Wrap Angle

Enter the value of the wrap angle in degrees.

3.2.10 HTU Capacity

Enter the Capacity of the HTU Transducer used in lb (pounds). This is the capacity of an individual HTU, not the system capacity. NOTE: Resetting Capacity clears all previous span points

3.2.11 Count By

Select the resolution of each display increment (1, 2, 5, 1 0).

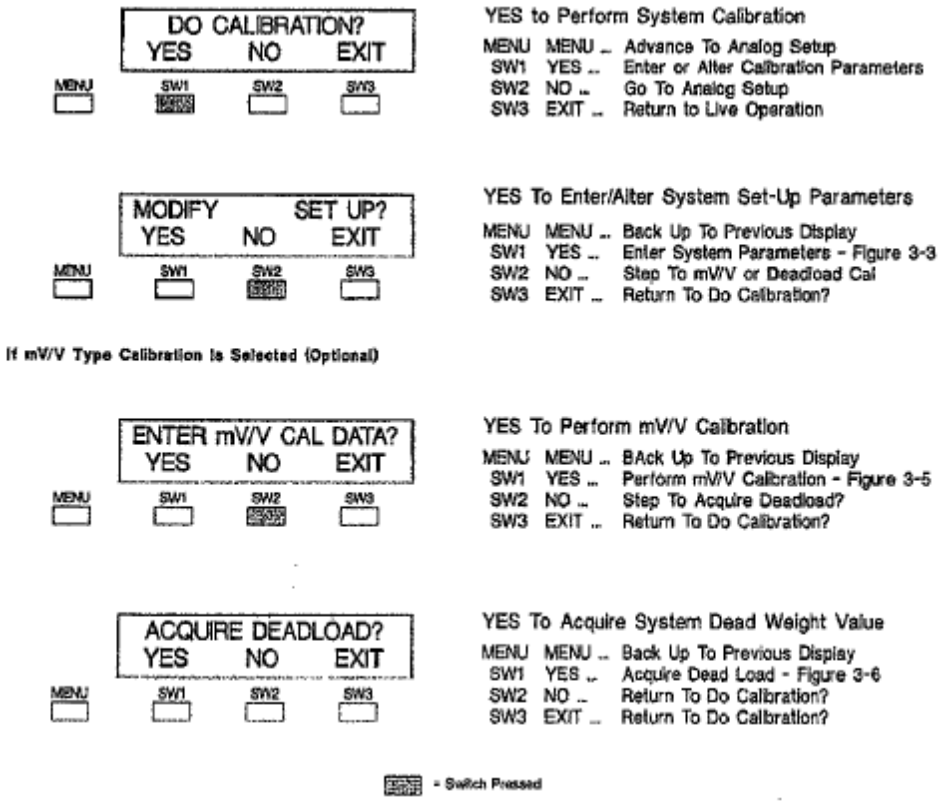


Figure 3-2. DXt-40 Calibration Menu.

Modify Set Up

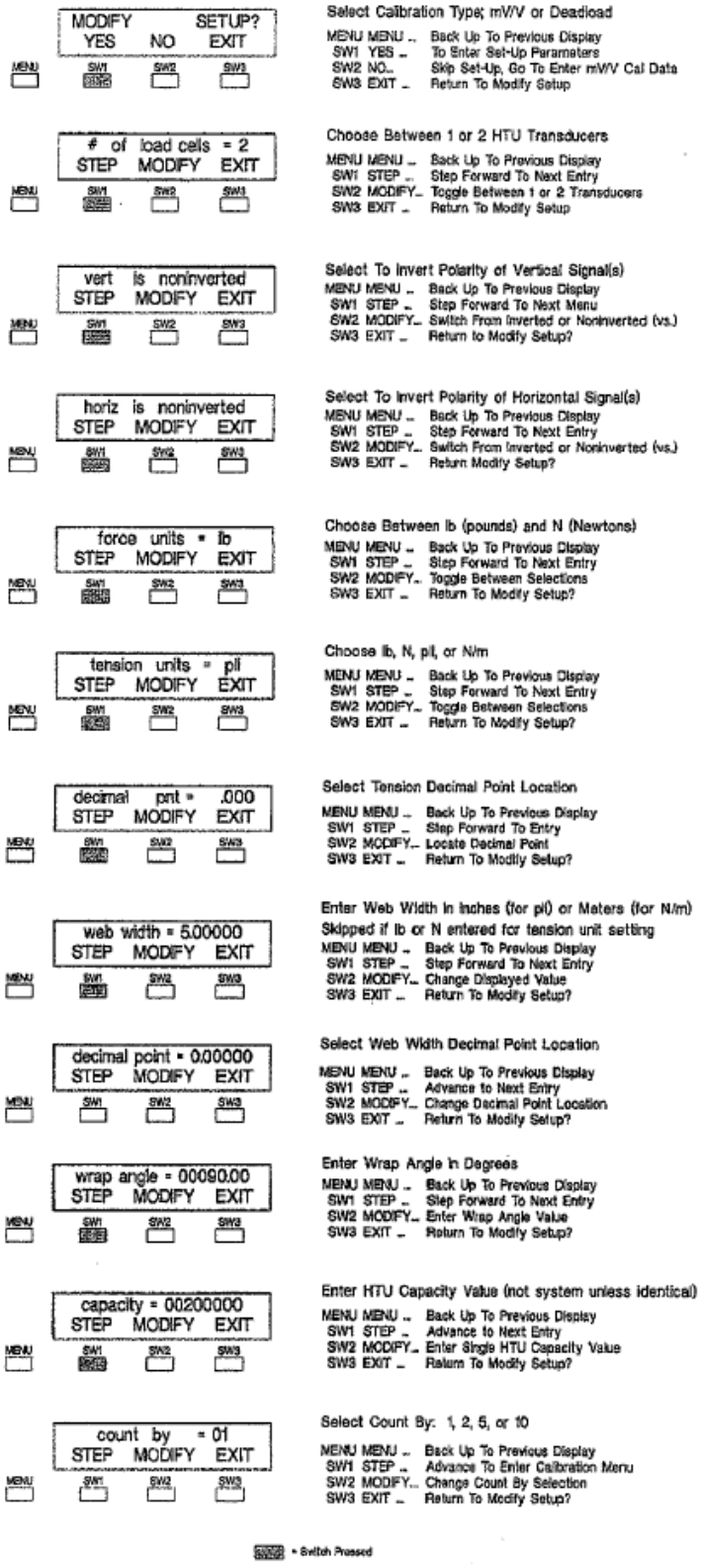


Figure 3-3. System Parameter Entry Flow Diagram.

3.3 DIGITAL CALIBRATION

3.3.1 HTU Transducer Calibration Data

The DXt-40-HTU allows system calibration by simply entering the mV/V data supplied with each HTU Transducer (Figure 3-4), The Calibration Sheet provided includes the zero (or no load) output of the transducer and the output when loaded to its capacity for both the Horizontal and Vertical channels. The cal sheet also includes a value for crosstalk between channels which is also entered during the calibration process to achieve the highest possible force measurement accuracy.

3.3.2 Entering mV/V Calibration Points

Following Figure 3-5 instructions, enter the zero balance (no load) value followed by the mV/V value for capacity and then the crosstalk value. This process is repeated for the horizontal and vertical channels of the Drive HTU and then the Work HTU. Note the capacity is not entered during this process; capacity is entered in the setup parameters (paragraph 3.2).

3.3.3 Acquire Deadload

After all mV/V load points have been entered, a zero reference must be acquired. Deadload zero cancels the signal output related to system equipment (roller, pillow block, etc.) in the no load condition. Addition of any force from this point is referred to as the live force. Follow Figure 3-6 instructions to acquire the system deadload signal by letting the DXt-40-HTU read and store the no load signal. When this procedure is complete, the system is calibrated.

BLH ELECTRONICS INC.
75 Shawmut Road
Canton Massachusetts

HTU Transducer
Calibration Certificate

PART NUMBER	CAPACITY	SERIAL NO.
471513	20,000 lb	90962

Z (Vertical)			X (Horizontal)		
INPUT RESISTANCE	185	Ω	INPUT RESISTANCE	185	Ω
OUTPUT RESISTANCE	500	Ω	OUTPUT RESISTANCE	500	Ω
INSULATION RESISTANCE	> 5000	M Ω	INSULATION RESISTANCE	> 5000	M Ω
ZERO BALANCE	+ 0.0745	mV/V	ZERO BALANCE	+ 0.0267	mV/V
Span	+ 1.9995	mV/V	Span	+ 1.9995	mV/V
Z Cross Talk [Z Output] X@F.S	- 0.0453		X Cross Talk [X Output] Z@F.S	+ 0.0844	

Force Calibration: Test equipment used is certified to be in current calibration and traceable to the National Institute of Standards and Technology. The loads applied are on the basis of attraction of the earth's gravitational field at a point where the value of gravity equals 980.356 cm/sec^2 on masses standardized against brass standards in air

Calibration Date: _____

Certified: _____

Figure 3-4. Typical Load Cell Calibration Sheet.

Digital Calibration

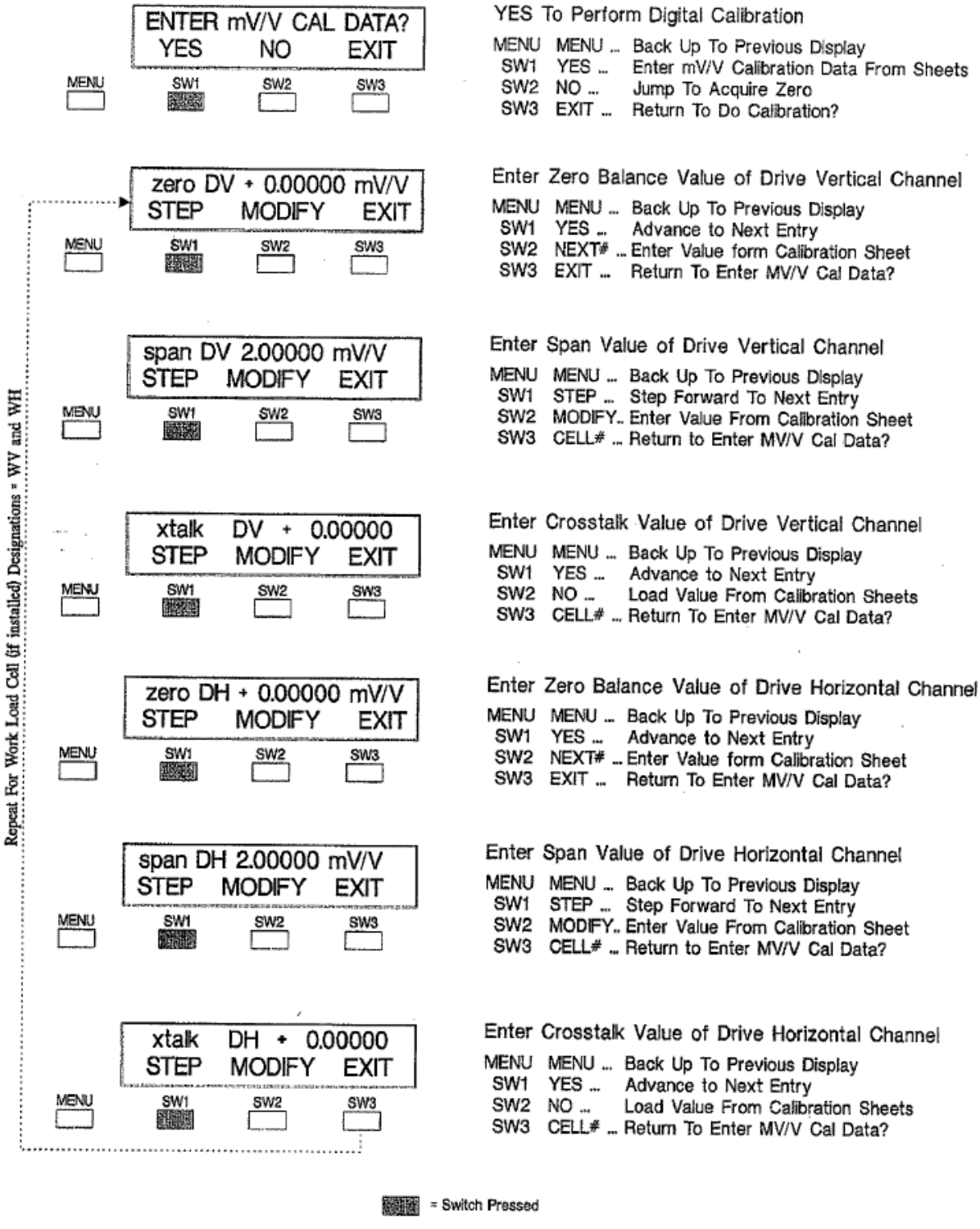


Figure 3-5. Millivolt per Volt Calibration Guide.

Acquire Deadload* (Establish Zero Weight Reference)

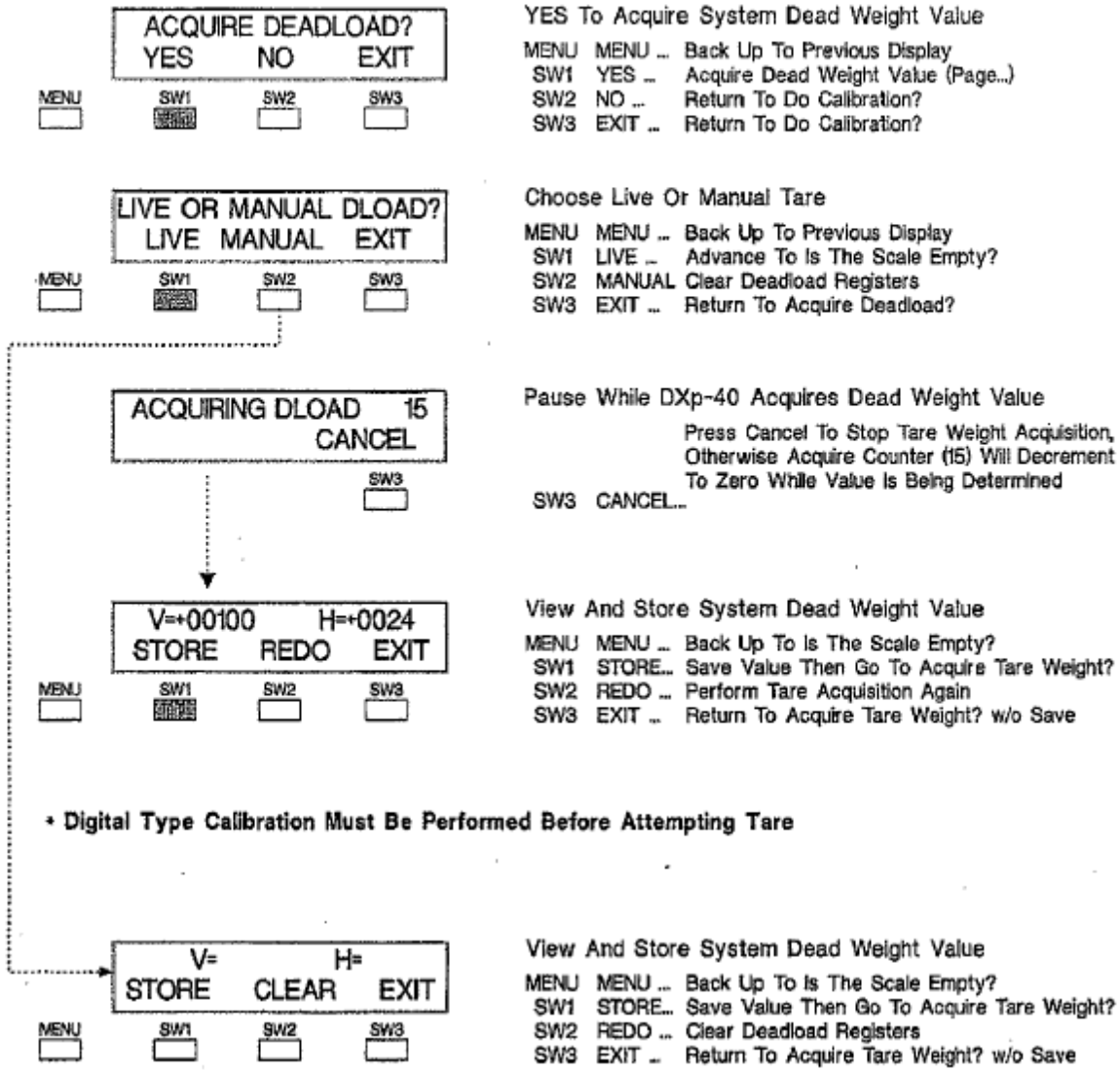


Figure 3-6. Acquire Deadload (Used with mV/V Cal Only).

SECTION 4. Operation

4.1 GENERAL

DXt-40-HTU Transmitters power up in the Tension measurement mode (Figure 4-1). Tension is presented as a force in pounds or Newtons or as a force per web width in pli or N/m. The units to be displayed are configured during system setup. Figure 4-2 presents the display panel switch functions for the operating mode. The DXt-40-HTU can display much more than the web tension. From the operating mode, the values of the vector resultant and angle can be displayed, and the individual forces from each HTU can be viewed as engineering units, mV/V or as a percent.

4.1.1 Tension Display

The tension value is determined by a combination of measurements and calculations. The measurements consist of the individual vertical and horizontal forces detected by the DXt-40 from the web acting on the HTU. Based on these measurements, the DXt-40-HTU calculates the Resultant force as a Vector and the direction of the Vector as an angle in degrees. Once the resultant force is known, the web tension can be determined by using the wrap angle information entered during system setup. The actual tension in the web is then displayed as a total force or as a force per linear distance if the web width was entered during system setup.

4.1.2 Resultant Display (Total)

The resultant display shows the Vector force and angle of direction in degrees. The resultant is calculated by the DXt-40-HTU from the individual horizontal and vertical forces determined from the Drive and Work transducers. (Fr = square root of the sum of the squares). The angle of direction is also displayed in degrees. The angle is calculated from zero to 90 degrees with reference to the vertical plane, where a purely vertical force is at zero degrees and a purely horizontal force is 90 degrees.

The DXt-40-HTU setup assumes that it is desired to display the forces and angles of a normal tension system as positive numbers. The vector angle will be calculated a positive value as long as both the vertical and horizontal forces are the same polarity. If either the vertical or the horizontal force goes negative, the resultant angle will also be negative.

During system setup, the DXt-40-HTU provides an opportunity to invert the polarity of the vertical or horizontal channels. This would be selected if the normal direction of web force was in a direction that produced a negative going output on the HTU transducer. The wiring of the HTU should never be reversed to achieve this inversion.

4.1.3 Individual Display

The individual forces from the Drive and Work HTU are displayed in force units, mV/V or as a percent. When viewed as a percent, the calculations are done so that the vertical forces can be compared to each other and the horizontal forces can be compared to each other.

Drive Vertical + Work Vertical = 100%

Drive Horizontal + Work Horizontal = 100%

4.2 ERROR CORRECTION

Should an error condition occur during system operation, a flashing capital 'E' will appear next to the tension information on the display (Figure 4-3). If the system is overloaded, (total or individual cell capacity exceeded) the word 'OVER' also will appear flashing beneath the flashing 'E'. To evaluate and correct system errors, enter the diagnostic mode as shown in Figure 4-3 and proceed to SECTION 5 (Cell Diagnostics).

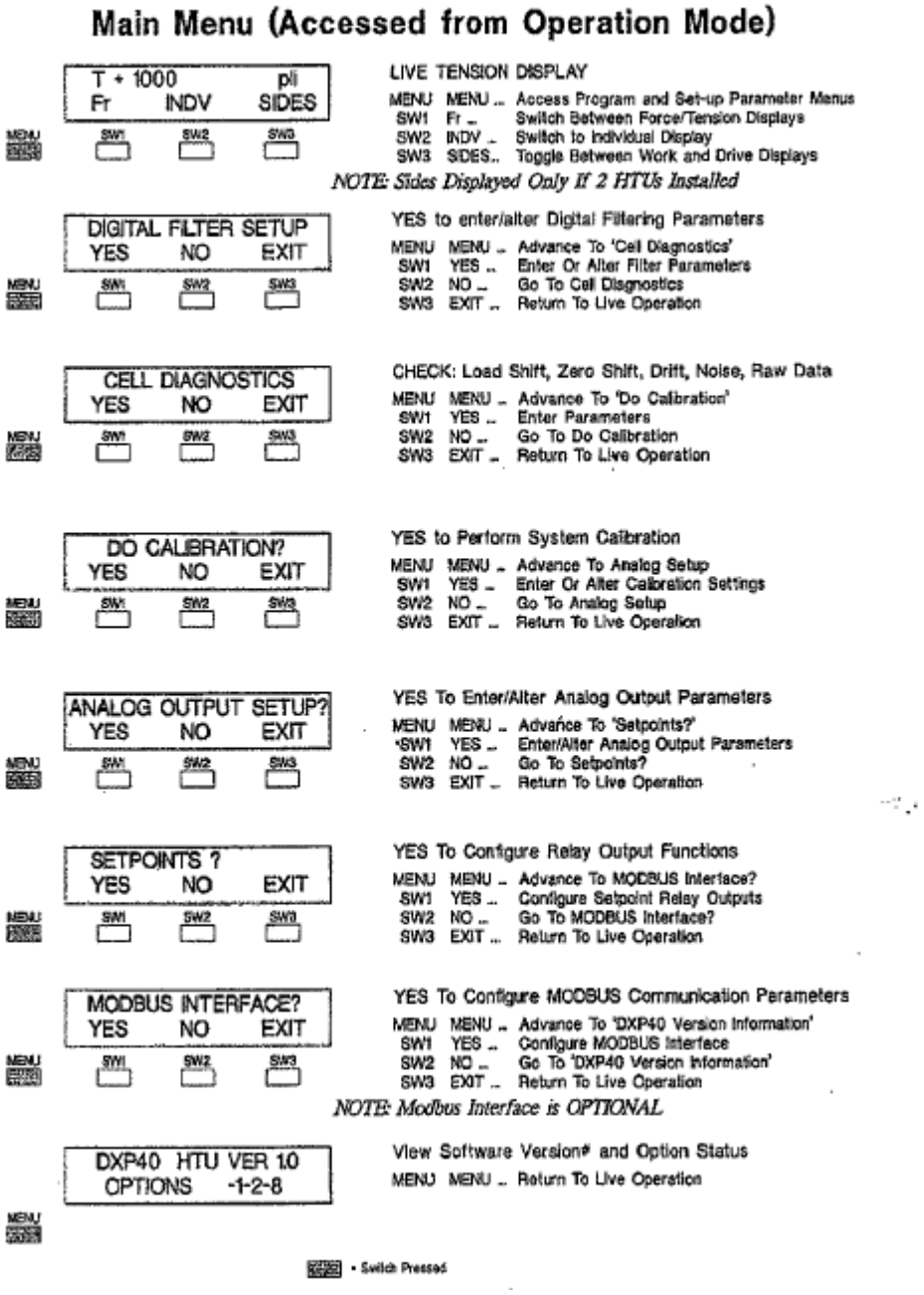
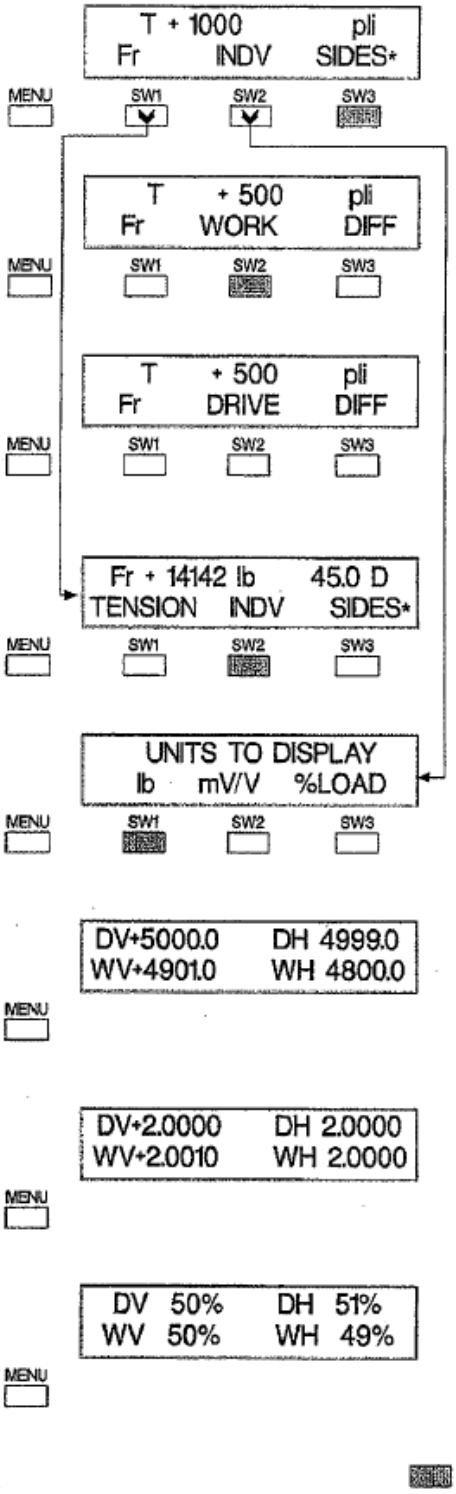


Figure 4-1. DXt-40 Main Menu - Power Up In Gross Mode.

Operating Mode Switch Selections



Live Tension or Force Display

MENU	MENU ...	Access Parameter Change Menus
SW1	Fr ...	Switch to Tension/Force Display
SW2	INDV ...	Switch to Individual Display
SW3	SIDES...	Display Work and Drive Side Values

View Work Side Values

MENU	MENU ...	Return To Operation Mode
SW1	Fr ...	Toggle Between Tension/Force Displays
SW2	WORK ...	Switch to Drive Side Values
SW3	DIFF ...	Display Differential Tension/Force Value

View Drive Side Values

MENU	MENU ...	Return To Operation Mode
SW1	Fr ...	Toggle Between Tension/Force Displays
SW2	DRIVE ...	Switch to Work Side Values
SW3	DIFF ...	Display Differential Tension/Force Value

MENU	MENU ...	Access Parameter Change Menus
SW1	TENSION	Return to Previous Selection
SW2	INDV ...	Switch to Individual Display
SW3		

View Individual HTU Cell Data

MENU	MENU ...	Return to Previous Display
SW1	lb ...	Display Force in lb or N
SW2	mV/V ...	Display Transducer mV/V Output
SW3	%Load ...	Display Horiz. and Vert. Percentages

Work and Drive Cell Engineering Units

MENU	...	Units To Display
SW1	...	
SW2	...	
SW3	...	

Individual Cell Display In Millivolts

MENU	...	Units to display
SW1	...	
SW2	...	
SW3	...	

Individual Cell Display In % Of Load

MENU	...	Units To Display
SW1	...	
SW2	...	
SW3	...	

▓ = Switch Pressed

*SIDES displayed only if 2 HTU transducers installed, otherwise blank

Figure 4-2. Switch Functions in the Operating Mode.

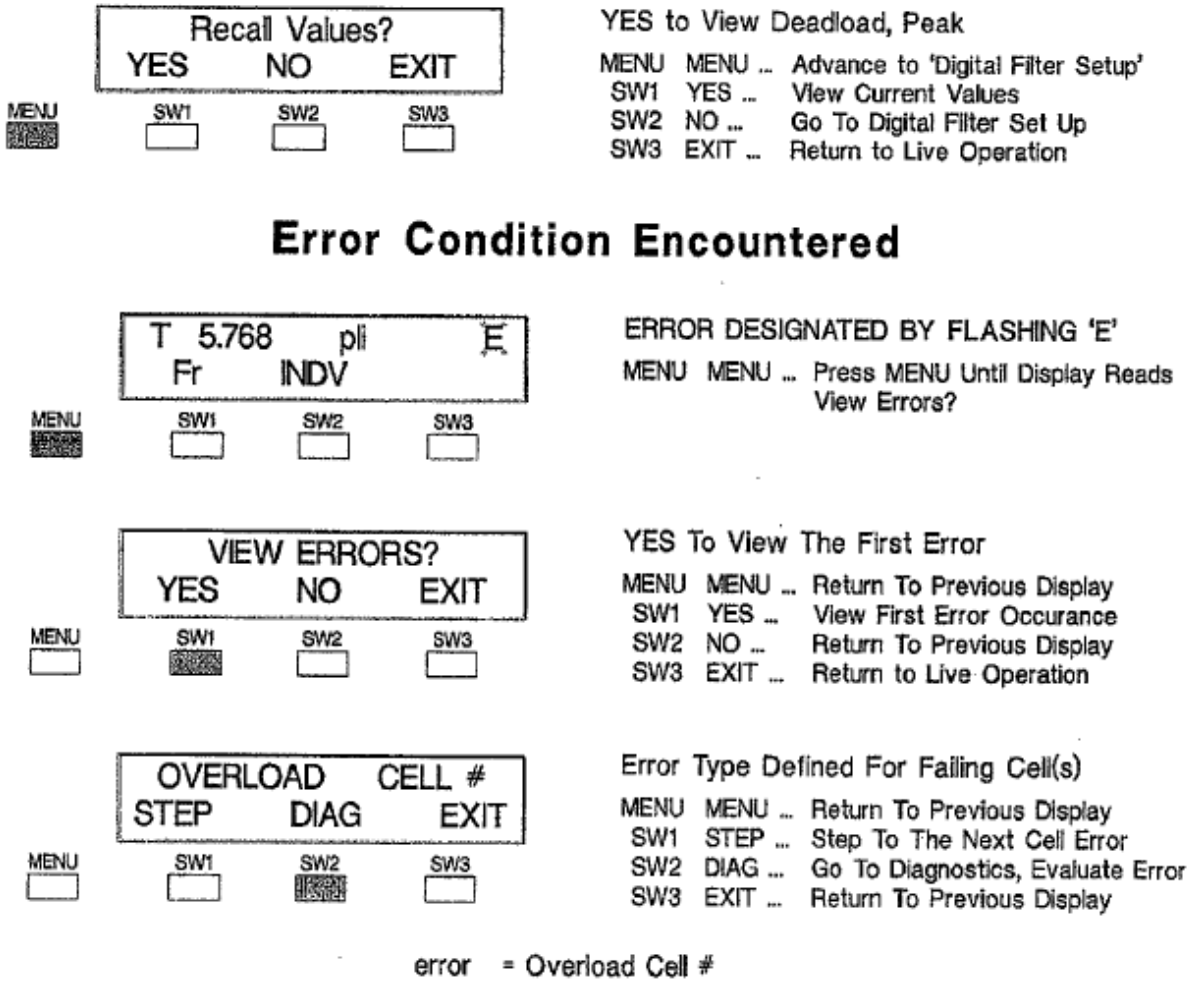


Figure 4-3. Error Detection & Correction Switch Selections.

SECTION 5. Dynamic Digital Filters

5.1 GENERAL

Digital filtering (including motion) constitutes the first set of parameter entries in the main menu (Figure 5-1, unshaded). Digital filtering combines moving averaging (filter) with response and noise bands to eliminate vibration and agitation noise from dynamic process systems. Filtering removes unwanted, mechanically induced fluctuations from the tension signal while maintaining rapid response to genuine process changes.

5.2 FILTER PARAMETERS

Each filter component has adjustable parameters (Figure 5-2) so that every tension system can be 'tuned' to its own unique environment.

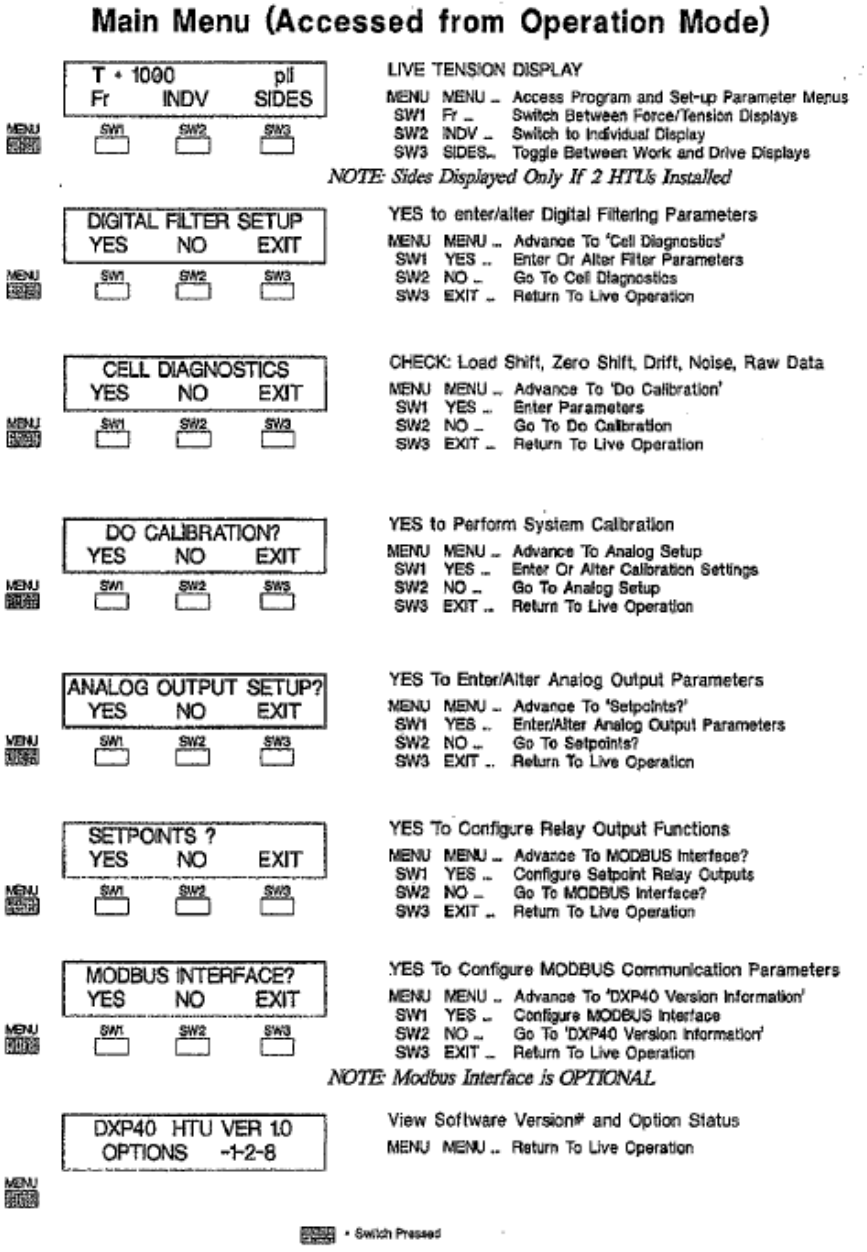


Figure 5-1. Main Menu Digital Filter Selection.

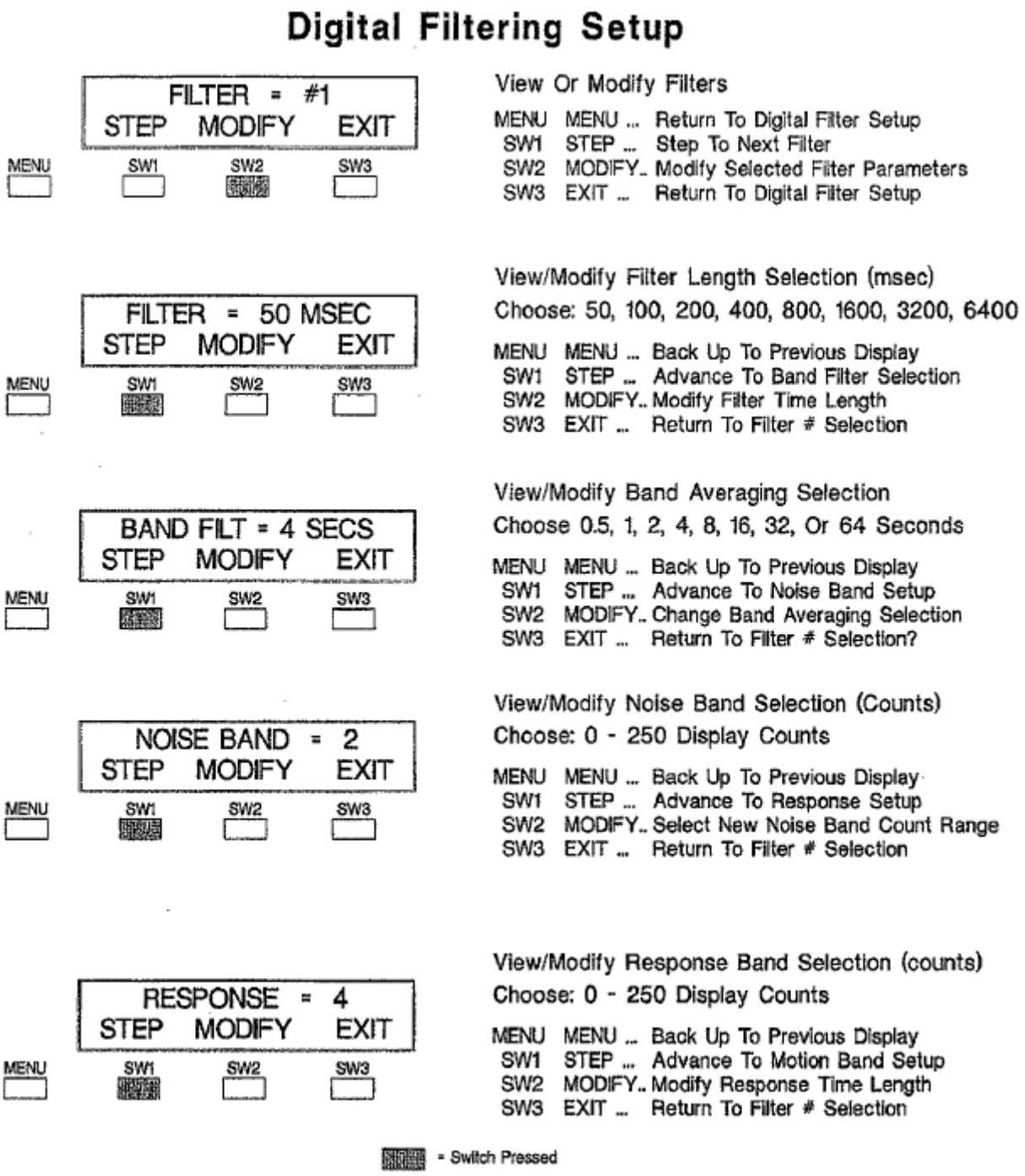


Figure 5-2. Digital Filter and Motion Setup.

5.3 DYNAMIC FILTER

Dynamic Digital Filter software is an advanced series of filtering algorithms for attenuating random signal noise. Using the pre-filtered signal from the standard filter, the Dynamic Filter applies a two step approach (Noise Band and Response Band) to adaptively reduce the noise components of the tension signal without adversely affecting system dynamics (Figure 5-3).The resulting real time signal provides stable web tension information for high resolution

indication and precise control over a broad spectrum of mechanical and electrical disturbances.

5.3.1 Band Filter

Band Filter is an exponential software filter which is applied only to signal fluctuations which fall within the Noise and Response band limits. The Band Filter is fully applied to signal fluctuations which fall within the Noise Band. For signal changes which fall outside the Noise Band but within the Response Band, proprietary statistical analysis algorithms are applied to the Band Filter resulting in progressively lower dampening proportional to time within the Response Band and direction of signal change. For signal changes which fall outside both Noise and Response bands, the Band Filter is canceled. This allows heavy dampening of system noise while maintaining quick response to changes in weight signals. The Band Filter length* is selectable at 0.5, 1, 2, 4, 8, 16, 32, and 64 seconds. The equivalent frequency attenuation is as follows:

Filter length (sec)	Frequency attenuation (Hz)
0.5	10
1	5
2	2.5
4	1.25
8	0.63
16	0.31
32	0.16
64	0.08

*Filter length is the time for an instant change to be fully reflected at the output.

5.3.2 Noise Band

Noise band is the + and - limit of the amplitude fluctuations in tension signal due to external electrical or mechanical influences. For changes in signal amplitude equal to or less than the Noise Band limit, the Band Filter is fully applied for maximum dampening. In Many applications, the standard deviation, determined by the Noise Test (paragraph 6.2.4), can be used to establish the value of the Noise Band. Under the Noise Test menu, view the standard deviation without any filtering applied. For 68% attenuation (1 sigma filter), select the largest value and round it up to an enterable value for the Noise Band.

For 99% attenuation (3 sigma filter), multiply the largest standard deviation value by 3 and round it up to an enterable value for the Noise Band. Noise Band amplitude selections are from 0 (off) to 250 display counts (display resolution).

5.3.3 Response Band

Response band is the 4. and - limit in terms of the amplitude of changes in signal outside the Noise Band limit. Response allows quick response to small changes in signals outside the Noise Band but within the Response Band. For changes in signal amplitude equal to or less than the Response Band limit, the Band Filter is applied with progressively lower damp¬ening effect to allow responsive changes in the tension signal. Response Band amplitude selections are from 0 (off) to 260 display counts (display resolution). It is recommended that the Noise Band setting be multiplied by 1, 2, 3, or 4 to get the Response Band setting. With the process in a steady state, set the Noise Band according to the standard deviation value. With the Response Band set to zero any spikes that fall outside the Noise Band will cause the displayed or transmitted signal to jitter. Increase the Response Band setting until the jitter disappears.

The two bands work together to separate system noise from true change in web tension signal achieving higher accuracy and more dependable data for control purposes.

5.3.4 Default Parameters

All DXt-40-HTU transmitters (even those without the dynamic filter) are shipped with these default parameters: band filter = 32 seconds, noise band = 1, and response band = 4.

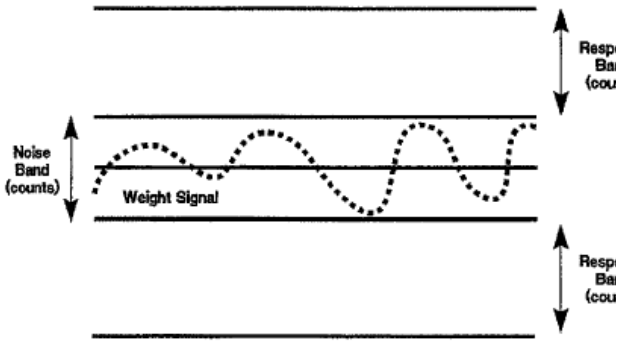


Figure 5-3. Graphical Operation Example.

5.4 OPTIONAL SECOND FILTER

If the remote input option (paragraph 8.3) is installed, two sets of filtering parameters may be entered. Dual filters provide optimal control for systems with changing process dynamics. With the display reading 'DIGITAL FILTER SETUP?', press YES for filter 1, and press YES again for filter 2. Enter parameters for both filters as previously described. Filter selection is accomplished using remote digital input number 4. When input number 4 (DIG 4) is low (grounded), filter 2 is selected; high selects filter 1.

SECTION 6. On-Line Load Cell Diagnostics

6.1 GENERAL

The next step in the DXt-40-HTU main menu is diagnostic error analysis and parameter entry (Figure 6-1). The unique quad AID converter design makes it possible to diagnose system errors down to the exact load cell. Each load cell is continually checked for open circuit/wiring and overload. DXt-40-HTU diagnostics also detect system malfunctions such as impact shock loads and residual build up problems.

Figure 6-2 provides an overall flow diagram for all diagnostic functions. Once an error is detected, the display shows a flashing 'E' while the serial output transmits the error code to the host computer. Also, a discrete relay output (optional) can be configured for error detection activation. Flow diagrams (Figure 6-3) show how to pinpoint the faulty cell(s) and change error condition parameters, if desired.

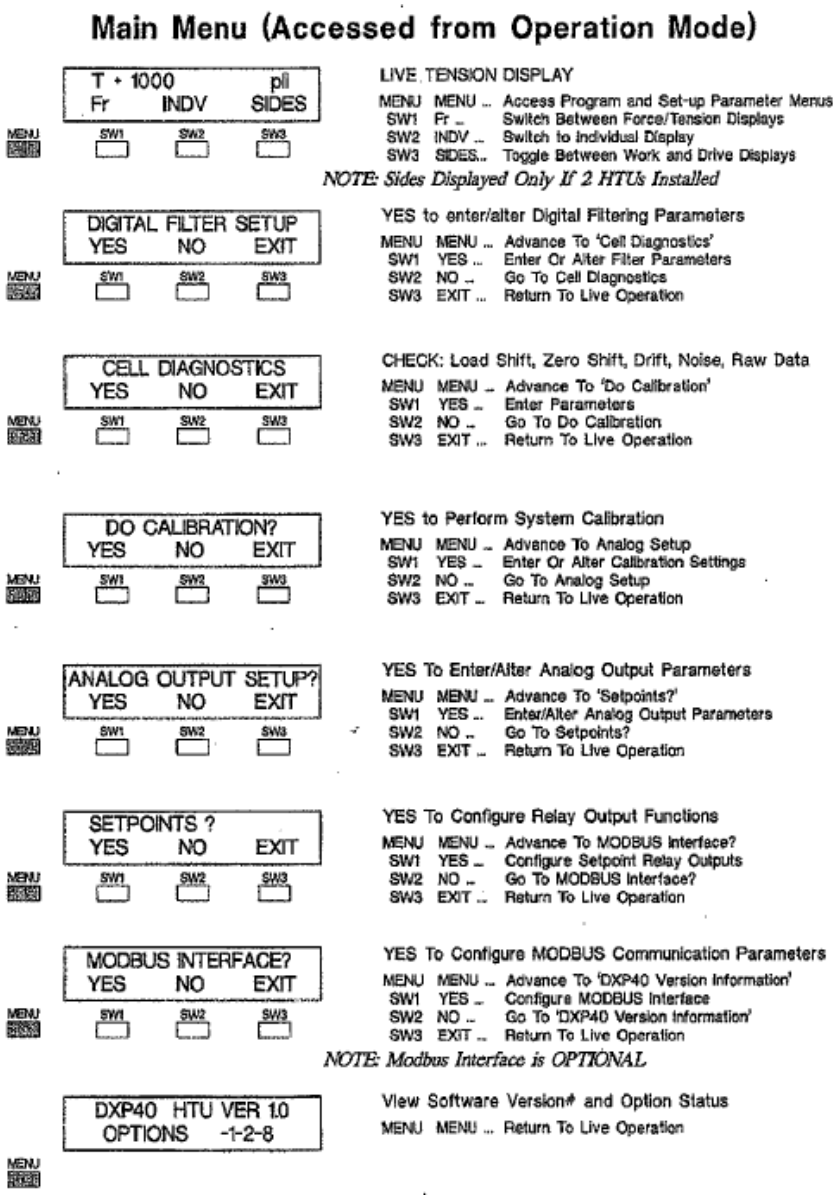


Figure 6-1. Diagnostic Error Evaluation Main Menu.

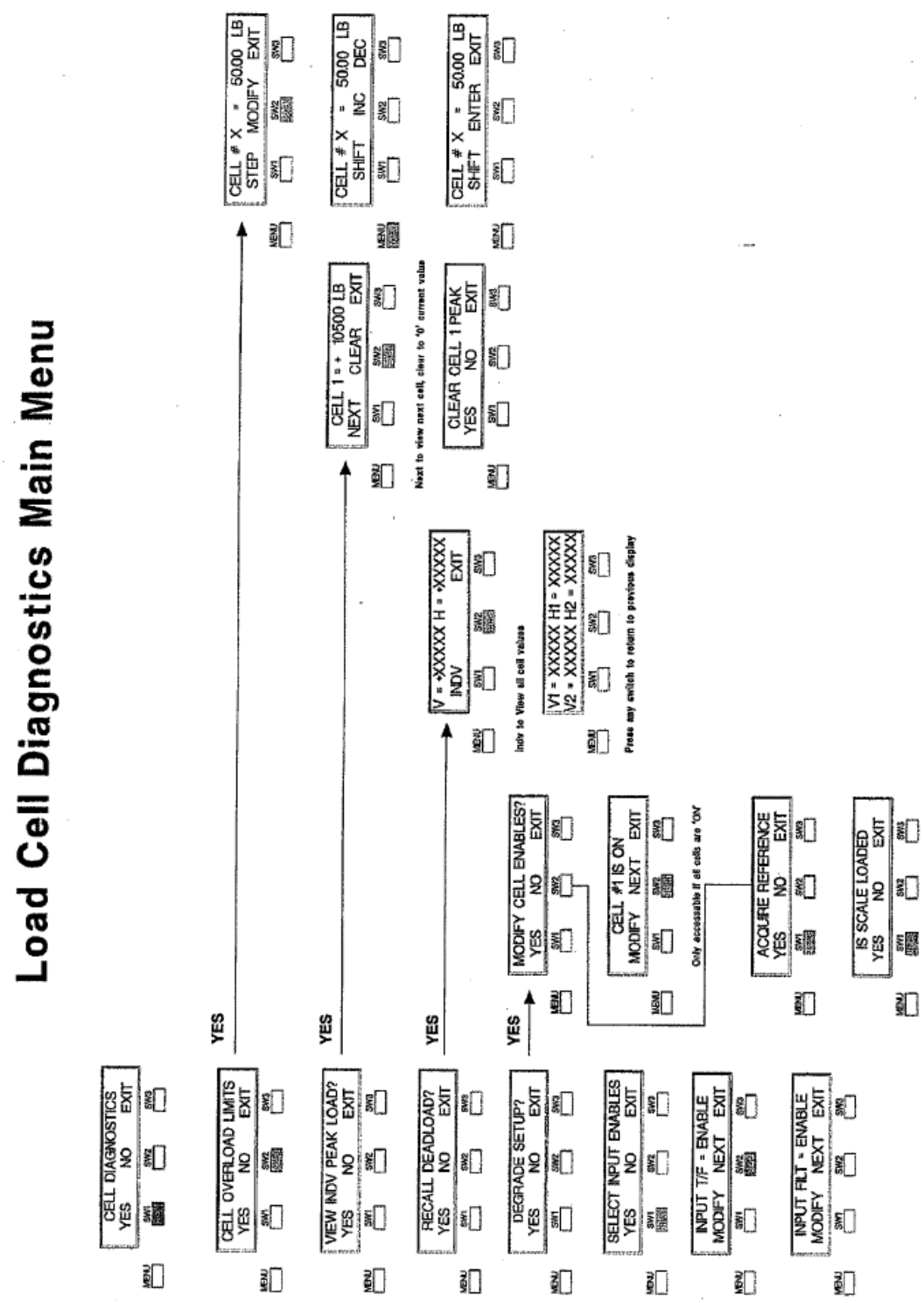


Figure 6-2. DXt-40 HTU Diagnostic Routines.

6.2 DIAGNOSTIC TESTS

Overload is checked and updated every conversion (50 msec). Activate recall and degrade functions only as needed.

Flow diagrams (Figure 6-3) provided for each test show how to distinguish the cell/system fault and change parameters if desired.

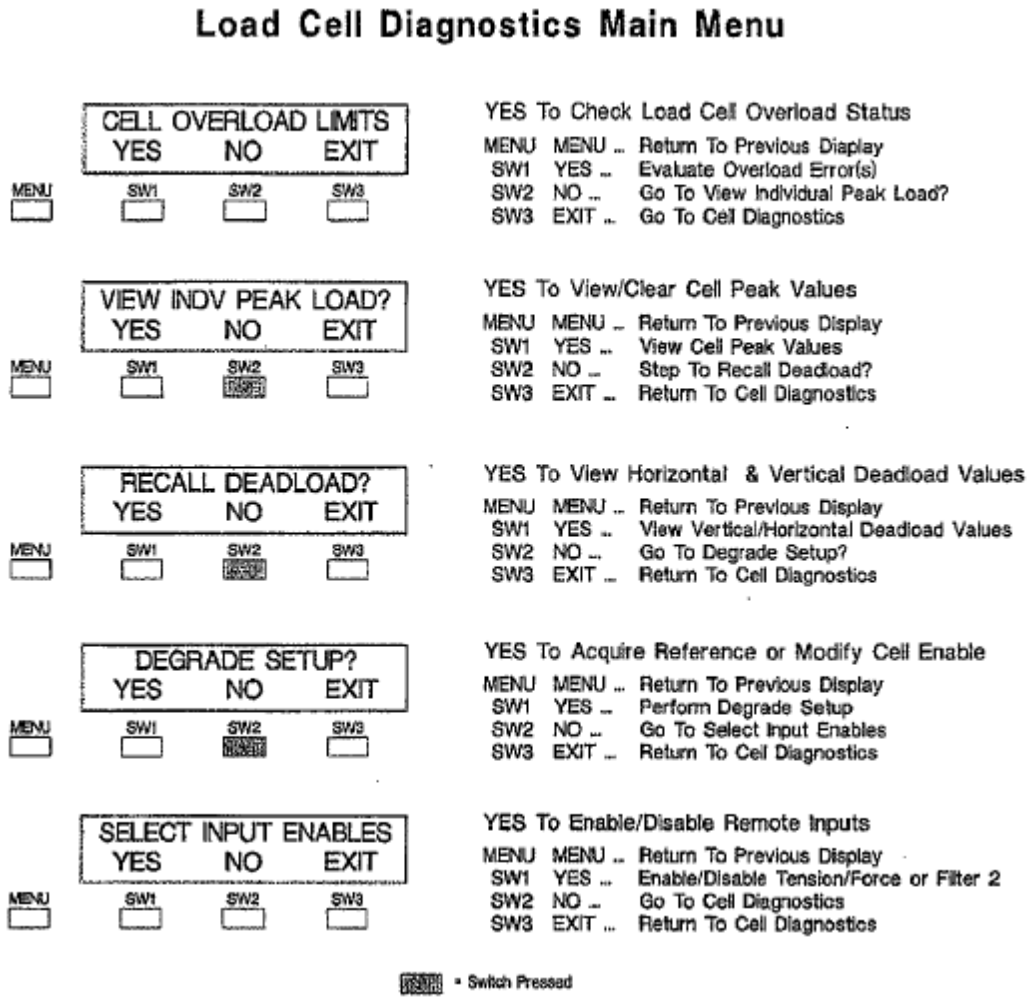


Figure 6-3. Diagnostic Error Evaluation Main Menu.

6.2.1 Overload

Since overload is critical to system safety and load cell integrity, it is checked every 50 msec. Cell overload limits are typically set at the cell's rated capacity. A running peak value for each cell is recorded and may be checked (or cleared) at any time. In older systems, overload typically signaled a total system overload (system capacity exceeded).

The DXt-40-1-ITU, however, can alert an operator to a single cell overload, even though total tension force does not exceed system capacity. Single cell overloads can be caused by shock loads and poor system design. Figure 6-4 provides a flow diagram for cell overload evaluation.

Load Cell Overload Limit Selection

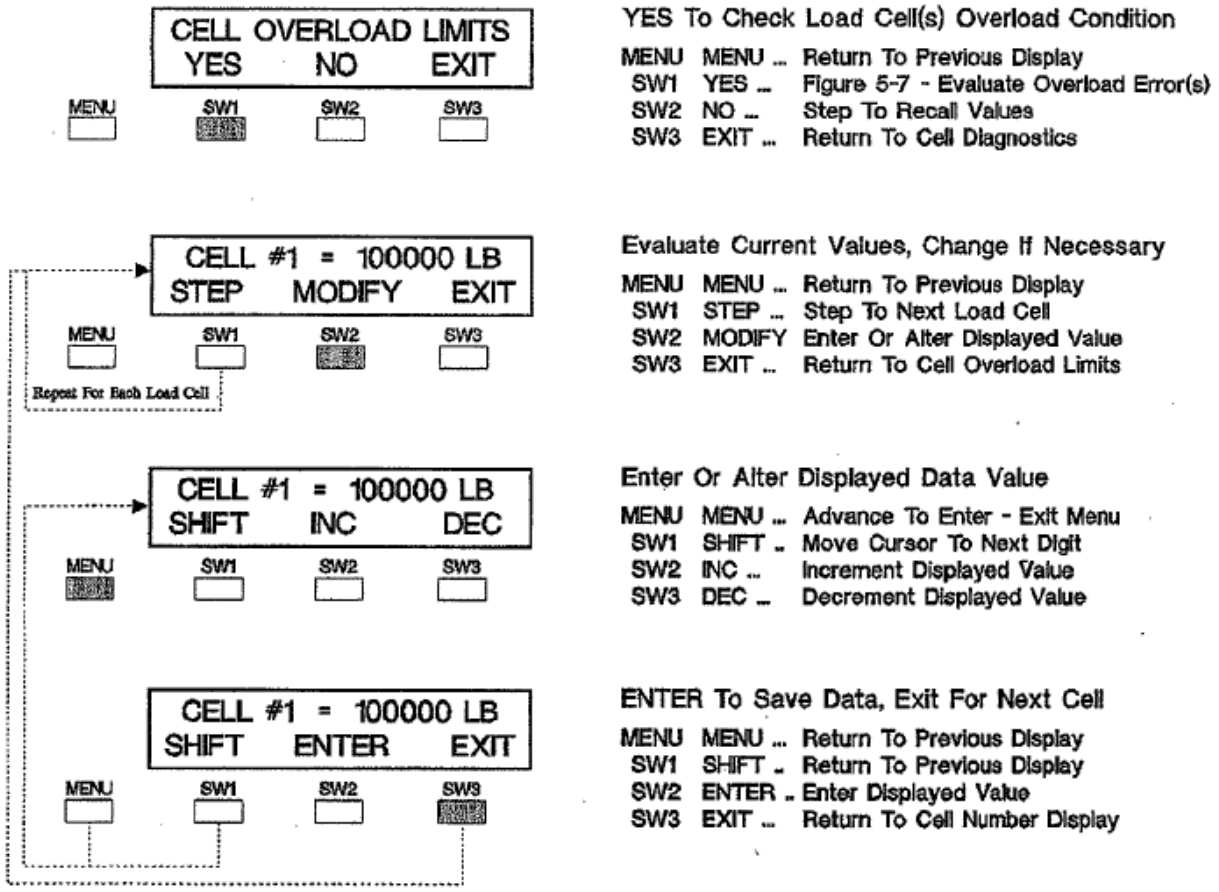


Figure 6-4. Overload Error Evaluation Instructions.

6.2.2 View Individual Peak Load

This mode allows a system supervisor to view the maximum force applied to each transducer. After viewing, value(s) may be reset to 0 (zero). See Table 6-1 for the designation of each cell. Figure 6-5 shows flow options for the view individual peak load function.

NOTE: Table 6-1 designations apply with conventional HTU (work/drive) wiring.

Table 6-1. Peak Force Designations

Cell Designation	Force Direction	HTU Allocation
Cell 1	Vertical	HTU - 1
Cell 2	Horizontal	HTU - 1
Cell 3	Vertical	HTU - 2
Cell 4	Horizontal	HTU - 2

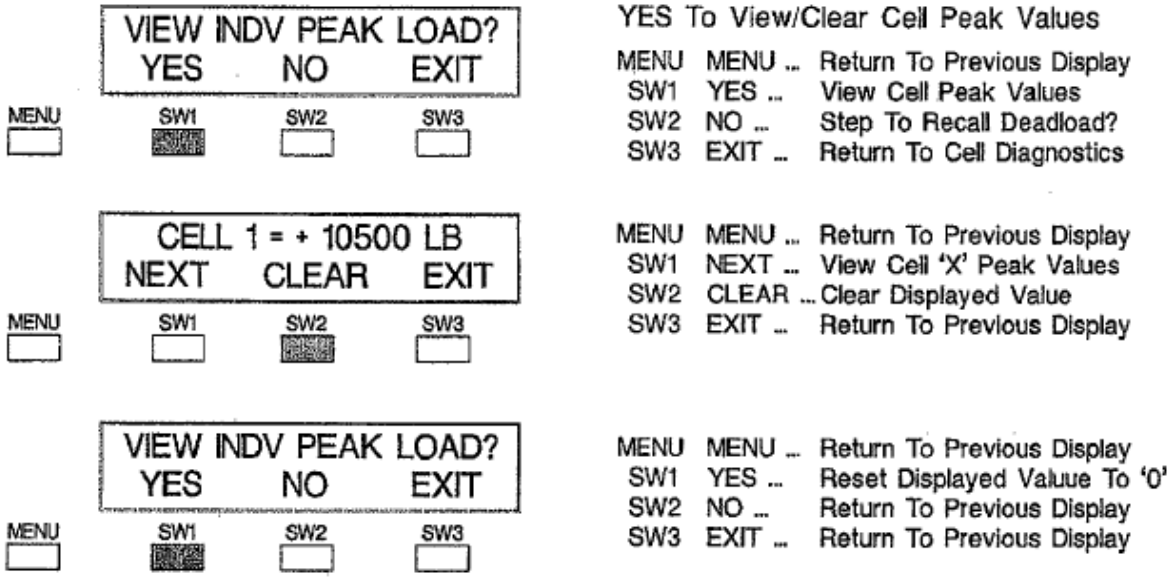


Figure 6-5. View and Clear Peak Value Functions.

6.2.3 Recall Deadload

Recall deadload values allows an operator to view the dead weight (system equipment, roll, pillow block, etc.) value for each HTU. Figure 6-6 shows how to recall any or all values.

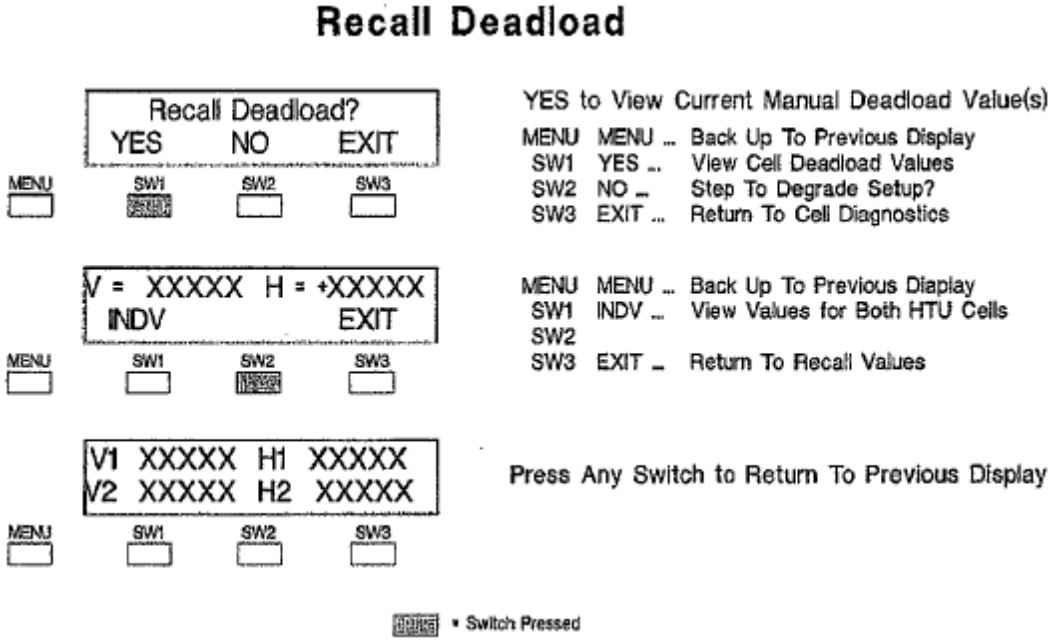


Figure 6-6. Recall Values Flow Diagram.

6.2.4 Degrade Mode Function

If a diagnostic test identifies an HTU load cell as providing faulty data, it is possible using degrade mode operation to eliminate the erroneous data and continue operation. Since the DXt-40-HTU measures each channel independently and digitally calculates the tension information, degraded mode operation shuts off the actual measurement from the suspect channel(s) and uses a calculated digital substitute value, corrected for system balance and channel sensitivity. The resulting system performance will be reduced somewhat, but will still be compensated for load imbalance. This mode of operation makes it possible to continue system operation with minimal interruption.

To activate degraded mode operation it is necessary to shut-off the suspect channel using the Cell Enable menu (Figure 6-7) accessed via the keypad. It is not possible to automatically activate this mode internally or remotely through the serial port.

Prior to degrade mode operation, a degrade mode reference must be established. This reference establishes individual cell characteristics for use in future degrade mode operation. To enter the reference point, perform the following:

1. Calibrate the system and acquire a system deadload zero (mV/V calibration also must acquire deadload zero).
2. Load system to at least 20% of full scale capacity.
3. Proceed to the Degrade Setup Menu (Figure 6-10) and make sure both cells are 'On'.
4. With a display of ACQUIRE REFERENCE choose YES to advance to IS SCALE LOADED. Choose YES again to enter reference value.

When degrade mode is operational, a capital 'D' will appear on the right side of the internal LCD weight display. A capital 'D' also will be transmitted in the status portion of the terminal and continuous serial outputs.

If the Modbus option is present, status 1 (registers 40003, 40203, and 40403) bit 11 and input 12 (function 02) will be set to a '1'.

NOTE: Degrade mode cannot be implemented remotely using the serial interface or digital inputs.

NOTE: For proper degrade Mode function, the system center of gravity must remain the same.

NOTE: To enter a degrade mode reference point, both cells must be functional, turned 'On', and the system must be loaded to at least 20% of total capacity.

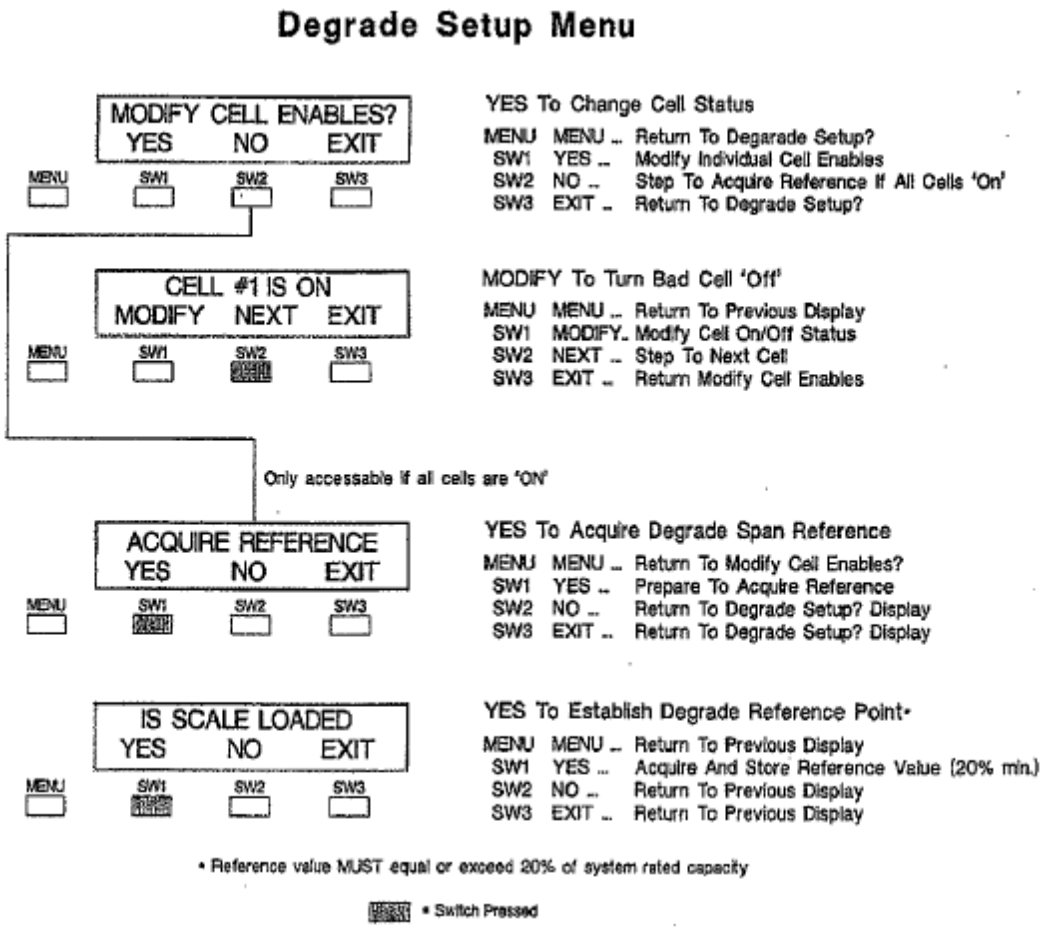


Figure 6-7. Degrade Mode Cell Selection and Reference.

6.2.5 Remote Input Enables (Optional)

Paragraph 8.3.1 defines the remote inputs optionally available with DXt-40 instruments. This section of diagnostic configuration determines whether or not individual remote inputs are enabled. Follow the flow diagram presented in Figure 6-8 to enable or disable each of the inputs as desired.

NOTE: If the remote filter input is disabled, filter 2 parameters are not accessible (see Figure 6-11 explanation).

DXp-40 Remote Input Enable/Disable Selection

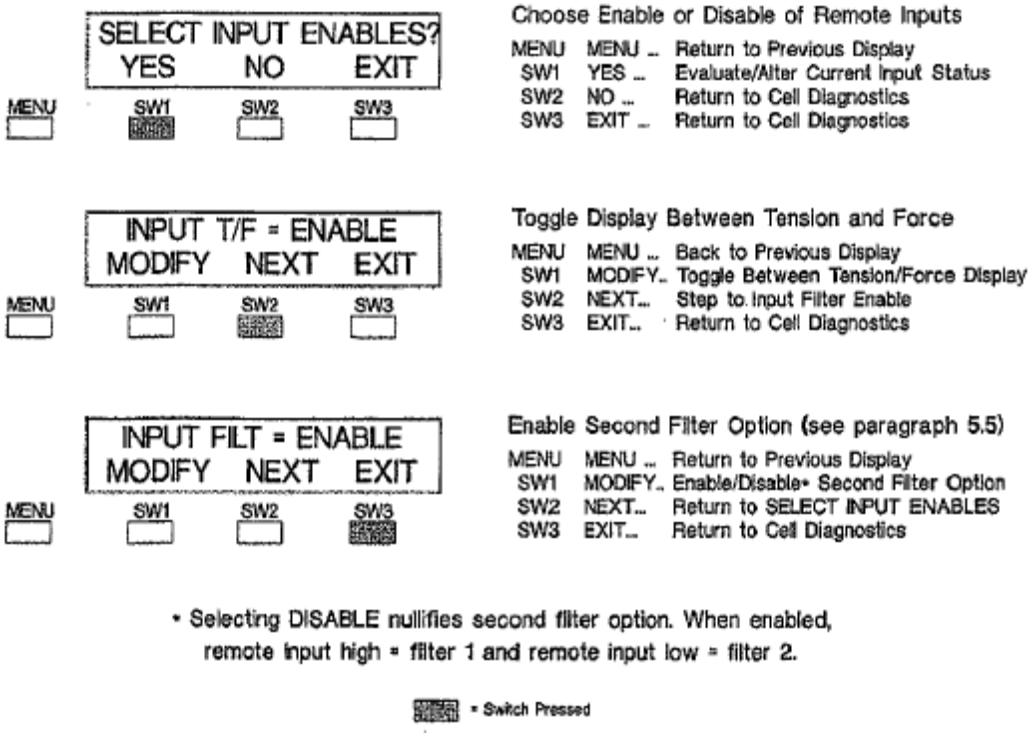


Figure 6-8 Remote Input Enable Selection.

SECTION 7. Serial Communication

7.1 GENERAL

The DXt-40-HTU is equipped with a variety of standard and optional serial output formats that are selected using a series of DIP switches (Figure 7-1). DIP switch positions 1, 2, and 3 (Table 7-1) allow four format choices; continuous output, terminal/computer interface, and MODBUS RTU. Allen-Bradley Remote I/O is, available as an option, but requires different documentation (see page 7-9). All types of DXt interfacing will be discussed in the following paragraphs. Positions 4-7 designate transmitter address for applications requiring more than one DXt unit (Table 7-2). Switch position 8 is unused and should be left in the '0' (ON) position.

7.1.1 Standard Simplex Output (Continuous Output).

The simplex output format is designed to transmit gross weight data (ASCII coded) to a remote terminal or computer. The accuracy of this point to point, digital communication interface is much greater than simple analog current or voltage approximates. Simplex outputs are transmitted in the format on page 7-2, top left-hand column.

Table 7-1. Serial Interface and Baud Rate Selections

Switch Positions 1 2 3	Baud Rate	Interface
0 0 0	9600	Digi-System Network
1 0 0	28800	Digi-System Network
0 1 0	57600	Digi-System Network
11 0	1200	Continuous Output
0 0 1	9600	Continuous Output
1 0 1	1200	Terminal Interface
0 11	9600	Terminal Interface
1 1 1	*	MODBUS RTU

0 = ON * See Figure 7-2, page 7-9

Table 7-2. DXt-40-HTU Transmitter Address Selections

Switch Position 4 5 6 7	Address
0 0 0 0	16
1 0 0 0	1
0 1 0 0	2
1 1 0 0	3
0 0 1 0	4
1 0 1 0	5
0 1 1 0	6
1 1 1 0	7
0 0 0 1	8
1 0 0 1	9
0 1 0 1	10
1 1 0 1	11
0 0 1 1	12
1 0 1 1	13
0 1 1 1	14
1 1 1 1	15

0 = ON

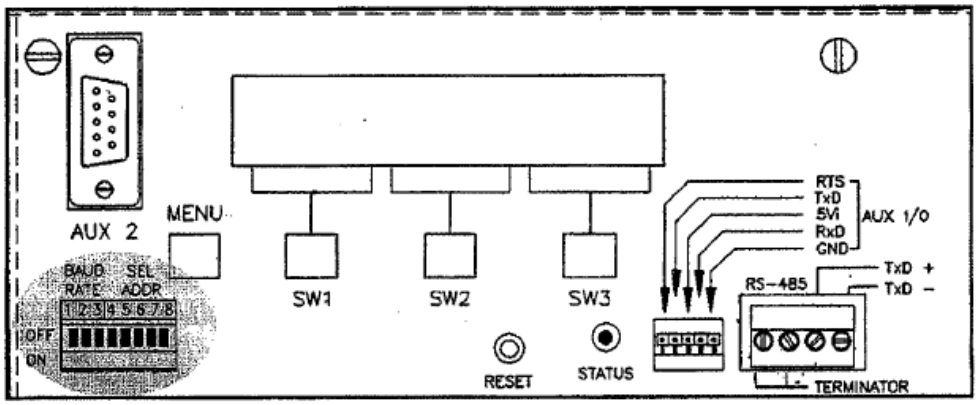


Figure 7.1 Serial Communication Parameter Selection Switch.

STX/ADR/POL/DATA/SP/UNITS/MODE/STATUS/CR/LF

Where:

STX=	1char. Start of Text (02H)
ADR=	DXt-40-HTU unit address, 3 ASCII charac
POL=	Polarity sign: space for positive data, minus (-) for negative data
DATA=	7 char; six digits with decimal point or leading space, leading zeros = spaces
UNITS=	1 char; in continuous mode `T', `F', or `A'
STATUS=	1char; M (motion), O (overload), or E (Erro
CR/LF=	2 char; carriage return, line feed (0DH/0A
SP=	1 char; ASCII space (20H)

Total bits per character = 1 start, 1 even parity, 7 data, and one stop.

7.1.2 Optional Computer/Terminal Interface.

This half duplex (transmit and receive) format is designed for two way communication between a single DXt-40-HTU, or a network of DXt-40-HTU units, and a computer/terminal. Protocol accommodates all operations such as lb, N, pli, and N/m, as well as remote filter selection. Use of this format requires customer developed device specific software to run the various network operations. Table 7-3 defines the terminal interface protocol.

Table 7-3. Computer/Terminal Interface Protocol

Terminal Interface

ASCII Com-mand	Description	Action	Response
`G'	Total Tension	Send Current Tension	`01 (sp/8 pol & data bytes/sp) G' [adr/sp/pol/data/sp/`G'/CRLF]
`N'	Total Force	Send Current Force	`01 (sp/8 pol & data bytes/sp) N' [adr/sp/pol/data/sp/`N'/CRLF]
`T'	Total Angle	Send Current Angle	`01 (sp/8 pol & data bytes/sp) T' [adr/sp/pol/data/sp/`T'/CRLF]
`DG'	Drive Tension	Send Drive Side Tension Value	`01 (sp/8 pol & data bytes/sp) G' [adr/sp/pol/data/sp/`G'/CRLF]
`DN'	Drive Force	Send Drive Side Force Value	`01 (sp/8 pol & data bytes/sp) N' [adr/sp/pol/data/sp/`N'/CRLF]
`DT'	Drive Angle	Send Drive Side Angle Value	`01 (sp/8 pol & data bytes/sp) T' [adr/sp/pol/data/sp/`T'/CRLF]
`WG'	Work Tension	Send Work Side Tension Value	`01 (sp/8 pol & data bytes/sp) G' [adr/sp/pol/data/sp/`G'/CRLF]
`WN'	Work Force	Send Work Side Force Value	`01 (sp/8 pol & data bytes/sp) N' [adr/sp/pol/data/sp/`N'/CRLF]
`WT'	Work Angle	Send Work Side Angle Value	`01 (sp/8 pol & data bytes/sp) T' [adr/sp/pol/data/sp/`T'/CRLF]
`QG'	Quad Gross	Send Individual Gross Values	`01 (sp/8 pol & data bytes/sp) x4 G' [Adr/sp/pol/data (1-4)/sp/`G'/CRLF]
`QV'	Quad mV/V	Send Individual mV/V Values	`01 (sp/8 pol & data bytes/sp) V' [Adr/sp/pol/data (1-4)/sp/`V'/CRLF]
`Q%'	Quad Percent	Send %Load Values	`01 + 0 + 0 + 0 +0 0 %L' [Adr/sp/pol/data (1-4)/sp/`%'/CRLF]

Table 7-3 (cont.) Computer/Terminal Interface Protocol.

ASCII Com-mand	Description	Action	Response
'EE'	Diag. Errors	Send Current Diagnostic Errors	'01 O O O O', CRLFw Error for cells 1-4 O = Overload _ = No Error
'SC'	Set Continuous	Send Constant Displayed (Total)	'01 (sp/8 pol & data bytes/sp) G or N
'SD'	Set Demand	Tension/Force Data Upon Request	
'SFxxxxxx'	Set Serial Format: where Xxxxxx 0= 6 digits data 1= 7 digits data xXxxxx 0= leading spaces 1= leading zeros xxXxxx 0= decimal point 1= no decimal point xxxXxx 0= units (G/N/T/V/%) 1= no units	Changes To Serial Data Format	
'SLx'	Set Filter Length x=1: filter 50 ms x=2: filter 100 ms x=3: filter 200 ms x=4: filter 400 ms x=5: filter 800 ms x=6: filter 1600 ms x=7: filter 3200 ms x=8: filter 6400 ms	Enter or Alter Filter Length	
'SBxxx'	Set Noise Band xxx= 000 to 250 display counts	Enter/Alter Noise Band	
'SRxxx'	Set Response Band xxx= 000 to 250 x 50 ms (0 to 12,500 ms max)	Enter/Alter Response Band	

Table 7-3 (cont.) Computer/Terminal Interface Protocol.

ASCII Com-mand	Description	Action	Response
`SAx'	Set Band Filter: where x=1: 0.5 seconds x=2: 1 second x=3: 2 seconds x=4: 4 seconds x=5: 8 seconds x=6: 16 seconds x=7: 32 seconds x=8: 64 seconds	Set New Band Filter: notes 1 & 2	
`SSnx'/CR	Set Setpoint `n' Value n=setpoint #, x=value (up to 7 ASCII chrs followed by CRLF)		
`RF'	Recall Serial Format		`01 RFxxxxxx'/CRLF
`RL'	Recall Filter Length		`01 RLx'/CRLF
`RB'	Recall Filter Band		`01 RBxxx'/CRLF
`RR'	Recall Filter Response		`01 RRxxx'/CRLF
`RA'	Recall Band Averaging		`01 RAx'/CRLF
`RSn*'	Recall Setpoint # Value		`01 RSnxxxxxxx'/CRLF
`R0*'	Recall Set Point Outputs(xxxx=setpts 4-1) x='0' if setpoint off x='1' if setpoint on		`01 R0xxxx'/CRLF
`Axx'	Address `01' - `16'	Enable Addressed DXt-40 To Communicate All Others, Disabled	

Note 1 Remote filter settings are not stored in EEPROM and will revert to EEPROM settings upon power down.

Note 2 Remote filter length is averaging applied to raw data before band or response is applied. Remote filter band has its own variable filter (band filt) which is applied to delta data that remains within the +/- band. Data remains within the band if the difference between the current data and the last averaged data is less than or equal to the band setting.

Remote filter response setting is added to the noise band setting. If the change in value from one conversion to the next exceeds the noise band and falls within the response band, the following takes place: the first time data falls within the response band, the full noise band filter is applied. If, on subsequent conversions, the change in value still falls within the response band, the noise band filter is progressively reduced until it reaches a length of 50 msec, at which point the noise band filter is restarted at the current weight value.

When changing data is outside both the noise and response bands, the noise band filter is reset and restarted.

Abbreviations:

adr	address, 3 ASCII chars: first two are `01' - `16' followed by an ASCII space
pol	polarity: ASCII plus or minus sign
data	weight data: 7/8 characters, 6/7 digits w/decimal point or leading space
sp	ASCII space (20H)
units	one character: G=Tension, N=Force, T=Angle
stat	weigh status: O=overload, space=normal
CRLF	carriage return line feed: two characters 0DH 0AH
'	single quotes: ASCII character string

* Applies only when setpoint option installed

7.1.3 Optional MODBUS Protocol

This interface method is applicable to virtually any PLC or other process control computer with MODBUS communication capability. The interface provides tension and diagnostics information and allows for remote computer control functions as well as the ability to download new calibration data and set point values. Information is transmitted in blocks of data thereby minimizing polling and response delays. The interface operates with the DXt-40-HTU configured as the slave device and the host computer as the master. Table 7-4 presents a complete overview of register and bit allocations for each MODBUS format. Figure 7-2 (page 7-9) presents the interface baud rate and parity selections.

MODBUS Functions Supported:

02 Read Input Status
03 Read Holding Registers
06 Preset Single Register
16 (10 Hex) Preset Multiple Registers

DXt-40 Data Formats Provided:

- FORMAT #1: One 16 bit signed integer - 32768 to 32767 for all web tension data mv/v data is divided by 10
- FORMAT #2: Two 16 bit signed integers for most tension data (the two integers must be added together to get -65536 to 65534) One 16 bit signed integer for diagnostic & %data One 16 bit signed integer for mv/v data (divided by 10)
- FORMAT #3: Two 16 bit signed integers for all tension data (the high word, 1st integer, must be multiplied by 32768.0 then added to the low word, 2nd integer)

Table 7-4. MODBUS Register Allocations

DXt40 READ ONLY REGISTERS (Function 03)

READ ONLY ITEM	FORMAT #1 ADR #REG	FORMAT #2 ADR #FtEG	FORMAT #3 ADR #REG
1 - STATUS 3	40001 1	40201 1	40401 1
2- STATUS 2	40002 1	40202 1	40402 1
3- STATUS 1	40003 1	40203 1	40403 1
4 - TENSION DECIMAL POINT	40004 1	40204 2	40404 2
5 - SPARE	40005 1	40206 2	40406 2
6- GROSS CELL 1	40006 1	40208 2	40408 2
7 - GROSS CELL 2	40007 1	40210 2	40410 2
8 - GROSS CELL 3	40008	40212 2	40412 2
9 - GROSS CELL 4	40009 1	40214 2	404)4 2
10- TENSION TOTAL	40010 1	40216 2	40416 2
11 - FORCE TOTAL	40011 1	40218 2	40418 2
12- ANGLE TOTAL	40012 1	40220 2	40420 2
13 - SPARE	40013	40222 2	40422 2
14- MV/V/10 CELL 1	40014 I	40224 1	40424 2
15 - MV/V/10 CELL 2	40015 1	40225 1	40426 2
16 - MV/V/10 CEL1 3	40016 1	40226 1	40428 2
17- MV/W10 CELL 4	40017 1	40227 1	40430 2
18 - % LOAD CELL 1	40018 1	40228 1	40432 1
19 - % LOAD CELL 2	40019 1	40229 1	40433 1
20- % LOAD CELL 3	40020 1	40230 1	40434 1
• 21 - % LOAD CELL 4	40021 1	40231 1	40435 1
22 - SPARE	40022 I	40232 2	40436 2
23- PEAK CELL 1	40023 1	40234 2	40438 2
24- PEAK CELL 2	40024 1	40236 • 2	40440 2
25- PEAK CELL 3	40025 1	40238 2	40442 2
26- PEAK CELL 4	40026 1	40240 2	40444 2
27- DRIVE TENSION	40027 1	40242 2	40446 2
28- DRIVE FORCE	40028 1	40244 2	40448 2
29- DRIVE ANGLE	40029 1	40245 2	40450 2
30- WORK TENSION	40030 1	40246 2	40452 2
31 - WORK FORCE	40031 1	40250 2	40454 2
32 - WORK ANGLE	40032 1	40252 2	40456 2
33 - 56 SPARE			

Table 7-4 (cont.) Status Register Bit Definitions.

STATUS REGISTER DEFINITIONS (Function, 03)

STATUS 1 (GENERAL STATUS)

BIT 0- ACTIVE FILTER, (0) = FILTER 1, (1) = FILTER 2 BIT I - SPARE

BIT 2- SPARE

BIT 3 - SPARE

BIT 4 - IN CAL

BIT 5- DIAG ERROR

BIT 6 - LIMIT OVERLOAD

BIT 7- A/D OVERLOAD

BIT 8- SPARE

BIT 9- SPARE

BIT 10 - POWERUP BIT 11 - SPARE (0) BIT 12 - SPARE (0) BIT 13 - SPARE (0) BIT 14 - SPARE (0) BIT 15 - SPARE (0)

STATUS 2

BIT 0- SETPOINT 1

BIT 1 - SETPOINT 2

BIT 2- SETPOINT 3

BIT 3- SETPOINT 4

BIT 4 - OVERLOAD LIMIT CELL I BIT 5 - OVERLOAD LIMIT CELL 2 BIT 6- OVERLOAD LIMIT CELL 3 BIT 7 - OVERLOAD LIMIT CELL 4 BIT 8- AID UNDERLOAD CELL 1 BIT 9- AID OVERLOAD CELL 1 BIT 10- A/D UNDERLOAD CELL 2 BIT 11 - AID OVERLOAD CELL 2 BIT 12- All) UNDERLOAD CELL 3 BIT 13- A/D OVERLOAD CELL 3 BIT 14- AID UNDERLOAD CELL 4 BIT 15- A/D OVERLOAD CELL 4

STATUS 3- SPARE, NOT USED

Table 7-4 (cont.) DXt-40 Read/Write Register Allocations

DXt-40 Read/Write Registers (Functions 03, 06, 16)

Read/Write	Format #1 ADR #REG	Format #2 ADR #REG	Format #3 ADR #REG
SPARE	40101 1	40301 1	40501 1
SETPOINT 1	40102 1	40302 2	40502 2
SETPOINT 2	40103 1	40304 2	40504 2
SETPOINT 3	40104 1	40306 2	40506 2
SETPOINT 4	40105 1	40308 2	40508 2
FILTER 1 LENGTH	40106 1	40310 1	40510 1
FILTER 1 BAND	40107 1	40311 1	40511 1
FILTER 1 RESPONSE	40108 1	40312 1	40512 1
FILTER 1 BAND AVERAGE	40109 1	40313 1	40513 1
FILTER 1 MOTION	40110 1	40314 1	40514 1
FILTER 1 MOTION TIMER	40111 **1**	40315 1	40515 1
FILTER 2 LENGTH	40112 1	40316 1	40516 1
FILTER 2 BAND	40113 1	40317 1	40517 1
FILTER 2 RESPONSE	40114 1	40318 1	40518 1
FILTER 2 BAND AVERAGE	40115 1	40319 1	40519 1
SPARE			
SPARE			
SPARE			
SPARE			
SPARE			
SPARE			
OVERLOAD CELL 1	40122 1	40327 2	40527 2
OVERLOAD CELL 2	40123 1	40329 2	40529 2
OVERLOAD CELL 3	40124 1	40331 2	40531 2
OVERLOAD CELL 4	40125 1	40333 2	40533 2

SETPOINT
any pos weight value

FILTER LENGTH
00 = 50ms

01 = 100ms

02 = 200ms

03 = 400ms

04 = 800ms

05 = 1600ms

06 = 3200ms

NOISE BAND
o - 250 counts
le. if counting
by 2 lbs:

02 = 4 fin

RESPONSE BAND
0- 250 counts

BAND FILTER
00 = 0.5 seconds

01 = **1** second

02 = 2 seconds

03 = 4 seconds

04 = 8 seconds

05 = 16 seconds

06 = 32 seconds

OVERLOAD

any pos weight value

Note: counts refers to displayed counts. If the display is counting by 2 (x2 increments), then presetting a register to 9 would equal 18 lb/ph/etc.

Table 7-4 (cont.) Input Status Bit Designations

INPUT STATUS DEFINITIONS (Function, 02)

INPUT 1 - ACTIVE FILTER, (0) = FILTER 1, (1) = FILTER 2	INPUT 17 - SETPOINT 1
INPUT 2 - SPARE	INPUT 18 - SETPOINT 2
INPUT 3-SPARE	INPUT 19 - SETPOINT 3
INPUT 4 - SPARE	INPUT 20- SETPOINT 4
INPUT 5 - SPARE	INPUT 21 - OVERLOAD LIMIT CELL 1
INPUT 6 - DIAG ERROR	INPUT 22 - OVERLOAD LIMIT CELL 2
INPUT 7- LIMIT OVERLOAD	INPUT 23 - OVERLOAD LIMIT CELL 3
INPUT 8 A/D OVERLOAD	INPUT 24 - OVERLOAD LIMIT CELL 4
INPUT 9 – SPARE	INPUT 25 - ND UNDERLOAD CELL 1
INPUT 10- SPARE	INPUT 26- ND OVERLOAD CELL 1
INPUT 11 - POWERUP	INPUT 27- ND UNDERLOAD CELL 2
INPUT 12- SPARE	INPUT 28- ND OVERLOAD CELL 2
INPUT 13- SPARE	INPUT 29- ND UNDERLOAD CELL 3
INPUT 14- SPARE	INPUT 30- AID OVERLOAD CELL 3
INPUT 15- SPARE	INPUT 31 - ND UNDERLOAD CELL 4
INPUT 16- SPARE	INPUT 32 - AID OVERLOAD CELL 4
	INPUT 33 - 48 SPARES

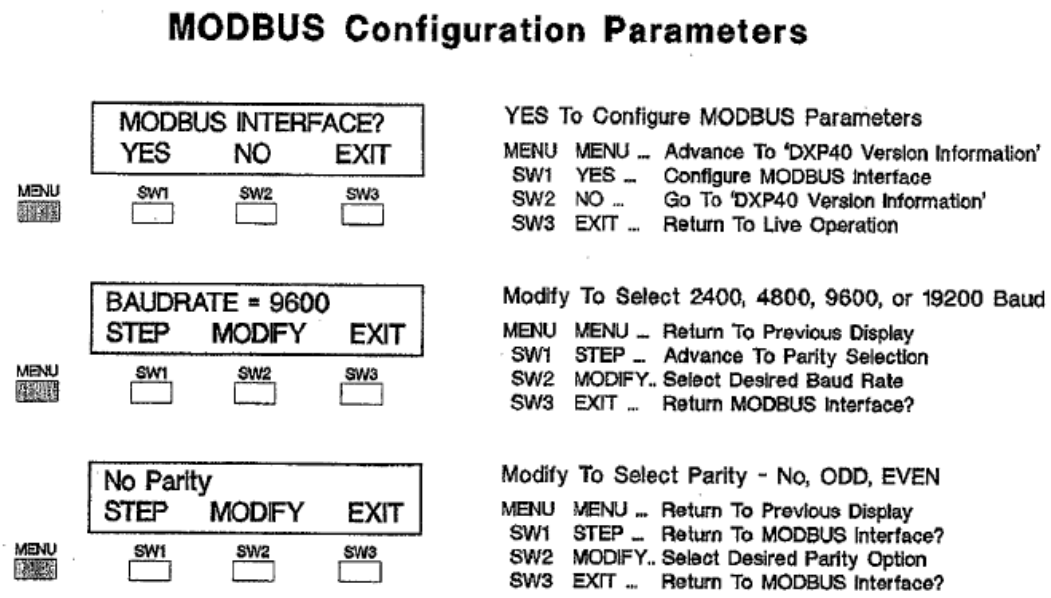


Figure 7-2. MODBUS Baud rate and Parity Selections (accessed from main menu).

7.1.4 Optional Allen Bradley Remote 110

This interface option uses Allen Bradley components in the DXt-40-HTU to establish a remote I/O network communication link to the PLC 5 series of programmable logic controllers. To the PLC, the DXt-40-HTU represents 1/4 rack of discrete I/O with 32 bits of in-put and output image files. All tension and status data uses discrete reads and writes to communicate information to the PLC in the shortest time possible. Non time critical information such as higher level diagnostics relies upon block transfers.

The complete details of this interface are covered in Book-2 of this manual.

SECTION 8. Process Control

8.1 GENERAL

The DXt-40-FITU is available with optional analog outputs and discrete inputs and outputs that allow it to be used as a blind local controller supervised by a host computer (Figure 8-1).

This control strategy off-loads simple control actions to the DXt-40-HTU, thereby reducing processing overhead in the host. It also maximizes response time for more precise set point cutoffs resulting in less tension variation.

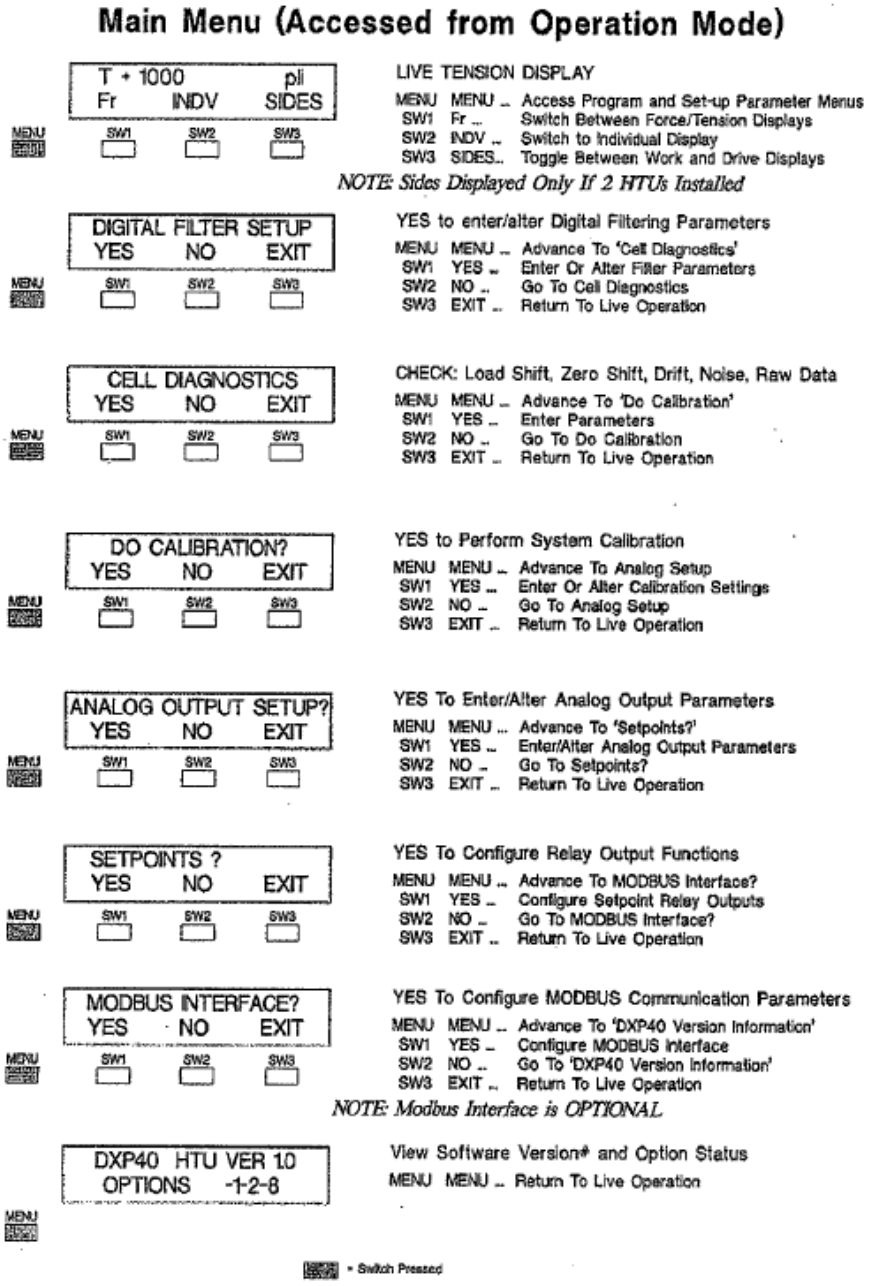


Figure 8-1. Analog and Set Point Selections in Main Menu.

8.2 OPTIONAL ANALOG OUTPUT

The Mt-40+1RJ is available with an optional 0-10 V and 4-20 mA analog output, representing web tension values as calibrated. This output is based upon a 16 bit digital to analog (D-A) conversion which represents up to one part in 65536 of analog precision. The scaling of the output is accomplished after the DXt-40-HTU is calibrated and can be ranged for any portion of the web tension or resultant force curve.

Although this output signal can feed directly to any PLC/DCS device, precise tension control occurs when using this signal as a direct input to a PID motor or clutch drive. Connect a current/volt meter to the appropriate analog output points (see Figure 2-5) and proceed with configuration as shown in Figure 8-2.

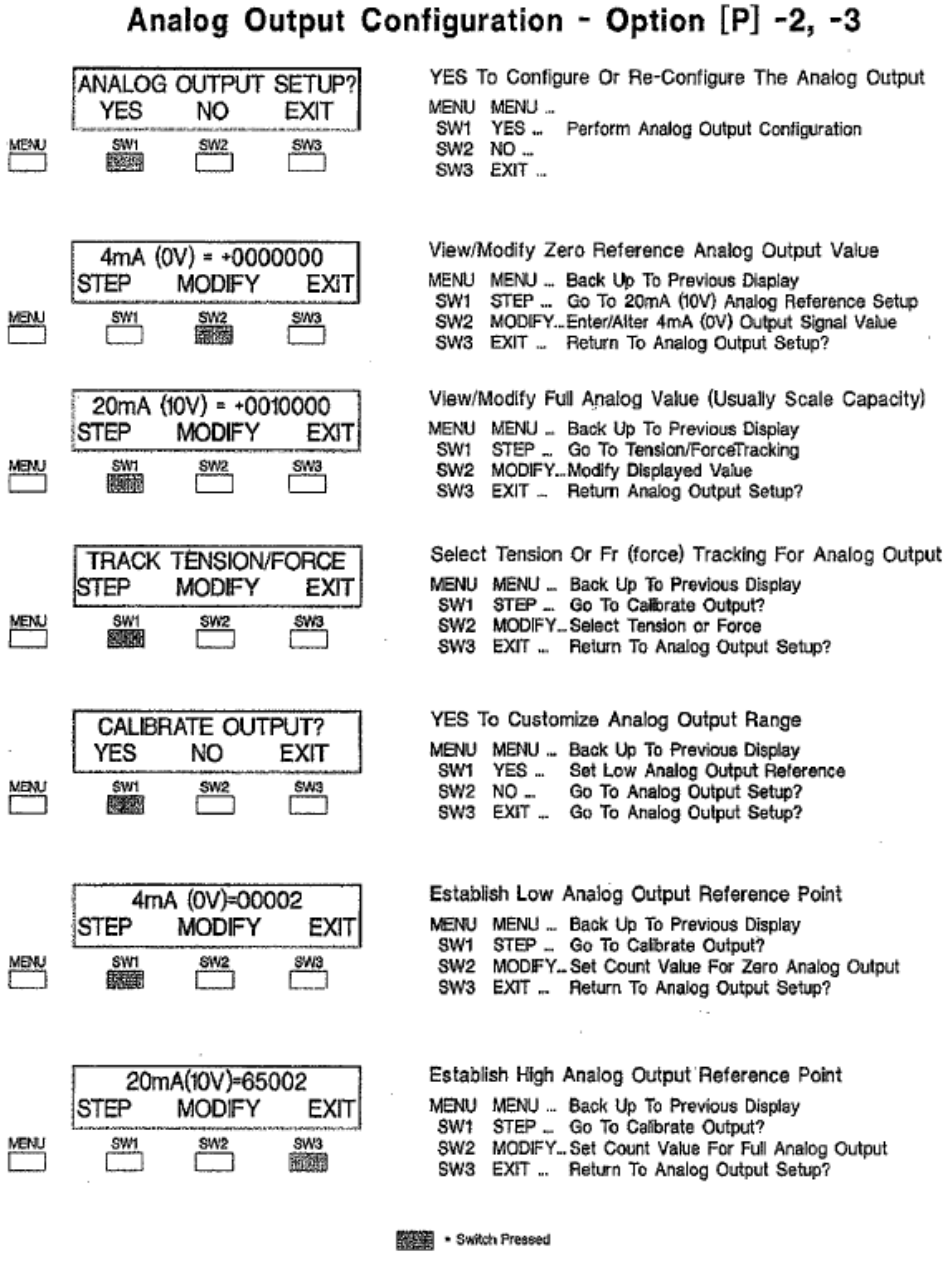


Figure 8-2a. Analog Output Configuration Flow Diagram.

8.2.1 Four Analog Output Option

Process Output option [P]-4 provides four independent analog outputs that track total tension/force, drive tension/force, work tension/force, and differential tension/force (drive minus work). The scaling of the output is accomplished after the DXt-40 is calibrated and can be ranged for any portion of the system tension output curve. Although functions are different, each analog channel (output) follows the same configuration procedure shown in Figure 8-3.

After configuring the first output, simply press STEP in the second block of Figure 8-3 (CAL ANALOG OUTPUT #X) and repeat the process for each subsequent channel.

To begin configuration, connect a current meter to the appropriate analog output points (see Figure 2-5) and proceed with configuration as shown in Figure 8-2.

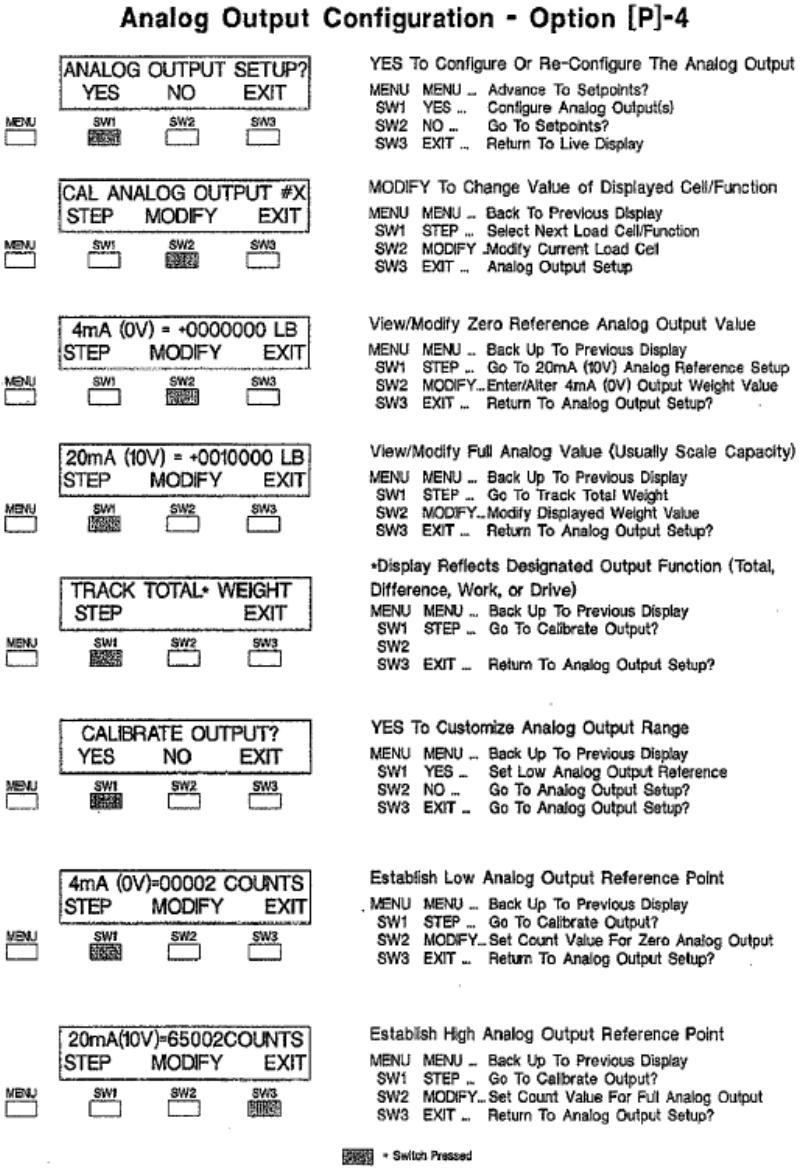


Figure 8-2b. Analog Output Configuration Flow Diagram.

8.3 OPTIONAL DISCRETE INPUTS and OUTPUTS - Option Di -2, -3, -4

8.3.1 Inputs

Remote initiation of a two position digital filter can be accomplished using the optional remote input connections (Figure 8-3). Remote inputs can be triggered by 12-24 VDC input signals (DIAG A - common output rating on many PLCs), open collector TTL devices (DIAG B), or other relays (DIAG C)

Open collector TTL and 12-24 VDC inputs are enabled in the logic low ('0') state. Logic low voltage is less than 5 VDC and current sinking capability must be no less than 3 mA. For a logic high ('1'), the voltage range is 10 to 28 VDC. If TL triggering is desired, open collector components MUST be used.

When using external relays, a closed relay equals '0' when one side of the relay is connected to digital common and the other side is connected to the input. A '1' is achieved by opening the relay.

PLC or DCS batch control systems can be configured to use these remote functions in combination with set point outputs to provide local ingredient add/discharge control.

NOTES:

1. Inputs function as shown in Figure 8-3.

2. Inputs are enabled/disabled in the diagnostic menu

Digital Inputs		
INPUT#	OPEN (1)	CLOSED (0)
Input 1	Tension/Force	Toggle Display
Input 2	——	Unused
Input 3	——	Unused
Input 4	Filter 1	Filter 2

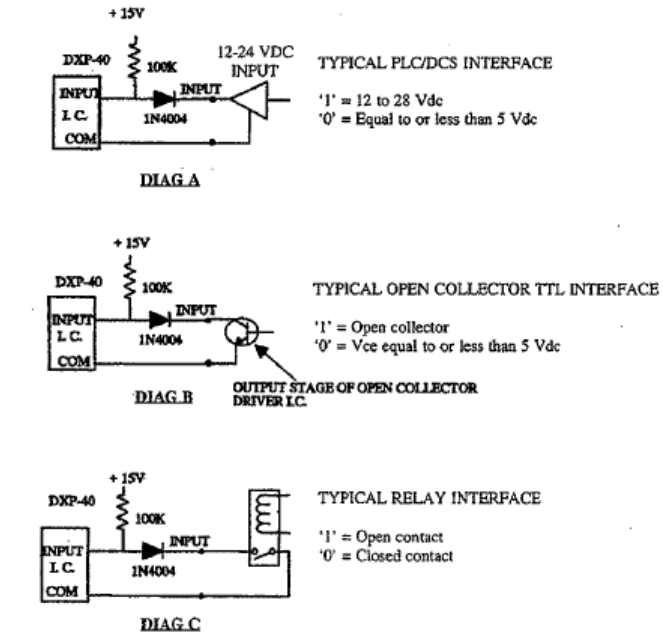


Figure 8-3. Digital Input Functions and Circuitry.

8.3.2 Outputs

Four programmable contact relay outputs are avail-able as set point or diagnostic alarm outputs. In the set point mode, each relay can be programmed to track gross or net operation and to have a deadband to eliminate relay chatter. In addition, the polarity (normally open or normally closed position) of the relay is selectable using jumpers on the relay board (units are shipped in the normally open position). Also, the relay condition above or below set point, or operation and a polarity sensitive mode is selectable. Set point values can be entered via the keypad or remotely through the serial port.

In addition to the use of relays for set point operation, the outputs can be configured to track any of the optional diagnostic functions. This provides a very simple method of communicating

diagnostic alarms to a host computer or operator. Figure 8-4 provides instructions for relay configuration and Figure 8-5 (next page) shows how to enter actual set point values. Tables 8-1 and 8-2 (next page) show set point polarity and hysteresis capability.

NOTE: With option [P]-4, a single relay output (SET-POINTS? in main menu) can be configured as a set point, tracking total tension/force, or simply as an alarm annunciator for the entire system. As an annunciator, any error condition encountered, whether single cell related or system malfunction, activates this output.

NOTE: NC/NO (normally closed/normally open) se-lection not available with solid state relays.

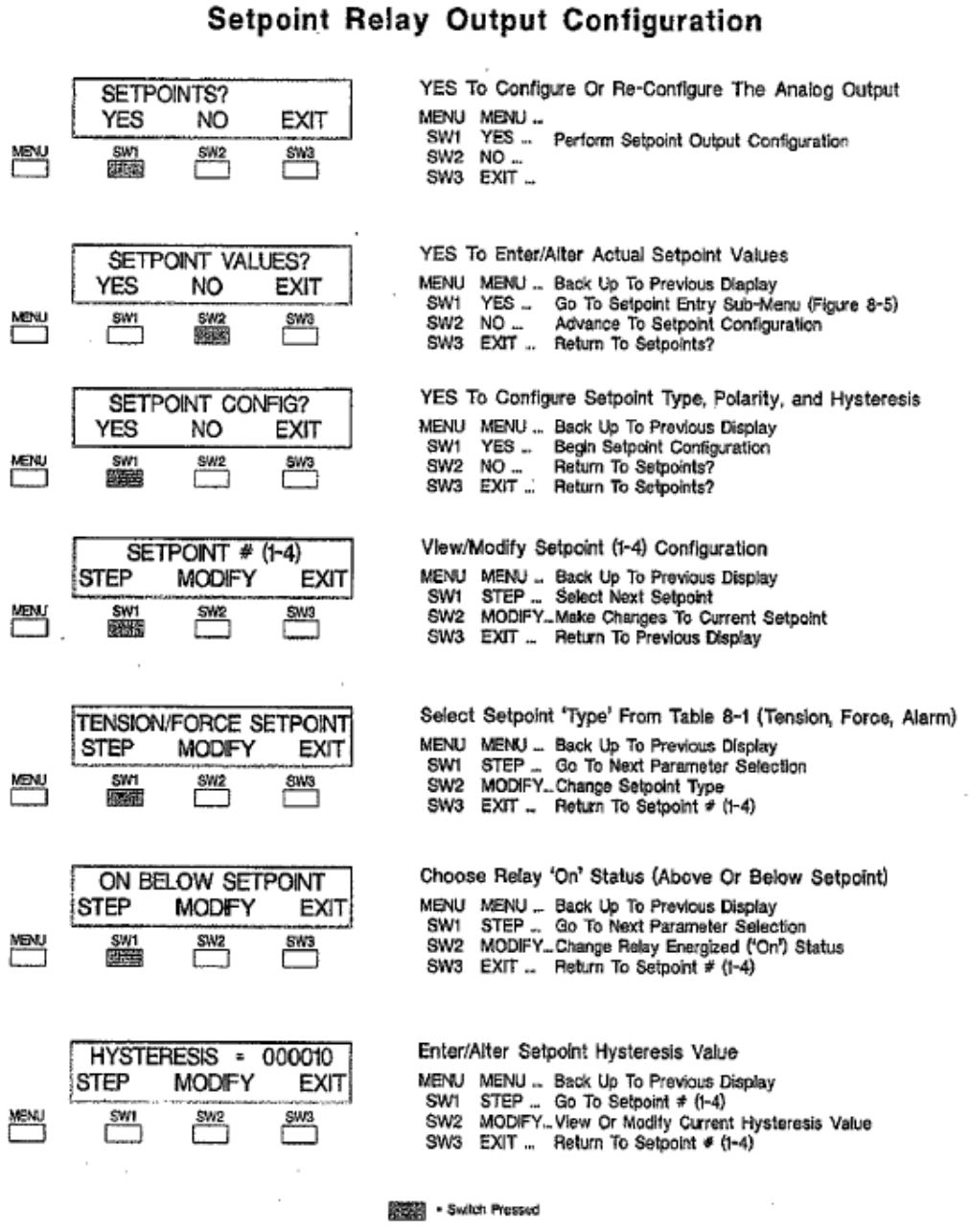


Figure 8-4. Relay Output Configuration.

Setpoint Entry Sub-Menu

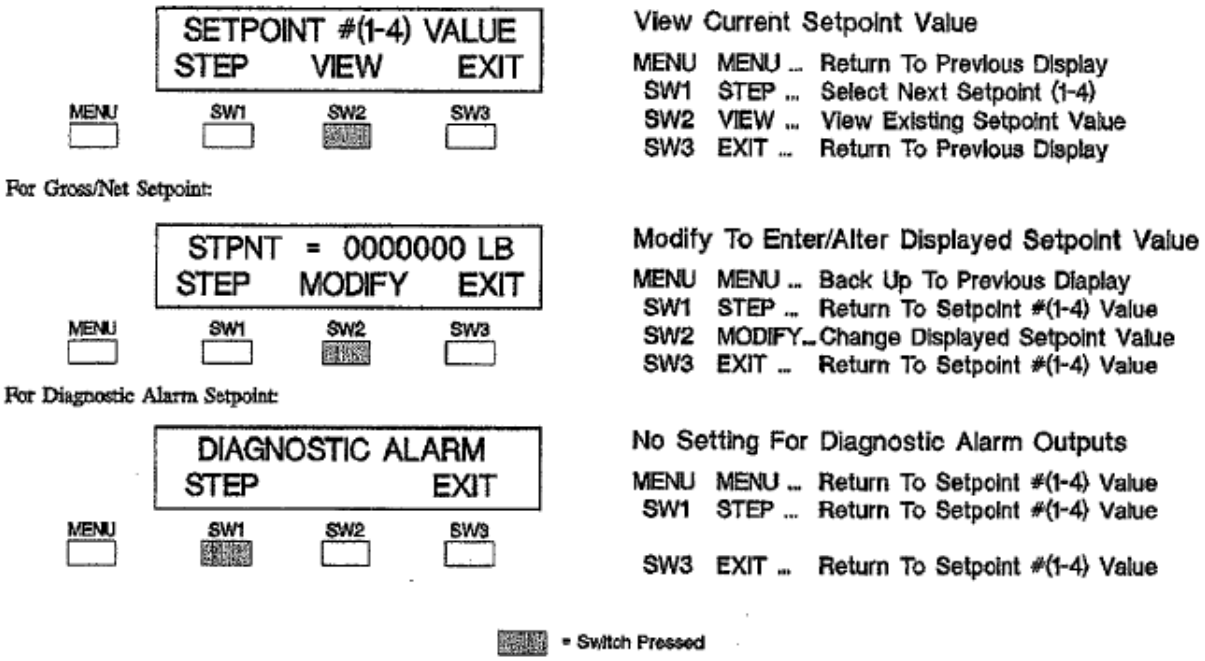


Figure 8-5. Set Point Value Entry Sub-Menu.

Table 8-1. Relay Output Selections and Parameters

Selectable Set Point Types And Respective Parameters		
Set Point Type	Programmable Parameters	
Tension Set Point	On Below Or Above	Hysteresis
Force Set Point	Hysteresis	
Diagnostic Alarm		

Table 8-2. Relay Output Polarity Selections

Set Point Type	**Relay Energized**	**Hysteresis Active**
Tension On Below Set Point	Below Set Point	Below Set Point
Tension On Above Set	Above Set Point	Above Set Point
Fr Set Point (ABS Value)	Below Set Point	Below Set Point
Diagnostic Alarm	If Diagnostic Error	None

Book-2

The Allen-Bradley

Remote I/O Interface

ENABLED™
BY ALLEN-BRADLEY TECHNOLOGY

Precision Force and Weight Measurement Technologies

SECTION 9. Introduction

This manual describes an Allen-Bradley Remote I/0 (R10) communication link between a BLH DXt-40 Web Tension Transmitter and an Allen-Bradley PLC-5 (Figure 1-1). This interface method uses technologies licensed by BLH from Allen-Bradley. Functionally this digital communication method provides a simple method of transferring web tension data, status, and diagnostic information as well as the retrieval and download of filter and other set-up parameters. Refer to BOOK I for DXt-40-HTU operating procedures and parameter definitions.

9.1 RIO OVERVIEW

The Allen-Bradley Remote I/O (R10) interface is a communications 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 DXt-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 web tension data and status information uses discrete reads and writes to communicate system information to the PLC in the shortest time possible. Block transfers are used to upload and download non-time critical information such as diagnostic, status, and individual load cell data.

NOTE: Transfer data differs according to mode selection

9.2 HE DM-40-HTU WEB TENSION TRANSMITTER

The DXt-40-1-ITU is a high performance web tension transmitter with features that make it suitable for all tension measurement applications. Allen-Bradley PLC-5. The transmitter includes individual analog to digital con-version channels for up to four load cells, microprocessor based electronics to digitize the load cell signals, and a serial RS-485 or Allen-Bradley Remote I/O communication port. For field mount applications, standard units are housed in a NEMA 4 epoxy painted steel enclosure.

Optionally the DXt-40-HTU is available with on-line diagnostics, digital calibration, and Dynamic Digital Filtering. Units also are available with Factory Mutual Approval for installation in a Class I, II, Ill, Division 2 hazardous locations.

Set-up and calibration procedures are accomplished using a series of internal switches and the internal display. In operation, it provides up to three million counts of web tension resolution at an update rate of 50 milliseconds.

9.3 ALLEN-BRADLEY PLC-5 PROGRAMMABLE CONTROLLER

The Allen Bradley PLC-5 series of mid-size programmable controllers are used as part of distributed process automation architecture. A variety of 1771 series racks and1/0 modules are available for local or remote discrete and analog process control. The PLC-5 can digitally • communicate to other devices using a conventional RS 232 or 423 serial port in addition to special interface ports such as Data Highway Plus, Scanner Communications, and Remote1/0 Adapter.

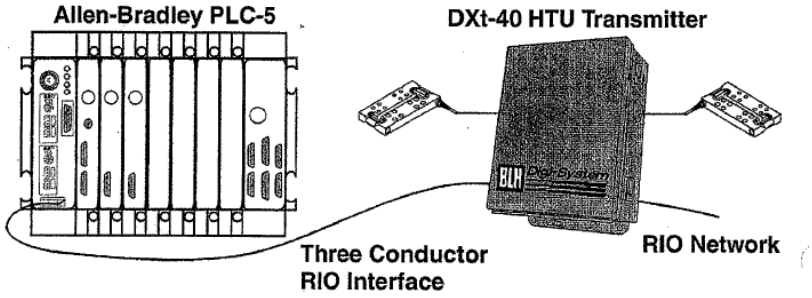


Figure 1-1. Allen-Bradley Remote I/O Network Interface.

SECTION 10. The Remote I/O Interface

10.1 OPERATIONAL OVERVIEW

The Allen-Bradley Remote I/O (RIO) interface is standard on many PLC-2, 3, and 5 series programmable logic controllers. The technology used in the interface and licensed by Allen-Bradley to BLH enables the DXt-40 HTU transmitter to communicate tension information to the PLC as if it were a 1/4 rack of discrete I/O. By using the standard RIO interface port and representing tension data as simple discrete I/O, a low cost reliable communication link between the PLC and system is established. Standard PLC ladder logic instructions convert binary data to an integer or floating point tension value without special software drivers and scan delays that occur when data block transfers are used. The DXt-40 HTU also communicates status information, diagnostics, and calibration data to the PLC.

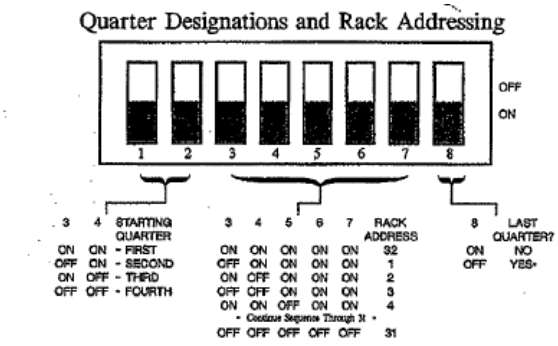
CONFIGURATIONS:

- One Quarter Rack. The DXt-40 is configured to act as 1/4 rack of I/O using 2 input words and 2 output words in the PLC's I/O image table. DXt-40 addressing supports racks 1-8 only. Four DXt-40's constitute 1 full rack, each using a different starting quarter.
- Discrete Transfer Tension data and operating status information transmitted through discrete transfer using the PLC's Remote I/O image table.
- Block Transfer Block data transfers are initiated by the PLC ladder logic program to obtain more in depth status, diagnostic, and individual load cell data.
- Word Integrity Is Ensured. The DXt-40 will always transmit both input image table words intact. To ensure word integrity on the PLC side, immediate writes to the output image table should be written low word first.

10.2 HARDWARE CONFIGURATIONS

Rack address and starting quarter designations are all configured using a row of DIP switches in the DXt-40 (Figure 10-1). The DXt-40 is able to be addressed up to rack number 32. Whenever the DIP switch settings are changed, the unit must be reset to allow the processor to read the new switch settings.

RIO interface baud rate selections are available through the DXt-40 main menu (Figure 10-2). Recommended cable lengths are presented in Figure 10-1.



Cable Lengths, Terminations, and Maximum # Of DXp-40s

BAUD RATE	MAXIMUM CABLE LENGTH	TERMINATION FOR LAST DXP ON CABLE	MAXIMUM DXPs PER SCANNER
57.6K	10,000 FEET	150 OHMS	16
115.2K	5,000 FEET	150 OHMS	16
230.4K	2,500 FEET	82 OHMS	32

Figure 10-1. RIO Communication DIP Switch Settings.

Main Menu (Accessed from Operation Mode)

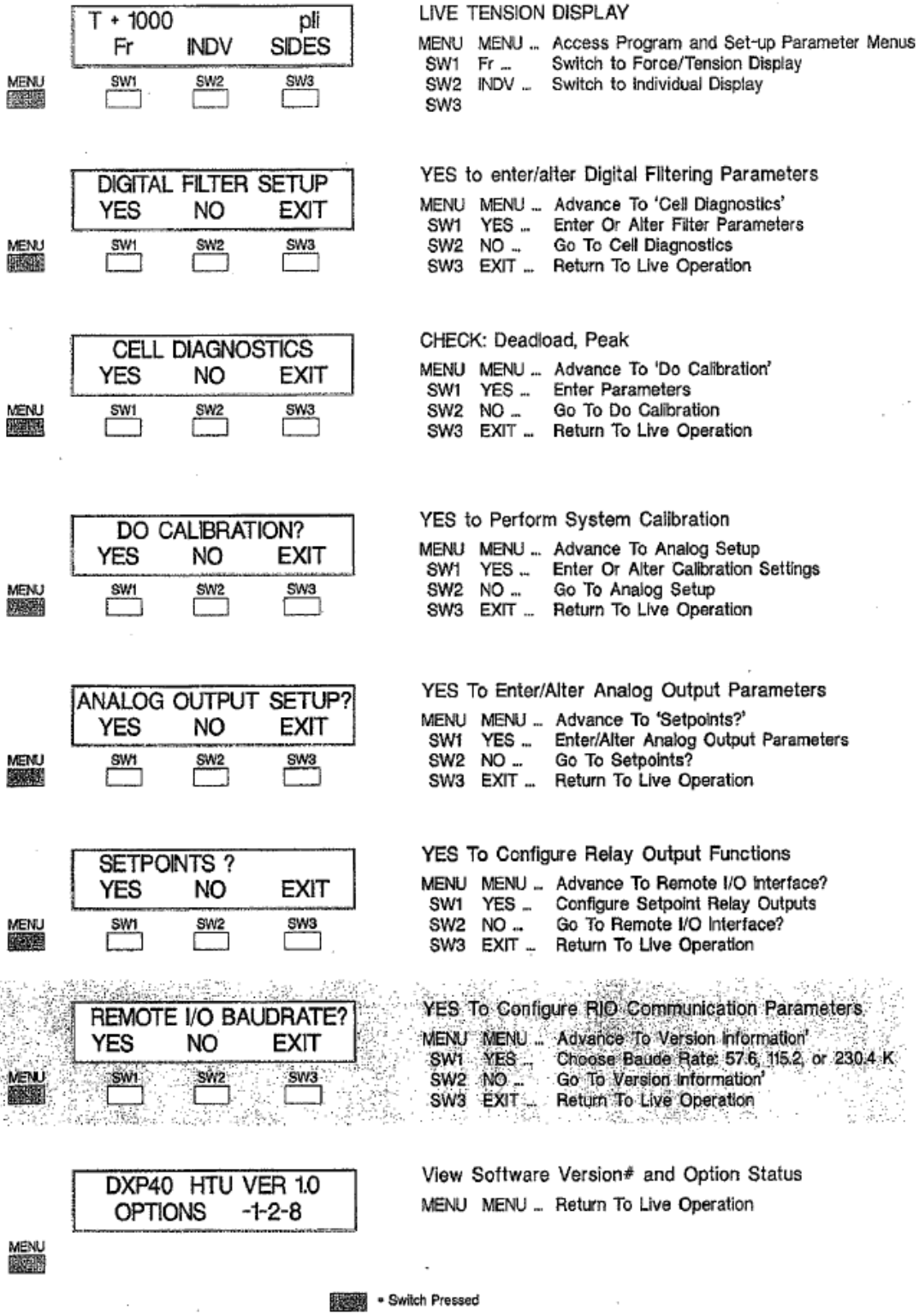


Figure 10-2. Revised DXt-40 Main Menu w/Baud Rate Selection.

10.3 DISCRETE DATA TRANSFER

10.3.1 Output Image Table

The PLC-5 initiates the communication interface by transmitting two words from the output image table (Figure 10-3). The first word is regarded as a 'spare' by the DXt-40 HTU.

The second word contains the commands that the PLC-5 expects the DXt-40 to perform. Word 2 controls set points, fitter selection, filter operation, and DXt-40 operating mode status.

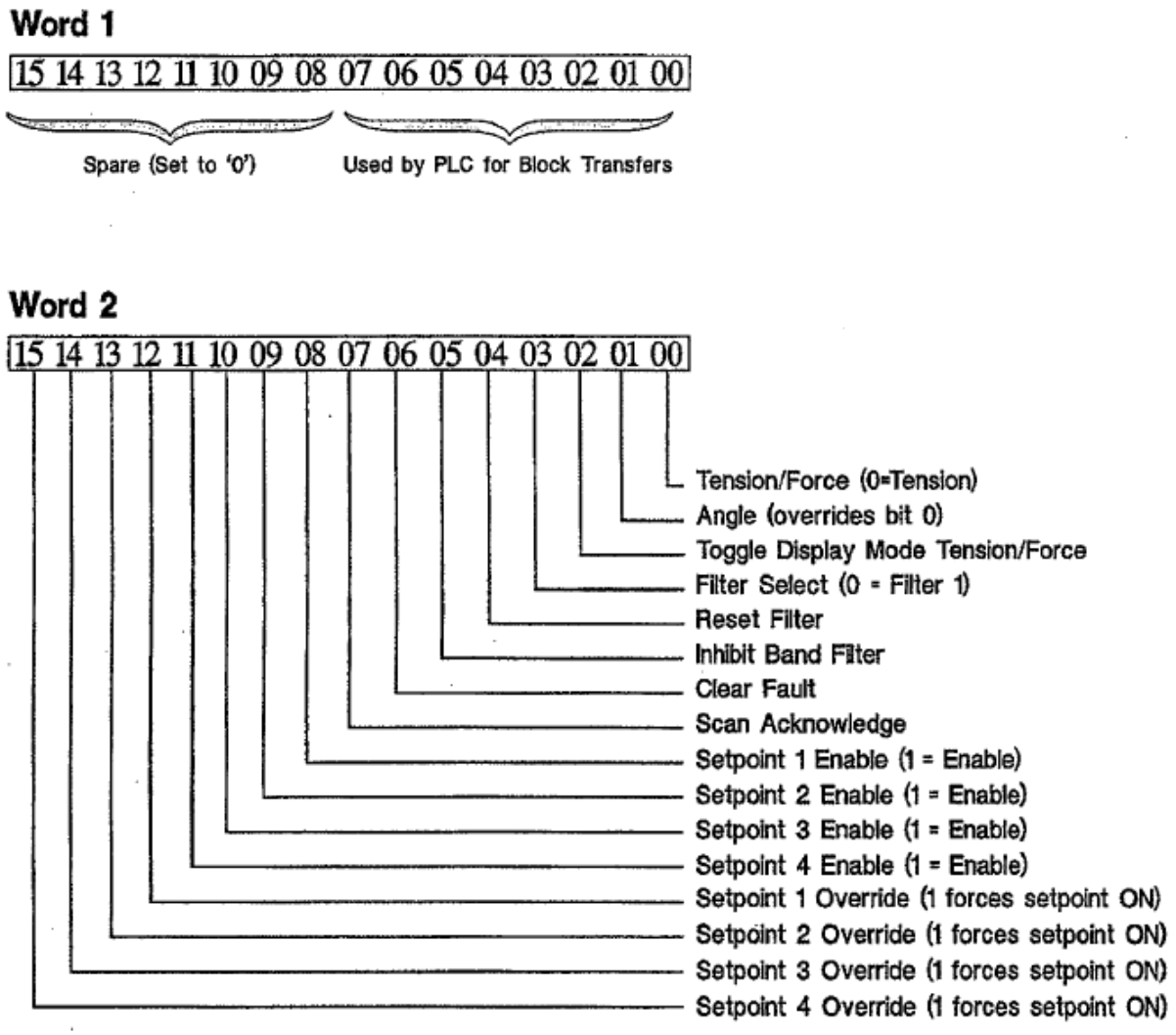


Figure 10-3. The Output Image Table.

10.3.2 Input Image Table

After evaluating the contents of the output image table, the DXt-40 responds by transmitting two words to the input image table (Figure 10-4).

The first word contains signed integer weight data. The second word contains the upper order data bits, system status, error condition, and set point status information.

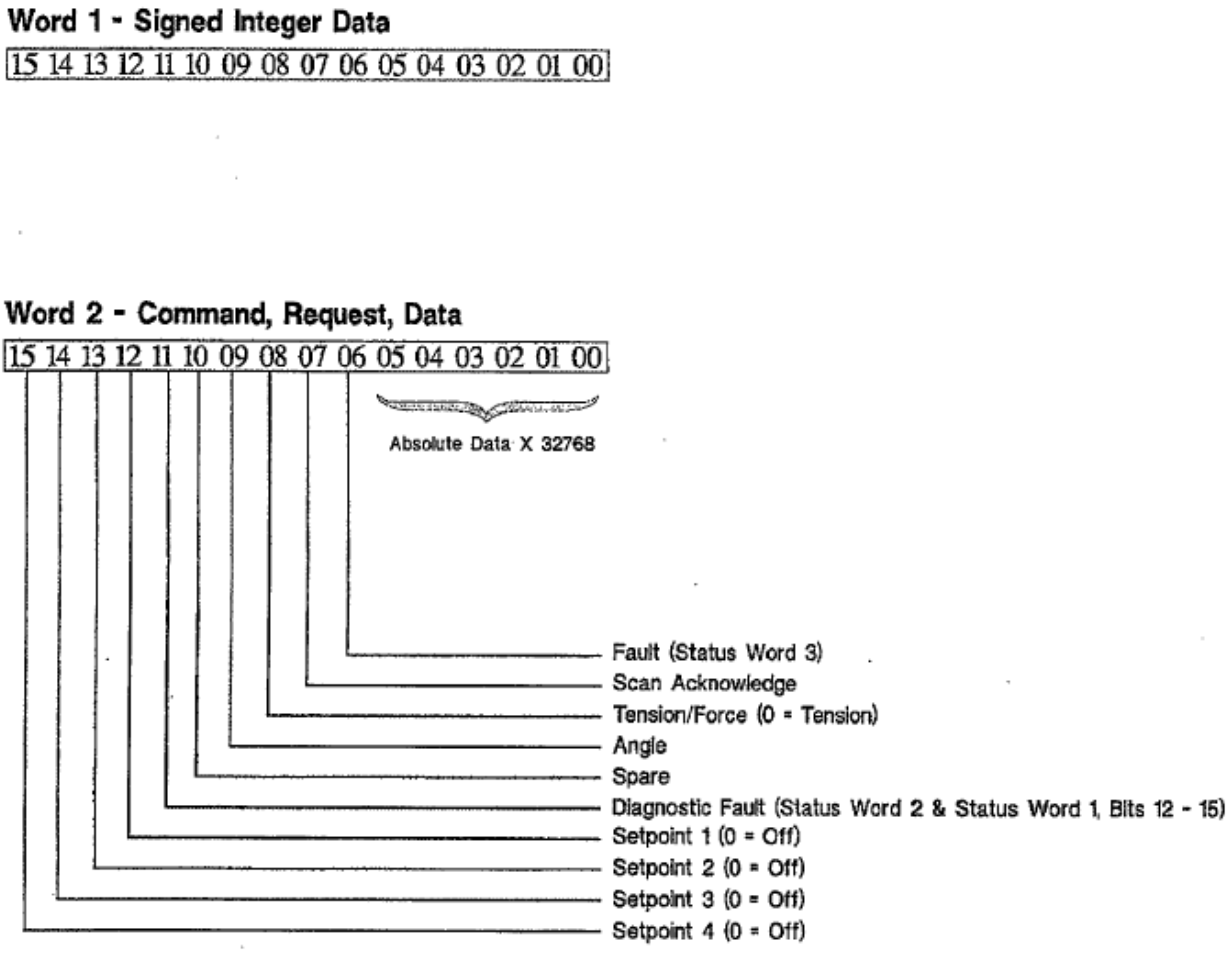


Figure 10-4. The Input Image Table.

10.4 BLOCK DATA TRANSFERS

10.4.1 Interface Basics

Block data transfers are initiated by the ladder logic program write (BTW) and read (BTR) commands. The transfer sequence begins when the PLC sends the DXt-40 a one word (16 bit integer) write command containing a register location pointer. This pointer is the 16 bit integer value of the first register the PLC wishes to read (factory default upon shipment is register 1).

Table 10-1 presents all available single and double word register locations. After establishing the starting register location, the PLC then transmits a read transfer block command telling the DXt-40 how many words of information are needed.

10.4.2 Block Transfer Reads (BTRs)

Once the register location pointer value is established, the PLC logic program must issue a block transfer read command to obtain DXt-40 information. A BTR can request up to 64 words of DXt-40 information (see Table 10-1). The DXt-40 will respond to the BTR by transmitting the number of words requested, starting at the pointer location. NOTE: The first word transmitted by the DXt-40 will be the register pointer value. The DXt-40 adds this word at the beginning of the transmission to 'echo' the pointer value prior to transmitting requested data. Therefore, the SIR command MUST add 1 to the number of words requested. If the PLC needs four words of DXt information, the BTR request must be for five words (Figure 10-5).

10.4.3 Block Transfer Writes (BTWs)

Some of the DXt-40 registers may be written to by the PLC (indicated by an '*' in Table 10-1). This allows parameters such as filter, set point, and diagnostic values to be down loaded on-the-fly by the PLC ladder logic program. When writing to the DXt-40, the first word must be the register location pointer. Therefore, the program MUST always add 1 to the BTW command length (Figure 10-6). For example, to change a set point value, the BTW length must equal 2 with the first word being the set point register location pointer and the second word being the new set point value. Parameter guidelines for writing data to the DXt-40 are presented in Table 10-2.

10.4.4 A Perpetual Pointer

One advantage to DXt-40 block transfers is that the register pointer is retained in DXt-40 EEPROM. When a write block selects (points to) a register location, that location may be accessed (read) repeatedly without having to re-write the register location word. Of course the register pointer can be changed as often as needed, but the last written location will always be remembered, even during power down. This feature saves a lot of BTWs when the PLC is monitoring a particular register or block of registers over a period of time.

10.4.5 Fault Evaluation

Three status words, register locations 1, 2, and 3, provide detailed explanations of error conditions en-countered by the DXt. When a fault is detected, either bit 6 (fault) or bit 11 (diagnostic fault) in word 2 of the input image table is set to a '1' to alert the PLC of an error condition. The PLC must then perform a BTR of the appropriate status register to evaluate and correct the error. If bit six (fault) is set, check status word 3 for the error explanation. If bit 11 (diagnostic fault) is active, check status word 2 and status word 1 bits 12 - 15 for the error explanation. Table 10-3 gives the status word bit definitions.

10.4.6 Remote Filter Configuration

DXt-40 transmitters equipped with the optional Dynamic Digital Filter can be instructed by the PLC to change filter settings on-the-fly. This unique feature allows optimal, pre-determined filtering parameters to be implemented at critical moments during system operation. Changing filter parameters throughout the process ensures data stability and maximum system response to actual tension changes. Filter parameters are stored at register locations 59-70 (Table 10-1). Table 10-2 defines the filter parameters that can be written to these registers in the DXt-40.

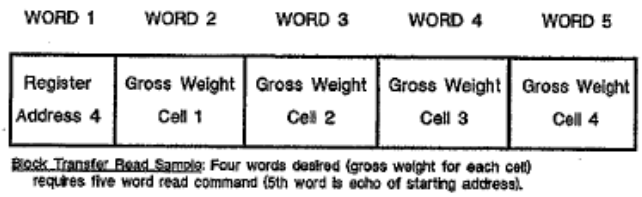


Figure 10-5. Block Transfer Read (I3TR) Sample.

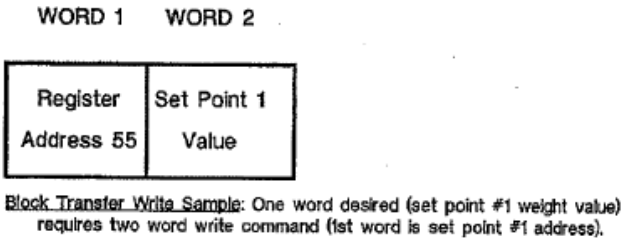


Figure 10-6. Block Transfer Write (BTW) Sample.

Table 10-1. Single & Double Word Register Pointer Locations

Single Word Registers		Double Word Registers	
01	STATUS 3	100	SPARE
02	SPARE	102	SELECTION 1 (see output image table)
03	STATUS 1	104	SELECTION 2 (see output image table)
04	SELECTION 1 (see output image table)	106	SELECTION 3 (see output image table)
05	SELECTION 2 (see output image table)	108	SELECTION 4 (see output image table)
06	SELECTION 3 (see output image table)	110	SPARE
07	SELECTION 4 (see output image table)	112	INDV TOTAL CELL 1
08	INDV TOTAL CELL 1	114	1NDV TOTAL CELL 2
09	1NDV TOTAL CELL 2	116	INDV TOTAL CELL 3
10	INDV TOTAL CELL 3	118	1NDV TOTAL CELL 4
11	INDY TOTAL CELL 4	120	MV/V CELL 1
12	MV/V/10 CELL 1	122	MV/V CELL 2
13	MV/V/10 CELL 2	124	MV/V CELL 3
14	MV/V/10 CELL 3	126	MV/V CELL 4
15	MV/V/10 CELL 4	128	PEAK TOTAL (MODE A ONLY)
16	% LOAD DRIVE (MODE A ONLY)	130	PEAK CELL 1
17	% LOAD WORK (MODE A ONLY)	132	PEAK CELL 2
18	SPARE (MODE A ONLY)	134	PEAK CELL 3
19	SPARE (MODE A ONLY)	136	PEAK CELL 4
20	PEAK TOTAL CELLS 1-4 (MODE A	138	SPARE
21	PEAK CELL 1	140	SPARE
22	PEAK CELL 2	142	SPARE
23	PEAK CELL 3	144	SPARE
24	PEAK CELL 4	146	SPARE
25	SPARE	148	SPARE
26	SPARE	150	SPARE
27	SPARE	152	SPARE
28	SPARE	154	SPARE
29	SPARE	156	SPARE
30	SPARE	158	SPARE
31	SPARE	160	SPARE
32	SPARE	162	SPARE
33	SPARE	164	SPARE
34	SPARE	166	OVERLOAD CELL 1
35	SPARE	168	OVERLOAD CELL 2
36	SPARE	170	OVERLOAD CELL 3
37	SPARE	172	OVERLOAD CELL 4
38	SPARE		
39	SPARE		
40	SPARE		
41	SPARE		
42	SPARE		
43	SPARE		
44	SPARE		
	SPARE		
46	SPARE		
47	SPARE		
48	SPARE		
49	SPARE		
50	SPARE		
51	SPARE		
52	SPARE		
53	SPARE		
	SPARE		
55*	SETPOINT I (Option)		
56*	SETPOINT 2 (Option)		
57*	SETPOINT 3 (Option)		
58*	SETPOINT 4 (Option)		
59*	FILTER I LENGTH		
60*	FILTER 1 MOTION BAND		
61*	FILTER 1 MOTION TIMER		
62*	FILTER 2 LENGTH		
63*	FILTER 2 MOTION BAND		
64*	FILTER 2 MOTION TIMER		
65*	FILTER 3 LENGTH		
66*	FILTER 3 MOTION BAND		
67*	FILTER 3 MOTION TIMER		
68*	FILTER 4 LENGTH		
69*	FILTER 4 MOTION BAND		
70*	FILTER 4 MOTION TIMER		
71*	SPARE		
72*	SPARE		
73*	SPARE		
74*	SPARE		

* Word(s) can be written to by PLC I•

1).Single word register integer data = -32768 to +32767

2). Double word integer data must be converted to floating point using the following equation:

((word2) x 32768.0) ÷ word1

range = -9,999,999 to 9,999,999

75* **OVERLOAD CELL 1**
76* **OVERLOAD CELL 2**
77* **OVERLOAD CELL 3**
78* **OVERLOAD CELL 4**

Table 10-2. Block Transfer Write Parameters.

Set Point Entries
0 to 9,999,999

Filter Parameter Entries

Filter Length	Band Averaging	Motion	Motion Timer
00 = 50 ms	00 = 2	00 = OFF	00 = 1/2 sec
01 = 100 ms	01 = 4	01 = 1 count	01 = 1 sec
02 = 200 ms	02 = 8	02 = 2 counts	02 = 2 sec
03 = 400 ms	03 = 16	03 = 3 counts	03 = 3 sec
04 = 800 ms	04 = 32	04 = 5 counts	
05 = 1600 ms	05 = 64	05 = 10 counts	
06 = 3200 ms	06 = 128	06 = 20 counts	
07 = 6400 ms	07 = 256	07 = 50 counts	

Band Filter
0 to 250 counts

Filter Response
0 to 250 counts

Overload
0 to 9,999,999

* Counts refers to displayed counts. If displayed weight is counting by 2 lb increments, then a selection of nine counts will equal 18 lb.

NOTE: Refer to BOOK 1 for DXt-40-FITU parameter definitions.

Table 10-3. Status Word Bit Definitions

STATUS 1 (GENERAL STATUS)	
BIT 0	SPARE
BIT 1	SPARE
BIT 2	SPARE
BIT 3	SPARE
BIT 4	SPARE
BIT 5	IN CAL
BIT 6	SPARE
BIT 7	SPARE
BIT 8	INPUT 1
BIT 9	INPUT 2
BIT 10	INPUT 3
BIT 11	INPUT 4
BIT 12	OVERLOAD LIMIT CELL 1
BIT 13	OVERLOAD LIMIT CELL 2
BIT 14	OVERLOAD LIMIT CELL 3
BIT 15	OVERLOAD LIMIT CELL 4
STATUS 2 Not Used - SPARE	
STATUS 3 (FAULTS)	
BIT 0	POWERUP
BIT 1	EEPROM CODE ERROR - DEFAULT DATA OVERLOAD
BIT 2	EEPROM READ ERROR
BIT 3	EEPROM WRITE ERROR
BIT 4	SPARE
BIT 5	SPARE
BIT- 6	SPARE
BIT 7	SPARE
BIT 8	ND UNDERLOAD[1] CELL 1
BIT 9	AID OVERLOAD[2] CELL 1
BIT 10	ND UNDERLOAD CELL 2
BIT 11	ND OVERLOAD CELL 2
BIT 12	AID UNDERLOAD CELL 3
BIT 13	ND OVERLOAD CELL 3
BIT 14	*ND* UNDERLOAD CELL 4
BIT 16	ND OVERLOAD CELL 4

1 Underload = input signal too low
2 Overload = input signal too high

SECTION 11. Definitions and Explanations

11.1 INPUT IMAGE TABLE BITS

A table is provided to explain the Input Image Table presented in Figure 10-4. Table 11-1 defines the bit structure of both input words.

Table 11-1. Input Image Table Word 'Bit' Definitions

Word 1 BITS 0 - 15 DATA (signed integer, -32768 to +32767)
Signed integer.

Word 2

BITS 0- 5 ABSOLUTE OVERFLOW DATA x 32768
Word 2 bits 0-5 is absolute overflow data from word 1 used if absolute tension data is greater than 32,767. These 5 bits are combined with the word 1 integer in a floating point register by the following steps.

1. Do a Masked move of Word 2 bits 0 - 5 to an integer register.
2. Multiply the integer register by 32768.0 and put the result in a floating point register.
3. Negate the floating point result if the word 1 integer is negative.
4. Add the word 1 integer to the floating point result.

BIT 6 FAULT
Is set If there is a fault causing tension data to be incorrect. This bit is cleared or suppressed by setting the clear fault bit in word 2 of the output image table.

BIT 7 SCAN ACKNOWLEDGE
This bit is a copy of *the* same bit in the output image table. When the DXt-40 receives the output image table data it copies this bit to the same location in the input image table. The plc can thus know if the remote I/O DXt-40 has received the last write to the output image table.

BIT 8 T/F, TENSION/FORCE DATA ID
If this bit = 0 the data in word 1 and bits 0-5 of word 2 is tension data. If this bit = '1 the data is force data.

BIT 9 ANGLE DATA ID.
If this bit =1, then bit 8 is superceded and the data in word 1 and bits 0-5 of word 2 is angle data.

BIT 10 SPARE

BIT 11 DIAGNOSTIC FAULT
Is set if any of the diagnostic fault bits are set in the status #1 register bits 12 -15 or status #2 register bits 0-15. These status registers are accessible through a block transfer read.

BIT 12 SETPOINT #1
Is set If setpoint #1 output is on. If word 2 bit 8 of the output image table = 1 the setpoint #1 output is controlled by the DXt-40. If word 2 bit 8 of the output image table = 0 the setpoint #1 output Is controlled by word 2 bit 12 of the output image table.

BIT 13 SETPOINT #2
Is set If setpoint #2 output is on. If word 2 bit 9 of the output Image table = 1 the setpoint #2 output is controlled by the DXt-40. If word 2 bit 9 of the output image table = 0 the setpolnt #2 output is controlled by word 2 bit 13 of the output image table.

BIT 14 SETPOINT #3
Is set if setpoint #3 output is on. If word 2 bit 10 of the output Image table = 1 the setpoint #3 output is controlled by the DXt-40. If word 2 bit 10 of the output image table - 0 the setpoint #3 output is controlled by word 2 bit 14 of the output Image table.

BIT 15 SETPOINT #4
Is set if setpoint #4 output is on. If word 2 bit 11 of the output Image table = 1 the setpoint #4 output is controlled by the DXt-40. If word 2 bit 11 of the output image table = 0 the setpoint #4 output Is controlled by word 2 bit 15 of the output image table.

11.2 OUTPUT IMAGE TABLE BITS

Table 11-2 shows the structure and bit definition of each Output Image Table word. Reference Figure 10-3 to view word breakouts.

Table 11-2. Output Image Table Word/Bit Definitions

Word 1 Unused

Word 2
BIT 0 TENSION/FORCE (0 = TENSION)

Used for requesting tension or force data. I f= 0, tension data will be returned to the input image table. If= 1, force data will be retumed.

BIT 1 ANGLE
If this bit changes from 0 to 1, then bit 0 is superceded and the data returned is angle data.

BIT 2 TOGGLE DISPLAY
If this bit changes from 0 to 1, the DXt display changes from tension to force or vise-versa

BIT 3 FILTER SELECT (0 = FILTER 1, 1 = FILTER 2)
This bit is 'or'ed with the discrete filter select input as shown in the following table: INIPUT BIT 3 FILTER SELECT SELECTED

FILTER 1	0	FILTER 1
FILTER 1	1	FILTER 2
FILTER 2	0	FILTER 2
FILTER 2	1	FILTER 2

BIT 4 RESET FILTER
If this bit changes from 0 to 1 the DXt-40 ofill reset or restart the filter using data from the current aid conversion. This may be helpful in overcoming time lags caused by heavy averaging.

BIT 5 INHIBIT BAND FILTER
When this bit is set to 1 the band filter is Inhibited. Set to 1 for a minimum of 50 milliseconds and then reset to 0 resets the band filter. If the band is wide, and heavy averaging is applied this will quicken the response to small signal changes which fall within the band width. When the band filter is reset quick centering algorithms will rapidly find the center of a noisy input signal.

BIT 6 CLEAR FAULT
Setting this bit will clear all fault bits in status register 3 except for eeprom faults. Eeprom faults require the DXt-40 to be reset. If the a/d overfunderrange faults persist the corresponding fault flags will be set again when this bit returns to 0.

BIT 7 SCAN ACKNOWLEDGE
This bit is set or reset by the plc to achieve data transfer synchronization between the plc's program scan and the remote I/O scan. When the DXt-40 receives the output image table data it copies this bit to the same location in the input image table. The plc can thus know if the remote ifo DXt-40 has received the last write to the output image table.

BIT 8 SETPOINT #1 ENABLE (I =ENABLE)
Setting this bit to 1 enables the DXt-40 setpoint #1 output to be controlled by the DXt-40. If reset to 0 the setpoint #1 output is controlled by BIT 12.

BIT 9 SETPOINT #2 ENABLE (1 = ENABLE)
Setting this bit to 1 enables the DXt-40 setpoint #2 output to be controlled by the DXt-40. If reset to 0 the setpoint #2 output is controlled by BIT 13.

BIT 10 SETPOINT #3 ENABLE (1 = ENABLE)
Setting this bit to 1 enables the DXt-40 setpoint #3 output to be controlled by the DXt-40. If reset to 0 the setpoint #3 output is controlled by BIT 14.

BIT I I SETPOINT #*4* ENABLE (1 = ENABLE)
Setting this bit to 1 enables the DXt-40 setpoint #4 output to be controlled by the DXt-40. If reset to 0 the setpoint #4 output is controlled by BIT 15.

BIT 12 SETPOINT #1 OVERRIDE
If BIT 8 = 0 the state of this bit controls the setpoint #1 output. A 1 turns on the setpoint #1 output.

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