INSTRUCTION MANUAL

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850A47-1
January 1997
SECTION 1 - INTRODUCTION

The Digitrac is a microprocessor based, PI or PID selectable control, designed for precise closed loop tension control of a moving web. All data and calibration is done through the touch pad keyboard or through RS232 or RS422 serial I/O ports. The Digitrac is capable of controlling rewinds, unwinds or a variety of point to point control applications. Standard features include:

* Touch pad keyboard for input of data and calibration
* Serial I/O input and output
* Selectable analog outputs
* Pulse or voltage inputs for diameter and web speed
* Taper tension
* Manual or automatic operation
* Storage for up to six complete set-ups
* Digital and analog display of actual tension simultaneously
* Soft starts and stops
* Adjustable hold levels
* Capable of copying set-ups
* English or metric units

All set up and operation information is provided on a 32 character alpha numeric display with over 70 screens of on-line help. Set-up and calibration information is stored in a non-volatile RAM.

SECTION 2 - INSTALLATION

Mount the enclosure in a protected area with a temperature range of 0-50°C, (32-122°F). All external electrical connections should be made through conduit or through sealing type cord connectors to prevent contamination of the low level circuits on the printed circuit board, which could reduce system accuracy. Inside the enclosure, route any excess AC power leads as far as possible from the circuit board, front panel ribbon cable and all sensor leads.

SECTION 3 - ELECTRICAL CONNECTIONS

All user connections are made on the TB1, TB2, and TB3 terminal blocks. The terminal block connectors can be unplugged from the DIGITRAC printed circuit board by sliding them away from the board. See Figure 5.

3.1 CONNECTIONS YOU MUST MAKE

You must make the following connections in order to have a workable DIGITRAC system.

AC Power Supply  See Step 1 below
RUN/STOP        See Step 2 below
Tension Sensors  See Step 3 below
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Output to clutch, brake, motor controller, etc.

90VDC for magnetic particle clutch or brake See Step 4 and 5 below
or
Other Outputs See Step 4 and OUT+ and OUT- below

**STEP 1**

3.1.1 **TB1 Electrical Connections (AC Power Supply)**

The following terminals are configured by setting switch SW1. Be sure that the position of SW1 matches the a.c. supply voltage being used.

Install filter board into TB1.

TB1-1 - This terminal is not used.

AC L1 - Set SW1 to match the voltage on the two a.c. lines being used to supply the DIGITRAC. Then connect one of the two a.c. lines to this terminal.

AC L2 - Connect the remaining a.c. line to this terminal.

Ground Conductor - Connect this wire to the ground stud as shown in Figure 3 or 4.

**STEP 2** (Use shielded cable for all control wiring)

3.1.2 **TB2 Electrical Connections (E-STOP, RUN/STOP)**

The following input terminals are configured by jumpers JP7 and JP8. These jumpers should be set prior to using these terminals. See section 5 "Setting Jumpers" in this manual.

E-STOP A jump wire is connected from this terminal to GND at the factory. With the factory setting of JP7 and JP8 (see Section 5 "Setting Jumpers" in this manual), this jump wire completes the Emergency STOP circuit. An Emergency STOP is initiated when this circuit is broken. A switching device can be connected in place of this jump wire so that the circuit can be broken from a remote location. The switching device can be mechanical (such as a pushbutton) or solid
state (such as a transistor). In its normal state the device should hold E-STOP at the logically low voltage. When actuated, it should allow E-STOP to go to the logically high voltage for at least 1/4 second. The device should be capable of handling approximately 10 milliamps of direct current.

**RUN/STOP**
A switching device which operates in conjunction with the system RUN/STOP switch is connected to this terminal to signal the DIGITRAC when the system has been started or stopped. The switching device can be mechanical (such as an "ON/OFF" switch) or solid state (such as a transistor). The device should be capable of handling approximately 10 milliamps of direct current.

**STEP 3**

**Tension Sensor Input Ranges**
The printed circuit board is configured at the factory for the 0-21 millivolt range and no modifications are needed when using a MAGPOWR tension sensor.

**0-500 Millivolt Range**
Cut jumper wires JP10 and JP11 to set the sensor input range for 0-500 millivolts D.C.

**0-10 Volt Range**
Cut jumper wires JP9, JP10, JP11, and JP12 to set the sensor input range for 0-10 volts D.C.

**3.1.3 TB2 Electrical Connections (Tension Sensor Connections)**
The following four terminals are used to connect the tension sensing device to the DIGITRAC.

**WHITE**
Connect the WHITE sensor lead to this terminal. This terminal is the higher potential connection for the low voltage signal from the web tension sensor.

**BLACK**
Connect the BLACK sensor lead to this terminal. This terminal is the lower potential connection for the low voltage signal from the tension sensor.

**GREEN**
Connect the GREEN sensor lead to this terminal. This terminal is the lower potential connection for the 10VDC power signal to the web tension sensor.

**RED**
Connect the RED sensor lead to this terminal. This terminal is the higher potential connection for the 10VDC power signal to the web tension sensor.
STEP 4

NOTE: If 90VDC Power Supply printed circuit board (3B117-1) is to be used, then the following three steps must be completed before installing this board.

1. Set jumper JP2 on the main Digitrac printed circuit board for 0 TO +10VDC output. Terminals 3 to 10 and 6 to 7 (See Section 5 "Setting Jumpers" in this manual)
2. AC electrical lines connected at 1,2 and 3 of TB1 (See step 1 Electrical Connections AC Power Supply) must be 115 VAC.
3. Set SW1 on main Digitrac circuit board to 115 VAC setting.
   Proceed to Section 3.1.5

3.1.4 Analog Outputs (Use shielded cable for all control wiring)

The following two terminals are configured by jumper JP2. The jumper should be set prior to using these terminals. See Section 5 "Setting Jumpers" in this manual.

OUT- This terminal is the lower potential connection of the two OUTput terminals. If the OUTput terminals are configured for voltage then this terminal will be at the same potential as the DIGITRAC's analog common. If the OUT terminals are configured for current then this terminal will source current at a rate proportional to the present output.

OUT+ This terminal is the higher potential connection of the two OUTput terminals. If the OUTput terminals are configured for voltage (by setting JP2), this terminal will be driven to a voltage proportional to the present output and relative to analog common. The voltage range is set by JP2. If the OUTput terminals are configured for current (by setting JP2), this terminal will serve as the current sink for OUT-. 
3.1.5 Installation of 90VDC Power Supply Printed Circuit Board

NOTE: FOR USE ON 115 VAC SYSTEMS ONLY. 230 VAC WILL DESTROY THIS BOARD.

Install the four nylon mounting pins into the main Digitrac circuit board (See figure 1 on page 43).

Position the 3B117-1 90VDC Power Supply printed circuit board over the four mounting pins aligned with the four mounting holes in the 90VDC Power Supply circuit board. Push the four mounting pins securely into the 90VDC Power Supply board securing both boards together.

Connect the ribbon cable assembly between J1 of 90VDC power supply board and P2 of main Digitrac circuit board.

Connect the two wire cable assembly between J2 of 90VDC power supply board and J1 of main Digitrac circuit board.

STEP 5 (90VDC PCB only)

3.1.6 TB1 Electrical Connections on 90VDC Power Supply

The following two terminals are configured by J3 on the 90VDC Power Supply Circuit Board. These jumper selections are shown on the following page:

1. OUT- This terminal is the lower potential connection of the two OUTput terminals.
2. OUT+ This terminal is the higher potential connection of the two OUTput terminals.
J3 Jumper  This Jumper is located on the 90VDC Power Supply
Printed Circuit Board

MAGPOWR
Clutch/Brake Family

1/8 AMP
C-1
B-5
B-50
HDB-1

1/4 AMP
C-3
C-10
B-25
HDB-10
HDB-3

1/2 AMP
C-50
C-100
CCC
CCB
HDB-50
HDB-100

1 AMP
3.2 OPTIONS AND THEIR CONNECTIONS

The following options and connections may be made to enhance performance, if desired.

INERTIA COMPENSATION and TAPER TENSION

Inertia compensation is available on both unwinds and rewinds to more accurately control the tension while stopping. Linear taper tension can be used on rewinds to make the tension decrease as the rewind roll gets bigger. No further connections are needed to use either or both of these features. However, both features will be more accurate if a DIAMETER INPUT TYPE of "VOLTAGE" or "PULSE" is selected.

DIAMeter IN  
(See INERTIA COMP and  
TAPER TENSION above.)  See Section 3.2.1 next page. If the diameter input type is "PULSE", then you must also have a WEB SPEED sensor.

WEB SPEED  
(See DIAMeterIN above)  See Section 3.2.1 next page

TENsion OFF  
(for remote tension on/off)  See Section 3.2.1 next page

E-STOP (Emergency Stop)  See Section 3.1.2

RUN/STOP, TENsion OFF,  
and E-STOP inputs may  See GND/OPTO in Section 3.2.1  
be opto-isolated  next page

SERIAL I/O  A serial interface is available  
as a factory option. See Section 4
3.2.1 TB2 Optional Electrical Connections (Customer Option)  
(Use shielded cable for all control wiring)

The following input terminals are configured by jumpers JP7 and JP8.  
The jumpers should be set prior to using these terminals. See Section 5  
"Setting Jumpers" in this manual.

TENS. OFF A switching device can be connected to this terminal to  
allow tension to be turned off or on at a location other  
than the DIGITRAC front panel. The switching device can be  
mechanical (such as a push button) or solid state (such as a  
transistor). When actuated, it should hold TENS. OFF at the  
logical low state for at least 1/4 second. The device  
should be capable of handling approximately 10 milliamps of  
direct current.

GND/OPTO This terminal can have one of two functions. The function  
it has depends on the settings of JP7 and JP8. With one  
setting of JP7 and JP8 (the factory setting) it is used as a  
GrouND return for the switching devices connected to  
E-STOP, and RUN/STOP. With the other setting of JP7  
and JP8, it is used as a means of supplying the  
OPTO-couplers on board the DIGITRAC with an external supply  
to electrically isolate the switching devices connected to  
E-STOP, and RUN/STOP from the DIGITRAC's circuitry. See  
Section 5 "Setting Jumpers" in this manual.

GND This terminal can be used as a GrouND return for the device  
providing the signal to the WEB SPEED terminal.

WEB SPEED If a WEB SPEED sensor is used, its output signal is  
connected to this terminal. This terminal must be  
configured as an analog input or a digital input by setting  

+5V This terminal can be used as a +5Volt supply for the  
device providing the signal to the WEB SPEED terminal.  
The maximum load current at this terminal should be no  
more than 200 milliamps (100 milliamps with backlit display).
TENS. OUT This terminal will have a zero to five volt signal which is directly proportional to tension. Zero volts corresponds to zero tension and five volts corresponds to the maximum tension. Maximum tension is the value entered by the user when the screen "MAXIMUM TENSION?" is displayed by the DIGITRAC.

GND This terminal serves as a Ground reference for TENS. OUT and a Ground return for DIAM. IN.

DIAM. IN If a diameter sensor is used, DIAMeter INput should be configured by setting JP5 to accommodate the sensor's signal type, (voltage or pulsed). The diameter sensor signal is then connected to this terminal.
SECTION 4 - SERIAL I/O OPTION

The DIGITRAC can be ordered from the factory with serial I/O connection capabilities. The connections required are RS232 or RS422. These connections are the same for a complete DIGITRAC with the serial I/O option or for a printed circuit board level only DIGITRAC with serial I/O option. Use shielded cable for all control wiring.

4.1 SETTING UP THE REMOTE TERMINAL

Before beginning to set up your remote terminal refer to your remote terminal User's Manual for information on setting the following options. This is a general list and options 4 and 5 may not apply to all remote terminals.

1) Set the baud rate for the remote terminal to be 4800 BAUD.
2) Configure the remote terminal for 8 data bits, 1 start bit, 1 stop bit, and no parity bits.

3) Set the terminal for FULL DUPLEX operation.

4) If the remote terminal allows, set the LINE FEED AUTO option to OFF.

5) If the remote terminal allows, set the SCROLLing option to ON.

4.2 TB3 Serial I/O Connections

The following terminals serve as connections for serial communications between the DIGITRAC and other devices. They are configured by setting JP6. See Section 5 "Setting Jumpers" in this manual.

RS422 IN These two terminals serve as the connection point for two lines on which RS-422 like serial information is to be received by the DIGITRAC.

RS422 OUT These two terminals serve as the connection point for two lines on which RS-422 like serial information is to be transmitted by the DIGITRAC.

RS232 IN This terminal serves as a connection point for the line on which RS-232 like serial information is to be received by the DIGITRAC.

RS232 OUT This terminal serves as a connection point for the line on which RS-232 like serial information is to be transmitted by the DIGITRAC.

GND This terminal serves as a Ground reference for RS232 IN and RS232 OUT.
4.3 REMOTE TERMINAL COMMANDS

The table shown below lists the remote terminal keys that perform DIGITRAC functions. Some DIGITRAC functions require two or more keys to be pressed in sequence on the remote terminal. The number keys and the decimal point are used for data entry. The DIGITRAC accepts both upper and lower case letters. This function table may be displayed on the remote terminal at any time by pressing the help key "H".

<table>
<thead>
<tr>
<th>DIGITRAC FUNCTION</th>
<th>TERMINAL KEY(S)</th>
<th>DIGITRAC FUNCTION</th>
<th>TERMINAL KEY(S)</th>
</tr>
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<tbody>
<tr>
<td>AUTO</td>
<td>A</td>
<td>TENSION SET/ACT</td>
<td>T</td>
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<tr>
<td>MANUAL</td>
<td>M</td>
<td>TENSION ON/OFF</td>
<td>O</td>
</tr>
<tr>
<td>CLEAR ENTRY</td>
<td>C</td>
<td>SETUP 1</td>
<td>S1</td>
</tr>
<tr>
<td>ENTER</td>
<td>RETURN</td>
<td>SETUP 2</td>
<td>S2</td>
</tr>
<tr>
<td>REFRESH SCREEN</td>
<td>R</td>
<td>SETUP 3</td>
<td>S3</td>
</tr>
<tr>
<td>ITEM NUMBER</td>
<td>I</td>
<td>SETUP 4</td>
<td>S4</td>
</tr>
<tr>
<td>NEXT ITEM</td>
<td>N</td>
<td>SETUP 5</td>
<td>S5</td>
</tr>
<tr>
<td>PRIOR ITEM</td>
<td>P</td>
<td>SETUP 6</td>
<td>S6</td>
</tr>
<tr>
<td>PROGRAM</td>
<td>SPG</td>
<td>SPEC 1</td>
<td>SP1</td>
</tr>
<tr>
<td>DIAMETER</td>
<td>D</td>
<td>SPEC 2</td>
<td>SP2</td>
</tr>
<tr>
<td>UP ARROW</td>
<td>+</td>
<td>SPEC 3</td>
<td>SP3</td>
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<tr>
<td>DOWN ARROW</td>
<td>-</td>
<td>HELP</td>
<td>H</td>
</tr>
</tbody>
</table>

The help key "H" also displays a list of DIGITRAC item numbers on the remote terminal for use in selecting item numbers.

<table>
<thead>
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<th>DIGITRAC ITEM NUMBERS</th>
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<td>BAUD RATE 13</td>
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<tr>
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<td>DIA AT WEIGHT 37</td>
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<td>ERROR LIMIT 19</td>
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<td>FULL ROLL DIA 12</td>
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<td>HOLD LEVEL 26</td>
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<tr>
<td>START TIME 48</td>
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<td>MAXIMUM TENSION 16</td>
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<td>SAMPLE TIME 31</td>
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4.4 REMOTE TERMINAL

SETTING THE DIGITRAC FOR REMOTE TERMINAL OPERATION

The last two items in the PROGRAM CONFIGURATION loop determine the baud rate of the serial interface and tell the DIGITRAC the type of terminal connected to the serial interface.
4.4.1 SETTING BAUD RATE

DIGITRAC WITH FRONT PANEL KEYBOARD

The SELECT BAUD RATE screen selects the serial interface communication rate from five standard baud rates, 300, 600, 1200, 2400, and 4800. Use the up and down arrow keys to choose a baud rate. The remote terminal connected to the serial interface must have the same baud rate setting as the DIGITRAC for proper communication.

DIGITRAC WITHOUT FRONT PANEL KEYBOARD

The BAUD RATE defaults to 4800 baud on power up. The remote terminal connected to the serial interface must be set to 4800 baud for proper communication.

4.4.2 SELECTING REMOTE TERMINAL TYPE

The DIGITRAC supports the following terminal types:

1) Standard Dumb Terminal (with non-destructive carriage return)
2) Standard ANSI Terminal
3) Generic "TTY" Terminal
4) AT&T Model 513 Terminal
5) Data General Models D210 and D211 Terminals
6) Datapoint Datastation 3601 Terminal
7) DEC VT52, VT100, VT102, and VT220 Terminals
8) ADDS Viewpoint Terminal

If another remote terminal is used, configure the DIGITRAC TERMINAL TYPE to be either DUMB or ANSI. The dumb terminal mode uses only ASCII characters and does not recognize or send any ESCAPE or CONTROL character sequences. The ANSI terminal mode recognizes and sends the standard ANSI ESCAPE character sequences. Choose the terminal type which works best with the remote terminal you are using.
SECTION 5 - SETTING JUMPERS

JP1  This jump block setting is not adjustable by the user.

JP2  This jump block carries two jumpers. There are four usable positions for the uppermost jumper and two usable positions for the lower most jumper. The figure below illustrates these positions and the configurations imposed by each position.

Note: Any setting of these jumpers not specifically shown is invalid.

1 TO 5 VDC OUTPUT

-10 TO +10 VDC OUTPUT

0 TO +10 VDC

4 TO 20 ma OUTPUT
JP3  This jumpblock has only one jumper with two possible positions. In the left most position, jumping pins 1 and 2, the DIGITRAC is configured to accept a pulsed web speed input. In the right most position, jumping 2-3, the DIGITRAC is configured to accept a voltage web speed input.

JP4  This jumpblock has one jumper with two positions. In the leftmost position, jumping pins 1 and 2, the DIGITRAC's analog input range is 0 to +10 volts with respect to Ground. In the rightmost position, jumping 2-3, the analog input range is -5 to +5 volts with respect to Ground.
JP5 All valid settings of this jumpblock are shown below.

121110 9 8 7
JP5  DIA.  AUX. 1/0
1 2 3 4 5 6

AUXiliary INPUT CONFIGURED TO DIFFERENTIAL ANALOG
DIAmeter INPUT SET TO ANALOG

121110 9 8 7
JP5  DIA.  AUX. 1/0
1 2 3 4 5 6

AUXiliary INPUTS CONFIGURED TO DIFFERENTIAL ANALOG
DIAmeter INPUT SET TO PULSED

121110 9 8 7
JP5  DIA.  AUX. 1/0
1 2 3 4 5 6

AUX 1 IS ANALOG INPUT
AUX 2 IS GND
DIAmeter INPUT SET TO PULSED

121110 9 8 7
JP5  DIA.  AUX. 1/0
1 2 3 4 5 6

AUX 1 IS ANALOG INPUT
AUX 2 IS GND
DIAmeter INPUT SET TO VOLTAGE

121110 9 8 7
JP5  DIA.  AUX. 1/0
1 2 3 4 5 6

AUX 1 IS ANALOG OUTPUT 0 TO +5 V
AUX 2 IS GND
DIAmeter INPUT IS VOLTAGE

121110 9 8 7
JP5  DIA.  AUX. 1/0
1 2 3 4 5 6

AUX 1 IS ANALOG OUTPUT 0 TO +5 V
AUX 2 IS GND
DIAmeter INPUT IS PULSED

121110 9 8 7
JP5  DIA.  AUX. 1/0
1 2 3 4 5 6

AUX 1 IS PULSED DIGITAL INPUT 0 TO +5 V
AUX 2 IS GND
DIAmeter INPUT IS VOLTAGE
JP6 This jumpblock has one jumper with two possible positions. In the leftmost position, jumping pins 1 and 2, the DIGITRAC is configured to accept its serial input from the RS422 IN terminals of TB3. In the rightmost position, jumping 2-3, the DIGITRAC is configured to accept its serial input from the RS232 IN terminals of TB3.

1 2 3
JP6 SERIAL IN RS 422 IN
1 2 3
JP6 SERIAL IN RS 232 IN

JP7/8 The settings of JP7 and JP8 determine the type of coupling used to interpret the switching signals applied to the terminals TENS, OFF, E-STOP, and RUN/STOP of TB2. If JP7 and JP8 are set in their leftmost positions, each jumping their respective pins 1 and 2, then the terminal GND/OPTO will be configured to OPTO(-coupler common). In this configuration the factory installed wire between the E-STOP and GND/OPTO terminals should be removed and the user’s +5 volt d.c. supply should be connected to the GND/OPTO terminal of the DIGITRAC. Then, in order to actuate TENS. OFF, E-STOP, or RUN/STOP, the user’s switching devices need only pull these terminals to 5 volts below his +5 volt supply or 0 volts, i.e. user ground. The net effect of this configuration is to reduce the possibility of erroneous signals by isolating the switching devices from DIGITRAC’s GrouND.

1 2 3
REMOTE GND.
JP7
1 2 3
SWITCH COUPLING

If JP7 and JP8 are set in their rightmost positions, each jumping their respective pins 2 and 3, the terminal GND/OPTO will be configured to GrouND. In this configuration the user’s switching devices need only connect TENS. OFF, E-STOP, or RUN/STOP to the terminal GND/OPTO to actuate these terminals.

1 2 3
DIGITRAC GND
JP7
1 2 3
JP8
SWITCH COUPLING

Note that JP7 always has exactly the same jumper position as JP8. No other combination is valid.
SECTION 6 - BASIC CALIBRATION

6.1 MAKING IT GO (BASIC CALIBRATION)

Before the system RUN switch is pressed the first time the DIGITRAC will need some basic information. Some of the information is given to the DIGITRAC before it is turned on by setting its jumpers. See Section 5 "SETTING JUMPERS" in this manual. The remaining information is given to the DIGITRAC after it is turned on by pressing keys on its keypad.

Since the DIGITRAC has not yet been given any system information the first screen to appear when the power switch is turned on will be

"1
OFF
TENSION:
XXXX LBS".

The "1" shows that the DIGITRAC will be storing information into and retrieving information from setup "1". The "OFF" shows that the DIGITRAC is not controlling tension and that its output is zero or "OFF". The word "TENSION:" indicates that the data being displayed where the X's are is what the DIGITRAC has calculated to be the present tension. The "LBS" is an abbreviation and indicates that the data being displayed is in units of pounds of force.

NOTE: Shift key is white and when pressed it shifts the operation of the next key pressed to the function in white.

The remaining basic information the DIGITRAC will need to control tension is given to the DIGITRAC through the keypad. If the "SHIFT" key is pressed and then the "PROG" key the DIGITRAC will display the screen

"PROGRAM:
CALIBRATE".

This display indicates that the DIGITRAC is ready to receive system information. If either the "NEXT ITEM" or the "ENTER" key is pressed the DIGITRAC will display the screen

"CALIBRATE
BASIC".

6.2 SYSTEM TYPE

If either the "NEXT ITEM" or the "ENTER" key is pressed, the DIGITRAC will proceed to the first of ten screens which prompt for basic system information. The first screen is

"SELECT SYSTEM:
UNWIND".
There are eight possible selections for the type of system being controlled.

"UNWIND" A system in which a controlled amount of back torque is applied to an unwinding roll to maintain tension in the material being unwound.

"REWIND" A system in which a controlled amount of forward torque is applied to a winding roll to maintain tension in the material being wound.

"TYPE 1" A system in which a controlled amount of torque is applied to a set of pinch rollers immediately following an unwinding roll to maintain a tension in the material following the pinch rollers which is greater than the tension in the material following the unwinding roll.

"TYPE 2" A system in which a controlled amount of torque is applied to a set of pinch rollers immediately following an unwinding roll to maintain a tension in the material following the pinch rollers which is less than the tension in the material following the unwinding roll.

"TYPE 3" A system in which a controlled amount of torque is applied to a set of pinch rollers located between two sets of driven rollers. The controller's function is to maintain a required tension in the material following the first set
of driven rollers. The tension in the material following the control rollers is greater than the required tension in the material following the first set of driven rollers.

"TYPE 4" This system is similar to TYPE 3 except that the tension in the material following the control rollers is less than the tension in the material following the first set of driven rollers.

"TYPE 5" A system in which a controlled amount of torque is applied to a set of pinch rollers located between another set of pinch rollers and a winding roll. The controller's function is to maintain a required tension in the material feeding into the control rollers. The tension in the material following the control rollers is greater than the required tension in the material feeding into the control rollers.
"TYPE 6" This system is similar to TYPE 5 except that the tension in the material following the control rollers is less than the required tension in the material feeding into the control rollers.

If the system type is not "UNWIND" the up or down arrow keys can be used to select another type. When the appropriate type is showing on screen, pressing NEXT ITEM or ENTER will tell the DIGITRAC to remember that type and to show the next screen, which starts the sensor calibration.

6.3 SENSOR CALIBRATION

"UNLOAD SENSING ROLL <ENTER>".

When the above screen is showing and the NEXT ITEM or the ENTER key is pressed the DIGITRAC will attempt to calibrate its tension sensor input to zero. This will effectively cancel the weight of the sensing roll so that the display reads "0.0" with zero tension. This process will take approximately 10 seconds. The following screen

"WAIT 10 SEC . . ."

will be displayed. If the input signal is not within range the DIGITRAC will display

"EXCESSIVE ROLL WEIGHT <ENTER>".

If this screen appears pressing ENTER will cause the DIGITRAC to return to the "UNLOAD SENSING ROLL" screen.

If the input signal is within range the DIGITRAC will prompt for the next piece of information

"CALIBRATION TENSION: XXXX LB ".

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The value entered here should represent the amount of weight applied to the sensing roll during the automatic calibration step below. If an incorrect digit is pressed simply press the "CLEAR ENTRY" key and re-enter the value. Pressing NEXT ITEM will save the value entered and display

"MAXIMUM TENSION?
XXXX LB ".

The upper limit on tension is entered by pressing the appropriate numerical keys on the keypad and then pressing NEXT ITEM or ENTER. If NEXT ITEM is pressed the DIGITRAC will display

"APPLY CALIBRATE
TENSION <ENTER>".

The sensing roll should now be loaded with a known force. The known force may be applied using an accurate spring scale or (more accurately) a dead weight as shown below. In either case, the temporary web should be threaded as the web would normally be threaded in the machine to insure the same wrap angles. In wide web applications, the known force should be applied near the center of the sensing roll using a narrow web (a rope is satisfactory).

[Diagram of temporary web, sensing roll, and weight]

Pressing NEXT ITEM or ENTER will cause the DIGITRAC to automatically scale its tension sensor input. If the DIGITRAC is unable to scale this input it will display

"UNABLE TO CALIBRATE<ENTER>".

Pressing ENTER will return the display to the "CALIBRATION TENSION:" screen allowing this number to be re-entered and the calibration retried.

Note: The DIGITRAC would be "UNABLE TO CALIBRATE" for one of two reasons. The calibration tension applied in the previous step produced a signal that was less than 1/8 the tension entered at the "MAXIMUM TENSION" screen. In this case the calibration tension should be increased. The other reason would be that the calibration tension applied in the previous step produced a signal that was greater than the DIGITRAC's acceptable input range. In this case sensor sizing should be checked.
If the DIGITRAC successfully scales its tension sensor input it will display

"REMOVE CALIBRATE
  TENSION <ENTER>  ".

When this screen appears the calibration weight can be removed. The tension sensors are now calibrated. Pressing ENTER will advance the display to the START-STOP-HOLD functions.

6.4 START-STOP-HOLD FUNCTIONS

"START TIME?
  XXXX SEC"

The DIGITRAC is asking for the time it will take the web to reach its running speed in seconds. After the start time is entered pressing NEXT ITEM will go to the next display

"DELAY TO HOLD
  MODE?  XXXX SEC"

At this display the time in seconds that the DIGITRAC delays before applying the hold level output (entered in the following screen) is entered. Pressing NEXT ITEM will display

"HOLD LEVEL?
  XXXX % ".

Entering the desired hold level and pressing NEXT ITEM will display the last of the basic calibration screens

"STOP MULTIPLIER?
  XXXX "

A number is entered here that the DIGITRAC will use to increase or decrease output level during the "DELAY TO HOLD MODE" time, (while the web is stopping). If the value entered is greater than 1.00 the DIGITRAC output will be proportionately increased during this time. If the value entered is less than 1.00 the DIGITRAC output will be proportionately decreased during the "DELAY TO HOLD MODE" time. Entering 1.00 will show no apparent change in output.

Pressing NEXT ITEM will display

"BASIC CAL DONE
  SEE INSTRUCTIONS"

Pressing NEXT ITEM or ENTER will return the DIGITRAC to the

"1
  TENSION:
  OFF  XXXX LBS"
The data area (XXXX) in the above display should now show DIGITRAC's assessment of present tension.

6.5 DESIRED TENSION (SET POINT)

The DIGITRAC now has the basic information (stored in SETUP 1) it needs to control tension. However, it still needs one piece of data before the RUN switch is pressed, the value of tension to be maintained, or the "DESIRED TENSION". Pressing a numeric key (0-9), the decimal point, the up arrow key, or the down arrow key will change the display to "DESIRED TENSION?

XXX LBS".

If a numeric key or the decimal point was pressed that character will be showing in the first position of the data area (XXXX) of this screen. If the up arrow key or down arrow key was pressed previously this screen will be displaying the present value of DESIRED TENSION. If the up arrow key or down arrow key is pressed again or is held down from the previous step the value displayed will begin to increment or decrement respectively.

Note: Any valid key will repeat its function if it is pressed and not released. It will continue repeating its function until it is released.

When the desired value of tension is showing in the screen, pressing NEXT ITEM or ENTER will save the value and return the DIGITRAC to the screen. The DIGITRAC is now ready to control tension.

Note: Because the DIGITRAC's dynamic adjustment is so simple, it is recommended that adjustment be performed sometime soon after the system is initially started. See Section 7 TUNING THE DIGITRAC in this manual.

Pressing the "TENSION ON/OFF" key will cause the DIGITRAC to go to its control mode. It will also change the display to "1[2][4]

OFF YYYY LBS"

The character locations [1],[2],[3], and [4], combined, constitute a bar graph display which gives a continuous indication of percent of MAXIMUM TENSION. The bars will fill each character from bottom to top and in sequence as tension increases from zero to MAXIMUM TENSION. The "H" indicates that the DIGITRAC is in Hold mode.
When the system RUN switch is pressed the "H" in the above screen will change to an "A" indicating the DIGITRAC is now in Automatic mode and controlling tension. This should be evident in the bar graph and numeric displays.

The DIGITRAC can also be run in Manual mode, i.e. the DIGITRAC's output can be set manually. Before running in manual mode the manual level should be set. Manual level is set at the MANUAL LEVEL screen. To get to the MANUAL LEVEL screen from the TENSION: screen press NEXT ITEM twice. This will bring up the screen

"MANUAL LEVEL? XXXX % ".

The output level desired when the DIGITRAC is in Manual mode can now be set. Simply enter the value and press ENTER or use the up or down arrow keys to adjust the level gradually. To return to the TENSION: screen press the "TENSION SET/ACT" key.

The DIGITRAC can be changed to Manual mode by pressing the "SHIFT" key and then the "MANUAL" key. The DIGITRAC screen will change to

" 1[2][4] TENSION:
M[1][3] XXXX LBS".

Notice that the mode indicator has changed to an "M". The bar graph ([1] [2] [3] [4]) and data area (XXXX) now reflect the tension resulting from the present setting of manual level.

SECTION 7 - TUNING THE DIGITRAC

The DIGITRAC can be easily tuned using the "OPTIMIZE" screens. Pressing the SHIFT key and then the PROG key will enter the program loops. The first screen will be

"PROGRAM:
CALIBRATE".

Pressing NEXT ITEM will bring up the screen

"CALIBRATE
BASIC".

Now the up arrow and down arrow keys are used to get to the screen

"CALIBRATE
DYNAMICS".

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Pressing NEXT ITEM will bring up the first screen in the calibrate DYNAMICS loop

"1[2][4]OPTIMIZE STABILITY

Stability is optimized while the web is running using the up arrow and down arrow keys. Pressing the up arrow increases stability. Pressing the down arrow decreases stability.

A basic procedure would be to press and hold the down arrow until the web tension becomes unstable. This can be observed by watching the web itself or by viewing the bar graph (located at [1][2][3][4] in the display) motion in the DIGITRAC display. (A minus "−" sign will blink at [5] in the display to confirm that stability is being reduced.) The up arrow key is then pressed and held until a stable web is observed. (A plus "+" sign will blink at [5] in the display to confirm that stability is being increased.) Stability is now at optimum.

Pressing NEXT ITEM will bring up the second screen in the calibrate DYNAMICS loop

"1[2][4]OPTIMIZE COMPension

COMPension is optimized while the web is running using the up arrow and down arrow keys. Pressing the up arrow decreases COMPension. Pressing the down arrow increases COMPension.

A basic procedure would be to press and hold the down arrow until the web tension becomes unstable. This can be observed by watching the web itself or by viewing the bar graph (located at [1][2][3][4] in the display) motion in the DIGITRAC display. (A minus "−" sign will blink at [5] in the display to confirm that COMPension is being increased. The "−" sign is used because web will become less stable as COMPension is increased.) The up arrow key is then pressed and held until a stable web is observed. (A plus "+" sign will blink at [5] in the display to confirm that COMPension is being decreased.) COMPension is now at optimum.

Pressing NEXT ITEM will bring up the last screen in the calibrate DYNAMICS loop, where we optimize the error limit.

"1[2][4]OPTIMIZE

ERROR LIMit is optimized while the web is running using the up arrow and down arrow keys. Pressing the up arrow decreases ERROR LIMit. Pressing the down arrow increases ERROR LIMit.

A basic procedure would be to press and hold the down arrow until the web tension becomes unstable. This can be observed by watching the web
itself or by viewing the bar graph (located at [1][2][3][4] in the display) motion in the DIGITRAC display. (A minus "-" sign will blink at [5] in the display to confirm that ERROR LIMIT is being increased. The "-" sign is used because web will become less stable as ERROR LIMIT is being increased.) The up arrow key is then pressed and held until a stable web is observed. (A plus "+" sign will blink at [5] in the display to confirm that ERROR LIMIT is being decreased.) ERROR LIMIT is now at optimum.

The DIGITRAC is now tuned to the behavior of the present system. Pressing NEXT ITEM or TENSION SET/ACT will return the DIGITRAC to the operate loop at the screen

"1[2][4] TENSION:
A[1][3] XXXX LBS"

SECTION 8 - WHILE IT'S RUNNING

MOST OF THE TIME WHILE IT'S RUNNING

A "loop" is defined in one sense as a more or less circular path that crosses itself. The screens that appear on the DIGITRAC display are arranged in loops. The main loop is the "Operate Loop" the rest of the loops are "Program Loops". All the loops cross at one screen, the TENSION: screen. If the "SHIFT" key was not pressed, pressing the key marked "TENSION SET/ACT" will always return the display to the TENSION: screen. The TENSION: screen is the first screen in the operate loop. See Section 11 SCREEN DIAGRAM in this manual.

The screens that were stepped through in Sections 6.1 - 6.4 make up the program loop called CALIBRATE-BASIC. There are seven other program loops which allow DIGITRAC to be more closely characterized to a system. Program loops are entered by pressing the "SHIFT" key and then the "PROG" key. They are exited when the end of the particular loop is reached and NEXT ITEM is pressed or by simply pressing the "TENSION SET/ACT" key. Once the DIGITRAC has been setup for a system it is likely that very little time will be spent in the program loops.

Most of the time, while it's running, the DIGITRAC will be in the operate loop. There are six screens in this loop. Two of them, the TAPER PERCENT screen and the ENTER WEB/SPOOL WIDTH screen, appear only if they are needed. See Section 9 WHAT EACH SCREEN DOES in this manual.
SECTION 9 - SCREENS

WHAT EACH SCREEN DOES

APPLY CALIBRATE
TENSION <ENTER>

See Section 6.3 SENSOR CALIBRATION in this manual.

BAR GRAPH TIME?

XXXX Sec

This screen is used to tell the DIGITRAC how often to refresh its bar graph display in screens that show data that is continuously changing. This feature is useful when data and thus the bar display is changing so rapidly that it becomes difficult to see. This value is independent of the numeric display time set at the "NUMERIC DISPLAY TIME?" screen. See the screen definition for this screen in this section.

BASIC CAL DONE
SEE INSTRUCTIONS

This screen indicates that you have reached the end of the program loop CALIBRATE-BASIC.

CALIBRATE:

BASIC

This is the label screen for the calibrate BASIC loop. Pressing NEXT ITEM when this screen is showing will bring up the first screen in the BASIC loop.

CALIBRATE:

DIAMETER

This is the label screen for the calibrate DIAMETER loop. Pressing NEXT ITEM when this screen is showing will bring up the first screen in the DIAMETER loop.

CALIBRATE:

DYNAMICS

This is the label screen for the calibrate DYNAMICS loop. Pressing NEXT ITEM when this screen is showing will bring up the first screen in the DYNAMICS loop.

CALIBRATE:

WEB SPEED
This is the label screen for the calibrate WEB SPEED loop. Pressing
NEXT ITEM when this screen is showing will bring up the first screen in
the WEB SPEED loop.

CALIBRATION
TENSION: XXXX LB

See Section 6.3 SENSOR CALIBRATION in this manual.

COPY TO SETUP X
FROM SETUP Y

This screen is used to copy from one setup to another. This can save
time if an alternate setup is needed that has only a few parameters
changed.

The present setup number is always shown at the X in the first line of
this screen. The setup number at Y can be changed by using the up arrow
or down arrow keys.

Note: The setup to be programmed should be selected prior to using this
function. See Section 10 "SHIFT KEY FUNCTIONS" in this manual.

CORE DIAMETER?

XXXX IN

This screen is displayed only if the response to the "IS TAPER TENSION
USED?" screen was "YES".

CORE TENSION:

XXXX LBS

CORE TENSION screen is used to set the starting tension on rewind
systems when tension is to be tapered. The screen is then displayed in
place of the DESIRED TENSION screen.

DELAY TO HOLD
MODE? XXXX SEC

The value of the maximum amount of time the system will take to reach 0
velocity from its running velocity should be entered here.

DERIVATIVE
TIME? XXXX SEC

The value entered in this screen will be used only when the optimize
method is "PID" (see the screen definition for "OPTIMIZE METHOD?" in
this section). The value will be used to determine the DIGITRAC's
response to a changing input signal. A higher value corresponds to a
more exaggerated response. The net effect of the derivative function is
to cause the DIGITRAC to try to anticipate where the signal it reads
from the tension sensor(s) is going. This is useful when trying to compensate for a sluggish system.

**Note:** The value in this screen will be altered if the OPTIMIZE COMP function in the calibrate DYNAMICS loop is used.

**DESIRED TENSION?**

XXX LBS

This screen is used to set the value of the tension that the DIGITRAC is to maintain. It is not displayed when tension is to be tapered. See the screen definition for "CORE TENSION:" in this section.

**DIA INPUT TYPE?**

NONE

This screen is used to tell the DIGITRAC what type of diameter input signal will be used. If the screen indication is "NONE" the DIGITRAC will assume that no diameter input is used.

If the screen indication is "VOLTAGE" the DIGITRAC will expect an analog input signal. The analog diameter input signal range is 0 to +10 volts at the "DIAM. IN" terminal with respect to the GND terminal (0 volts corresponds to 0 diameter).

If the indication is PULSED the DIGITRAC will expect a train of pulses at the "DIAM. IN" input. The DIGITRAC will measure time from the start of one pulse to the start of the next to determine the roll diameter (large time measurements correspond to large diameters). The DIGITRAC is capable of measuring from 20 to 10,000 pulses per second.

**DIAMETER AT THIS WEIGHT?**

XXX IN

This screen is displayed only if the response to the "IS INERTIA COMP USED?" screen was "YES" and immediately after the screen "ROLL WEIGHT?". The diameter of the roll that corresponds to the value entered at the "ROLL WEIGHT?" screen should be entered.

**ENTER CODE TO LOCK ******

This is the first screen in the program security loop if the program loops have been "NOT SECURED". A code is entered here that must be re-entered at the "ENTER CODE TO UNLOCK" screen to regain access to the program loops. See the screen definition for this screen in this section.

**ENTER CODE TO UNLOCK ******
This is the first screen in the program security loop if the program loops have been "SECURED". In order to gain access to the programming loops the code that was entered at the "ENTER CODE TO LOCK" screen must be entered. See the screen definition for this screen in this section.

ENTER PRESENT
DIA. XXXX IN

The present roll diameter is entered here. This calibration must be done while the DIGITRAC is in the run mode.

ENTER WEB/SPOOL
WIDTH XXXX IN

This screen appears only if inertia compensation is to be used (the response to the "IS INERTIA COMP USED?" screen was "YES").

ERROR LIMIT?
XXX %

The value entered here will limit the amount of error that the DIGITRAC will accept (error is the difference between the tension being sensed and the desired tension).

EXCESSIVE ROLL
WEIGHT <ENTER>

See Section 6.3 SENSOR CALIBRATION in this manual.

FULL ROLL DIA?
XXX IN

This screen is displayed only if the response to the "IS TAPER TENSION USED?" screen was "YES". The diameter of the roll when it is full should be entered.

HOLD LEVEL?
XXX %

The value in percent of the DIGITRAC's output that should be maintained during Hold mode should be entered here.

Note: If tension tapering is being used and the response to the "HOLD LEV CHANGES W/TENSION?" screen is "YES", the value entered here will be hold level at core. Thus, a value that is put in the data display (XXXX) will change when ENTER is pressed to the tapered value corresponding to present tension.

HOLD LEV CHANGES
W/DIA? NO
If the indicator in this screen is "YES" the DIGITRAC will adjust hold level proportionally with roll diameter. This will occur if diameter is modified by keypad entry or by the DIGITRAC itself when diameter is estimated or measured.

**HOLD LEV CHANGES**

**W/TENSION? NO**

If the indicator in this screen is "YES" the DIGITRAC will adjust hold level proportionally with tension. This will occur if tension is modified by keypad entry or by the DIGITRAC itself when tension tapering is used.

**INTEGRATOR**

**TIME? XXXX SEC**

The value entered here is used directly by DIGITRAC to adjust its response to rapidly changing analog input signals. A higher value will cause the DIGITRAC to reduce (slow down) its response to rapidly changing signals.

**Note:** The value in this screen will be altered if the OPTIMIZE STAB function in the calibrate DYNAMICS loop is used.

**IS INERTIA COMP**

**USED? NO**

Inertia compensation is what the DIGITRAC does to its output when it detects a change in speed. For example suppose the system type is "UNWIND" and the web is at its running velocity. If the stop switch is pressed the roll's inertia will act against the torque required to maintain tension in the web. If the response to the above screen is "YES", the DIGITRAC would attempt to compensate for this inertia by increasing its output signal. What the DIGITRAC does to its output signal is determined by the system type selected. See the screen definition for "SELECT SYSTEM" in this section.

**IS TAPER TENSION**

**USED? NO**

If tension is to be tapered the indicator on this screen should be "YES". To alter the indicator use the up arrow key or the down arrow key. See the screen definition for the screen "TAPER PERCENT?" in this section.

**INVALID ENTRY**

**PRESS <ENTER>**

This screen is displayed if the code entered to confirm the code to lock or the code entered to gain access to the program loops is incorrect. Pressing ENTER will allow code entry to be retried.
MANUAL LEVEL?
    XXXX %

The MANUAL LEVEL screen is used to set the output level that will be
maintained when the DIGITRAC is changed to Manual mode.

MAXIMUM TENSION?
    XXXX LB

See Section 6.3 SENSOR CALIBRATION in this manual.

NUMERIC DISPLAY
TIME?     XXXX SEC

This screen is used to tell the DIGITRAC how often to refresh its
display ( XXXX ) in screens that show data that is continuously changing.
This feature is useful when data and thus the data display is changing
so rapidly that it becomes difficult to read. This value is independent
of the bar graph time set at the "BAR GRAPH TIME?" screen. See the
screen definition for this screen in this section.

OPTIMIZE METHOD?
    PI

There are two methods available in the DIGITRAC to optimize its control
function. One method is "PI" indicating proportional plus integral
compensation, the other is "PID" indicating proportional plus integral
plus derivative compensation. If the required system control function
is known, the proportional gain, integrator time, derivative time, and
error limit can be set in the program "PARAMETERS" loop. See the screen
definitions for "PROPORTIONAL GAIN?", "INTEGRATOR TIME?", "DERIVATIVE
TIME?", and "ERROR LIMIT" in this section. If the system control
function is not known, they can be left at their factory settings or
they can be adjusted experimentally using the calibrate "DYNAMICS" loop.

A basic procedure would be to run the system with "PI" selected and the
above parameters at their factory settings. If system response is
believed to be causing a problem, go to the calibrate "DYNAMICS" loop
and adjust the parameters using the up arrow and down arrow keys. [See
the screen definitions mentioned above]. If the apparent system
response does not improve or improves only slightly, return to this
screen and change the optimize method to "PID". Return to the calibrate
"DYNAMICS" loop and readjust the parameters using the up arrow and down
arrow keys.

1[2][4] OPTIMIZE COMP

This is the second screen in the calibrate DYNAMICS loop. COMPensation
is optimized while the web is running using the up arrow and down arrow
keys. Pressing the up arrow decreases COMPensation. Pressing the down arrow increases COMPensation.

A basic procedure would be to press and hold the down arrow until the web velocity becomes unstable. This can be observed by watching the web itself or by viewing the bar graph (located at [1][2][3][4] in the display) motion in the DIGITRAC display. (A minus "−" sign will blink at [5] in the display to confirm that COMPensation is being increased. The "−" sign is used because web will become less stable as COMPensation is increased.) The up arrow key is then pressed and held until a stable web is observed. (A plus "+" sign will blink at [5] in the display to confirm that COMPensation is being decreased.) COMPensation is now at optimum.

1[2][4]OPTIMIZE

This is the third screen in the calibrate DYNAMICS loop. ERROR LIMit is optimized while the web is running using the up arrow and down arrow keys. Pressing the up arrow decreases ERROR LIMit. Pressing the down arrow increases ERROR LIMit.

A basic procedure would be to press and hold the down arrow until the web tension becomes unstable. This can be observed by watching the web itself or by viewing the bar graph (located at [1][2][3][4] in the display) motion in the DIGITRAC display. (A minus "−" sign will blink at [5] in the display to confirm that ERROR LIMit is being increased. The "−" sign is used because web will become less stable as ERROR LIMit is being increased.) The up arrow key is then pressed and held until a stable web is observed. (A plus "+" sign will blink at [5] in the display to confirm that ERROR LIMit is being decreased.) ERROR LIMit is now at optimum.

1[2][4]OPTIMIZE STAB

This is the first screen in the calibrate DYNAMICS loop. Stability is optimized while the web is running using the up arrow and down arrow keys. Pressing the up arrow increases stability. Pressing the down arrow decreases stability.

A basic procedure would be to press and hold the down arrow until the web tension becomes unstable. This can be observed by watching the web itself or by viewing the bar graph (located at [1][2][3][4] in the display) motion in the DIGITRAC display. (A minus "−" sign will blink at [5] in the display to confirm that stability is being reduced.) The up arrow key is then pressed and held until a stable web is observed. (A plus "+" sign will blink at [5] in the display to confirm that stability is being increased.) Stability is now at optimum.
1[2][4] OUTPUT LEVEL
H[1][3] XXXX %

This screen displays the DIGITRAC's present output level in percent of maximum output. The bar graph ([1][2][3][4]) gives a quantitative indication of this percentage.

OUTPUT LIMIT:
    XXXX %

The DIGITRAC will not allow its output to exceed the value entered here.

Note: The DIGITRAC ignores the output limit when it is trying to compensate inertia.

PRESENT SPEED
FT/MIN XXXX

This screen is used to calibrate WEB SPEED. The present velocity of the web should be entered here.

PROGRAM:
    CALIBRATE

This is the label screen for the program CALIBRATE loop. Pressing NEXT ITEM when this screen is showing will bring up the first screen in the CALIBRATE loop. See Section 6.1 MAKING IT GO in this manual.

PROGRAM:
    CONFIGURE

This is the label screen for the program CONFIGURE loop. Pressing NEXT ITEM when this screen is showing will bring up the first screen in the CONFIGURE loop.

PROGRAM:
    COPY SETUPS

This is the label screen for the program COPY SETUPS loop. Pressing NEXT ITEM when this screen is showing will bring up the first screen in the COPY SETUPS loop.

PROGRAM:
    NOT SECURED

This is the label screen in the program security loop if the program loops have been "NOT SECURED". Pressing NEXT ITEM or ENTER will bring up the first screen in the security loop.
PROGRAM:
PARAMETERS

This is the label screen for the program PARAMETERS loop. Pressing NEXT ITEM when this screen is showing will bring up the first screen in the PARAMETERS loop.

PROGRAM:
SECURED

This is the label screen in the program security loop if the program loops have been "SECURED". Pressing NEXT ITEM or ENTER will bring up the first screen in the security loop.

PROPORTIONAL
GAIN? XXXX

This screen is used to enter a value for the amount of change in DIGITRAC's output with respect to a change in its error signal (the difference between the tension being sensed and the desired tension). A higher value will cause the DIGITRAC's response to be more exaggerated.

Note: The value in this screen will be altered if the OPTIMIZE COMP or OPTIMIZE STAB functions in the calibrate DYNAMICS loop is used.

REMOVE CALIBRATE
TENSION <ENTER>

See Section 6.3 SENSOR CALIBRATION in this manual.

REPEAT CODE TO
LOCK ***

The code entered at the "ENTER CODE TO LOCK" screen is re-entered here for confirmation.

ROLL WEIGHT?
XXXX LBS

This screen is displayed only if the response to the "IS INERTIA COMP USED?" screen was "YES". The weight of the roll should be entered.

RUNNING VELOCITY
FT/MIN XXXX

This screen is displayed only if the response to the "IS INERTIA COMP USED?" screen was "YES" and the response to the "SPEED INPUT TYPE" screen was "NONE". The running velocity of the web should be entered.
Notice that the MAXIMUM INPUT VOLTS must be greater than 10.

If the indication is PULSED the DIGITRAC will expect a train of pulses at the "WEB SPEED" input. The DIGITRAC will measure time from the start of one pulse to the start of the next to determine the web velocity (large time measurements correspond to low speeds). The DIGITRAC is capable of measuring from 20 to 10,000 pulses per second.

START TIME?
   XXXX  SEC

The value of the amount of time the system takes to reach its running velocity from 0 velocity is entered here.

STOP MULTIPLIER?
   XXXX

If inertia compensation is not being used the value entered here will be the number the DIGITRAC uses to multiply its output by while the system is stopping.

If inertia compensation is being used the value entered here will be used as an indication to the DIGITRAC of the amount of increase in braking friction that is applied to the system external to the DIGITRAC's control loop. If no increased braking friction is applied the value entered should be "1.00".

TAPER PERCENT?
   XXXX  %

Taper is sometimes used on rewrinds to decrease tension as the roll diameter increases. The greater the percentage entered at this screen the more tension will be reduced from core tension as the roll winds. The TAPER PERCENT screen appears only if tension is to be tapered, i.e. the response to the "IS TAPER TENSION USED?" screen was "YES".

1[2][4]  TENSION:
H[1][3]   XXXX  LBS

This screen is the most used of all the DIGITRAC screens. Located in the operate loop it displays present tension and is always accessible (if the "SHIFT" key has not been pressed) by pressing the "TENSION ON/OFF" key.

TIME TO ZERO
SPEED   XXXX  SEC

This screen is displayed only if the response to the "IS INERTIA COMP USED?" screen was "YES" and the response to the "SPEED INPUT TYPE"
The time the system requires to reach 0 velocity from its running velocity should be entered.

Note: The value entered at the "DELAY TO HOLD MODE" screen should be greater than this value so that the DIGITRAC does not switch to Hold mode prior to the system coming to a full stop.

UNABLE TO
CALIBRATE<ENTER>

See Section 6.3 SENSOR CALIBRATION in this manual.

UNLOAD SENSING
ROLL <ENTER>

See Section 6.3 SENSOR CALIBRATION in this manual.

WAIT 10 SEC ...

See Section 6.3 SENSOR CALIBRATION in this manual.

WIDTH AT THIS
WEIGHT? XXXX IN

This screen is displayed only if the response to the "IS INERTIA COMP USED?" screen was "YES" and immediately after the screen "ROLL WEIGHT?". The width of the roll that corresponds to the value entered at the "ROLL WEIGHT?" screen should be entered.
SECTION 10 - SHIFT KEY FUNCTIONS

The functions listed in this section are accessed by pressing the "SHIFT" key followed by the key labeled with the appropriate shift function.

AUTO  This key is used to switch the DIGITRAC to Automatic mode.

DIA   This key will allow direct access to the "ENTER PRESENT DIA" screen. Pressing NEXT ITEM at that screen will return the screen which was being accessed when the "SHIFT" key was pressed.

ITEM# This key will allow quick access to certain program loop screens. Pressing this key will bring up the "ITEM#" screen. The accessible screens and their item numbers are listed below in alphabetical order.

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MANUAL This key is used to switch the DIGITRAC to Manual mode.

PROG  This key is used when the program loops need to be accessed.
The "SETUP" keys are used to change the present setup. Pressing "SETUP1" switches the DIGITRAC to setup1. Pressing "SETUP2" switches the DIGITRAC to setup2 and so forth.

**NOTE:** Changing setups is disallowed while the DIGITRAC is in Automatic mode.

The "SPEC" keys are reserved function keys.
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FIGURE 1

(4) .875" DIA. HOLES IN BOTTOM

(4) .312" DIA. MOUNTING HOLES
FIGURE 4
DIGITRAC WIRING DIAGRAM
APPENDIX A

Wiring Guidelines

For wiring guidelines, refer to the IEEE Standard No. 518-1982, available from IEEE, Inc. 345 East 47th Street, New York, NY 10017 USA. All wiring must conform to local codes and practices.

Noise Sources

- Switches and relay contacts operating inductive loads such as motors, coils, solenoids, and relays, etc.
- Thyristors or other semiconductor devices which are not zero crossover-fired (randomly-fired or phase angle-fired devices).
- All welding machinery and heavy current carrying conductors.
- Fluorescent and neon lights.

Avoiding Noise Sensitivity

- Physical separation and wire routing must be given careful consideration in planning the installation. For example, ac power supply wires should be bundled together and must be kept physically separate from control signal wires, like sensor cables. A 1" (305 mm) minimum separation is usually effective. Cross all wires at 90° angles whenever crossing wires is unavoidable.

- Identify and locate electrical noise sources such as solenoids, relay contacts, motors, etc. Route the wire bundles and cables as far away as possible from these noise sources. Do not mount relays or switching devices close to a microprocessor control. Do not install phase angle-fired devices in the same electrical enclosure or on the same power line with a microprocessor control.

- Shielded cables must be used for all controller signal wires to protect from electromagnetic noise. Also:
  - Run low level signal wires and shields unbroken from signal source to the control circuit.
  - Connect the shield to the control circuit common at one end only. The tension sensor cable shield must be grounded at the control. Minimize the length of wire unprotected by shield near the point of connection. Never leave the shield unconnected at both ends. Never connect both shield ends to a common or ground.
  - Do not use the shield as a signal return.

- Use twisted pair wire (1 twist per inch) any time control circuit signals must travel over two feet.

- Select the size or gauge of wire by calculating the maximum circuit current and choosing the gauge meeting that requirement. Using greater wire sizes than required generally increases the likelihood of electrostatic (capacitance) coupling of noise, while using inadequately sized wire will introduce unwanted resistances or impedances.

- Use a direct line from the AC power source to each input requiring AC power. Do not daisy chain ac power (and return) lines, or output signal (and return) lines.

- A single point ground must be used for all equipment. Use separate 12-gage (or heavier) insulated wire to ground each piece of equipment to the same ground point, normally a heavy bus bar. Multiple ground paths which create ground loops, must be avoided. Do not ground the control to the single point ground and to the machine frame.

- Do not confuse chassis grounds (safety ground) with control circuit commons or with ac supply return (or neutral) line. Each return system must be wired separately. Never use chassis ground (safety) as a conductor to return circuit current.

Reducing Noise

- Use "snubbers" (QUENCHARC™ P/N: 0804-0147-0000) to filter out noise generated by relays, relay contacts, solenoids, motors, etc. A snubber is a simple filter device using a 0.1uf, 600 volt, non-polarized capacitor in series with a 100Ω, ½ watt resistor. The device should be installed at the noise source and can be used on ac or dc circuits.

- The ultimate protection from power source noise is an "uninterruptable" power supply. This "senses" the ac power line; when the power source fluctuates, a battery powered 60Hz inverted circuit takes over, supplying power within one-half to the cycle of the ac line.

Appendix A
FIGURE 5
ELECTRICAL CONNECTIONS

CAUTION:
1) SET VOLTAGE SELECT SWITCH BEFORE APPLYING POWER.
2) ALL JUMPERS MUST BE SET BEFORE APPLYING POWER.

= CONNECT TO GROUND STU. (0.5 INCH MAXIMUM SHIELD EXTENSION)