Instruction Manual Addendum
DIGITRAC 2® Field Bus
Model D2EFB & D2FB

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List of Figures and Tables

1.0.0   Introduction

The DIGITRAC 2 Field Bus connects to a DeviceNet or Profibus-DP bus through an HMS Fieldbus Systems gateway. The DIGITRAC 2 communicates over RS-485 to the gateway and the gateway formats the data for the specific field bus. DeviceNet users should read sections 2 and 4 of this manual. Profibus-DP users should read sections 3 and 4 of this manual.

2.0.0   DeviceNet

For DeviceNet, HMS ComAdaptor 016590 is required. The DeviceNet gateway is designed according to the ODVA specification for a Communication adapter (profile number 12). It is acting as a "group two only server" on the DeviceNet network. Baud rate and Mac LD can be set via a Dip-Switch. Network Status and Module Status are displayed on dual color LEDs. Only two connections are supported, 1 Explicit, and 1 Polled I/O.

2.1.0   Installation and Setup

2.1.1   ComAdapter (Gateway)

Figure 1 shows the bottom side of the HMS ComAdapter 016590, and the electrical connections.
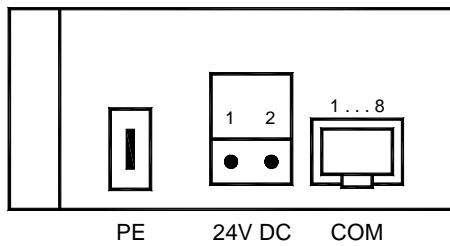
Figure 1. ComAdapter Electrical Connections
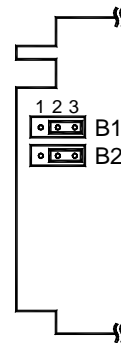
Figure 2. ComAdapter Jumpers

Open the ComAdapter by disconnecting the base plate and move jumpers B1 and B2 to positions 2-3 as shown in figure 2. This selects RS-485 operation.

The metal connector "FASTON" must be connected to Protective Earth (PE).

The 2-pin connector supplies the ComAdapter with 24 vdc +/- 20% power. The maximum current draw is 150 madc. Pin 1 is +24 vdc and pin 2 is ground.

The serial communication port is a standard 8-pin RJ45 connector. Figure 3 shows the serial wiring connections between the ComAdapter and the DIGITRAC 2 Field Bus.
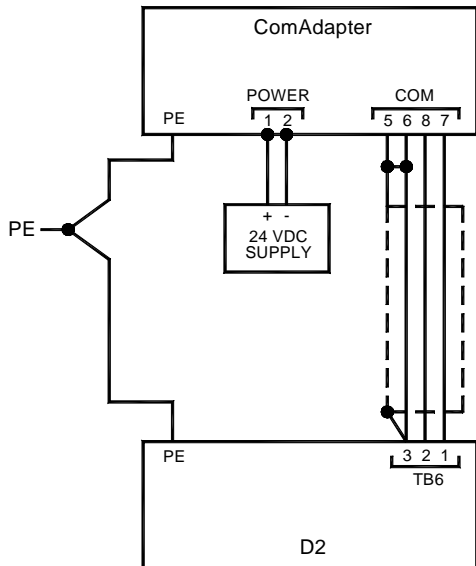
Figure 3. ComAdapter and DIGITRAC 2 Connections
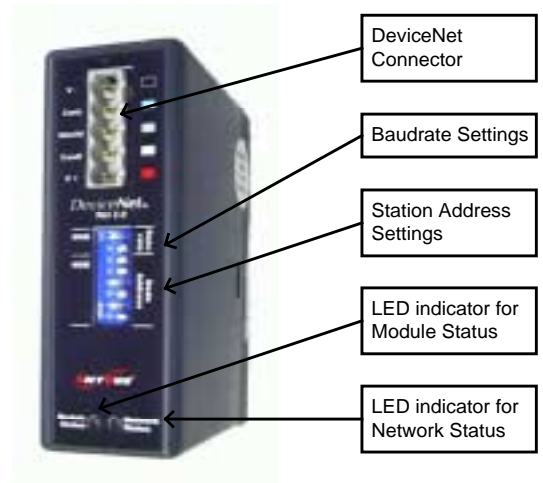
Figure 4. ComAdapter Front Panel

MacId (Node Address) and baud rate are configured via a dipswitch on the front of the module. The range for MacID is between 0 and 63. The range for baud rate is between 0 and 2 (0=125kb, 1=250kb, 2=500kb).
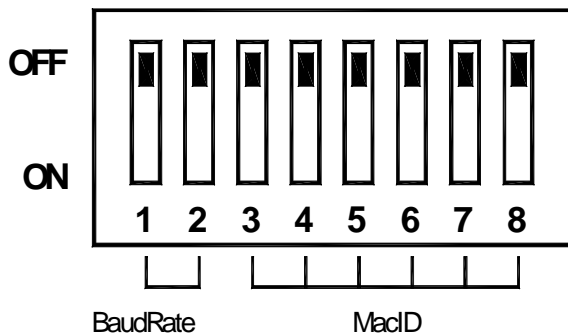
AD0 = 8
AD1 = 7
AD2 = 6
AD3 = 5
AD4 = 4
AD5 = 3

BD0 = 2
BD1 = 1

Address	DIP 3-8
0	000000
1	000001
...	...
62	111110
63	111111

Baudrate bit/sec	DIP 1-2
125k	00
250k	01
500k	10
Reserved	11

2.1.2 Setting DIGITRAC 2 Field Bus Jumpers

Set JP3, JP4, and JP16 on DIGITRAC 2 Field Bus board to "485/422".
Set JP1 and JP2 on DIGITRAC 2 Field Bus board to "BIAS".

2.2.0 Operation

The home screen of the DIGITRAC 2 Field Bus provides information about the connection status to the ComAdpater and the DeviceNet network. The upper left corner of the display indicates the network status. The display shows "i" when the DIGITRAC 2 Field Bus is initializing the ComAdapter. The display shows "c" when the DIGITRAC 2 Field Bus and the ComAdapter have established a connection with each other. The display shows "o" when the DeviceNet side of the ComAdpater is "On-Line".

Apply power to the DIGITRAC 2 Field Bus and the ComAdpater. The DIGITRAC 2 Field Bus will display an "i" in the Connection Status area as the DIGITRAC 2 Field Bus initializes the ComAdapter. When the ComAdapter has been initialized the DIGITRAC 2 Field Bus will display a "c" in the Connection Status area and the ComAdapters Module Status LED will turn solid Green.

Figure 5. DIGITRAC 2 Home Screen

Calibrate and configure the DIGITRAC 2 Field Bus as described in the DIGITRAC 2 Instruction Manual (850A154-1).

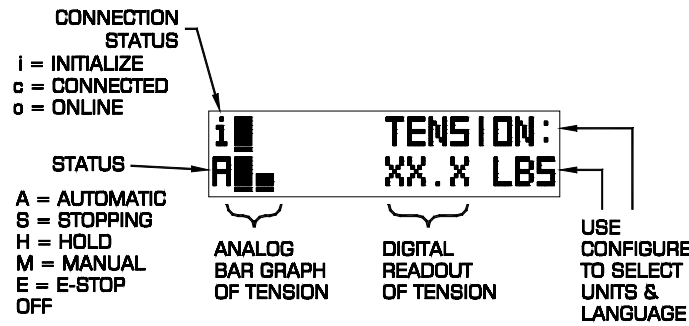Configure a DeviceNet scanner to connect to the ComAdapter. The Polled I/O input data size is 200 bytes. The Polled I/O output data size is 200 bytes. The parameters in the Polled I/O data are enumerated in Section 2.3.0. The electronic data sheet file may be downloaded from http://www.anybus.com/fbfiles.htm and selecting the file named HMS-1003.EDS. All data in the Polled I/O input and output data areas are frozen on fieldbus going to an OFF-line condition. A document describing all the DeviceNet objects contained in the ComAdapter may be downloaded from http://www.anybus.com/download.htm and select the file AnyBus ComAdapters, DeviceNet, Design Appendix.

2.3.0   DIGITRAC 2 Field Bus DeviceNet Parameters

2.3.1   Number Conventions

All numbers preceded by "0x" are hexadecimal numbers. All other numbers are in decimal.

2.3.2   Polled Data

The length of the Polled I/O Data is 200 bytes. The organization of the parameters contained in the poll data is listed in Table 1.

Name	Type	Offset	Operation Type
Status	WORD	0	Read Only
Tension Measured	REAL	2	Read Only
Toggle Tension On/Off	BOOL	6	Write Only
Set Auto Mode	BOOL	8	Write Only
Set Manual Mode	BOOL	10	Write Only
Desired Tension	REAL	12	Read / Write
Manual Level	REAL	16	Read / Write
Taper Percent	REAL	20	Read / Write
Setup Change Flag	UINT	24	Read / Write
Setup Data	Array of USINT, Length = 130	26	Read / Write
Reserved	Array of USINT, Length = 44	156	Read / Write

Table 1. Polled I/O Parameters

Status: 7 status bits are contained in the Status bit string. A bit set to a 1 corresponds to the active state for the bit. The status bits are described in Table 2 with their corresponding bit number and bit mask value. The status may also be configured as an UNIT.

Bit Name	Bit Mask	Bit Number	Description
E-Stop Active	0x0200	9	Set when E-Stop is active.
Tension On	0x0100	8	Set when Tension is On.
Start	0x0040	6	Set when DIGITRAC 2 is in the Starting mode.
Manual	0x0008	3	Set when DIGITRAC 2 is in Manual mode.
Hold	0x0004	2	Set when DIGITRAC 2 is in Hold mode.
Stop	0x0002	1	Set when DIGITRAC 2 is in the Stopping mode.
Run	0x0001	0	Set when DIGITRAC 2 is in the Run mode.

Table 2. DIGITRAC 2 Field Bus Status Bits

Tension Measured: The value of the tension measured by the tension sensor(s) and displayed by the DIGITRAC 2 Field Bus. The units correspond to those selected during setup of the DIGITRAC 2 Field Bus .

Toggle Tension On/Off: Changing the state of this boolean variable causes the DIGITRAC 2 Field Bus to toggle the tension output On and Off. The actual state of tension On/Off may be read in the DIGITRAC 2 Field Bus Status word. The state of tension On/Off will only change when the DIGITRAC 2 Field Bus is configured for Tension On/Off equal to TOGGLE.

Set Auto Mode: Changing the state of this boolean variable causes the DIGITRAC 2 Field Bus to switch to Automatic mode.

Set Manual Mode: Changing the state of this boolean variable causes the DIGITRAC 2 Field Bus to switch to Manual mode.

Desired Tension: The value of the setpoint tension. This value may be read or written. The units correspond to those selected during programming of the DIGITRAC 2 Field Bus.

Manual Level: The value of the manual setpoint in percent. This value may be read or written.

Taper Percent: The value of the taper in percent. This value may be read or written.

Setup Data: The setup data contains all the variables needed to specify a setup in the DIGITRAC 2 Field Bus. These variables include diameter calibration, taper calibration, and configuration parameters. The data is in a non-standard format and the description of setting or changing individual items is beyond the scope of this document. The data should only be read and written as a group.

Setup Change Flag: This variable controls when the DIGITRAC 2 Field Bus reads the Setup Data and executes a setup change based on the new Setup Data. This variable also acknowledges whether the setup change was successfully completed. Setup changes will only occur in the DIGITRAC 2 Field Bus when the system is in HOLD mode.

Set this variable to the value 0x5555 to execute a setup change. The DIGITRAC 2 Field Bus will acknowledge by setting this variable to 0xAAAA if the setup change was successful, and will set this variable to 0xFFFF if the setup change was unsuccessful. The user should set this variable to 0x0000 after the DIGITRAC 2 Field Bus has sent the acknowledge value.

The following psuedo-code illustrates a simple example:

```
SetupData = New_Setup_Data // Fill the Setup Data array with new setup data

SetupChangeFlag = 0x5555   // Tell DIGITRAC 2 to execute a setup change
While ( (SetupChangeFlag ≠ 0xAAAA) AND (SetupChangeFlag ≠ 0xFFFF) )   // wait for the
acknowledge

// Determine if the setup change was successful
If (SetupChangeFlag == 0xAAAA) Then Print("Setup Change Successful")
If (SetupChangeFlag == 0xFFFF) Then Print("Setup Change Failed")

SetupChangeFlag = 0x0000 // clear the setup change flag
```

2.4.0   DeviceNet ComAdapter LED Indicators

LED's	Description
Module_Status, steady off	No Power
Module_Status, steady red	Unrecoverable Fault
Module_Status, steady green	Device Operational
Module_Status, flashing red	Minor Fault
NetWork_Status, steady off	Not powered, Not on line
NetWork_Status, steady green	Link OK on line, connected
NetWork_Status, steady red	Critical link failure
NetWork_Status, flashing green	On line, not connected
NetWork_Status, flashing red	Connection time out

2.5.0   DeviceNet Scanner Setup

Two timers in the DeviceNet scanner should be set to a value long enough to receive the 200 byte Poll response from the ComAdapter. The first timer is the Interscan Delay timer. This timer tells the scanner how long to wait for a response from the ComAdapter. The second timer is the Expected Packet Rate timer. This timer value is sent to the ComAdapter and tells the ComAdapter how often to expect to receive data from the scanner. If these timers are set too fast, then received and transmitted data may not be reliably transferred.

3.0.0   Profibus-DP

For Profibus-DPH, MS ComAdaptor 016570 is required. The Profibus-DP gateway is designed according to PROFIBUS-DP EN50170 (DIN 19245). Station address can be set via two rotary switches. Network termination is switch selectable. Network Status and Module Status are displayed on three LED indicators. Only cyclic I/O data transmission is supported.

3.1.0   Installation and Setup

3.1.1   ComAdapter (Gateway)

Figure 6 shows the bottom side of the HMS ComAdapter 016570, and the electrical connections.
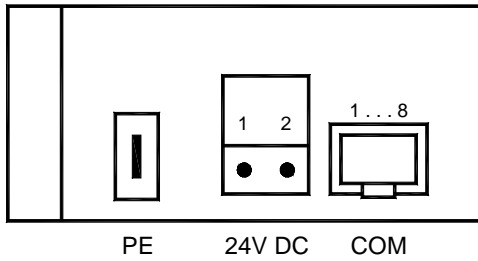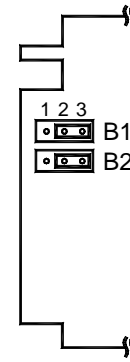
Figure 6. ComAdapter Electrical Connections

Figure 7. ComAdapter Jumpers

Open the ComAdapter by disconnecting the base plate and move the jumpers B1 and B2 to positions 2-3 as shown in Figure 7. This selects RS-485 operation.

The metal connector "FASTON" must be connected to Protective Earth (PE).

The 2-pin connector supplies the ComAdapter with 24 vdc +/- 20% power. The maximum current draw is 150 madc. Pin 1 is +24 vdc and pin 2 is ground.

The serial communication port is a standard 8-pin RJ45 connector. Figure 8 shows the serial wiring connections between the ComAdapter and the DIGITRAC 2 Field Bus.

Setting the station address (= node address) is done via two rotary switches at the front of the unit. The range for station addresses is between 0 and 99.

Baud rate is automatically detected and adjusted to the selected baud rate on the Profibus network. The device supports baud rates up to 12 Mbit/s.

If the device is physically installed as the first or last unit on the network the termination switch should be set to the ON position to terminate the ends of the Profibus cable.
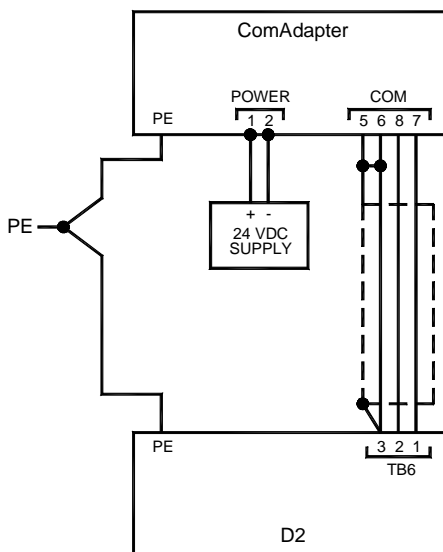

Figure 8. ComAdapter and DIGITRAC 2 Connections

Figure 9. ComAdapter Front Panel

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3.1.2   Setting DIGITRAC 2 Field Bus Jumpers

Set JP3, JP4, and JP16 on DIGITRAC 2 Field Bus board to "485/422".
Set JP1 and JP2 on DIGITRAC 2 Field Bus board to "BIAS".

3.2.0   Operation

The home screen of the DIGITRAC 2 Field Bus provides information about the connection status to the ComAdpater and the Profibus network. The upper left corner of the display indicates the network status. The display shows "i" when the DIGITRAC 2 Field Bus is initializing the ComAdapter. The display shows "c" when the DIGITRAC 2 Field Bus and the ComAdapter have established a connection with each other. The display shows "o" when the Profibus side of the ComAdpater is "On-Line".

Apply power to the DIGITRAC 2 Field Bus and the ComAdpater. The DIGITRAC 2 Field Bus will display an "i" in the Connection Status area as the DIGITRAC 2 Field Bus initializes the ComAdapter. When the ComAdapter has been initialized the DIGITRAC 2 Field Bus will display a "c" in the Connection Status area and the ComAdapters Module Status LED will turn solid Green.
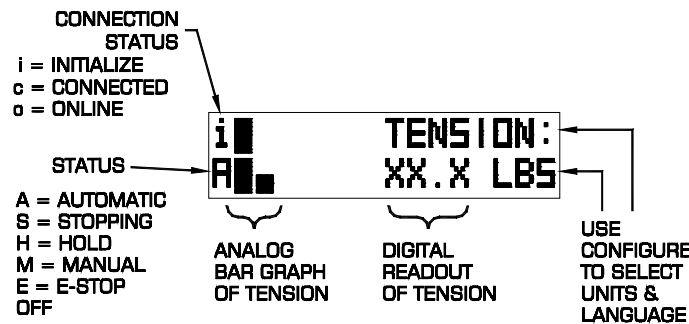
Figure 10. DIGITRAC 2 Home Screen

Calibrate and configure the DIGITRAC 2 Field Bus described in the DIGITRAC 2 Instruction Manual (850A154-1
Configure a Profibus scanner to connect to the ComAdapter. The Cyclic I/O input data size is 200 bytes. The Cyclic I/O output data size is 200 bytes. The parameters in the cyclic I/O data are enumerated in section 3.3.0.

The electronic data sheet (GSD) file may be downloaded from http://www.anybus.com/fbfiles.htm and selecting the file named HMS-1003.GSD. All data in the Cyclic I/O input and output data areas are frozen on fieldbus going to an OFF-line condition.

3.3.0   DIGITRAC 2 Field Bus Profibus - DP Parameters

3.3.1   Number Conventions

All numbers preceded by 0x are hexadecimal numbers. All other numbers are in decimal.

3.3.2   Cyclic Data

The length of the Cyclic I/O Data is 200 bytes. The organization of the parameters contained in the cyclic data is listed in table 3.

Name	Type	Offset	Operation Type
Status	Bit String, 2 octets	0	Read Only
Tension Measured	Floating Point	2	Read Only
Toggle Tension On/Off	Boolean	6	Write Only
Set Auto Mode	Boolean	8	Write Only
Set Manual Mode	Boolean	10	Write Only
Desired Tension	Floating Point	12	Read / Write
Manual Level	Floating Point	16	Read / Write
Taper Percent	Floating Point	20	Read / Write
Setup Change Flag	Unsigned16	24	Read / Write
Setup Data	Array of Unsigned8, Length = 130	26	Read / Write
Reserved	Array of Unsigned8, Length = 44	156	Read / Write

Table 3. Cyclic I/O Parameters

Status: 7 status bits are contained in the Status bit string. A bit set to a 1 corresponds to the active state for the bit. The status bits are described in Table 4 with their corresponding bit number and bit mask value. The status may also be configured as an Unsigned16.

Bit Name	Bit Mask	Bit Number	Description
E-Stop Active	0x0002	14	Set when E-Stop is active.
Tension On	0x0001	15	Set when Tension is On.
Start	0x4000	1	Set when DIGITRAC 2 is in the Starting mode.
Manual	0x0800	4	Set when DIGITRAC 2 is in Manual mode.
Hold	0x0400	5	Set when DIGITRAC 2 is in Hold mode.
Stop	0x0200	6	Set when DIGITRAC 2 is in the Stopping mode.
Run	0x0100	7	Set when DIGITRAC 2 is in the Run mode.

Table 4. DIGITRAC 2 Field Bus Status Bits

Tension Measured: The value of the tension the DIGITRAC 2 is reading from the load cells. The units are the units selected during programming of the DIGITRAC 2.

Toggle Tension On/Off: Changing the state of this boolean variable causes the DIGITRAC 2 to toggle the tension output On and Off. The actual state of tension On/Off may be read in the DIGITRAC 2 Status word. The state of tension On/Off will only change when the DIGITRAC 2 is configured for Tension On/Off equal to TOGGLE.

Set Auto Mode: Changing the state of this boolean variable causes the DIGITRAC 2 to switch to Automatic mode.

Set Manual Mode: Changing the state of this boolean variable causes the DIGITRAC 2 to switch to Manual mode.

Desired Tension: The value of the setpoint tension. This value may be read or written. The units are the units selected during programming of the DIGITRAC 2.

Manual Level: The value of the manual setpoint in percent. This value may be read or written.

Taper Percent: The value of the taper in percent. This value may be read or written.

Setup Data: The setup data contains all the variables needed to specify a setup in the DIGITRAC 2. These variables include diameter calibration, taper calibration, and configuration parameters. The data is in a non-standard format and the description of setting or changing individual items is beyond the scope of this document. The data should only be read and written as a group.

Setup Change Flag: This variable controls when the DIGITRAC 2 reads the Setup Data and executes a setup change based on the new Setup Data. This variable also acknowledges whether the setup change was successfully completed. Setup changes will only occur in the DIGITRAC 2 when the system is in HOLD mode.

Set this variable to the value 0x5555 to execute a setup change. The DIGITRAC 2 will acknowledge by setting this variable to 0xAAAA if the setup change was successful, and will set this variable to 0xFFFF if the setup change was unsuccessful. The user should set this variable to 0x0000 after the DIGITRAC 2 has sent the acknowledge value. The following psuedo-code illustrates a simple example:

```
SetupData = New_Setup_Data // Fill the Setup Data array with new setup data
SetupChangeFlag = 0x5555   // Tell DIGITRAC 2 to execute a setup change
While ( (SetupChangeFlag ≠ 0xAAAA) AND (SetupChangeFlag ≠ 0xFFFF) )   // wait for the
acknowledge
```

// Determine if the setup change was successful

```
If (SetupChangeFlag == 0xAAAA) Then Print("Setup Change Successful")
If (SetupChangeFlag == 0xFFFF) Then Print("Setup Change Failed")
```

```
SetupChangeFlag = 0x0000 // clear the setup change flag
```

3.4.0 Profibus ComAdapter LED Indicators

Name	Color	Function
Fieldbus Diagnostics	Red	Indicates certain faults on the fieldbus side. **Flashing Red 1 Hz** – Error in configuration: IN and/or Out length set during initialization of the module is not equal to the length set during configuration of the network. **Flashing Red 2 Hz** – Error in User Parameter data: The length/contents of the user parameter data set during initialization of the module is not equal to the length/contents set during configuration of the network. **Flashing Red 4 Hz** – Error in initialization of the Profibus communication ASIC. **Turned Off** – No diagnostics present.
On-Line	Green	Indicates that the module is On-Line on the fieldbus. **Green** – Module is On-Line and data exchange is possible. **Turned Off** – Module is not On-Line
Off-Line	Red	Indicates that the module is Off-Line on the fieldbus. **Red** – Module is Off-Line and no data exchange is possible. **Turned Off** – Module is not Off-Line

4.0.0   Application Notes

4.1.0   Copying same setup between multiple DIGITRAC 2 Field Bus Units

Since each DIGITRAC 2 Field Bus will have slightly different calibration parameters for differences in offset/gains of the tension sensor(s), clutch, or brake wired to each DIGITRAC 2 Field Bus, each unit will need to be calibrated after the common setup parameters are transferred. The steps for copying setup data between two DIGITRAC 2 Field Bus units is shown below.

1. Configure and calibrate the first DIGITRAC 2 Field Bus.

2. Transfer the setup data from the first DIGITRAC 2 Field Bus to the DeviceNet or Profibus master.

3. Transfer the setup data from the DeviceNet or Profibus master to the second DIGITRAC 2 Field Bus.

4. Second DIGITRAC 2 Field Bus Unit:
    a) Calibrate the tension sensors.
    b) Calibrate the diameter if using estimated diameter and/or taper tension.
    c) Set the Hold Level if using Hold Level Changes with diameter, or Hold Level Changes with Tension.

5. Repeat steps 3 and 4 for each additional Digitrac 2 Field Bus unit.