



OPERATING INSTRUCTIONS
Digital Tension Controller
STEADYWEB™ 6
DOC 801-2539



5 YEAR WARRANTY



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READ THIS!

*** SAFETY INFORMATION ***

Please read this manual prior to installing and operating the controller. Take care to follow local codes and only allow properly trained individuals to operate or service the equipment. Failure to follow the manual's instructions and practice safe working habits could result in property damage, personal injury and/or death.

▲ WARNING:

Before servicing the SteadyWeb 6, power should be removed from the device. Failure to do so could result in property damage, personal injury and/or death.

▲ CAUTION:

The SteadyWeb 6 contains circuit boards with static sensitive devices. When working directly with these circuit boards, users should always practice proper grounding techniques, including the use of ground straps.

STEADYWEB™ 6 ORDER CODE

Your unit's order code description matches the labeled digits with your choices.

Example: SW6P-U-E-AC-100-TLS,SFD

SW6X - X - X - X - XX - OPTIONS (Separated by commas)

OUTPUT	ZONE	PACKAGING	POWER	METER SCALE	OPTIONS
P = Pneumatic V = Electric D = Drive	U = Unwind R = Rewind I = Intermediate	E = Enclosure O = Open	AC = 100-240V, 50/60Hz 24 = 24 Vdc	0 to 1, 3, 5, 7, 10, 15, 20, 25, 35, 50, 75, 100, 125, 150, 200, 250, 300, 400, 500, 750, 1000, 1250, 1500, 2000, 2500, 3000, 4000, 5000	230 = 230 Volt Power Input (1) 24 = 24 Vdc Output (1) 420 = 4-20mA Output 45 = 45 Vdc Output (1) B10 = Bipolar 10V Output DB9 = Serial Data Connector (2) DRC = Din Rail Clip (6) MPF = Metric Pneumatic Fittings (3) RO = Reverse Output RS23 = RS232 Interface (4) RS48 = RS485 Interface (4) RTA = Remote Tension Amplifier SFD = Speed Follow by DC Tach SFP = Speed Follow by Pulse Tach TLS = Tension Limit Switch (5) TOR = Tension On Relay (5) TTD = Taper Tension by DC Tachs TTF = Taper Tension by Diameter Follower TTDP = Taper Tension by DC/Pulse Tachs TTP = Taper Tension by Pulse Tachs Z = Special (SPR)

Notes: 1. V version only, 230 refers to power input of V module, 24 and 45 refer to output voltage. 2. Used only for RS23 and RS48 options when having the enclosure configuration. 3. P version only. 4. Select only ONE of RS23 or RS48 options. 5. Select only ONE of TOR or TLS options. 6. VOUT enclosure only.

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1 USER INTERFACE OVERVIEW

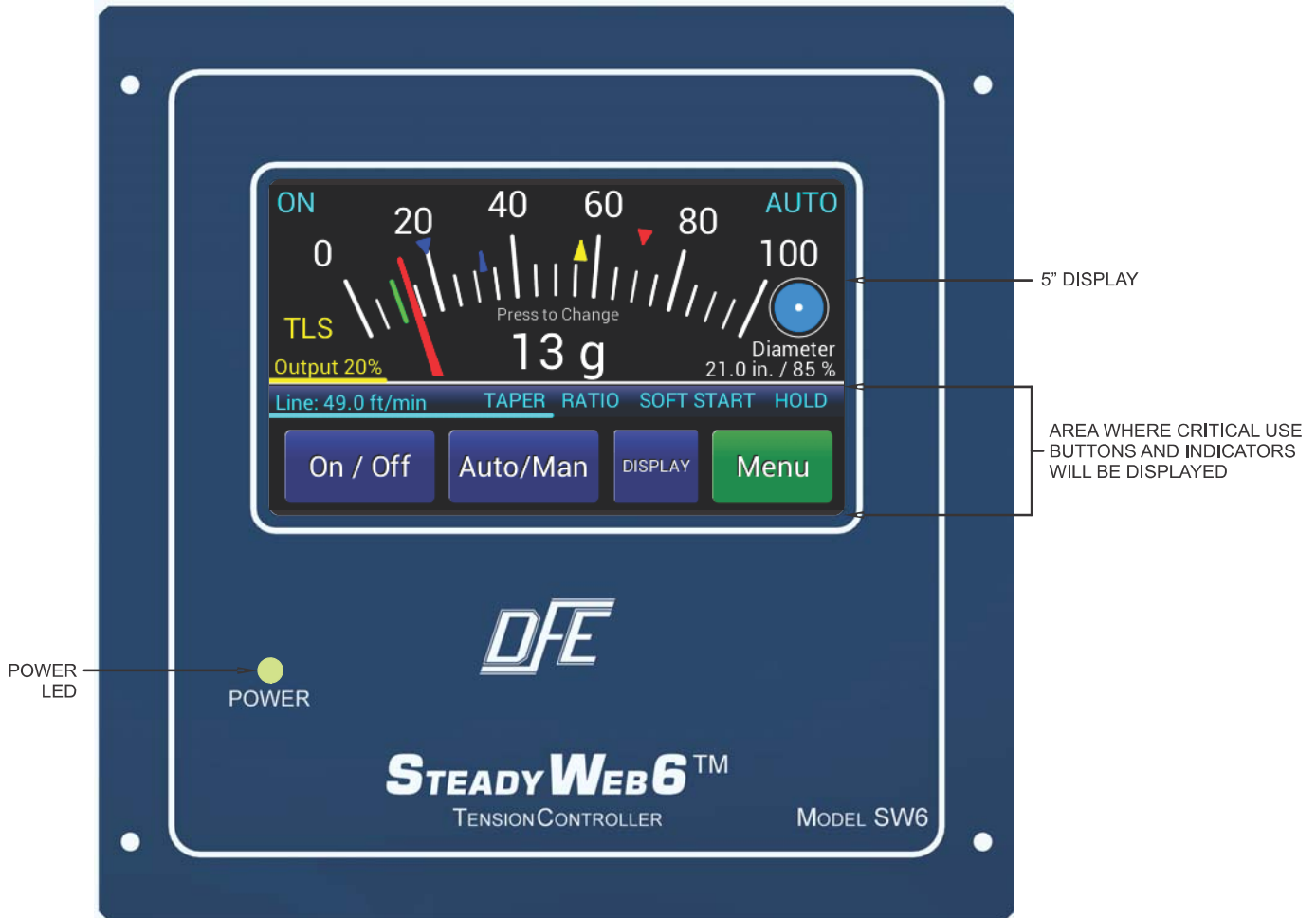


Figure 1 – STEADYWEB™ 6 USER INTERFACE

1.1 MAIN INTERFACE DESCRIPTION

The Steady Web 6 accepts all instructions and displays all information via a 5" touchscreen display (Fig. 1). All controller functions are context driven, and operate with color-coded buttons on the display. There are no mechanical knobs, switches or buttons to operate.

For ease of use, the locations of the critical-use buttons/critical-awareness indicators have been made uniform from one screen to the next. Those uniformly located buttons / indicators (Fig. 2) include the following:

1. Tension **On/Off**, **Auto/Man** (Manual), and **Display** toggle buttons (all colored blue and at the bottom of the screen). The only time the On/Off toggle button displays as anything other than On/Off is when the controller is placed in E-STOP by an external input. When in E-STOP, the On/Off button displays as **E-STOP**, and may only be restored by clearing the E-STOP signal, external to the controller. There are no functions within the controller which will permit over-riding an external E-Stop signal.
2. **Line Speed**, **Taper**, **Ratio**, **Soft Start** and **Hold** (Sample & Hold) mode status indicators on the information line above the toggle buttons, when active.
3. **TLS** indicator and **Roll Diameter** indicator, left and right of the tension display, above the information line, when applicable.
4. Tension **On/Off** Status (upper LH corner) and **Man/Auto** Status (upper RH corner)

1.1 MAIN INTERFACE DESCRIPTION continued...



Figure 2 – LOCATIONS OF TOGGLE BUTTONS / INDICATORS IN DISPLAY

All screens, settings and adjustments which are not primarily tension-displaying functions require some on-screen navigation to access them.

The remaining button in the lower right hand corner of the screen is green and displays as either “Menu”, “Back” or “Save” depending on what screen is current, and is used to advance to other menus, to back out of menus, or to save selections or adjustments.

Green buttons on menu screens indicate selectable functions. When there are more buttons in a menu than fit on the menu screen, the excess buttons are off-screen, but the menu screen may be shifted to reveal them by pressing arrow buttons at one or both ends of the screen (Fig. 3). If there are no arrows at the end of the screen, then there are no off-screen buttons to reveal.

Holding a green button down will bring up related information, which effectively serves as an on-screen manual.

Grey buttons indicate functions that may not be selected until certain conditions are met. If in doubt about why a button is grey, it may be pressed and held to view the explanation. Sometimes meeting the necessary conditions requires permission-based access and actions in accordance with the **Technical Reference Manual (DFE P/N 801-2540)**.

On navigation screens, pressing the Back button will return the prior screen. If the Back button has been replaced with another function, the use of which is not desired, the screen may be exited via the Display button instead.

In the unlikely event of a screen failure, an always-on Power LED (Fig. 1) on the front of the controller will inform the operator if the unit is still powered up.



Figure 3 - SCREEN SHOWING SIDE ARROWS

1.2 DISPLAY MODE DESCRIPTIONS

To display the tension setpoint, real time tension and related process information, the Tension Display mode should be used when making product, and the Menu Display mode should generally be used when making changes to the process. When in Tension Display mode, pressing the Menu button will switch to the Menu Display mode. Likewise, when in Menu Display mode, pressing the Display button will return the screen to Tension Display mode.

TENSION DISPLAY MODES: Two different screens are available in Tension Display mode. Tension can either be displayed as a momentary value on an analog meter (Fig. 4) or as tension vs. time in a trend-line plot (Fig. 5) and may be toggled back and forth by pressing the Display toggle button.

Operator-adjustable display settings include **Tension Update Time**, **Display Damping**, **Plot Update Time**, **Line Speed Display**, **Diameter Display** and **Display Brightness**, the adjustments of which are described in Section 2.2, DISPLAY ADJUSTMENTS.

1.2 DISPLAY MODE DESCRIPTIONS continued...

1. **Analog Meter** - The analog meter displays tension with a bold needle sweeping across similarly bold divisions in the form of a traditional analog meter, and is the default display (Fig. 4). The meter scale is determined by the full range tension value. This easily read analog meter is further enhanced by a large digital tension readout in the center of the screen, and expresses the measured tension in white characters. The auto tension setpoint is indicated by a yellow caret atop the smaller divisions of the analog meter.

The controller output, when tension control is on, is indicated as a percentage of full output to the left of the meter scale, above the On/Off button. When tension control is off, this indicated as the manual setpoint instead.



Figure 4 - ANALOG METER DISPLAY



Figure 5 - TREND LINE GRAPH DISPLAY

When Taper is active, a blue caret, also found atop the smaller divisions of the meter scale indicates the dynamic tension setpoint.

When TLS Low and / or TLS High are active, those limits are indicated by blue and red carets respectively, atop the larger divisions of the meter scale. For more details about TLS, see Section 2.6, TLS ALARMS AND RESETTING THEM.

2. **Trend-line Graph** - An alternative to the analog meter, the tension trend-line graph (Fig. 5) plots both the tension and the controller output versus time, from right to left. Since the plots of tension and controller output can cross or overlap each other, the controller output is plotted as a line, and the area below the tension plot is filled in, with both sets of data plotted in contrasting colors for improved clarity. The plots of the tension and output are keyed to a legend in the left margin and the auto tension setpoint is identified by a yellow caret in the right margin of the trend-line graph. If Taper is active, and auto tension control is on, the dynamic tension setpoint is indicated by a "T" moving in the right hand margin of the display.

The time it takes for the trend-line to cross the screen is the **Line Graph Update Time**, and is selectable as 30 seconds or 1, 2, 5, 10 or 30 minutes, per Section 2.2, DISPLAY ADJUSTMENTS. The greater durations allow for a greater data sample, but with a loss of resolution.

The trend-line may also be paused by holding down the Display button until the trend-line stops moving across the screen. Plotting will resume when the Display button is pressed again. Tension data for the paused period will not be recorded, and may not be retrieved.

When TLS is used, neither TLS Low nor TLS High Limits will be indicated on the Trend-line graph. If either tension limit switch is tripped however, the on-screen alarms will still be issued, and must be cleared according to Section 2.6, TLS ALARMS AND RESETTING THEM.

This trend-line graph display also appears repeatedly in the Technical Reference Manual (DFE P/N 801-2540) on PID Tune View displays which allow for real-time P, I, and D adjustments while viewing the controller output and tension.

1.3 MENU MODE AND NAVIGATION

From either of the tension display screens, the Menu button will deliver the operator to the Main Menu (Fig. 6) where subordinate menus appear for further navigation. Note that the names of all menu screens are consistently displayed at the center of the top line.

1.3 MENU MODE AND NAVIGATION continued....

1. **OPERATOR MENU** - Under the Operator Menu, the following choices are available:

- **Disp Configuration** - Tension Update, Display Damping, Plot Update Time, Line Speed Display, Diameter Display & Display Brightness (See Section 2.2, DISPLAY ADJUSTMENTS for more detail).
- **Configure Taper** - Taper Enable & Taper Percentage (See Section 2.5, TAPER TENSION for more detail).
- **Store / Delete Setup** - Store Setup & Delete Setup (See Sections 2.3.1, and 2.3.3 for more detail).
- **Recall Setup** - As many as 30 user-named setups (See Section 2.3.2 for more detail).

2. **DIAGNOSTIC MENU** - Under the Diagnostic Menu, the following choices are available (All are Read Only, and are useful for discussions with DFE Tech Support), with all other choices greyed out:

- **Version Menu** - Displays versions and revisions of the software and hardware
- **Read Digital Inputs** - Displays digital input signals
- **Read Analog Inputs > Transducer** - Displays analog input signals from the transducers
- **Read Analog Inputs > Signal Inputs** - Displays analog input signals from other than the transducers

3. **SETUP MENU** and **CALIBRATION MENU** - Both require permission-based access and actions in accordance with the **Technical Reference Manual (DFE P/N 801-2540)**.



Figure 6 - MAIN MENU

2 OPERATING INSTRUCTIONS

2.1 BASIC OPERATION

When the controller has been properly set up and the control loop has been tuned, it should maintain constant tension while the machine is running and while speed, roll diameter, or other conditions change. However, during startup of a new roll you may want to change modes, setpoint or other settings. Usually, the only thing the operator will need to do is turn tension On or Off, toggle between Auto and Manual modes, and change the Auto tension setpoint or Manual output setting.

With tension off, to turn tension on and enable output, press the tension On / Off button. If the controller is in Auto mode, the output will ramp up or down to tension the web to the Auto Tension Setpoint. If the controller is in Manual mode, the output will change to the manual output setting. Either the auto or manual mode will be indicated as active by the Auto / Man status indicator in the upper right hand corner of the display. The Auto and Manual modes can be toggled back and forth by pressing the Auto / Man button.

While in either auto or manual mode, the “+” and “-” buttons for adjusting the auto tension setpoint or the manual output setting can be brought up by touching the tension display screen.

2.2 DISPLAY ADJUSTMENTS

Operator-adjustable display settings described below may be found and adjusted at *Menu > Main Menu > Operator Menu > Display Configuration* (Fig. 7). Adjustments to these settings may be made using the up and down arrows, and then saved by pressing the SAVE button. These adjustments serve visual purposes only, and do not affect the control loop.

- **Tension Update** - Choose 0.2, 0.5, 1.0, 2.0 or 5.0 seconds and press SAVE to adjust the time it takes for the display to update with new information. Longer updates produce fewer changes in displayed information over time, at the expense of rapid visual response to changes in tension.
- **Display Damping** - Choose 0.0, 0.2, 0.4, 0.8, 1.6 or 3.2 sec and press SAVE to adjust how smoothly information is displayed.
- **Plot Update Time** - Choose 30 sec or 1, 2, 5, 10 or 30 min and press SAVE to adjust time that tension displays before dropping off the trend-line graph screen. This also applies to the PID tune screen referenced repeatedly in the Technical Reference Manual (DFE P/N 801-2540).
- **Line Speed Display** - Choose Auto, On or Off and press SAVE. When in Auto, if line speed is required for control, it will be displayed by default. Otherwise, either On or Off may be chosen to force the display of line speed or to suppress it.
- **Diameter Display** - Choose Auto, On or Off and press SAVE. When in Auto, if the roll diameter is required for control, it will be displayed by default. Otherwise, either On or Off may be chosen to force the display of roll diameter or to suppress it.
- **Display Brightness** - Adjust between 10% and 100% and press SAVE to control the brightness of the display.

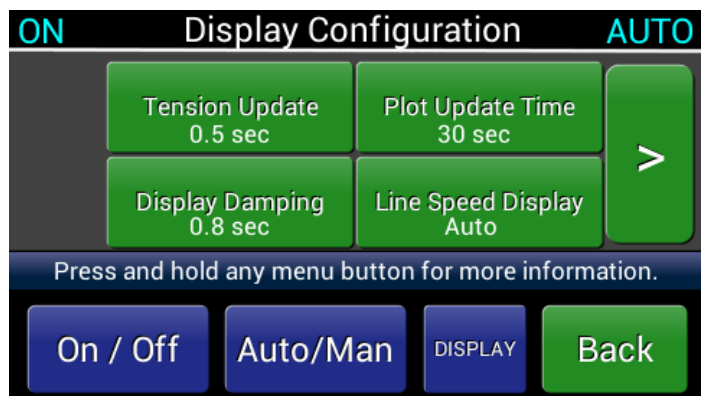


Figure 7 - DISPLAY CONFIGURATION MENU

2.3 SAVING, RECALLING AND DELETING SETUPS

An **Active Setup** is composed of all the most recently selected settings and is held in non-volatile memory, meaning that even if power is lost, the settings will not be. The active setup is not recalled using the named setups, but will automatically come up again upon restart if the controller is shut down while operating in that setup.

2.3 SAVING, RECALLING AND DELETING SETUPS continued...

A **Saved Setup** is a group of settings saved together in a named setup, and is also preserved in non-volatile memory. Only by saving a named setup after changing one or more settings in that named setup (overwriting), or by deleting the named setup, can saved settings be lost. The SW6 controller is limited to 30 named setups.

Setups are saved, recalled or deleted through the Operator Menu > Store / Delete Setup and the Operator Menu > Recall Setup menus, as described below:

1. **Store Setup** - Select Store Setup, then scroll to the location in which to store the setup and press the Select button (Fig. 8).

If overwriting an existing setup, the existing name will show up on the information line, and may be accepted as-is. New names must be entered with the keypad (Fig. 9). Once the setup name is assigned, and the OK button is pressed, the screen will advance to confirm the saved setup with a press of the Save button (Fig. 10), and return to another screen indicating the setup was saved. OK must be pressed to exit.

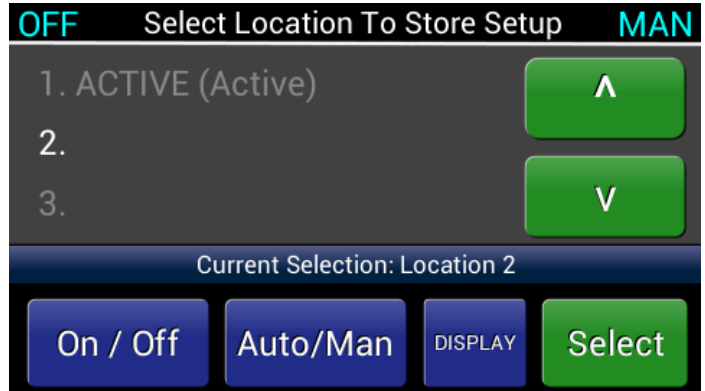


Figure 8 - SELECT LOCATION TO STORE



Figure 9 - NAME SETUP SCREEN

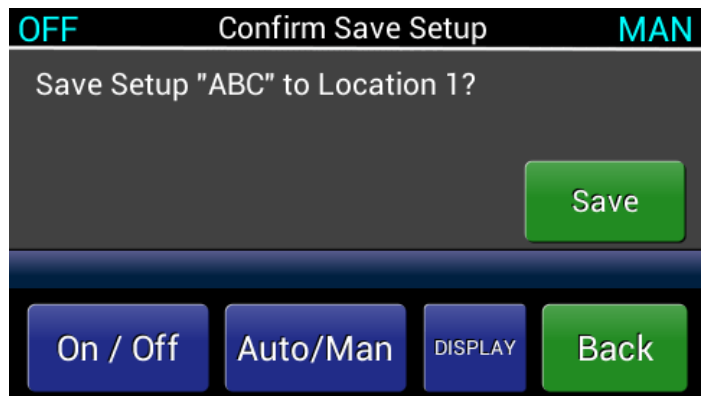


Figure 10 - CONFIRM SAVE SETUP

2. **Recall Setup** - Scroll to the named setup to be recalled (Fig. 11) and press the Recall button. Press Recall in the next screen to copy the selected setup as the active setup. The controller will return another screen indicating that the selected setup was recalled. OK must be pressed to exit.
3. **Delete Setup** - Select Delete Setup, then scroll to the named setup to be deleted and press the Select button (Fig. 12). The controller will return another screen indicating that the selected setup was deleted. OK must be pressed to exit.

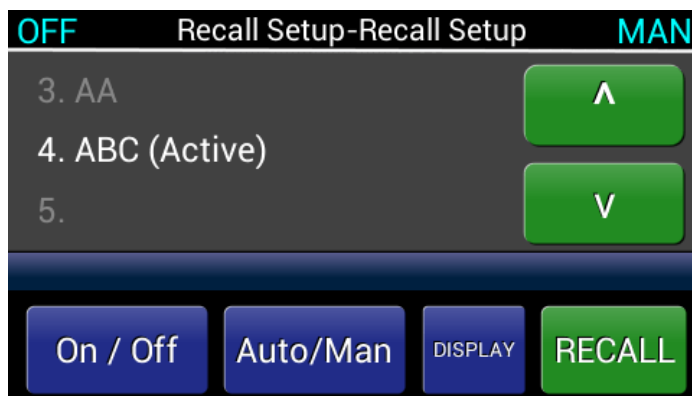


Figure 11 - RECALL SETUP

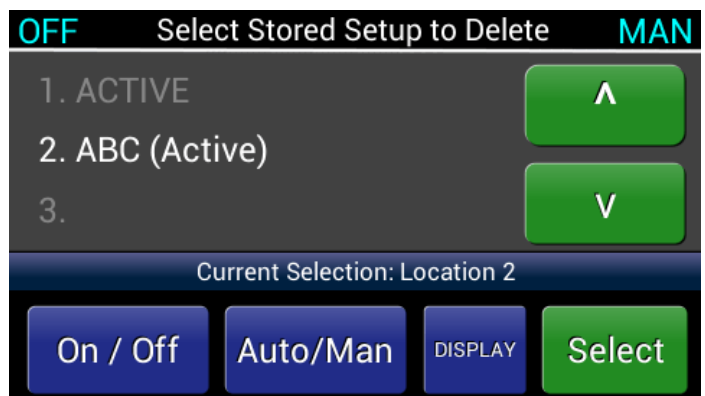


Figure 12 - SELECT SETUP TO DELETE

2.4 AUTO TENSION SETPOINT AND MANUAL OUTPUT SETTING

Pressing or tapping the tension display area on either the Analog Meter or Trend-line Graph display will bring up “+” and “-” buttons (Fig. 13), which are used to adjust the auto tension setpoint by pressing or holding them down. Buttons used to adjust numerical values are velocity sensitive, meaning that the longer the button is depressed, the faster values change.

Setpoint adjustments made in this manner apply only to the mode displayed on screen at the time. In other words, if the “+” and “-” buttons are used in the Auto mode, no change is made to the Manual output, and vice versa.

When adjusting the auto tension setpoint with the “+” and “-” buttons in either the Analog Meter or Trend-line Graph display, the actual tension in white characters is temporarily replaced with the auto tension setpoint in yellow characters. When the “+” and “-” buttons fade away, the auto tension setpoint in yellow characters disappears and the tension in white characters returns.



Figure 13 - ADJUSTING SETPOINT

2.5 TAPER TENSION

In some cases where poor roll quality might result from winding the entire roll at constant tension, certain types of roll quality problems can be avoided by reducing the tension as the diameter of the roll increases from the core. This reduction is known as **Taper**, and may be enabled at *Menu > Main Menu > Operator Menu > Configure Taper > Taper Enable* (Fig. 14). Because the tension setpoint is constantly changing in this case, a new control target has been established, called the Dynamic Tension Setpoint.

The dynamic tension setpoint is the auto tension setpoint, linearly reduced by the **Taper Percentage**, going from core diameter to full roll diameter. For example, with an auto tension setpoint of 50 lbs, and the taper percentage set at 20%, the dynamic tension setpoint will be 50 lbs at core, and decrease linearly to $(100\% - 20\%) \times 50 \text{ lbs} = 40 \text{ lbs}$ at full roll.

The taper percentage may be adjusted at *Menu > Main Menu > Operator Menu > Configure Taper > Taper Percentage* (Fig. 15). The dynamic tension setpoint is identified on the momentary tension display with a blue caret above the short meter divisions (Fig. 16), and on the trend-line plot as a line plot with an adjacent “T” (Fig. 17) which moves up or down in the RH margin as the roll diameter changes.



Figure 14 - ENABLE TAPER TENSION

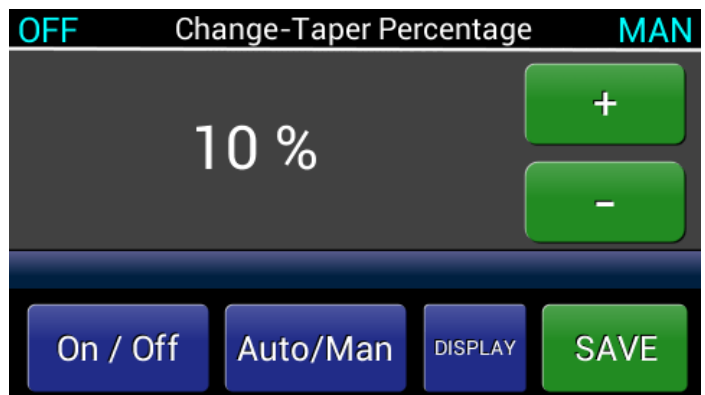


Figure 15 - SET TAPER PERCENTAGE

2.5 TAPER TENSION continued..



Figure 16 - TAPER SETPOINT ON METER

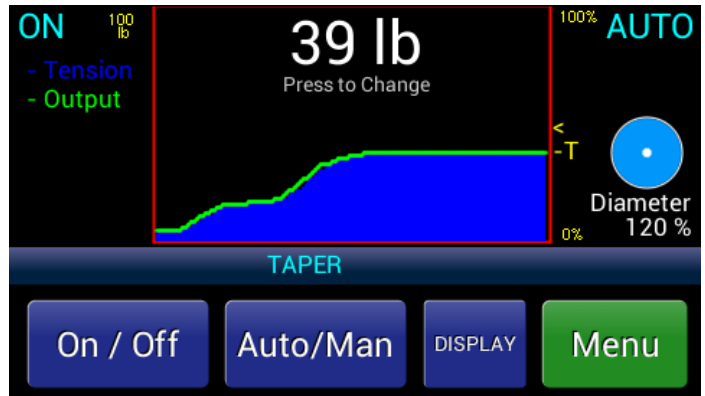


Figure 17 - TAPER DISPLAY ON TRENDLINE

Finding the right taper percentage for a particular process may take some experimentation in adjusting both the auto tension setpoint and the taper percentage. See the table below for common winding defects and corresponding corrective actions:

Location	Tight/Loose	Example	Move
Core	Tight	Blocking, Crushed Core	Decrease Tension
Core	Loose	Telescope During Unwinding	Increase Tension
Outside	Tight	Baggy Lane Due to Gage Variation	Increase Taper
Outside	Loose	Out-of-Round Roll	Decrease Taper
Global	Tight	Telescope During Winding, Starring	Increase Tension and Taper

Roisum, David R. What is the Best Taper to Run on My Winder? Converting Magazine, ©November 2007.

Figure 18 - EXAMPLES OF WHEN TO RUN TAPER

2.6 TLS, ALARMS AND RESETTING THEM

Tension Limit Switches (TLS) are used to indicate that tension is outside a specified range. The controller can be set up to respond several different ways when tension wanders outside the range specified with TLS settings.

If TLS is set in the Momentary mode, the controller will issue a visual on-screen "TLS" alarm in yellow letters to the left of the meter scale (Fig. 19) when tension is outside of the acceptable range. Once tension has returned to the specified range, the alarm will automatically reset and disappear.

Perhaps more useful is the Latched mode, when the same alarm appears accompanied by a more prominent "RESET TLS" message flashing in red across the meter scale (Fig. 20). The latched alarm may be reset only by pressing on the flashing red message, and only after tension has returned to the specified range.

In addition to issuing visual alarms when tension is out of range, TLS can also be set to disable tension control. If tension control is disabled by TLS, the controller cannot be relied upon to return tension to the specified range all by itself. To restore tension to the specified range, press and hold the tension On/Off button until tension returns to the specified range, and then release the button.

2.6 TLS, ALARMS AND RESETTING THEM *continued...*



Figure 19 - TLS SETPOINT SHOWN



Figure 20 - RESET TLS SCREEN

2.7 RESETTING DIAMETER ALARM

The diameter alarm alerts the operator that the roll has reached a size requiring attention. A flashing red message to “RESET DA” appears on screen when the diameter alarm is triggered (Fig 21), either by the roll exceeding the Maximum Diameter Trip Point or dropping below the Minimum Diameter Trip Point for longer than the Diameter Alarm Delay setting.

The alarm will persist until reset by manually pressing the flashing red message on the screen, even if the roll diameter returns to the acceptable range. If the diameter alarm is reset while the roll diameter is still outside the acceptable range, it will not trigger again until after the roll diameter has returned to the acceptable range, and again crosses the trip point.



Figure 21 - RESETTING DIAMETER ALARM

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