



**MOTOR POWERED UNWIND TENSION CONTROLLER
MWP – 12662 - 1**

**Instruction Manual
AO-70172 (Rev BA)**

Blank

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WebPro Motor Powered Unwind Tension Controller

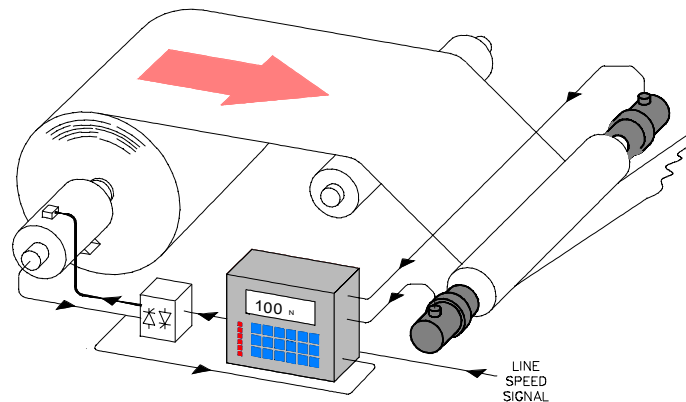
General Description

The **WebPro** Digital Tension Controller is part of a closed loop tension control system with transducer feedback. The Controller continuously controls the web tension to the TENSION SET POINT value and displays the true web tension on an LCD screen, either as a percentage or in engineering units. The screen will display the tension applied to each transducer separately by pressing the < LEFT tension or > RIGHT tension key. The sum of the LEFT and RIGHT tensions is displayed when the < > TOTAL key is pressed. The Controller will control to the TOTAL tension value even when the LEFT or RIGHT tension is being displayed. The Controller also has a dual range tension indication feature.

The measurement of actual web tension is made by sensing, with strain gauge transducers (sometimes referred to as "load cells"), the force on a sensing roller caused by the tension in the web. The electrical signal from the transducers is a combination of tension force and sensing roller weight. The weight of the sensing roller is zeroed out electrically, leaving the tension force only to be displayed on the screen. For wide web applications two transducers are recommended, one on each end of the sensing roller; for narrow web, wire, cable and filaments one transducer can usually be used.

Motor Powered Unwind System

Motor powered unwind systems can operate at tension levels lower than those of a brake system and can generate tension when the machine is at rest (stall tension) provided the machine is designed to allow this. The motor and drive must be suitable for continuous regenerative operation. The Controller requires either tachogenerators (tachos) or encoders or a combination of both, for the unwind reel speed and for the line speed. These speed signals are used by the Controller to calculate the reel diameter. The motor powered unwind Controller provides constant tension; there is no taper tension feature.



All drive electronics **MUST** be isolated from any supply voltage and the electronics common must be connected to ground/earth. If the drive electronics are not isolated or the common cannot be connected to earth, consult CMC Inc before use.

WebPro Motor Powered Unwind Tension Controller

Quickstart

The Controller is supplied with the software loaded for the application as ordered but it will require commissioning before use.

For more detailed information refer to the various sections later in this manual.

1. Carefully unpack the Controller, remove the rear cover and detach the bag containing the accessories. Attach the cable gland to the large hole in the rear cover. Mount the Controller in the operator's panel using the two keyhole brackets provided.

2. Position the links LK1 to LK5 on the Printed Circuit Board correctly for the type of transducer used.

Ensure that the mains voltage selector is set correctly.

3. Thread the mains supply cable through the gland and connect to the orange two-part connector. Thread the transducer cables, machine interlock cables, output cable and any other cables through the most convenient of the four smaller holes and connect to the terminal strips. If an encoder is to be used, thread the encoder cable through the rear cover and connect to the header using the crimps provided. Additional holes may be drilled and extra glands for the cables may be fitted by the user.

Ensure that the encoder is connected correctly to prevent damage to the power supply.

4. Fix the rear cover to the Controller and tighten the gland to retain the mains cable for safety purposes.

5. Switch on, the POWER LED will light, the company logos will be shown briefly then the Introduction screen will be shown.

6. Press 4, Commissioning, enter the default password, by pressing 5678 then press the ENTER key. Press 1, Machine parameters, then scroll through and enter the parameters for the installation.

By default only one transducer, the LEFT transducer, is enabled. For installations with two transducers, which is the normal situation for web applications, the RIGHT transducer must be enabled.

If a tacho is used the **MAXIMUM** input voltage is 10V DC.

If an encoder is used the number of pulses per second at maximum machine speed must be entered.

To accept and save the Machine parameters the CONFIRM key **MUST** be pressed.

7. Calibration for the sensing roller weight and maximum tension to be used is required; calibration for the speed of the machine may also be required.

8. The default Product number is 1 with a PI stability of SLOW. This should be sufficient to put the machine into service. To change the stability, open the Adjust PI stability screen from the Commissioning menu, start the machine and observe the bar graph. Reduce the PI stability to MEDIUM or FAST until the bar graph fluctuations just start to increase, then press CONFIRM.

WebPro Motor Powered Unwind Tension Controller

Installation

The following parts are supplied:

1. Controller, with software loaded for the application but requiring commissioning by the user.
2. Two keyhole mounting brackets.
3. Cable gland to be fitted to the rear cover and header connector kit for encoders.
4. Cabinet, if ordered.
5. Manual (this document).

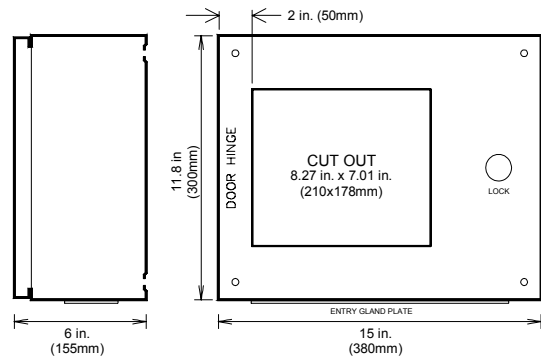
Transducers and cables may also be supplied to complete the system

The Controller should be installed using 'best practice' and in accordance with all relevant specifications. The Controller must be installed in a dry, non-hazardous location. A panel cutout 8.27in (210mm) wide x 7.01in (178mm) high is required. The Controller is 39.4in (100mm) deep, additional space for the cables is needed.

The Controller is retained by two mounting brackets. Remove the four screws securing the mounting brackets to the Controller. Insert the Controller into the cut out in the panel. Refit the four screws, attach the mounting brackets to the Controller and tighten the two nylon screws to retain the Controller.

Cabinet Installation

The cabinet has rear mounting holes for M8 fixing. When the Controller is supplied as a cabinet version the mains supply is terminated inside the cabinet on a three way terminal block. The incoming mains cable should be securely fastened by the gland plate cord grip.

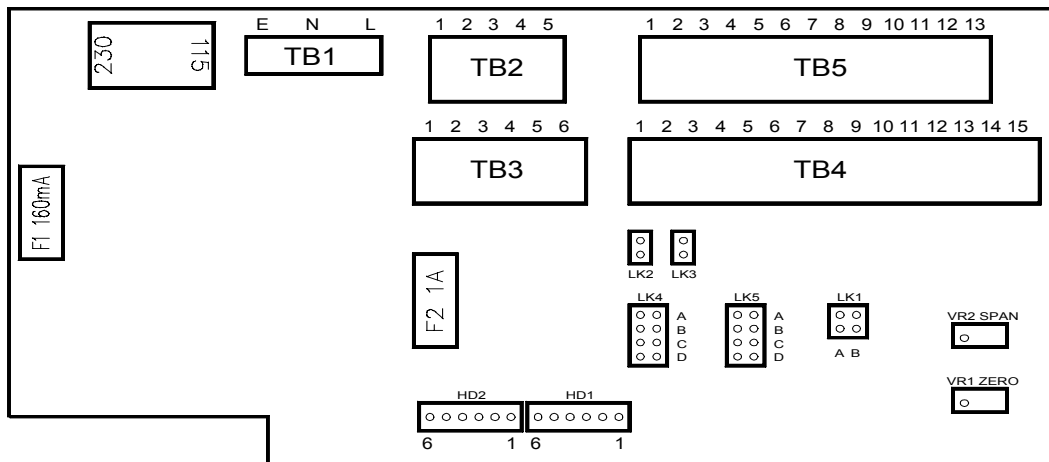


PCB Link Positions

The links LK1 to LK5 **MUST** be in the proper positions for correct operation. It may be found more convenient to position the links before connecting the Controller.

LK1	Excitation Voltage	Position B	This gives 5.6V for Cleveland-Kidder transducers
LK1	Excitation Voltage	Position A	This gives 10V for ACDF and foil transducers
LK2 and LK3		IN	For Cleveland-Kidder transducers to complete the bridge
LK2 and LK3		OUT	For full bridge transducers, the bridges are complete
LK4 and LK5	Gain	Position A	Normal gain for Cleveland-Kidder transducers
LK4 and LK5	Gain	Position B	High gain for Cleveland-Kidder transducers
LK4 and LK5	Gain	Position C	Normal gain for ACDF and foil transducers
LK4 and LK5	Gain	Position D	High gain for ACDF and foil transducers

The High gain positions providing three times the normal gain are used if the transducers are oversized and there is insufficient signal level for accurate calibration.



WebPro Motor Powered Unwind Tension Controller

Controller Connections

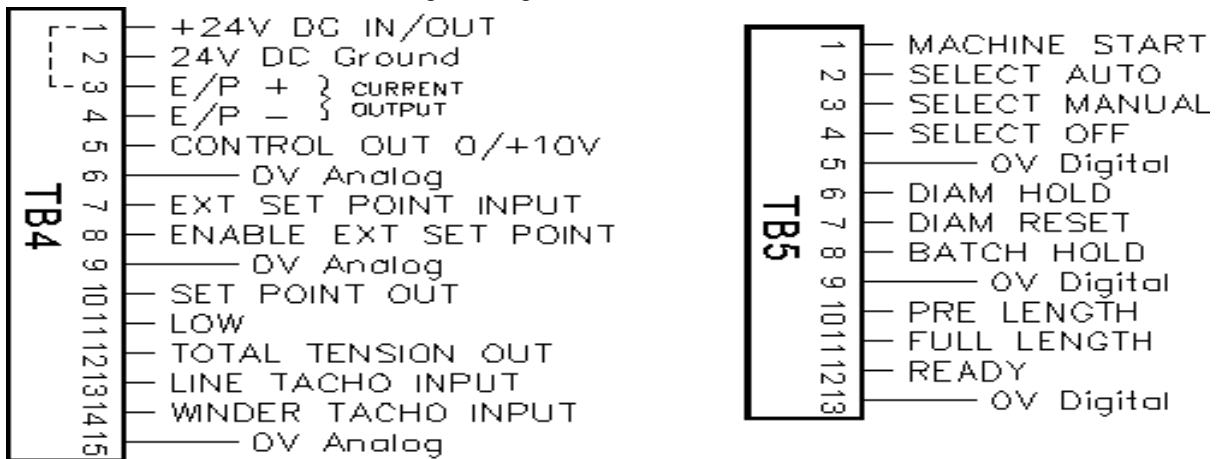
WARNING - Disconnect the Controller completely before any electric welding is undertaken on the machine. Failure to carry out this precaution could damage the Controller and will invalidate the warranty.
WARNING - The PCB uses devices sensitive to electrostatic voltages. Do **NOT** touch any components without first using proper electrostatic discharge ESD precautions.

The Controller uses Wago Cage Clamp terminals, it is recommended that the correct tool is used when inserting the cables. Wago part number 210-120 is available from Wago or CMC Inc.

Do **NOT** strain the terminals or the PCB. The terminals are suitable for cable sizes 12-24 AWG, 0.1-2.5sqmm. The cable ends should be terminated with ferrules or crimp tags.

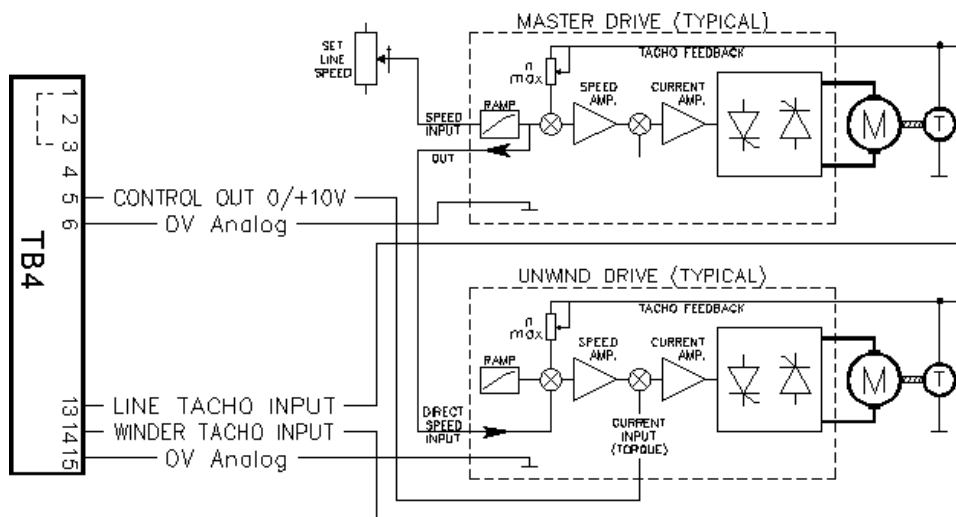
It is necessary to remove the rear cover to connect the Controller, set the links and select the mains supply voltage. Remove the rear cover and fit the cable gland (supplied loose) to the rear cover. Feed the mains cable through the cable gland and connect to the two part connect as shown. Feed the transducer cables and other cables through the most convenient holes in the rear cover and connect to the terminals. Replace the rear cover and secure the cable gland to retain the mains cable for safety purposes.

All the Controller 0V commons, analog and digital, are connected to earth E and to the metal case.



TB4 – Analog I/O

TB5 – Digital I/O



Torque Control connections shown, for Speed Control connect TB4/5 to the unwind direct speed input.

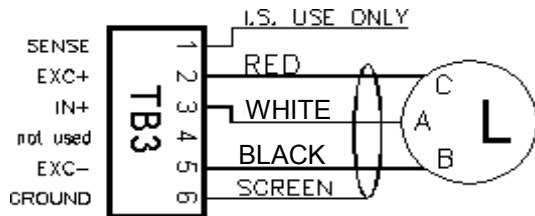
Under/over unwinding; the polarity of the line and reel tachos must be switched externally to provide a positive input to the Controller at all times.

WebPro Motor Powered Unwind Tension Controller

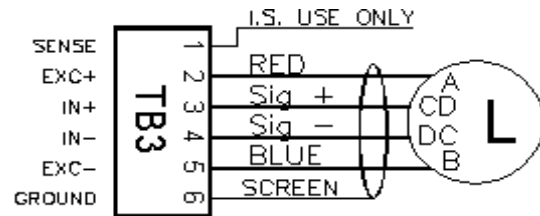
Transducer Connections

The Controller may be used with one half bridge transducer, two half bridge transducers, one full bridge transducer or two full bridge transducers. The strain gauges may be semiconductor with 5.6V or 10V DC excitation, each half bridge resistance 230Ω minimum; or foil with 10V DC excitation, each bridge resistance 350Ω minimum.

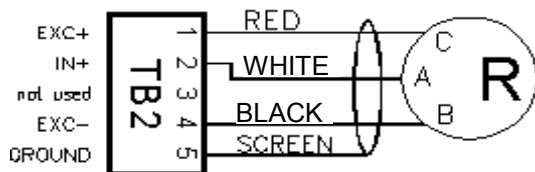
For systems with a single transducer connect the transducer to TB3 Left and disable the Right transducer, see Machine Parameters; Right transducer - Disabled/Enabled.



Cleveland-Kidder Transducers



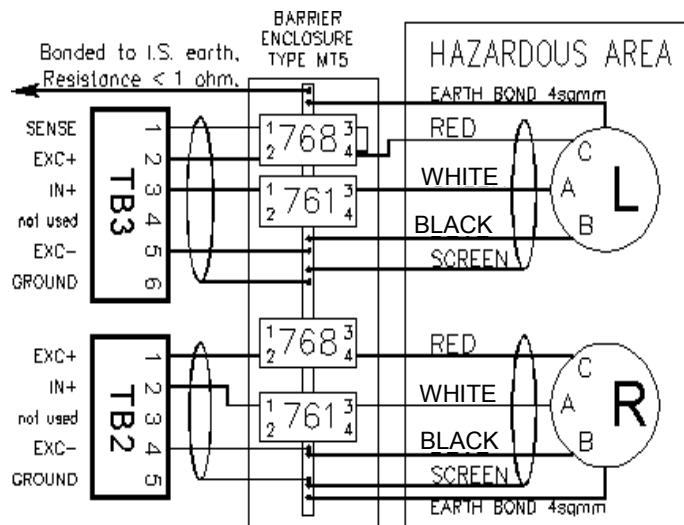
ACDF Transducers



Intrinsically Safe Transducer Connections for Hazardous Area Installations

CMC Inc tension transducers can be located in a hazardous area to provide an Intrinsically Safe installation to EN 50039 when a proprietary Zener Barrier module, **Part Number 4503**, is used. Tension transducers are passive components and are classified as simple apparatus by EN 50014. Strain gauge transducers (load cells) will be damaged if subjected to the 500 volt insulation test required by EN 50020. To comply with Intrinsic Safety regulations the body of the transducer must be bonded to the I.S. earth using 4 square millimetre green/yellow insulated cable.

Consult CMC Inc for connections to ACDF transducers in I.S. installations.



I.S. connections for Cleveland-Kidder transducers

NOTE It is the responsibility of the user to ensure that all relevant safety regulations are complied with. The integrity of all connections particularly the I.S. earth should form part of any maintenance procedure.

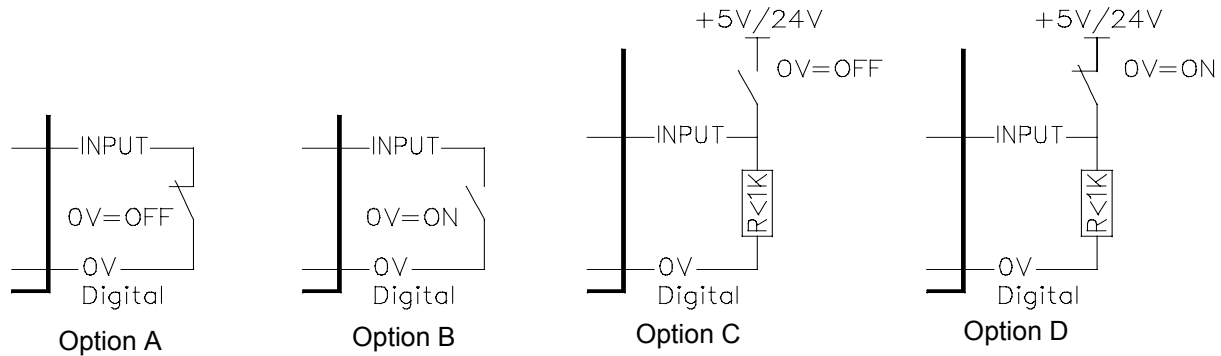
WebPro Motor Powered Unwind Tension Controller

Machine Sequence Logic and Connections

WARNING - Do **NOT** connect the digital inputs to a negative or AC supply, this will cause damage and will invalidate the warranty.

The digital inputs are opto-isolated and over voltage protected. The maximum input voltage is +24V DC.

The AUTO/OFF functions may be selected from the keypad if Enable MAN/AUTO/OFF keys is Enabled. The full range of Machine Sequence Logic is selected externally, see Machine Parameters.



The digital input is shown in the OFF position

Disabled, the input is inactive.

0V=OFF, requires the input to be open to 0V with a volt free contact closure or logic switch - Option A, or alternatively taken high (+5 to +24V) with a pull down resistor $R < 1K\Omega$ to function - Option C.

0V=ON, requires the input to be taken to 0V with a volt free contact closure or logic switch - Option B, or alternatively open to high (+5 to +24V) with a pull down resistor $R < 1K\Omega$ to function - Option D.

Machine Start, this toggles between AUTO and tension OFF.

Select Auto, a pulse greater than 100mS will put the Controller into the Automatic control mode.

Select Manual, this feature does not operate in Motor Powered Unwind Tension Controller.

Select Off, a pulse greater than 100mS will put the Controller into the tension OFF mode.

Diameter Hold, this will hold the current reel diameter value.

Diameter Reset, a pulse greater than 100mS will reset the held diameter value to the full reel value.

Batch Hold, this feature does not operate in Motor Powered Unwind Tension Controller.

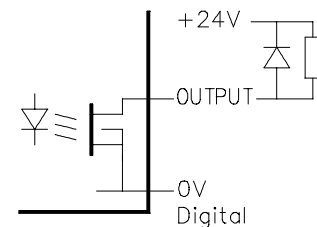
Enable Ext SP, this will allow an external tension set point to be used and will disable the keypad setting.

Select Auto; Select Off; the Controller will remain in the selected mode until an alternative input is selected even after the primary contact closure or logic level is removed. However, if the contact is maintained closed this will override any other contact or key.

Digital Output Connections

The digital outputs use open drain mosfets. The maximum that each output can switch is +24V DC at 100mA. The output may be used as a TTL output with a suitable pull up resistor. A freewheel diode should be connected across any load inductance to prevent damage to the mosfet and to suppress EMI.

When the low tension range is selected by pressing the LOW key the digital output on TB4/11 will be switched OFF, switched ON in high tension range. This may operate a relay to select the motor torque range.



When mains powered, the total current that can be taken from the Controller 24V DC supply by the digital outputs is 50mA maximum. When 24V DC powered this current will depend on the users supply.

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Power Supply Connections

The Controller may be powered by 110-120V, 220-240V 50/60Hz AC at 15VA or by 22-26V DC at 1A.

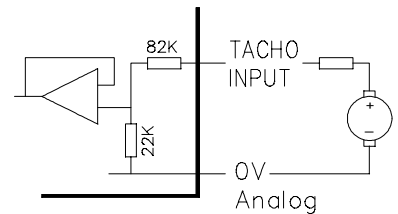
Before connecting the Controller to the mains ensure that the mains voltage selector switch is set correctly. The mains supply is terminated on TB1, a two part connector. The mains fuse F1 is 160mA. The 24V DC supply must be smooth and free from noise. The 24V supply is terminated on TB4; positive to pin 1, negative to pin 2. Pin 2 is connected to ground and the metal case. The 24V fuse F2 is 1A.

WARNING - Under no circumstances apply a voltage in excess of 36V between TB4/1 and 0V ground, this will cause serious damage and will invalidate the warranty.

Do not connect the AC mains and the 24V DC supplies to the Controller at the same time.

Tacho Connections

The Controller accepts a tacho input of +10V DC **MAXIMUM**. If the tacho voltage is higher than this, insert a resistor of appropriate value and dissipation in series with the Controller input. The Controller input resistance is 100K Ω . The input common 0V is connected to earth. The tachos must be Enabled, see Machine Parameters.

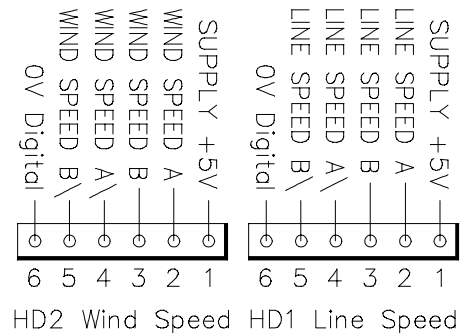


Under/over unwinding; the polarity of the line and reel tachos must be switched externally to provide a positive input to the Controller at all times.

Encoder Connections

Low pass filters should not be included in the encoder signal leads, these may degrade the pulse edges and introduce errors. The line speed encoder is terminated on header HD1. The reel speed encoder is terminated on header HD2. A +5V DC supply at 100mA is provided by the Controller on the headers, the Controller +24V DC supply may also be used.

Encoders of 100 to 1000 pulses per revolution are suggested. The maximum input frequency of the Controller is 100kHz. The encoder must be Enabled, see Machine Parameters. The encoder wires **MUST** be crimped correctly using the proper tool to ensure reliable operation.



Length Counter

If an encoder is available for the line speed this may be used as the input to the Length Counter feature. The length is counted up. If the Length Outputs in the Product Parameter menu are enabled, at the Preceding Length coincidence the output from TB5/10 is switched OFF, at the Full Length coincidence the output from TB5/11 is also switched OFF, see Digital Output above for more details. These outputs may be used to slow and then stop the machine. **NOTE** the Preceding Length is the value before the Full Length, for example if the Full Length is 500 metres and the machine needs to slow down at 480 metres, set the Preceding Length to 20 metres. Encoder compliment outputs are not necessary for the Length Counter feature. The count may be reset manually at any time by pressing the RESET LENGTH key. The maximum number of pulses allowed is 9999 pulses/metre or 3000 pulses/foot.

Batch Hold

This feature does not operate with the Motor Powered Unwind Tension Controller.

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System Set Up

The system must be set up before the Controller is used for the first time. The on screen prompts are very easy to follow and will guide the user through the Controller system set up and commissioning. The parameters can be easily changed later if necessary.

Press the SYSTEM SET UP key (called SET UP) to cancel an action or entry and return to the previous screen. Press the CONFIRM key when finished with a screen to confirm the entries. If the CONFIRM key is not pressed, the entries will not be saved to the memory and the existing parameters will be used. Pressing CONFIRM will also exit that screen and return to the previous screen.

When entering Commissioning values and Product Parameters, some values are entered by the numeric keys, some are entered by the +/- keys; this will be shown in the relevant sections later.

Use the Scroll keys to move the cursor up or down the menus. Enter a value using the ENTER key, the cursor will move down to the next item. The CONFIRM key must be pressed to save values to memory.

When the Controller is switched on, the program is loaded, the company logos are shown briefly then the Introduction screen below is shown. This sequence can be changed, see "Start in control screen" later.

CMC Advanced Digital Tension Controller
<ol style="list-style-type: none"> 1. Control 2. Change Product 3. Product Parameters 4. Commissioning

- Press 1 This will show the Control screen. To exit the Control screen press SET UP.
- Press 2 Enter a product number (1-20) Product 1 is the default
- Press 3 Enter the SET UP password 1234 (factory default) and then press ENTER.

Product # Parameters	(SET UP = cancel)
Minimum diameter	<i>Enter a value</i>
Full scale diameter	<i>Enter a value</i>
Length outputs	Disabled, Enabled
Preceding length	<i>(if a line encoder is available)</i>
Full length	<i>(if a line encoder is available)</i>
PI stability setting *	
Inertia time constant	<i>(Torque mode only)</i>
Inertia coefficient	<i>(Torque mode only)</i>
Maximum trim	
Current tension set point	<i>(The last tension value used)</i>

An asterisk * indicates that a further menu will open if this item is selected.

- Press 4 Commissioning password 5678 (factory default) and then press ENTER.

Commissioning Menu
<ol style="list-style-type: none"> 1. Machine Parameters * 2. Calibrate tension * 3. Calibrate speed * 4. Adjust PI stability * 5. Change Passwords * 6. Diagnostics *

An asterisk * indicates that a further menu will open if this item is selected.

WebPro Motor Powered Unwind Tension Controller

Machine Parameters

From the Commissioning Menu; press 1 to show the **Machine Parameters** screen

Machine Parameters	(SET UP = cancel)	changed by using	default value
Language	English Deutsch Français Italiano Español	+/-	English
Unit system	S.I. / Metric kgf / Pound/foot / Percent	+/-	S.I.
Controller application	Unwind		
Unwind type *	Brake / Speed / Torque	+/-	Brake
Output range	0-10V / 0-20mA / 4-20mA / 0-50mA	+/-	0-10V
Start in control screen	No / Yes	+/-	No
Enable MAN/AUTO/OFF keys	No / Yes	+/-	No
Dual tension range	No / Yes	+/-	No
Full scale (low)	<i>Enter a value</i>	numeric key	5000
Full scale (normal)	<i>Enter a value</i>	numeric key	5000
Minimum tension	3% minimum, 20% maximum	numeric key	6%
Static friction	Torque mode only, 10% maximum	numeric key	0%
Dynamic friction	Torque mode only, 20% maximum	numeric key	0%
Output level bias	20% maximum	numeric key	0%
Output level limit	100% maximum	numeric key	100%
Set point ramp rate	1% per second, 100% per second	numeric key	5%/sec
Soft stop time	10 seconds maximum	numeric key	6 secs
Display damping time	0.1 seconds, 3 seconds	numeric key	2 secs
Display precision	0.1, 0.5, 1, 5, 10	+/-	1
Digital inputs			
MACHINE START	Disabled, 0V=OFF, 0V=ON	+/-	Disabled
SELECT AUTO	Disabled, 0V=OFF, 0V=ON	+/-	Disabled
SELECT MANUAL	Disabled, 0V=OFF, 0V=ON	+/-	Disabled
SELECT OFF	Disabled, 0V=OFF, 0V=ON	+/-	Disabled
DIAMETER HOLD	Disabled, 0V=OFF, 0V=ON	+/-	Disabled
DIAMETER RESET	Disabled, 0V=OFF, 0V=ON	+/-	Disabled
BATCH HOLD	Disabled, 0V=OFF, 0V=ON	+/-	Disabled
ENABLE EXT SP	Disabled, 0V=OFF, 0V=ON	+/-	Disabled
Show internal calibration *	No / Yes	+/-	No
Right transducer	Disabled, Enabled	+/-	Disabled
Line tacho or encoder *	Disabled, Tacho, Encoder	+/-	Disabled
Winder tacho or encoder *	Disabled, Tacho, Encoder	+/-	Disabled

An asterisk * indicates that a further menu will open if this item is selected.

Remember to press the CONFIRM key, otherwise the parameters will not be saved to the memory.

Note Start in Control Screen

The Controller is despatched with this item set to "No". We recommend that after all commissioning is finished that this is then set to "Yes". When the Controller is now switched on, the program is loaded, the company logos are shown briefly and then the Control or operating screen ready for use by the operator.

Note

The Controller will not accept an invalid input value which is outside the limits of operation. If an invalid input is attempted the Controller will revert to the previous valid input.

WebPro Motor Powered Unwind Tension Controller

Language

(English, Deutsch, Français, Italiano, Español)

The default language is English. If changed, all text shown on the Controller will be changed to that language and an extra item "5 - Translations" will be added to the Introduction screen.

Unit system

(SI (newtons), Kgf, pounds/foot, percent)

Select a unit system. All items which use units will be changed accordingly.

Unwind type

(Brake, Torque, Speed)

Select the unwind type. In Torque and Speed control modes tachos or encoders must be available for the line speed and winder (reel) speed signals in order to calculate the reel diameter.

Start in control screen

(No / Yes)

The Controller is despatched from the factory with this set to "No". We recommend that after all commissioning and set up is finished that this is then set to "Yes". When the Controller is now switched on, the program is loaded, the company logos are shown briefly and then the Control or operating screen ready for use by the operator.

Enable MAN / AUTO / OFF keys

(No / yes)

When using the Digital Inputs to control the sequence of the system, this item should be set to "No" to prevent accidental operation.

Dual tension range

(No / Yes)

Select "Yes" if required. Enter two values of tension. The (normal) value must be the same value as entered during Calibrate tension. The (low) value should not be less than one third of the (normal) value. Terminal TB4/11 will be switched OFF when LOW is selected from the front panel.

TB4/11 is an open drain mosfet which may be used with a suitable electrical relay to select the motor torque range when in Torque control. See Digital Output Connections for more details.

Minimum tension

Enter a value, the minimum tension is 3%, the maximum is 20%. The system may not function correctly and may be unsafe if it is operated at zero tension (the motor may run forwards).

Static friction

(For Torque mode only)

Enter a value which overcomes the unwind static friction.

The procedure for establishing this value is explained in Controller Tuning - Torque mode, below.

Dynamic friction

(For Torque mode only)

Enter a value which overcomes the unwind dynamic friction.

The procedure for establishing this value is explained in Controller Tuning - Torque mode, below.

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Output level bias

This item should normally be set to 0%.

Output level limit

The procedure for establishing this value is explained in Controller Tuning, below.

Set point ramp rate

It may cause an unacceptable disturbance and be unsafe if the tension is changed too quickly. Enter a value which is slightly slower than the PI stability rate so that the system can maintain the desired tension value as the set point is changed.

Display damping time

If the tension is fluctuating enter a value between 0.1 and 3 seconds so that the display is steady. The Display Damping operates on the analog bar graph and the digital display.

Display precision

(1, 5, 10 (0.1, 0.5 and 1 for percent units))

Enter a value so the display can be read easily and the tension set point easily entered. This item also sets the resolution of the tension set point value.

Right transducer

(Disabled, Enabled)

Select "Disabled" when a single transducer is used, for example in wire and cable or narrow web applications. The single transducer must be connected to the "Left" terminals using TB3.

Line Tacho or Encoder *

(Essential for Speed and Torque modes)

If an encoder is selected enter the maximum number of pulses per second when the machine is at maximum speed. This allows for the encoder pulses per revolution and the gear ratio used. Enter the number of pulses per metre or foot if the Length Counter feature is required. The maximum number of pulses allowed is 9999 pulses/metre or 3000 pulses/foot. The tacho or encoder must be Enabled in order to function.

Winder Tacho or Encoder *

(Essential for Speed and Torque modes)

If an encoder is selected enter the maximum number of pulses per second when the machine is at maximum speed. This allows for the encoder pulses per revolution and the gear ratio used. The tacho or encoder must be Enabled in order to function

All Machine Parameters and Product Parameters, including the current TENSION SET POINT value are saved to non-volatile memory. This ensures that when the Controller is switched off or if the power is removed, the parameters are saved.

WebPro Motor Powered Unwind Tension Controller

Calibrate Tension

To calibrate the Controller correctly a spring balance or weights to provide the required tension force and some flat webbing or rope to simulate the web will be required. If the force is insufficient for the maximum required tension value, the Controller may be calibrated proportionally. The force should be no lower than 25% of the maximum or the accuracy of tension measurement will be reduced.

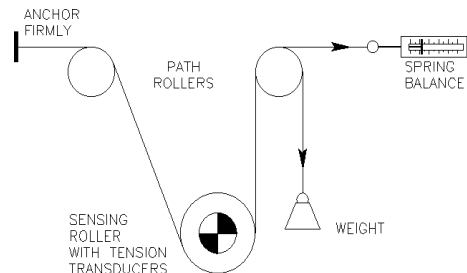
Switch on and allow to thoroughly warm up.

From the Commissioning Menu; press 2 to show the **Calibrate tension** screen.

Follow the on screen prompts. **Note** The Tension must be calibrated before the Speed is calibrated.

The Auto zero will compensate for the sensing roller weight and for any of the other analog zero offset voltages. Ensure that the line speed and reel speed signals and the external tension set point (if used) are at zero.

The Controller will calibrate both transducers simultaneously. The rope must be in the exact center of the web path so that each transducer is equally loaded.



After calibrating the tension, return to the Control screen and verify that the display shows zero when no tension is being measured and that the display shows the correct tension value when the weight or spring balance force is applied.

On first calibration two or three load applications may be necessary to "seat" the transducers.

Possible error messages:

Calibration has failed. Either the weight or spring balance force was much too small for accurate calibration, or the transducers are not operating correctly.

Press the SET UP key to return to the Commissioning menu

Calibration aborted

This is shown if the SET UP key is pressed during the calibration. The Controller will return to the Commissioning Menu screen.

The controller has not been calibrated or the settings are no longer valid. Press any key to continue.

Calibration of the Total Tension Analog Output

The Total Tension analog output provides 0 to +10V at 2mA for a remote meter or chart recorder. Make sure that no tension is being measured, then adjust VR1 until zero volts are measured at TB4/12. Using a known weight or spring balance apply the maximum tension and adjust VR2 to give +10V. The output is not damped. These adjustments must be done with the rear cover removed.

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Calibrate Speed

Note - During Calibrate speed the controller will not provide an output signal. To carry out the Calibrate speed disconnect the controller Control Out TB4/5 to the unwind drive and connect a suitable signal to the unwind drive direct speed input to represent the maximum unwind speed. This signal can usually be sourced from the unwind drive. Reconnect the controller when the Calibrate speed is completed.

From the Commissioning Menu; press 3 to show the **Calibrate speed** screen.

Follow the on screen prompts. **Note** the Tension must be calibrated before the Speed is calibrated.

Possible error messages:

Calibration has failed. Either the speed was much too low for accurate calibration, or the tachos and/or encoders are not operating correctly.

Press the SET UP key to return to the Commissioning menu

Calibration aborted.

This is shown if the SET UP key is pressed. The Controller will return to the Commissioning Menu screen.

**Tension must be calibrated before speed.
Select Calibrate tension from the menu.**

The controller has not been calibrated or the settings are no longer valid. Press any key to continue.

Product Parameters

The default is Product Number 1.

Product #	Parameters	(SET UP = cancel)
	Minimum diameter	<i>Enter a value</i>
	Full scale diameter	<i>Enter a value</i>
	Length outputs	Disabled, Enabled
	Preceding length	<i>(if a line encoder is available)</i>
	Full length	<i>(if a line encoder is available)</i>
	PI stability setting *	
	Inertia time constant	<i>(if a line tacho or encoder is available)</i>
	Inertia coefficient	<i>(if a line tacho or encoder is available)</i>
	Maximum trim	<i>(Speed and Torque control modes only)</i>

An asterisk * indicates that a further menu will open if this item is selected.

Enter a value for the Minimum Diameter (core) using the selected units.

Enter a value for the Full Scale Diameter (maximum) using the selected units.

If an encoder is available enable the Length Outputs and set the Preceding Length and Full Length.

The procedure for the PI stability settings and Maximum trim is explained in Controller Tuning, below.

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Controller Tuning - Speed mode

It is essential that all motor drives are correctly set in accordance with the suppliers instructions BEFORE the Controller is commissioned. The reel drive should be set so that any tension error due to acceleration and deceleration is as small as possible. The Controller will not compensate for incorrectly set drives.

In Speed mode, with the tension OFF, the unwind speed voltage as determined by the diameter calculator and the line speed only will be output from the Control Out terminal TB4/5. This should correspond closely to +10V at minimum diameter and maximum speed if the Output Level Limit is 100%.

Output Level Bias

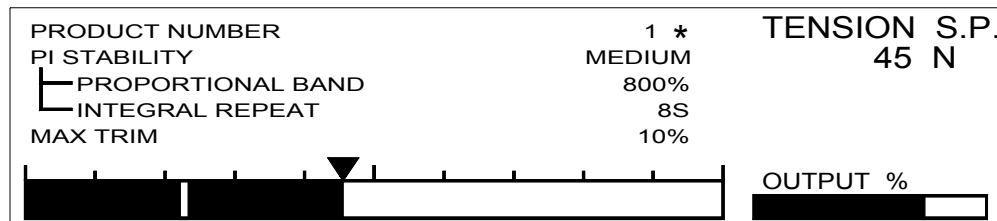
This item should be set to 0% in Speed mode.

Output Level Limit

This item should be set to a value equivalent to the reel drive speed input voltage at maximum speed. If the reel drive speed input at maximum speed is +10V this item should be set to 100%, if the reel speed input at maximum speed is +5V set this to 50%.

PI Stability Settings

There are two methods of setting the PI stability; through the Product Parameter menu with the machine at rest or through the Adjust PI stability menu with the machine running.



Access the Adjust PI stability menu from the Commissioning menu. Run the machine with the Controller in Auto at a Tension Set Point of approximately 50%. Use the SCROLL keys to select the parameter to be changed and adjust the parameter using the numeric keys or the +/- keys. Press the CONFIRM key to implement and save the change. An asterisk alongside the Product Number indicates that a parameter has been changed and that the CONFIRM key must be pressed to implement and save the change.

When the best performance is achieved stop the machine, remember to press CONFIRM and then press SET UP to return to the Commissioning menu.

To simplify the tuning there are five factory set PI values. One of these values should be suitable for most applications. If it is found necessary to apply different PI values, select Custom and starting from PI values that gave stable but sluggish operation, reduce the P band % value and reduce the I time value until the desired performance is achieved. Remember to press the CONFIRM key before exiting the Product Parameter or the Adjust PI stability menus in order to implement and save any changes.

The five preset PI values are:

	very slow	slow	medium	fast	very fast
Proportional band	2000%	1200%	800%	500%	200%
Integral time	20 sec	12 sec	8 sec	5 sec	2 sec

Maximum Trim

Set this item to a value which gives best overall performance. Too large a value may apply too much correction and make the system unstable. The value should be sufficient to compensate for tension disturbances, diameter calculator errors and any other errors. Extensible materials may require a trim value higher than more rigid materials. As a guide set this item to 10%.

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Controller Tuning - Torque mode

It is essential that all motor drives are correctly set in accordance with the suppliers instructions BEFORE the Controller is commissioned. The Controller will not compensate for incorrectly set drives. The line speed signal may be used to reduce any tension error caused by the inertia of a full reel when the machine accelerates or decelerates.

In Torque mode, with the tension OFF, the unwind torque voltage as determined by the diameter calculator and the tension set point will be output from the Control Out terminal TB4/5. This should correspond closely to +10V at maximum diameter and maximum tension if the Output Level Limit is 100%.

Output Level Limit

First set this item to a value equivalent to the reel drive torque input voltage at maximum torque. If the reel drive torque input at maximum torque is +10V this item should be set to 100%, if the reel torque input at maximum torque is +5V set this to 50%.

Select high tension and with the tension OFF, run the machine slowly with a reel of maximum diameter and with the Tension Set Point at maximum. Adjust the Output Level Limit until the measured tension is also at maximum. This will require stopping the machine and changing menus.

Static Friction

With no material in the machine, start the machine with the line speed set to zero so that the motors are energised but not rotating, increase the Static Friction value until the unwind motor just starts to rotate then decrease slightly, the unwind motor will slow to rest. This overcomes any static friction in the unwind drive.


Dynamic Friction

First set the Maximum Trim value to 5% and the PI to very slow to reduce the effect of the control function.

Run the machine slowly with a full reel at a tension near maximum. Slowly increase the machine speed to near maximum and allow the machine speed to settle. If the measured tension at high speed is lower than that at low speed, increase the Dynamic Friction value to compensate for rotational losses.

PI Stability Settings

There are two methods of setting the PI stability; through the Product Parameter menu with the machine at rest or through the Adjust PI stability menu with the machine running.

PRODUCT NUMBER	1 *	TENSION S.P.
PI STABILITY	MEDIUM	45 N
└─ PROPORTIONAL BAND	800%	
└─ INTEGRAL REPEAT	8S	
INERTIA TIME CONSTANT	2S	
INERTIA COEFFICIENT	0.0%	
MAX TRIM	10%	
		OUTPUT %

Access the Adjust PI stability menu from the Commissioning menu. Run the machine with the Controller in Auto at a Tension Set Point of approximately 50%. Use the SCROLL keys to select the parameter to be changed and adjust the parameter using the numeric keys or the +/- keys. Press the CONFIRM key to implement and save the change. An asterisk alongside the Product Number indicates that a parameter has been changed and that the CONFIRM key must be pressed to implement and save the change.

When the best performance is achieved stop the machine, remember to press CONFIRM and then press SET UP to return to the Commissioning menu.

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To simplify the tuning there are five factory set PI values. One of these values should be suitable for most applications. If it is found necessary to apply different PI values, select Custom and starting from PI values that gave stable but sluggish operation, reduce the P band % value and reduce the I time value until the desired performance is achieved. Remember to press the CONFIRM key before exiting the Product Parameter or the Adjust PI stability menus in order to implement and save any changes.

The five preset PI values are:

	very slow	slow	medium	fast	very fast
Proportional band	2000%	1200%	800%	500%	200%
Integral time	20 sec	12 sec	8 sec	5 sec	2 sec

Maximum Trim

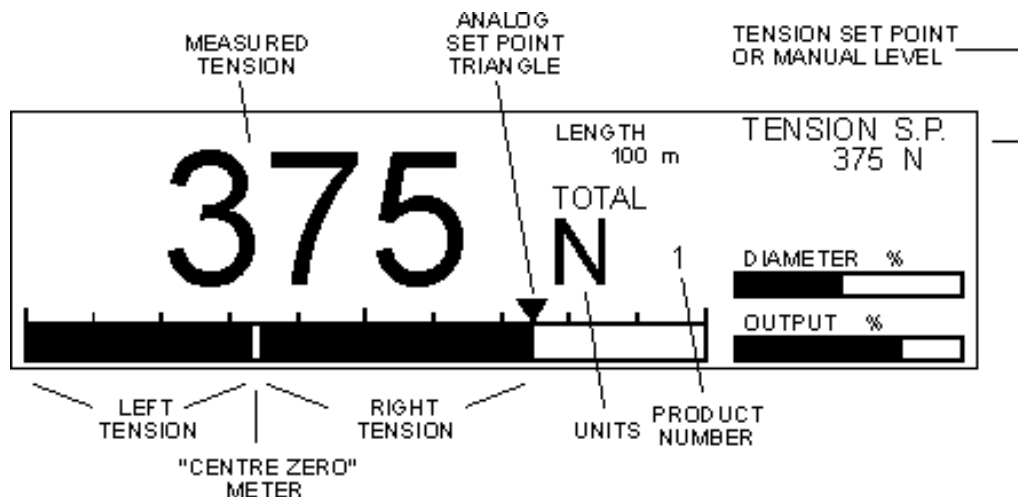
Set this item to a value which gives best overall performance. Too large a value may apply too much correction and make the system unstable. The value should be sufficient to compensate for tension disturbances, diameter calculator errors and any other errors. Extensible materials may require a trim value higher than more rigid materials. As a guide set this item to 10%.

Inertia Compensation

While accelerating or decelerating the machine at the normal maximum rate observe the measured tension bar graph and the desired tension set point triangle. If these differ by more than 10% adjust the Inertia Time Constant and the Coefficient to compensate for any increase in tension while accelerating or decrease in tension while decelerating. The Inertia Time Constant determines the rate of correction; the Coefficient determines the amount of correction.

Operating

A typical Control screen is shown below.



The manual feature is only available in Unwind Brake mode. The taper feature does not operate. The Auto Tension set point may be set with the numeric keys followed by ENTER or by the +/- keys. The analog tension set point triangle is only visible when the Controller is in Auto control. The measured tension analog bar graph and the set point triangle should coincide when in control.

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Change Passwords

From the Commissioning Menu; press 4 to show the **Change Passwords** screen.

Commissioning password:	Enter the number and press ENTER
Enter new set up password:	Enter up to four digits and press ENTER
New password again	Enter the same number and press ENTER
** Password changed **	
New commissioning password:	Enter up to four digits and press ENTER
New password again	Enter the same number and press ENTER
** Password changed **	

The factory default SET UP password is 1234

The factory default COMMISSIONING password is 5678

A password may be up to nine digits long, alternatively a single digit is valid.

Safety and EMC

Safety is paramount at all times.

The Controller has a number of built in safety features; password protection for the Product Parameters, a different password for Commissioning, the MAN/AUTO/OFF keys may be disabled, the Controller may only be changed to LOW tension when the tension is OFF and all SET UP keys are disabled when MAN or AUTO are selected. The KEY LED will confirm if any key is pressed. The Controller will not accept an invalid input value which is outside the limits of operation; if an invalid input is attempted the Controller will revert to the previous valid input. The Controller has been designed to meet UL and CSA requirements.

The Controller is self certified as compliant with the EC Low Voltage Directive 73/23 and is CE marked. The Controller is self certified as compliant with the EC EMC Directive 89/336. However the EMC performance will depend on the installation and environment and CMC Inc can give no guarantee that the installation will be free of problems. The Controller must be installed using best EMC practice and in particular the earth connection must provide a good EMC path to earth.

Additional Information

The CCFL (cold cathode fluorescent light) has a minimum expected life of 20,000 hours.

The non-volatile memory is battery backed. The battery has an expected life of one year without a recharge. The battery will recharge when the Controller is powered.

During power up the Controller may output a signal which may cause the machine to move if the controlled drive is powered and enabled.

External tension set point input

This is an analog signal of 0 to +10V DC, for Master - Slave applications. The input resistance is 100K Ω . The EXT SET POINT must be enabled in Machine Parameters to use this feature.

Tension set point output

This is an analog signal of 0 to +10V DC at 2mA maximum, for Master - Slave applications.

Adjusting the screen contrast

There are two unmarked keys, one below the CONFIRM key the other below the TENSION OFF key. Press both together and release, the KEY LED will flicker. Whilst flickering press one or the other unmarked key as required to adjust the screen contrast, release and allow the flickering to terminate.

Diameter Calculation

In Speed and Torque modes, when the line speed is above 6% the Controller continuously calculates the

WebPro Motor Powered Unwind Tension Controller

reel diameter by dividing the line speed signal by the reel speed signal, below 6% of line speed the diameter is held in memory and the calculator is disabled to prevent spurious operation. To avoid interaction with the control function the diameter calculator has a time constant of approximately 60 seconds from full reel diameter to core diameter. The diameter reset function has an instantaneous action.

Troubleshooting

With the exception of the fuses, F1 - 160mA and F2 - 1A, there are no user replaceable or serviceable parts in the Controller. If a fuse is ruptured the cause should be investigated before replacement.

1. If the POWER LED is lit, the incoming supply and fuses F1 rated at 160mA and F2 rated at 1A are correct. If the screen is blank or the backlight is not functioning the Controller must be returned to CMC Inc.
2. Check that the transducers are wired correctly and that the excitation voltage between TB2 (1 and 4), and between TB3 (2 and 5) is correct for the type of transducers used. Reset link LK1 if required.
3. Check that the Machine Sequencing switching is wired correctly and enabled from the Machine Parameters screen.
4. Check that the Output Level Limit is not set to zero, 0%.
5. In Speed and Torque modes, it should be possible to maintain the web tension better than +/-5% at all times. If not, investigate the motors and drives to confirm that they are of a type suitable for tension control with an adequate, linear torque rating and this torque is constant as it rotates, that all shafts and rollers are concentric and rotate freely and the web speed is constant.
6. In Speed mode, with the tension OFF, the unwind speed voltage as determined by the diameter calculator and the line speed only will be output from the Control Out terminal TB4/5. This should correspond closely to +10V at minimum diameter and maximum speed if the Output Level Limit is 100%.
7. In Torque mode, with the tension OFF, the unwind torque voltage as determined by the diameter calculator and the tension set point will be output from the Control Out terminal TB4/5. This should correspond closely to +10V at maximum diameter and maximum tension if the Output Level Limit is 100%.

