Bardac
drives

# Winder Card Installation Manual.

UG101535 Iss 2

## IMPORTANT SAFETY NOTES

READ AND UNDERSTAND THE RELAVANT
PRODUCT MANUALS BEFORE APPLYING POWER

The products in this manual are all open chassis components for use in a suitable enclosure

The product is a complex component only for professional assemblers. It is CE marked according to LVD 73/23/EEC amended 93/68/EEC. Follow the installation guidelines for EMC compatability. Further measures may be necessary. Installers must have a level of technical competence to correctly install. The EMC behaviour is the responsibility of the manufacturer of the system or installation using this component.

CE

Remember that the equipment you will be using incorporates...

High voltage electrical equipment
Powerful rotating machinery with large stored energy
Heavy components

... and your process may involve ...

Hazardous materials
Expensive equipment and facilities
Interactive components

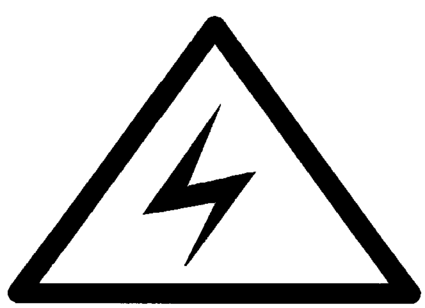
Always use qualified personnel to design, construct and operate your systems and keep SAFETY as your primary concern.

Thorough personnel training is an important aid to SAFETY and productivity.

SAFETY awareness not only reduces the risk of accidents and injuries in your plant, but has a direct impact on improving product quality and costs.

If you have any doubts about the SAFETY of your system or process, consult an expert immediately. Do not proceed without doing so.

HEALTH AND SAFETY AT WORK
Electrical devices can constitute a safety hazard. It is the responsibility of the user to ensure the compliance of the installation with any acts or bylaws in force. Only skilled personnel should install and maintain the equipment after reading and understanding the relevant instruction manuals. If in doubt refer to the supplier.



**DANGER**

ELECTRIC SHOCK RISK

Note. The contents of this manual are believed accurate at the time of printing. The manufacturers, however, reserve the right to change the content and product specification without notice. No liability is accepted for omissions or errors. No liability is accepted for the installation or fitness for purpose or application of any unit or product.

## CONTENTS



## GENERAL DESCRIPTION

THE TYPE 430 WINDER UNIT IS DESIGNED TO CONTROL THE WEB TENSION DURING WINDING OR UNWINDING. THE UNIT PROVIDES A CURRENT DEMAND SIGNAL FOR THE REEL DRIVE. CONTROL IS ACHIEVED BY CALCULATION OF THE REEL DIAMETER FROM THE WEB AND REEL SPEEDS.. MANY FEATURES ARE PROVIDED TO GIVE OPTIMUM CONTROL.

## PRESETTABLE PARAMETERS

**1) TENSION PROFILE**

a) CONSTANT TENSION
b) INCREASING TENSION
c) DECREASING TENSION
d) CONSTANT TORQUE

**2) LOSS COMPENSATION**

a) STATIC FRICTION
b) DYNAMIC FRICTION
c) ACCELERATION TORQUE
d) DECELERATION TORQUE

**3) CONTROL LIMITS**

a) MAXIMUM DIAMETER
b) MINIMUM DIAMETER
c) STARTING DIAMETER
d) TACHO SCALING

## OPERATIONAL FEATURES

DIGITAL STORAGE OF REEL DIAMETER AUTOMATICALLY ACTIVATED BY

a) WEB STANDSTILL
b) WEB BREAKAGE
c) POWER LOSS automatic switch to external battery
d) EXTERNAL COMMAND

## SIGNAL INPUTS

| | |
|---|---|
| REEL SPEED | FULL SCALE 5V TO 200V |
| WEB SPEED | FULL SCALE 5V TO 200V |
| PRESET | ALLOWS INITIAL STARTING DIAMETER TO BE ENTERED |
| DIAMETER | 0 TO 10V FOR 0 TO 100% STARTING DIAMETER |
| STANDSTILL | REDUCES OUTPUT TO 25% DURING STANDSTILL |
| HOLD | ALLOWS INDEPENDANT STORAGE OF DIAMETER |
| EXTERNAL PROFILE | 2 INPUTS. 1)TENSION 2)TAPER INDEPENDANT ADJUST |

## SIGNAL OUTPUTS

| | |
|---|---|
| WARNING RELAY | SINGLE POLE CHANGEOVER CONTACTS<br>DE-ENERGISED BY ZERO SPEED OR END LIMIT/WEB BREAK<br>(option to de-energise by SET function) |
| DIAMETER OUTPUT | 0 TO +10V REPRESENTS 0 TO 100% DIAMETER |
| TAPER | OUTPUT TO EXTERNAL TAPER ADJUSTMENT POT. |
| +10V | +10 VOLTS PRECISION REFERENCE |
| CURRENT DEMAND | 0 TO +10V OUTPUT TO REEL DRIVE CURRENT INPUT |

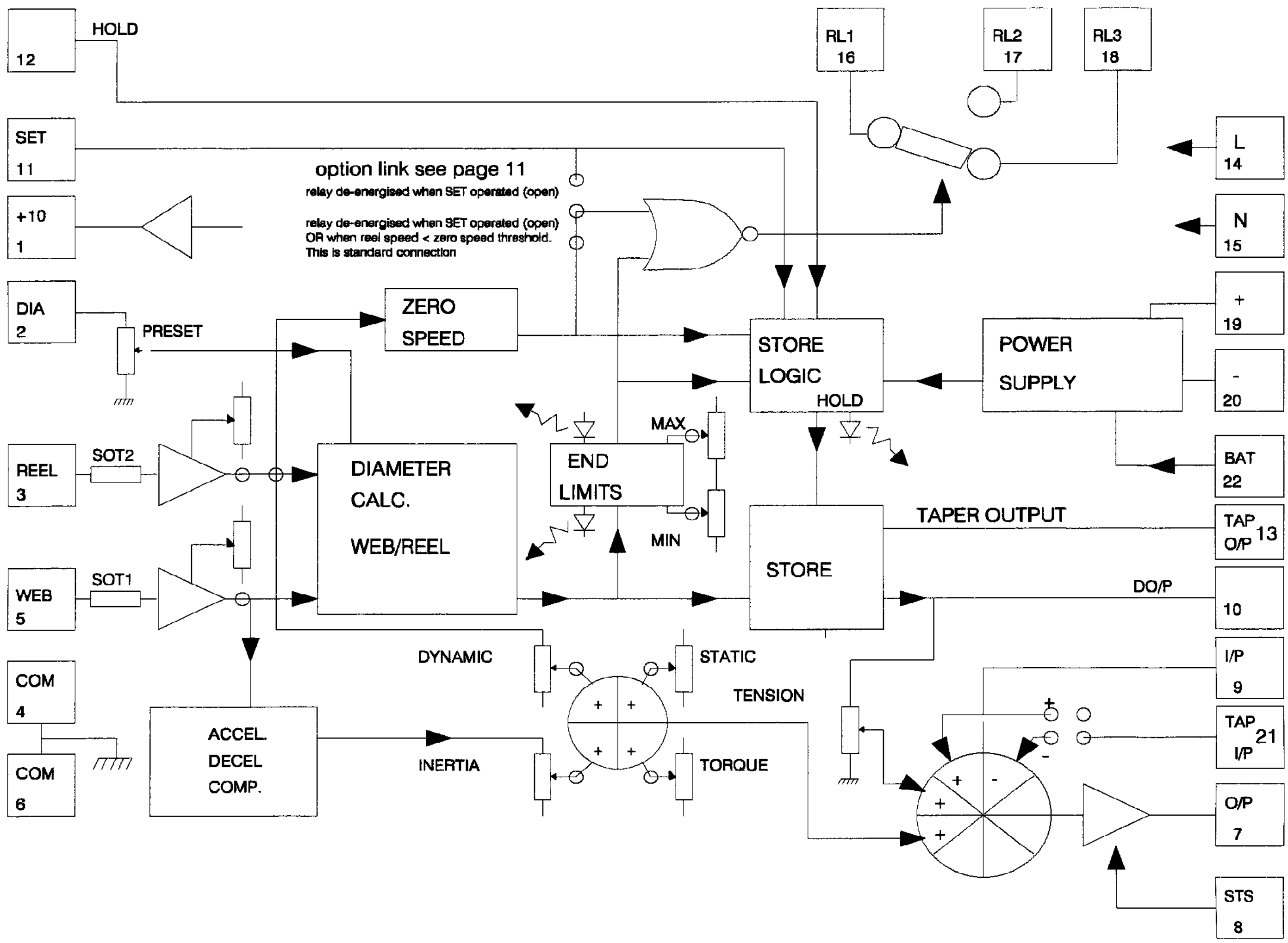
## LAMPS

MAINS POWER ON
HOLD ACTIVATED
MAXIMUM DIAMETER LIMIT
MINIMUM DIAMETER LIMIT

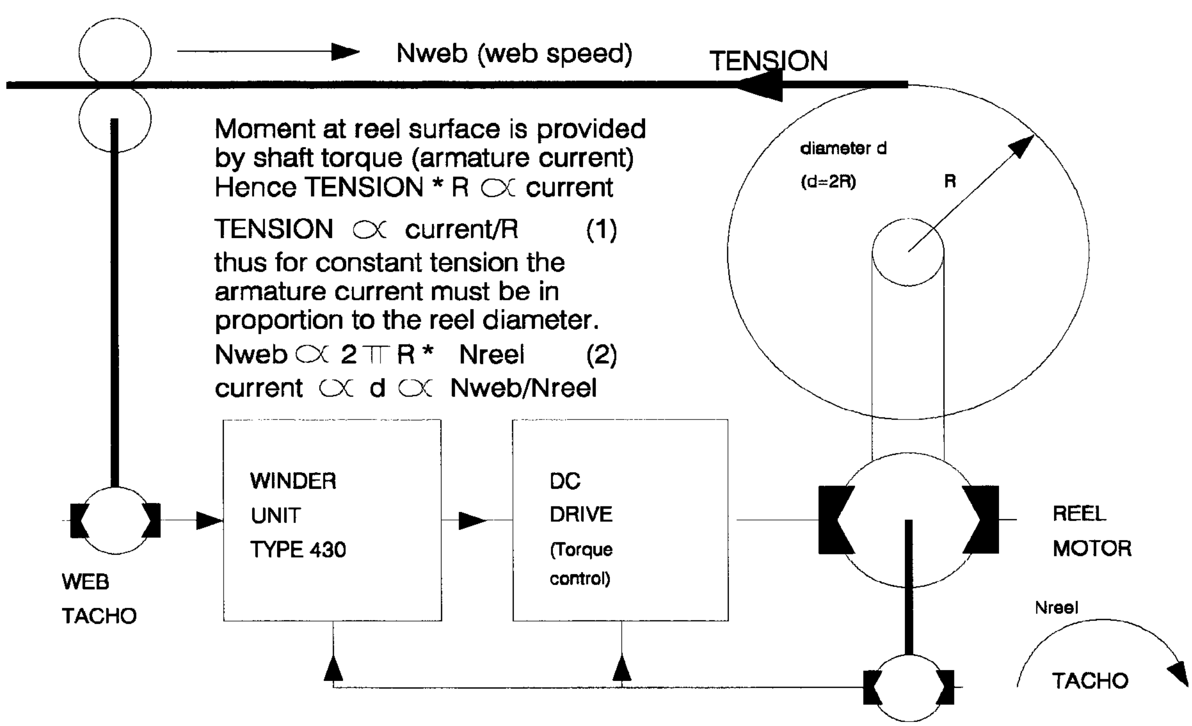
## POWER SUPPLY

100 TO 120 VAC / 200 TO 260 VAC 3VA OR +/-24V. EXTERNAL BATTERY TO POWER DIAMETER STORE DURING POWER LOSS 9V. UNIT PROVIDES AUTOMATIC CHARGING.

## Block diagram




## System configuration



MAX sets the upper limit of diameter detector.

MIN sets the lower limit of diameter detector

INERTIA provides compensation during accel. or decel.

DYNAMIC provides compensation for speed related friction

STATIC provides compensation for starting friction

TENSION adjusts the profile of tension during winding

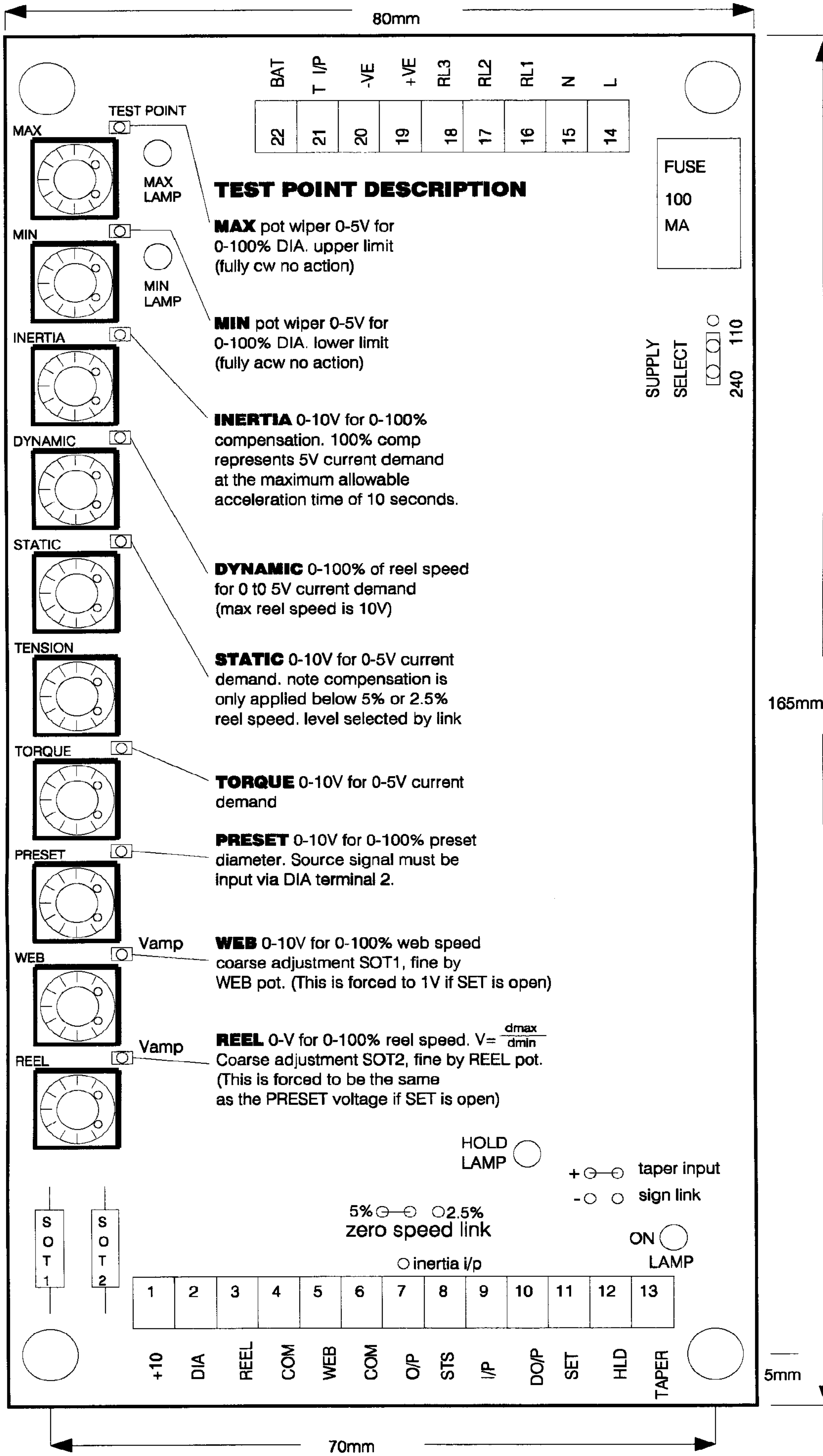
TORQUE allows the addition of constant torque component

PRESET adjusts the starting diameter from 0 to 100%

WEB scales the signal from the web tachometer

REEL scales the signal from the reel tachometer

SOT1 web tacho
SOT2 reel tacho
These resistors prescale the tacho full scale signals. (Vin). The scaled output (Vout) is on the pins near the presets.
Rsot (KOhms) = (Vin/Vout)*300-200



| | | |
|---|---|---|
| 1 | +10 | 10 volt precision reference. 10mA max. Used to drive external pots (10K) or input directly to DIA terminal 2. |
| 2 | DIA | input to top of PRESET pot. to determine starting diameter. (10K) If various starting diameters are required, then rotate PRESET fully clockwise and input 0-10V for 0-100% starting diameter. |
| 3 | REEL | Input terminal for voltage proportional to reel speed (Vin) |
| 4 | COM | system 0VOLTS |
| 5 | WEB | input terminal for voltage proportional to web speed (Vin) |
| 6 | COM | system 0VOLTS |
| 7 | O/P | 0-10V output. signal comprises sum of diameter calculation plus compensation components<br><br>the output signal is used to control the current in the reel drive |
| 8 | STS | STANDSTILL compensation. Used to provide a reduced tension during periods of standstill to prevent overheating. This terminal must be connected to +10V (1) to operate, otherwise open. |
| 9 | I/P | This input allows an external 0-10V signal to be summed in to allow external programming of the tension profile. The impedance is 100K. see fig. 1 |
| 10 | DO/P | DIAMETER OUTPUT 0-10VOLTS for 0-100% diameter 10mA max. see fig. 1 |
| 11 | SET | This terminal allows the starting conditions to be determined when open circuit.<br>1) the reel amp. is internally held at 1V.<br>2) the web amp. is internally reconnected to the PRESET pot.<br>3) the upper and lower limit pots are able to be adjusted without the lamps being latched. The HOLD function is inhibited.<br>The unit changes from PRESET to "live" operation 1 second after the SET terminal is connected to common. |
| 12 | HLD | HOLD. this allows independant storage of the diameter when open, connect to COM to inhibit. Internal pull up 4K7 +12V. HOLD lamp |
| 13 | TAPER | 0 to -10V output representing MIN to MAX diameter (not 0 to MAX) |
| 14/15 | L/N | ac supply input 240V AC or 110V AC +/-10%. via select jumper. |
| 16/17/18 | | RL1 pole / RL2 NO contact / RL3 NC contact. de-energised if reel drive speed falls below zero speed threshold. |
| 19 | +VE | This terminal is connected to the unregulated +ve rail +24V |
| 20 | -VE | This terminal is connected to the unregulated -ve rail -24V<br>19/20 may be used as outputs 10mA max. Or as inputs if no mains power is available. input range min +/-15V max +/-24V |
| 21 | T I/P | taper input summing terminal. 0-10V 100K. +/- link on board |
| 22 | BAT | Connect 9V battery plus if back up required. Trickle output 1.5mA<br>A PP3 type rechargeable battery will provide 10 hours storage. |

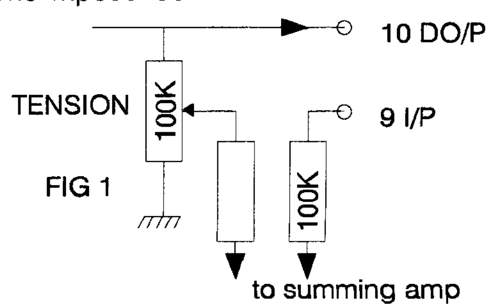
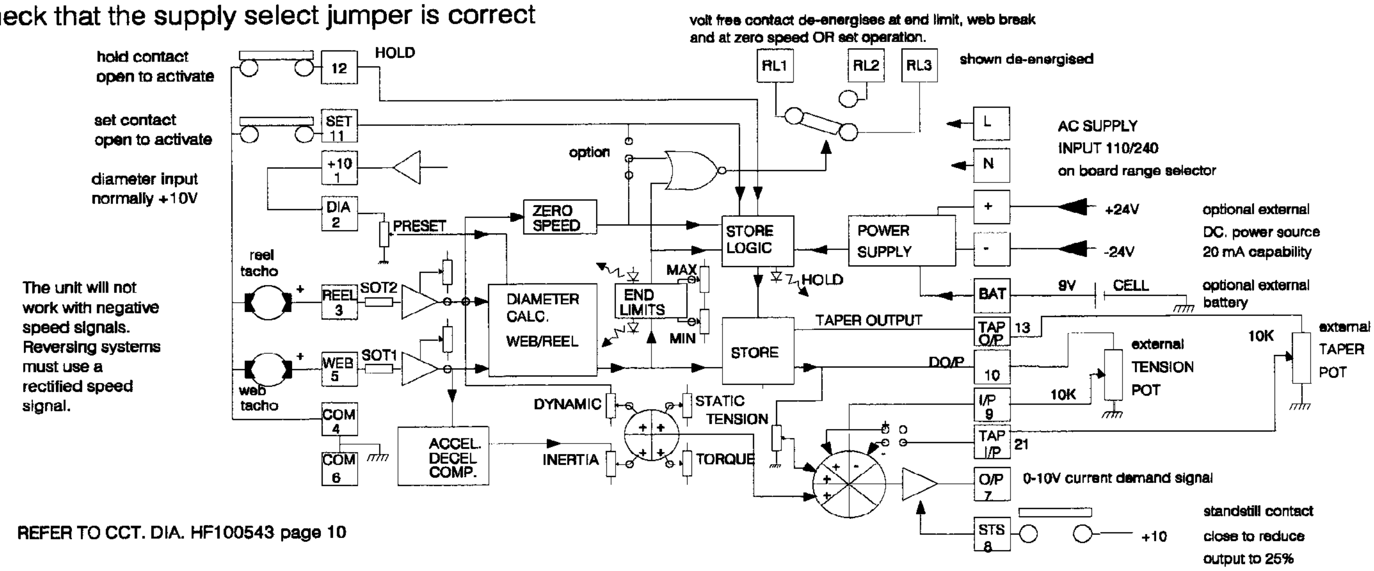



FIG 1

Check that the supply select jumper is correct




REFER TO CCT. DIA. HF100543 page 10

The unit is used in conjunction with a reel drive set up to control the armature current of the reel motor. A 0-10V signal is produced by the 430 and this is used as the current reference to the reel drive. The 430 computes the current reference by dividing the WEB speed by the REEL speed and then adding compensation for torque losses. The computed signal actually represents the REEL diameter and this is available as an output. The compensation signals are added at the final stage if required. Follow the steps in sequence to commission the system.

## STEP 1 CALIBRATING THE TACHO AMPS

SET on T11 must be closed

Each tacho input is provided with a scaling network and buffer amp with fine adjustment preset and output monitoring pin. The diameter calculator performs arithmetic on the voltages present at the 2 tacho amp pins. EG. WEB amp +10V, REEL amp +2V = diameter output 5V. DIA. output = Web / Reel

1) Determine the full scale calibration voltages. To do this find out the maximum and minimum diameters.
   EG MAX dia = 1000mm, MIN dia = 200mm.

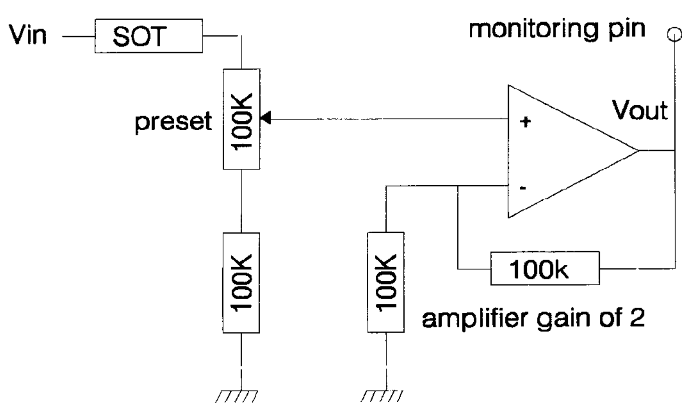
The WEB amp must be calibrated to +10V full scale

The REEL amp must be calibrated to 1000/200 = 5V full scale. (MAX/MIN)

This will provide a minimum diameter output of 2V and a maximum of 10V.

> For build up ratios (BUR) > 10:1. These systems will result in a Reel amp calculation exceeding 10V. Apply a multiplication factor to both calculated amp voltages of 10/BUR

2) Having determined the desired calibration voltages the next step is to calculate the tacho scaling resistor values.




**Formula for SOT**

SOT(KOhms) = (Vin/Vout)*300 - 200

EG full scale TACHO input 40V
desired Vout 5V

SOT = (40/5)*300 -200
 = 2400 -200
 = 2200 KOhms = 2M2

This formula will give the desired output with the preset midway

3) Calibrate both amps accordingly. When checking, if the full scale input voltages are not available then a lower dc voltage eg +10V from terminal 1 may be used but the output voltage must be calibrated in proportion to full scale (the amps are linear).

4) Fit the nearest value SOT resistor, and fine adjust the WEB and REEL presets.

## STEP 2 SETTING THE PRESET DIAMETER AND LIMIT DETECTORS

start with MAX clockwise and MIN anticlockwise

The object of this exercise is to provide a seamless start up situation. When the reel is empty, the ratio of the web and reel speeds is defined by the core starting diameter. Hence the unit needs to be pre-conditioned to think that the starting tacho voltages are already present and correct, before the drive system is actually running. This is achieved by the SET function on T11 and the PRESET pot on the unit.

With +10V entered into the DIA (2) and SET (11) open, a clockwise rotation of the PRESET pot produces a 0-10V diameter output on (10). With SET open, adjust PRESET to give a voltage on the dia. output which represents the starting dia. EG. minimum diameter 250mm, maximum diameter 1250mm, then starting diameter output is (250/1250)*10 = 2V.

Provided that the tacho amps have been correctly calibrated as described in step 1, the calculated starting DIAMETER output voltage T10, will now match the PRESET output DIAMETER voltage when SET is opened.. Hence when the system is waiting to start with the SET contact open the output voltage represents the starting diameter. When the system starts running and the live calculation process begins, the result will be the same. This will give a seamless transition between stopping and starting.

Note, because the PRESET function can be used to produce any dia. output, it can be used to statically check the current demand, and set up end limit detection (MAX, MIN). Also any dia. display units may be exercised.

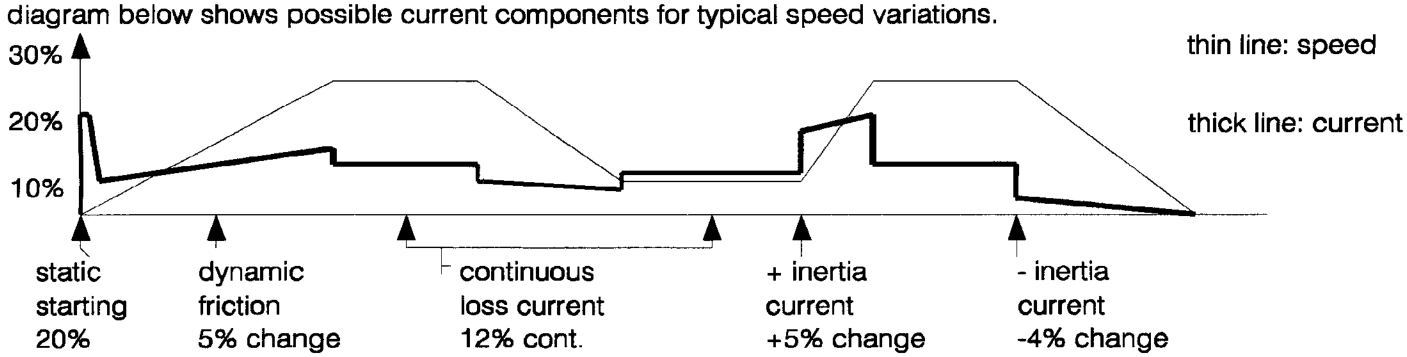
## STEP 3 SETTING THE COMPENSATION PRESETS

INITIAL SETTINGS

INERTIA, DYNAMIC, STATIC,and TORQUE anticlockwise TENSION clockwise. acw if external TENSION pot used.

NOTE. Adding the loss compensation signals should be left to the final stage of commissioning. This is an open loop compensation process and requires considerable care to complete successfully. In highly efficient systems this step may be unnecessary. Systems that require significant compensation loss adjustment are likely to suffer degradation of performance over time due to mechanical wear etc.

The reel must be run in speed first to find out the magnitude of the current needed to overcome losses. The diagram below shows possible current components for typical speed variations.

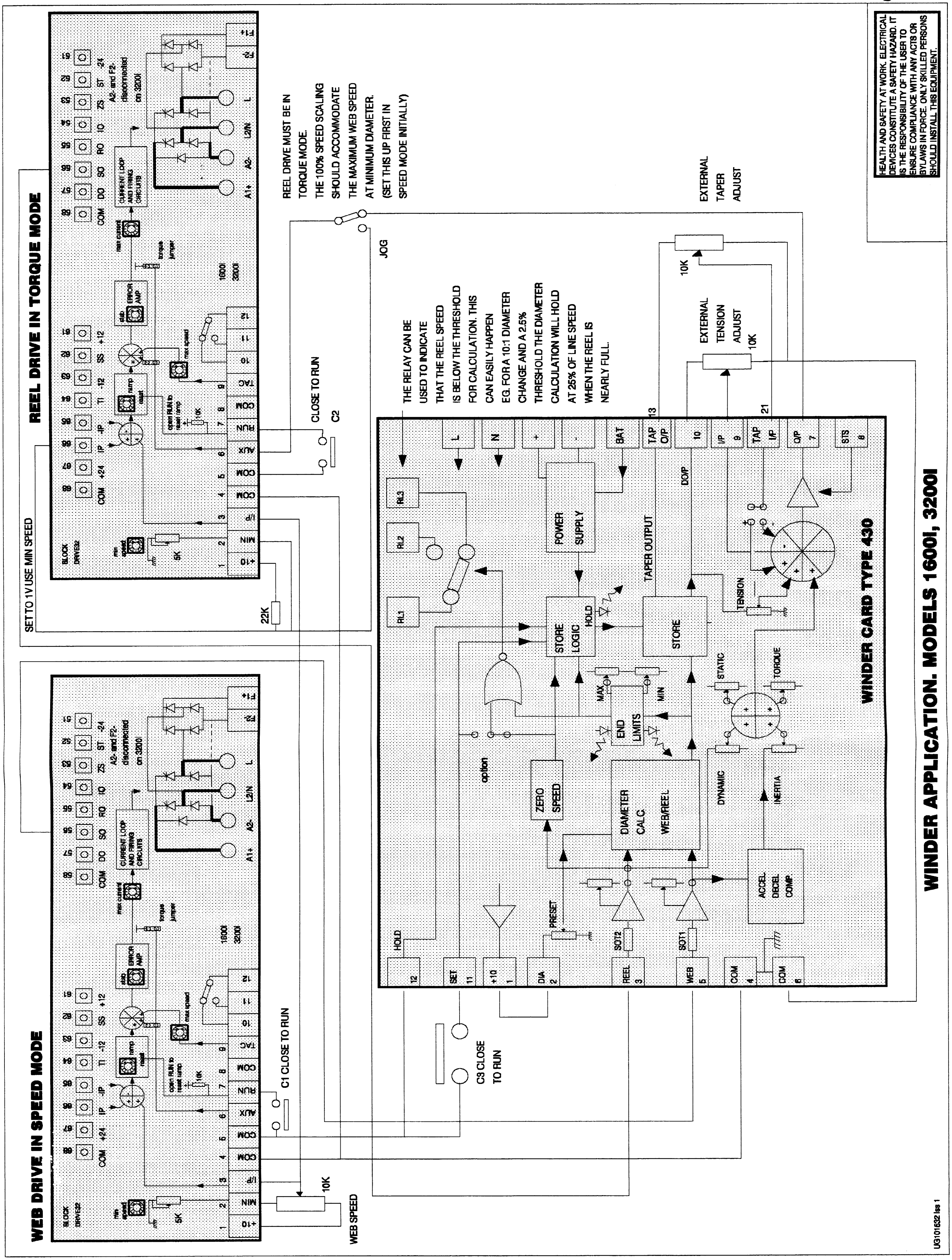



The observations must be made with a full and empty reel. The empty reel is more likely to be used at high speeds and the full reel at low speeds. The purpose of these observations is to find out how much current will be used to overcome the losses and hence be unavailable to provide tension in the web. A system with low losses will be the most accurate. A system with high losses and low tension requirement will be the least accurate.

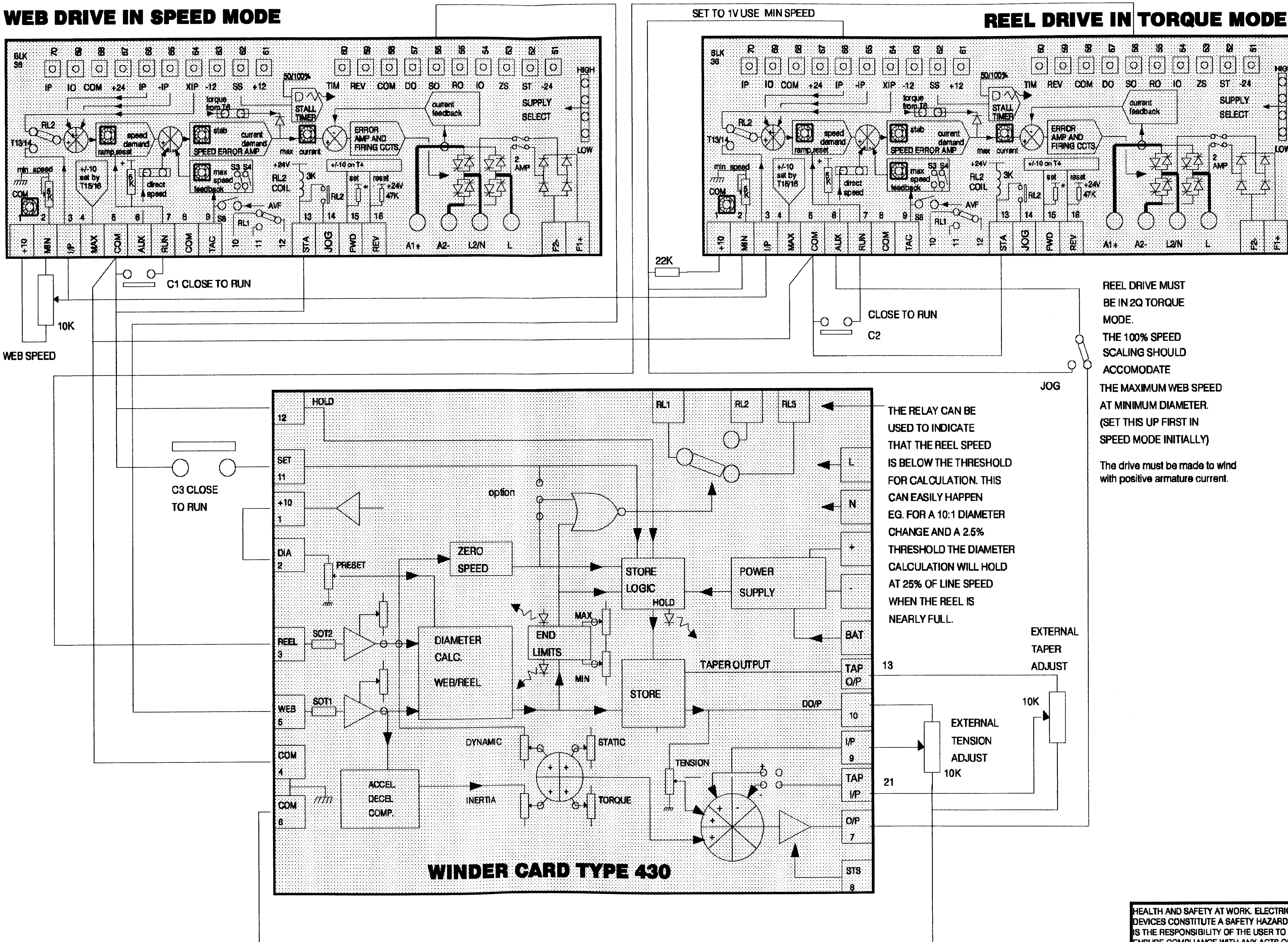
After making the speed observations the calibration can be completed. The unit is designed to provide a signal proportional to diameter and sum this via the tension control pot with the loss adjustment preset signals to give a torque demand to the reel drive.

Hence for a perfect system with no losses the diameter signal can range up to +10V, but for a system with 20% losses the diameter signal can only range up to 8V to allow the 2V compensation component to be added and not saturate the torque output signal. The diameter signal is summed with the loss signals via the TENSION preset. This must be set to the required strength. If an external tension pot is used, the on card TENSION must be set to zero (ACW). Also it may be necessary to limit the magnitude with series resistor if saturation occurs.

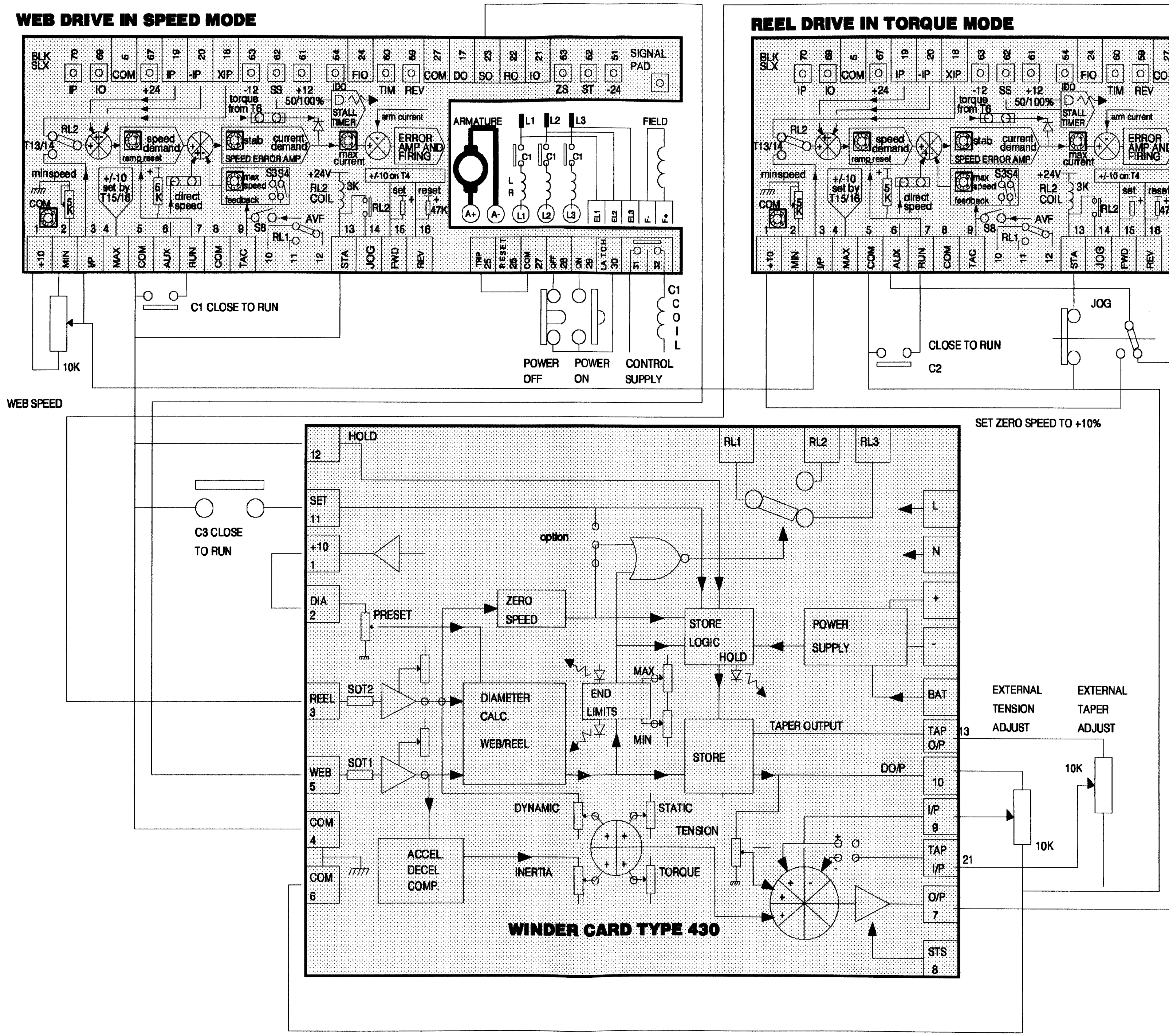
In reality the static component only exists at starting. The highest dynamic component occurs with low diameters. The inertia component is only transient. The best starting point is to assume that the diameter signal can excurse to +10V and then observe the final running system for saturation.




WINDER APPLICATION. MODELS 1600I, 3200I




**3600XRi controller, Winder application.**




REEL DRIVE MUST BE IN 2Q TORQUE MODE. THE 100% SPEED SCALING SHOULD ACCOMODATE THE MAXIMUM WEB SPEED AT MINIMUM DIAMETER. (SET THIS UP FIRST IN SPEED MODE INITIALLY)

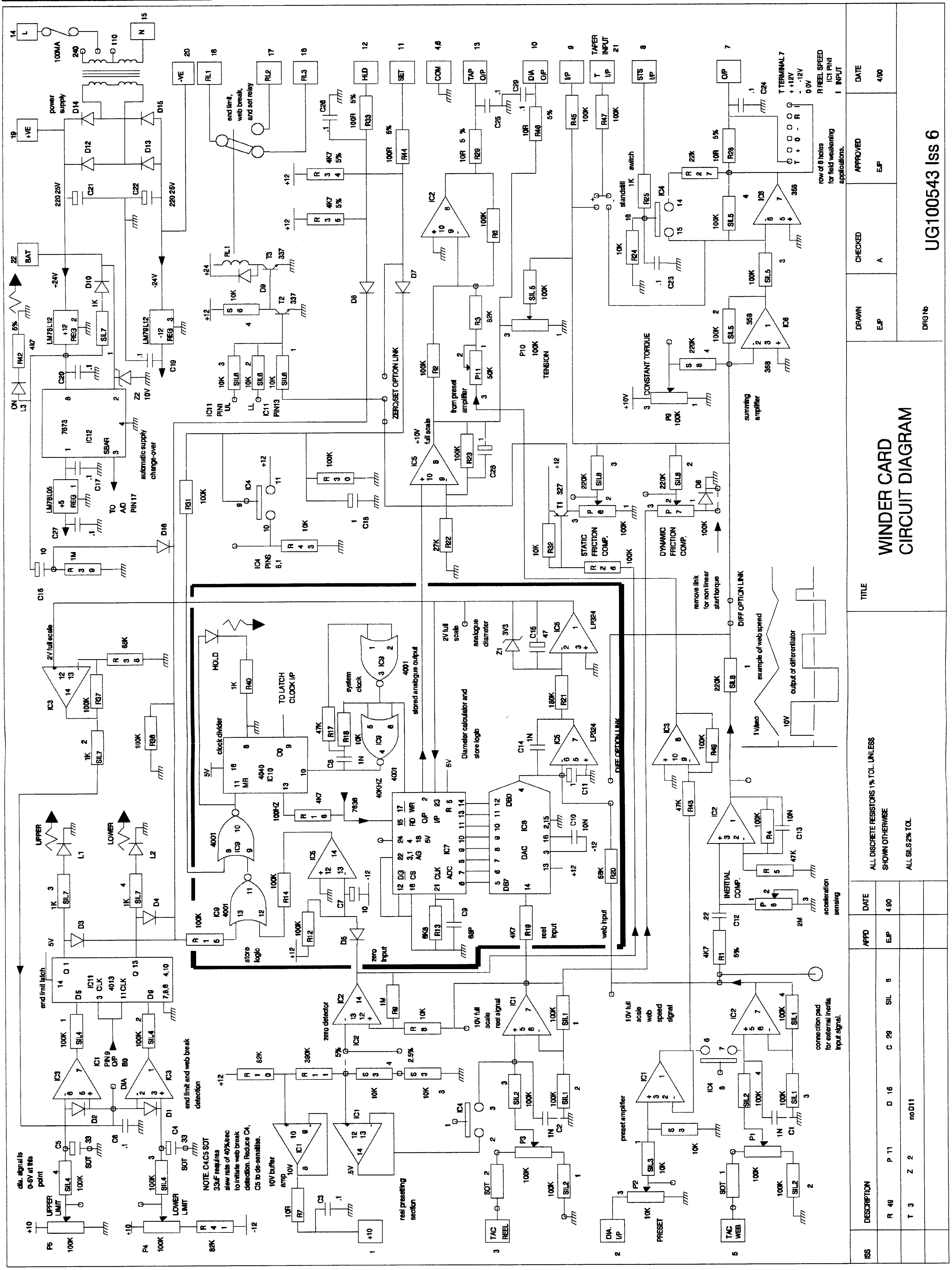
THE DRIVE MUST BE MADE TO WIND WITH POSITIVE ARMATURE CURRENT.

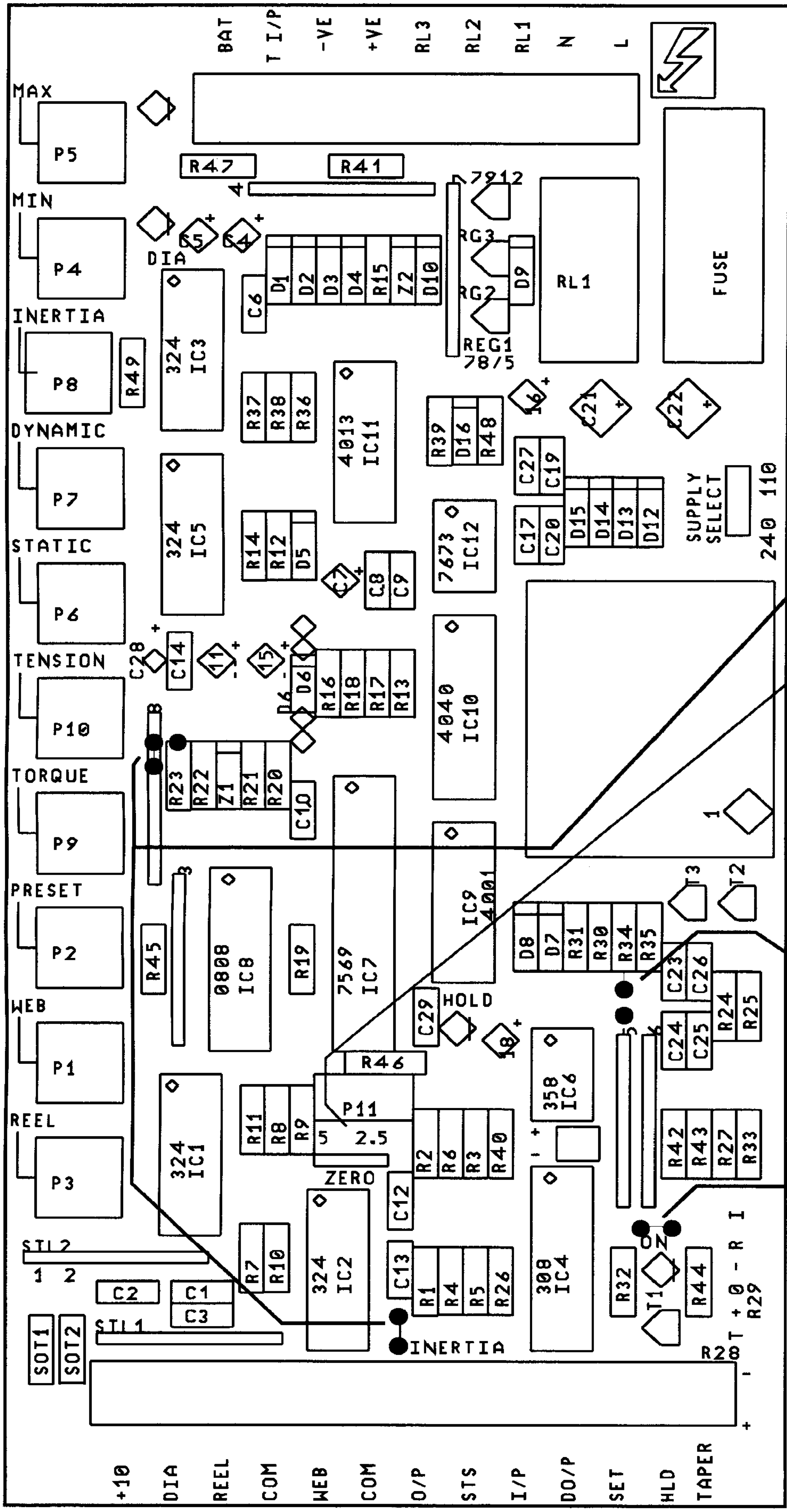
THE JOG CONTROL WORKS BY APPLY 100% TORQUE LIMIT AND DISCONNECTING THE SETPOINT. THE DRIVE THEN RUNS AT +10% SPEED AS SET ON THE ZERO SPEED PRESET.

WHEN IN WINDING MODE THE +10% OFFSET ENSURES THAT THE DRIVE REMAINS IN CURRENT LIMIT WITH AN EMPTY REEL.

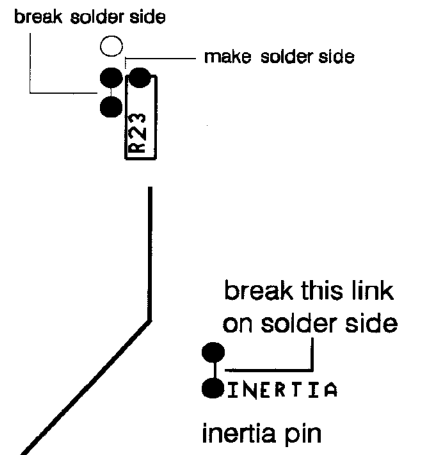
HEALTH AND SAFETY AT WORK. ELECTRICAL DEVICES CONSTITUTE A SAFETY HAZARD. IT IS THE RESPONSIBILITY OF THE USER TO ENSURE COMPLIANCE WITH ANY ACTS OR BYLAWS IN FORCE. ONLY SKILLED PERSONS SHOULD INSTALL THIS EQUIPMENT.

**Winding control with diameter calculation.**


WINDER CARD
CIRCUIT DIAGRAM
UG100543 Iss 6
ALL DISCRETE RESISTORS 1% TOL UNLESS SHOWN OTHERWISE
ALL SILS 2% TOL




DIFF option. This uses the Web derivative amp (was inertia comp.) for a different function. It is useful in systems which include a dancer arm between the web tacho and the reel. The signal from the dancer arm pot (position) is input to the INERTIA signal pin. The derivative of this signal (speed) is then added to the web tacho signal. This will then provide a composite signal which represents web speed after the dancer. The INERTIA preset now adjusts the scaling of the dancer derivative term.



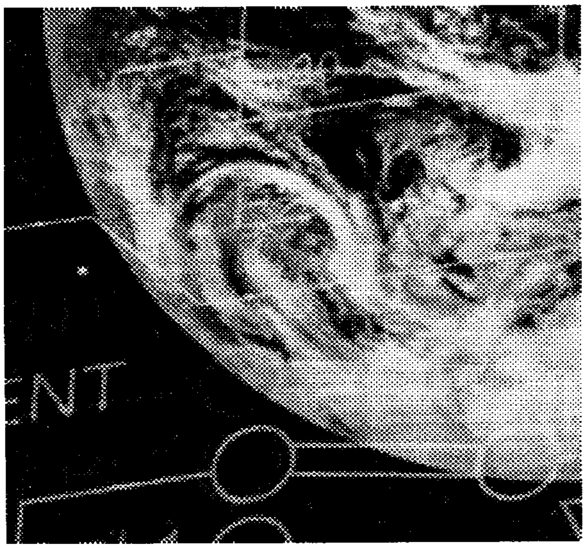

ZERO SPEED THRESHOLD
With large build up ratios and reduced web speeds, the reel speed can easily become less than the 2.5% threshold. (eg 10 : 1 build up at 25% web speed = 2.5% reel speed). To reduce the threshold below 2.5%, remove the jumper and connect an externally generated voltage signal to the centre pin of the selector. The voltage level required is 100mV per % threshold. Note, the calculation accuracy is reduced below the standard threshold.

Relay option links on solder side

SET
make this link and break ZERO link for relay to de-energise when SET operates (open)

ZERO (normally made)
with this link made the relay de-energises when SET operates (open), OR when the reel speed < zero speed threshold.

WORLD CLASS IN DESIGN



WORLD BEATING IN FUNCTION

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