

INSTRUCTION MANUAL

MODEL RTC-4 REWIND TENSION CONTROLLER

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MODEL RTC-4 REWIND TENSION CONTROLLER

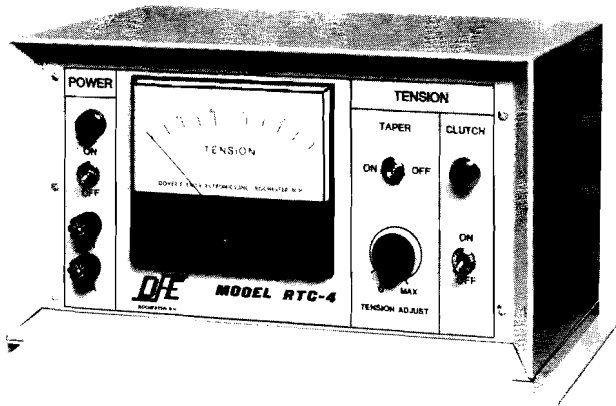
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DFE DATA SHEET

8210RTC4



MODEL RTC-4 REWIND TENSION CONTROLLER

DESCRIPTION

The RTC-4 is a small, precision automatic rewind tension controller designed for machines having rewind drives up to 7 1/2 h.p. It is used with magnetic particle, eddy current and friction clutches. A pair of DFE tension transducers are installed on an idler roll in the machine to sense tension. The transducers convert the force (due to web tension) on the idler roll into an electrical signal which is proportional to tension. The transducer signal is amplified and conditioned in the controller and is displayed on the tension meter located on the front of the enclosure. The meter is calibrated to read actual web tension expressed in pounds, ounces, or any other units desired. The transducer signal is also compared with the tension set point adjustment, located near the meter. The machine operator will turn the set point knob clockwise to increase and counterclockwise to decrease tension. The regulator circuit inside the controller will change the voltage applied to the clutch to increase or decrease web tension so the transducer signal will equal the set point signal. The controller does this continuously, so the machine operator needs to turn the set point knob to the desired tension level only once. Any change in web speed or roll diameter is automatically compensated for by the controller.

ADVANTAGES

- Small Size
- Low Cost
- Precision Control of Tension
- Actual Tension is Displayed on Meter for Easy Reference
- Very Simple and Fast to Install and Start Up
- Easy to Operate; No Skill Required
- No Dancer Roll Needed
- Transducers Have Negligible Movement; Do Not Affect Web
- Fast Response Quickly Compensates for Speed Changes
- Very Wide Tension Control Range
- Repeatable Results
- Tension Transducers take very little space in machine for mounting
- Precise Control of tension accomplished by RTC-4 improves roll profile by reducing telescoping and wandering, and smooth tension pattern allows the roll to go through subsequent operations with less difficulty
- One Year Limited Warranty

DOVER FLEXO ELECTRONICS INC.

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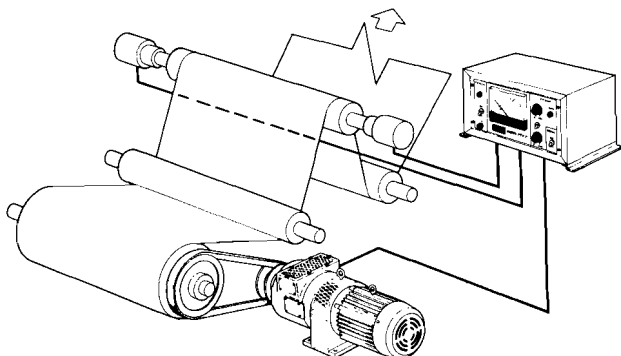
APPLICATIONS

The RTC-4 can automatically control tension on any roll-delivery machine used in the manufacture, printing, coating, laminating, slitting, treating or winding of wide or narrow webs of paper, foil, extensible and non-extensible films, textiles, non-wovens, linoleum, wallpaper, ribbons or tapes. The RTC-4 can also control tension between two sets of pull rolls if the upstream pull rolls are driven through an electric clutch.

The precision control of the RTC-4 is especially important when winding lightweight webs or extensible films where breakage or stretching can be serious problems. It is also important when blocking (the transfer of ink or coating to the overlying layer of the roll) can occur, and when pressure-sensitive coatings are being used. And precision control is required when the web is being slit and tension variations could cause the ribbons to move sideways, making it impossible to separate the rolls afterwards.

FEATURES

- Taut-Band Tension Meter
- Plug-in Circuit Cards
- Hinged Front Panel for Easy Access
- Steel Foot-Mounted Enclosure
- Fuse-Protected Input and Output with Fuses Mounted in Front of Enclosure
- Color-Coded Test Points on Each Circuit Card
- Constant Tension or Taper Tension Capability
- All Electrical Connections Located on Back of Enclosure
- Attached 5' Power Cord
- Transducer, Clutch and Tachometer Connections By Means of Military-Style Circular Connectors
- Clutch On/Off Switch with Amber Indicating Light
- Recessed Front Protects Meter and Switches from Damage

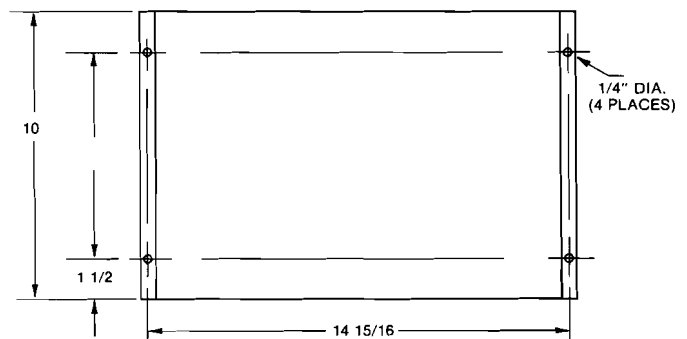


SPECIFICATIONS

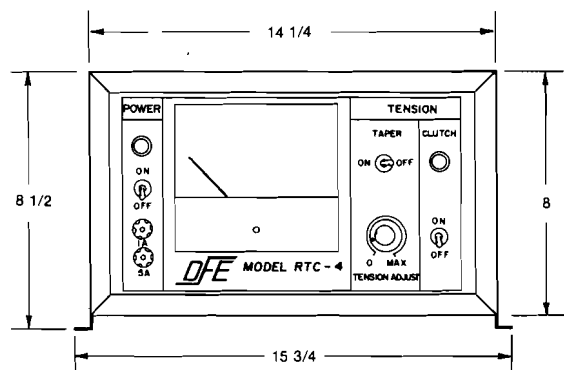
- Power: In 120 volt, 60 Hz @ 4 amp
Out 90 volt, DC @ 5 amp
- Zero (Tare) Range 50% of Transducer Rating
- Calibration Range 25:1
- Temperature Range 0°C to 40°C
- Transducer Supply 5 volt DC Regulated
- Transducer Input Signal 500 millivolts DC
- Tension Meter 5 1/2" × 4 3/4", taut band, 2%
Standard Meter Scales 0-1, 5, 10, 25, 50, 100
250, 500, 1000
- Typical System Accuracy 1% to 3%
- Power Cord 5' Long Type SJ with
Grounding Prong
- Weight 16 1/2 lbs.
- Operator Controls Power on/off toggle switch
with red indicating light
Tension Adjust
Clutch on/off toggle switch
with amber indicating light
Taper on/off toggle switch

DIMENSIONS

ALLOW 3" CLEARANCE MIN. FOR CONNECTIONS TO BACK



TOP VIEW



FRONT VIEW

RTC-4 CONTROLLER INSTALLATION

ELECTRICAL RATINGS:

INPUT ----- 120 VOLTS, 60hz. @ 6amp

OUTPUT ----- 90 VOLTS D.C. @ 5amp

LOCATION OF CONTROLLER

MOUNT THE CONTROLLER IN A DRY PLACE, AWAY FROM ANY SOURCE OF HEAT. IT SHOULD NOT BE MORE THAN 7 FEET FROM THE FLOOR. THE MOUNTING SURFACE SHOULD BE FREE OF EXCESSIVE VIBRATION.

WIRING

ALL EXTERNAL CONNECTIONS ARE MADE AT THE BACK OF THE CONTROLLER WITH CIRCULAR CONNECTORS.

1. THE TRANSDUCER CABLES ARE THE SHIELDED TYPE. THE END OF THE CABLE MARKED WITH A "G" HAS THE SHIELD ATTACHED TO THE CONNECTOR BODY. PLUG THIS END IN TO THE CONTROLLER.
2. CONNECT THE ENCLOSURE TO EARTH-GROUND.
3. DOUBLE CHECK ACCURACY OF ALL CONNECTIONS BEFORE APPLYING POWER TO THE CONTROLLER.

DESCRIPTION OF OPERATION

OPERATION OF THE SYSTEM

THE MODEL RTC-4 REWIND TENSION CONTROLLER IS PART OF A CLOSED LOOP (NEGATIVE FEEDBACK) CONTROL SYSTEM. THE OTHER PARTS OF THE SYSTEM ARE: TENSION TRANSDUCERS, EDDY-CURRENT CLUTCH, AND TENSION SET POINT POTENTIOMETER.

BRIEFLY, THE SYSTEM FUNCTIONS IN THIS WAY: THE PRESS OPERATOR SETS THE TENSION POT. TO THE DESIRED TENSION LEVEL. THE TRANSDUCERS MEASURE ACTUAL WEB TENSION. THE CONTROLLER COMPARES ACTUAL TENSION WITH DESIRED TENSION AND ADJUSTS THE TORQUE OUTPUT OF THE EDDY CURRENT CLUTCH TO BRING WEB TENSION TO THE DESIRED LEVEL. WHILE WINDING, THE CONTROLLER AUTOMATICALLY ADJUSTS CLUTCH TORQUE TO COMPENSATE FOR SPEED CHANGES, ROLL DIAMETER CHANGES, AND OTHER FACTORS TO MAINTAIN TENSION AT THE DESIRED LEVEL. WEB TENSION IS DISPLAYED ON A LARGE METER SO THE PRESS OPERATOR CAN SEE IT EASILY AT A GLANCE.

TRANSDUCER OPERATION

THE TENSION TRANSDUCERS CONVERT WEB TENSION INTO AN ELECTRICAL SIGNAL WHICH IS LINEARLY PROPORTIONAL TO TENSION. TWO TRANSDUCERS ARE USED, ONE ON EACH END OF THE GUIDE ROLL. THE TWO SIGNALS ARE ADDED TOGETHER SO THE SUM REPRESENTS AVERAGE TENSION.

EACH TRANSDUCER CONTAINS TWO STRAIN GAGES CONNECTED IN SERIES. THEY ARE WIRED SO THE FOUR GAGES FORM A BRIDGE WHICH IS EXCITED BY 5 VOLTS DC. AS A FORCE IS APPLIED TO THE TRANSDUCERS, THE RESISTANCE OF THE STRAIN GAGES CHANGES AND A SMALL OUTPUT VOLTAGE SIGNAL IS PRODUCED.

CIRCUIT CARD FUNCTION

A. THE TENSION AMPLIFIER CARD (TA-1) ACCEPTS THE TRANSDUCER SIGNAL, AMPLIFIES IT AND SENDS IT TO THE REGULATOR CARD AND THE TENSION METER. THE 5 VOLT POWER SUPPLY FOR THE TRANSDUCERS IS ALSO ON THIS CARD.

B. THE REGULATOR CARD (UR1) ACCEPTS THE TENSION SIGNAL AND COMPARES IT TO THE SIGNAL FROM THE TENSION SET POINT POT. THE RESULTING ERROR SIGNAL WILL BE HIGH IF TENSION IS TOO LOW, AND WILL BE LOW IF TENSION IS TOO HIGH. THIS SIGNAL CONTROLS THE OUTPUT STAGE WHICH ADJUSTS THE VOLTAGE TO THE EDDY-CURRENT CLUTCH.

C. THE 15 VOLT POWER SUPPLY CARD (15 V1) PROVIDES POWER FOR THE ELECTRONIC CIRCUITRY.

D. THE OUTPUT POWER SUPPLY CARD (OPS1A) PROVIDES POWER TO OPERATE THE EDDY-CURRENT CLUTCH.

E. THE ADJUST CARD (ADJ2) CONTAINS THE OPERATOR ADJUSTMENT POTENTIOMETERS: ZERO, CALIBRATE, GAIN, STABILITY, RESPONSE.

F. THE TAPER CARD (TC-3) COMPUTES THE DIAMETER OF THE REWIND ROLL BY COMPARING ROLL RPM AND WEB SPEED. AS ROLL DIAMETER INCREASES, THE TAPER CIRCUIT OUTPUT BECOMES MORE POSITIVE. THIS SIGNAL IS ADDED TO THE NEGATIVE SIGNAL OF THE TENSION SET POINT POT., EFFECTIVELY REDUCING THE SETTING OF THE POT. THUS TENSION DECREASES AS ROLL DIAMETER INCREASES.

START-UP PROCEDURE

DESCRIPTION OF ALL INTERNAL ADJUSTMENTS

ADJUSTMENT CARD:

ZERO - USED TO ADJUST THE TENSION METER TO ZERO.

CALIBRATE - USED TO CALIBRATE THE TENSION METER TO A KNOWN TENSION APPLIED AT THE TENSION SENSING ROLL.

GAIN - USED TO ADJUST THE CONTROLLER OVERALL CIRCUIT GAIN IN THE PROCESSING (OR REGULATOR) SECTION.

STABILITY - USED TO TUNE THE UNIT FOR OVERALL STABILITY AND STABLE OPERATION. ALSO, DETERMINES THE AMOUNT OF INTEGRATION OCCURRING IN THE PROCESSING (OR REGULATOR) SECTION.

RESPONSE - ADJUSTMENT USED TO ALLOW THE UNIT TO RESPOND TO FAST CHANGES THAT MIGHT OCCUR DURING THE WINDING PROCESS. WHEN FAST OR LARGE TENSION CHANGES OCCUR ON THE WEB THE RESPONSE POT DETERMINES HOW MUCH THE OUTPUT OF THE UNIT SHOULD CHANGE TO CORRECT FOR THESE TENSION CHANGES.

TAPER CARD:

TAPER - ADJUSTS THE AMOUNT (PERCENT) THAT THE TENSION DECREASES AS THE ROLL DIAMETER INCREASES. ADJUSTABLE FROM ZERO PERCENT TO AS MUCH AS 50%.

START-UP PROCEDURE

CALIBRATION

1. CHECK THE TRANSDUCERS TO BE SURE THEY ARE PROPERLY MOUNTED AND OREINTED. (REFER TO THE TRANSDUCER INSTALLATION INSTRUCTIONS.)
2. BEFORE APPLYING POWER TO THE TENSION CONTROLLER, CHECK THE TENSION METER NEEDLE. IF IT IS NOT ON ZERO, ADJUST THE SMALL SCREW BELOW THE METER SCALE UNTIL THE NEEDLE RESTS ON ZERO.
3. TURN ON POWER TO THE CONTROLLER AND LET IT WARM UP FOR 5 MINUTES.
4. TURN THE ZERO POT. ON THE ADJUSTMENT CARD UNTIL THE METER READS ZERO. (TURNING THE POT. CLOCK-WISE WILL INCREASE THE METER READING.)
5. THREAD A LENGTH OF ROPE OVER THE CENTER OF THE TENSION SENSING ROLL FOLLOWING THE EXACT SAME PATH AS THE WEB WILL TAKE. DO NOT PASS THE ROPE OVER DEAD BARS, DRIVEN ROLLS, BRACES OR ANY OTHER NON-FREE WHEELING MEMBER. THE SLIDING FRICTION INTRODUCED BY THESE MEMBERS WILL CAUSE IN-ACCURATE CALIBRATION. FASTEN ONE END OF THE ROPE SECURELY.
6. ATTACH A WEIGHT OF KNOWN VALUE TO THE OTHER END OF THE ROPE. (ITS WEIGHT SHOULD BE ABOUT HALF THE MAXIMUM SCALE READING OF THE TENSION METER). OR USE A SPRING SCALE TO APPLY THE REQUIRED FORCE.
7. TURN THE CALIBRATE POT. ON THE ADJUSTMENT CARD UNTIL THE METER READING IS THE SAME AS THE WEIGHT.
8. IF THE TENSION METER READS BACKWARDS, REVERSE THE TWO WHITE WIRES IN THE TRANSDUCER CABLES.
9. REMOVE THE LOAD FROM THE SENSING ROLL AND OBSERVE THE TENSION METER. IF IT DOES NOT RETURN TO ZERO, REPEAT STEPS 4, 7 and 9.

TUNING THE CONTROLLER FOR STABLE OPERATION

1. INSTALL AN EMPTY CORE ON THE REWIND SHAFT AND WEB UP THE PRESS. IT IS NOT NECESSARY TO PRINT AT THIS TIME.

2. LOCATE THE ADJUSTMENT CARD.
 - A. GAIN - THE GAIN POT IS A 1 TURN (320°) POT. SET THE GAIN POT 100% (FULLY) CW.
 - B. STABILITY - THE STABILITY POT IS A 1 TURN (320°) POT. SET THE STABILITY POT 60% CW.
 - C. RESPONSE - THE RESPONSE POT IS A 1 TURN (320°) POT. SET THE RESPONSE POT 25% CW.
3. RUN THE PRESS AT 150 FPM AND OBSERVE THE TENSION METER. IF TENSION FLUCTUATES MORE THAN 2 OR 3 DIVISIONS, ADJUST THE STABILITY AND RESPONSE POTS TO MINIMIZE FLUCTUATION.

TURN THE POTS VERY SLOWLY

- NOTE: STABILITY IS USUALLY SET HIGH AND RESPONSE IS USUALLY LOW. IF RESPONSE IS TOO HIGH IT WILL CAUSE INSTABILITY.
4. IF ADJUSTING THE STABILITY AND RESPONSE POTS DOESN'T STABILIZE THE CONTROLLER, TURN THE GAIN POT. CCW SLOWLY UNTIL STABILITY IS ACHIEVED.
 5. RUN THE PRESS AT MAXIMUM SPEED AND OBSERVE THE TENSION METER. IF NECESSARY, TENSION VARIATIONS CAN BE MINIMIZED BY SLOWLY ADJUSTING THE STABILITY AND RESPONSE POTS.

TROUBLE-SHOOTING PROCEDURE, RTC-4

THE PROCEDURE DETAILED HERE IS INTENDED TO HELP THE ELECTRICIAN TO DETERMINE WHICH PLUG-IN CIRCUIT CARD IS FAULTY SO IT MAY BE REPLACED WITH A NEW ONE. NO INSTRUCTION IS GIVEN FOR REPAIR OF THE CARDS THEMSELVES.

EQUIPMENT REQUIRED: (1) AC-DC MULTI-METER HAVING 0-1 VOLT AND 0-100 VOLT SCALES
(1) SMALL SCREWDRIVER OR TV TUNING TOOL TO ADJUST POTENTIOMETERS

TEST CONDITIONS: THE MACHINE MUST BE STOPPED.
THE WEB MUST LAY SLACK OR BE REMOVED FROM OVER THE TRANSDUCER ROLL.

ALL TESTS SHOULD BE DONE BY A QUALIFIED ELECTRICIAN

POINTS TO REMEMBER: *ALL VOLTAGES GIVEN ARE APPROXIMATE.
ACTUAL VALUES MAY VARY 20%.
*THE TESTS ARE WRITTEN TO DESCRIBE PROPER OPERATION OF EACH CARD. RESULTS WHICH ARE MUCH DIFFERENT FROM THOSE GIVEN INDICATE THAT A PROBLEM EXISTS.
*DO NOT CHANGE THE SETTING OF ANY POT. UNTIL TOLD TO DO SO.

EACH STEP IN THE FOLLOWING PROCEDURE SHOULD BE PERFORMED IN THE ORDER GIVEN!

1. TURN OFF POWER TO THE RTC-4 CONTROLLER PANEL.
2. TAKE A FEW MOMENTS TO LOCATE AND IDENTIFY EACH CIRCUIT CARD. NOTICE, EACH CARD HAS SEVERAL TEST JACKS OF DIFFERENT COLORS ON THE FRONT EDGE. THE SIGNIFICANCE OF THE COLORS IS EXPLAINED:

TENSION AMPLIFIER CARD (TA-1)

6. MEASURE VOLTAGE BETWEEN THE BLACK/WHITE AND WHITE (+) JACKS. IT SHOULD BE 5 VOLTS DC.
7. TURN THE ZERO POT. UNTIL THE TENSION METER READS FULL SCALE.
8. THE VOLTAGE BETWEEN THE GREEN AND BLACK (+) JACKS SHOULD BE 5 VOLTS DC.
9. TURN THE ZERO POT. UNTIL THE TENSION METER READS ZERO.

REGULATOR CARD (UR1)

10. SWITCH CLUTCH SWITCH "ON". TURN THE TENSION POT. FULLY CCW. THE VOLTAGE BETWEEN THE GREEN AND RED (+) JACKS SHOULD BE 0 VOLTS DC.
11. TURN THE TENSION POT. FULLY CW. MAKE SURE THE TENSION METER READS ZERO. VOLTAGE BETWEEN THE GREEN AND RED (+) JACKS SHOULD BE OVER 5 VOLTS DC.
12. THE VOLTAGE BETWEEN THE GREEN AND BLACK (+) TEST JACKS SHOULD BE 18 VOLTS DC.

OUTPUT POWER SUPPLY CARD (OPS1A)

13. WITH THE TENSION POT SET FULLY CW AND THE CLUTCH ON/OFF SWITCH ON, THE VOLTAGE BETWEEN THE RED (-) AND WHITE (+) TEST JACKS SHOULD BE 90 VOLTS DC.
14. SWITCH THE CLUTCH ON/OFF SWITCH OFF. THE VOLTAGE BETWEEN THE RED (-) AND WHITE (+) TEST JACKS SHOULD GO TO 0 ZERO VOLTS DC. SWITCH THE CLUTCH ON/OFF SWITCH ON. THE VOLTAGE SHOULD SLOWLY INCREASE TO 90 VOLTS DC.
15. SET THE TENSION POT FULLY CCW. THE VOLTAGE BETWEEN THE RED (-) AND WHITE (+) TEST JACKS SHOULD SLOWLY GO TO 0 ZERO VOLTS DC.

TAPER CARD (TC-3)

16. SET THE TAPER POT FULLY CCW. TAPER ON/OFF SWITCH OFF. THE VOLTAGE BETWEEN THE RED (-) AND GREEN (+) TEST JACKS, LOCATED ON THE TAPER CARD SHOULD BE 0 VDC.
17. SWITCH THE TAPER ON/OFF SWITCH ON. THE VOLTAGE BETWEEN THE RED (-) AND GREEN (+) TEST JACKS SHOULD BE 1.3 VDC \pm 2 VDC.
18. SET THE TAPER POT FULLY CW. THE VOLTAGE BETWEEN THE RED (-)

AND GREEN (+) TEST JACKS SHOULD BE $1.1 \text{ VDC} \pm .2\text{VDC}$. THERE SHOULD BE AT LEAST .2 VDC DIFFERENCE IN VOLTAGE READING BETWEEN THIS STEP AND STEP 17.

THIS COMPLETES THE TROUBLESHOOTING PROCEDURE, REFER TO THE START-UP PROCEDURE SECTION FOR CALIBRATION AND TUNING.

PREVENTIVE MAINTENANCE

Preventive maintenance for electronic equipment consists of keeping it clean. Layers of dust cause overheating of electronic components. If the dust is conductive it can cause short circuits and produce all kinds of strange behavior.

Check the equipment at least once a month. It doesn't take long and could prevent costly down-time.

DO NOT USE COMPRESSED AIR FOR CLEANING. DAMAGE COULD RESULT.

Use a dry, soft brush to remove dust.

If a solvent is necessary, use denatured alcohol.

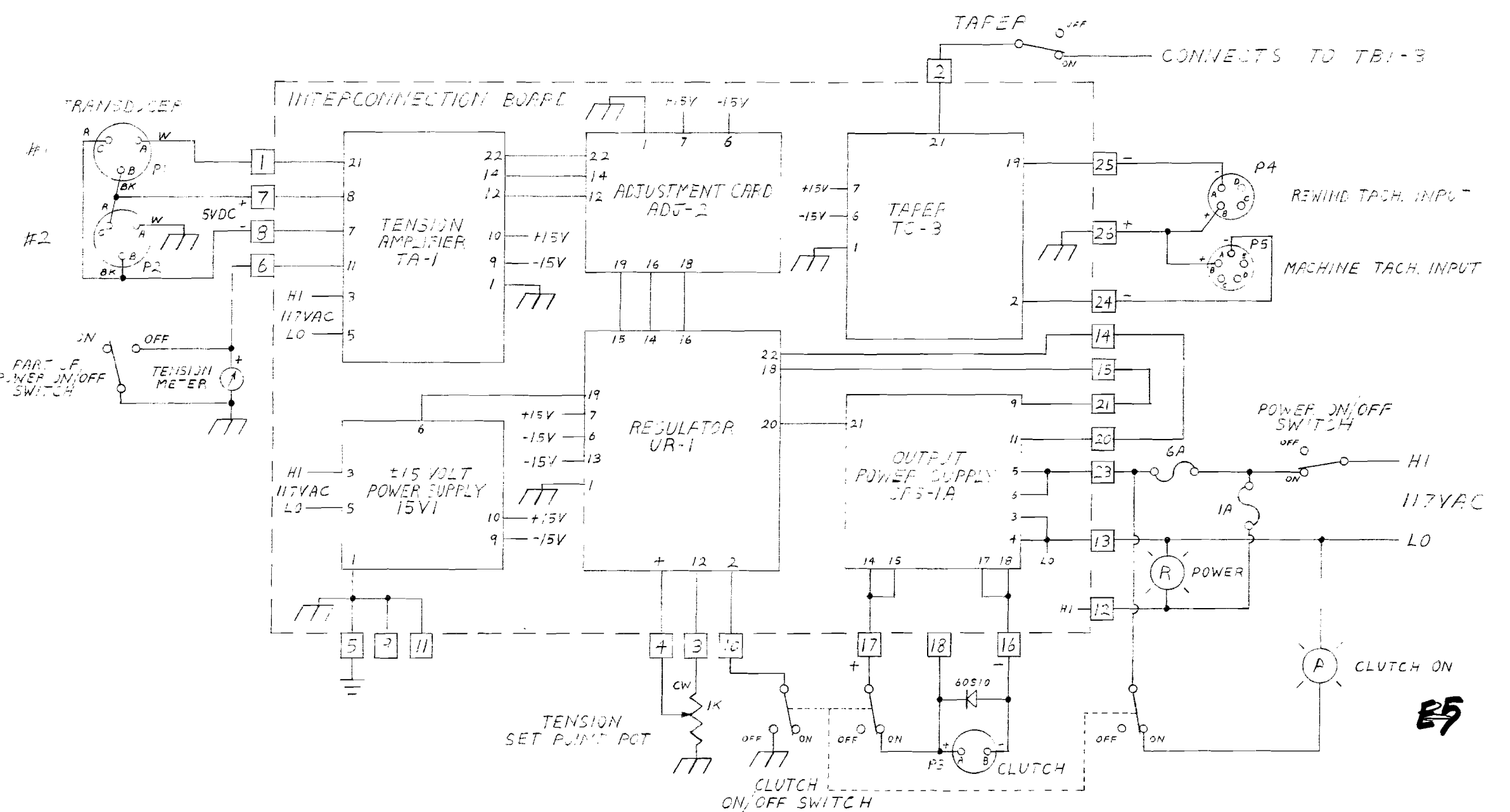
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REWIND TENSION CONTROLLER

MODEL RTC-4
DIAGRAM
REF.

DES	PART NO.	DESCRIPTION	QTY	MFR
1	OPS1A	Output Power Supply card	1	
2	15V1	15 Volt Power Supply Card	1	
3	TA1	Tension Amplifier card	1	
4	UR1	Regulator Card	1	
5	ADJ2	Adjustment Card	1	
6	TC-3	Taper Card	1	
7	C230D	SCR	2	
8	MR1126	Power Diode	2	
9	3AG	Fuse, 6amp 250 volt	1	
10	3AG	Fuse, 1amp 250 volt	1	
11	NE51H	Bulb, Neon	2	
12				
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14				
15				
16				
17		ELECTRICAL DIAGRAMS		
18	E453B	Interconnection Schematic		
19	E450D	Schematic		
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			MATL.	REF.	PART	DOVER FLEXO ELECTRONICS INC.		
					SCHEMATIC, INTERCONNECTION	ROCHESTER, N.H. 03867		
			MACHINED LIMITS UNLESS OTHERWISE SPECIFIED	DIMENSION UNLESS SPECIFIED	MODEL PTC-4	DR. BY	DATE	SCALE
			.X ± .04		USE REWIND TENSION CONTROLLER	JW	7-20-82	
			.XX ± .02			DRAWING NO. E453B		
			.XXX ± .005					
BY	DATE	REV.						

