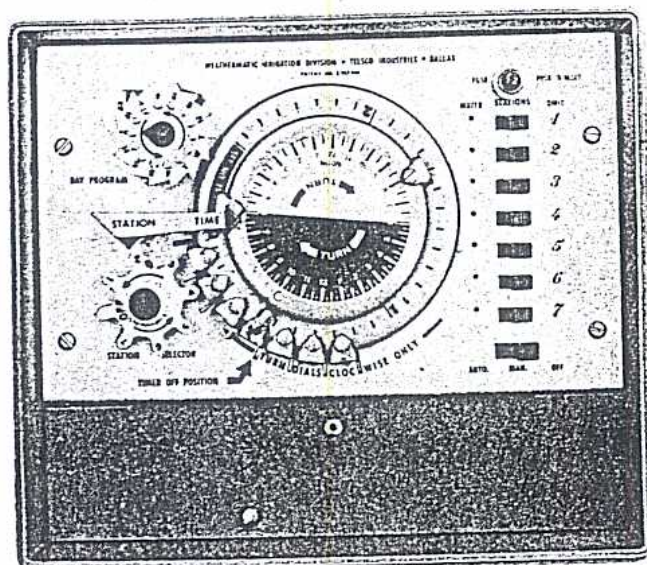


# INSTALLATION AND SERVICE MANUAL



## EM-7 CONTROL

INSTALLATION & SERVICE INSTRUCTIONS  
EM-7 CONTROL

I. Installation

- A. Mounting: Control should be mounted on wall out of the weather. Remove face sub-panel (33-102-2) and complete internal unit from housing. Fasten housing to wall with three screws provided, through holes in housing back. Replace internal unit less face sub-panel. (Terminal strip cover panel)
- B. Terminal wiring is attached to terminal block (33-247) as indicated by markings on back of sub-panel (33-102-2) and by schematic hookup located inside cover. Primary wiring is routed to the control by means of 1/2" or 3/4" conduit which attaches to the lower left hand corner. Pump circuit wiring, if used, is also routed through this conduit. Secondary wiring or valve solenoid conductors are routed from the control by means of 3/4" or 1" conduit which attaches to lower right hand corner of housing.

Splices in wiring are to be soldered, taped, and insulated. Provide one expansion curl in leads within three feet of valve and at least every 100 feet thereafter.

C. Electrical Rating:

1. Input is 115 VAC or 220 VAC as shown on controller data plate. Output to valves is 26 VAC.
2. Keep on a separately fused circuit, if possible.
3. The controller will operate a total of three valves:
  - A. Examples:

(3) section valves or (2) section valves and (1) master valve (which may be utilized in conjunction with a main vacuum breaker where required by code).

Caution: Capacity is ample for companion Weather-matic electric valves, but may not be sufficient for other makes.

4. The pump circuit includes a relay which acts as a switch during watering cycles and has a capacity of 125 V. A. If this capacity is exceeded use auxiliary relay as shown on wiring diagram attached to controller.



## II. Operation:

### A. Setting the Control: (Refer to controller parts diagram for parts identification)

1. The red Master Switch (33-251) has three positions:

OFF - Eliminates all watering.  
MAN - Manual or semi-automatic operation.  
AUTO - Automatic start and timing of water sequence.

Place Master Switch in OFF position while setting control.

2. Turn Clock Dial (33-100A) clockwise to set correct time under TIME arrow (33-110). Place one or more Clock Dial Trippers (33-106B) (without side tabs) at times watering cycle is to start. Space at least four hours apart. Tighten tripper screws securely.
3. Watering time for each station is determined by the space between tabbed trippers (33-106A) around the three Hour Timer Dial (33-101A) (under Clock Dial). Secure all seven trippers (seven required to complete indexing cycle of station knob (33-206) in desired positions within the two hour and thirty-seven minute timing zone.
4. Rotate Day Program Dial (33-205) counter-clockwise to set current day under pointer. Insert screws at (33-233) at days to water.
5. Rotate Station Selector Dial (33-206) counter-clockwise to OFF.
6. Place all unused Station Switches (33-219) in OMIT position. OMIT position on active station Switches may be used to eliminate that sprinkler section from the automatic cycle.
7. Automatic Operation - With control set, place Master Switch (33-251) in AUTO. Note: Omitted station may water briefly during AUTO cycle.
8. Semi-automatic Operation - Place Master Switch (33-251) in MAN position. Rotate Three Hour Timer Dial (33-101A) clockwise until Station #1 (33-206) trips at Station Arrow (33-110) to start automatic watering cycle. After watering, move Master Switch (33-251) to OFF or AUTO.
9. Manual Operation - Rotate Station Selector Dial (33-206) counter-clockwise to desired station. Place master Switch (33-251) in MAN position. Return station Selector Switch (33-206) to OFF and Master Switch (33-251) to OFF or AUTO after watering. MAN position by-passes the day Program Dial (33-205) to allow manual watering at any time.



10. The control will cycle automatically as long as there are trippers mounted on the Clock Dial (33-100A). Placing the Master Switch (33-251) in the OFF position breaks the electrical circuits to all output terminals.

B. Control Check-Out:

The following procedure may be used for checking the operation of the control after installation has been completed.

1. Set red Master Switch (33-251) in MAN position. Rotate Clock Dial (33-100A) clockwise until tripper (33-106B) set on Clock Dial (33-100A). Then rotate Three Hour Timer Dial (33-101A) clockwise causing Station Selector Dial (33-206) to index through the seven stations. Station Selector Dial (33-206) should indicate OFF after repositioning Three Hour Timer Dial (33-101A).
2. Each individual Station Omit Switch (33-219) may be checked by rotating Station Selector Dial (33-206) to corresponding numbered position opposite red arrow (33-110) marked "Station".
3. To check out Day Program Dial (33-205), set Master Switch (33-251) to AUTO. Rotate Clock Dial (33-100A) clockwise until dial projection engages and indexes Day Program Dial (33-205) from one day indication, with screw (33-233) removed, to another day indication, with screw (33-233) inserted. Station Selector Dial (33-206) must be set on a station and Station Omit Switch (33-219) corresponding to Station Selector (33-206) number must be set in "water" position. Watering should occur only when the screws (33-233) are inserted in Day Program Dial (33-205).

C. Circuitry:

Clock Motor (33-217-1 or 2) (M1) controls all timing, including Station Timing (33-101A), Clock (33-100A), and Day Program (33-205) and runs continuously.

Master Switch (33-251) (S2) has three positions; OFF, which opens circuit and eliminates all watering; MAN, which allow bypassing Day Program Switch (33-213A) (S1) for manual or semi-automatic operation and; AUTO, which incorporates switch (33-213A) (S1) into the circuit and provides completely automatic operation.

Day Program switch (33-213A) (S1), which is actuated by screws (33-233) in Day Program Dial (33-205), permits control of automatic circuit by breaking circuit when screws in Day Program Dial are removed.



Wafer Switch (33-214) (SW1) distributes current to each individual Station Switch (33-219) (S3-S9) and is indexed by Station Selector Dial (33-206).

Station Switches (33-219) (S3-S9) allows individual omission of watering on any station by breaking circuit to transformer (33-215-1) (T1) and circuit to pump starter.

Transformer (33-215-1) (T1) supplies reduced voltage to (SW2) wafer (33-214) through circuit breaker (33-218) (F1).

Circuit Breaker (33-218) (F1) protects the secondary of the transformer (33-215-1) (T1) from possible overload. Breaker is manual reset type.

Wafer Switch (33-214) (SW2) is indexed along with (SW-1) and switches power in sequence to each station output terminal.

### III. Service Instructions:

#### A. Control will not start automatically

1. Tripper tab spring (33-210) on face of Timer Dial (33-101A) dislocated.
2. Engagement spring (33-211) anchored between timer shaft (33-301A) and face panel (33-102-1) dislocated.
3. Clock tripper (33-106B) loose on dial (33-100A).
4. Clock clutch spring (33-114M) slipping.
5. Master Switch (33-251) defective.

#### B. Clock gains time during station timing

1. Timer wheel gear bearing (33-208) (nylon) too tight.
2. Motor (33-217-1 or 2) defective.

#### C. Clock Motor (33-217-1 or 2) (M1) stalled

1. One or more timing dial trippers (33-106A) jammed with Station Selector Dial (33-206). Improper tripper (33-106A) tripper leg spacing.
2. Station Selector Dial switch (33-214) index mechanism binding.
3. Timing Dial Trippers (33-106A) striking upper portion of housing. Lower face panel (33-102-1) location in housing.

#### D. Control operates but has no low voltage at terminal block (33-247)

1. Push fuse reset button (33-218) (F1). If circuit continues to break look for short in circuit between transformer (33-215-1) secondary and terminal block (33-247). Remove

"common neutral lead" from terminal strip (33-247) to valves to test this circuit. If circuit breaker (33-218) opens only when external wiring is hooked up, check for short circuited external wiring and valve solenoid coils.

2. Faulty transformer (33-215-1) (T1).
  - a. Check secondary voltage. Should be at least 28 volts no load and 26 volts at full load.
  - b. Excessive heating caused by short in secondary winding.
3. Check for faulty switches from MASTER AUTO, MAN, OFF switch (33-251) (S2) to terminal block (33-247).

E. Control continuously recycles

1. Timer wheel gear (33-204) grooved (caused by engagement of brass gear (33-301-A). Replace timer wheel gear (33-204).

F. Trippers (33-106A) on station knob (33-206)

1. Move station knob (33-206) closer to timing dial (33-101A)



## EM 7 CLUTCH REPLACEMENT

This repair, should not be attempted without proper training and facilities.

### A. Disassembly

1. Remove retaining nut from prion drive gear assembly (33-223A).
2. Turn timer shaft and gear assembly (33-301A) counter clockwise until pinion drive gear (33-223A) is backed off clear of motor (33-217) pinion. Remove pinion drive gear from timer shaft.
3. Remove clock gear assembly (33-201-A) and clutch spring (33-114M) by turning shaft hub (33-314) clockwise.

### B. Assembly (If clutch spring assembly (33-114A) is available disregard items #1, 1A and 2).

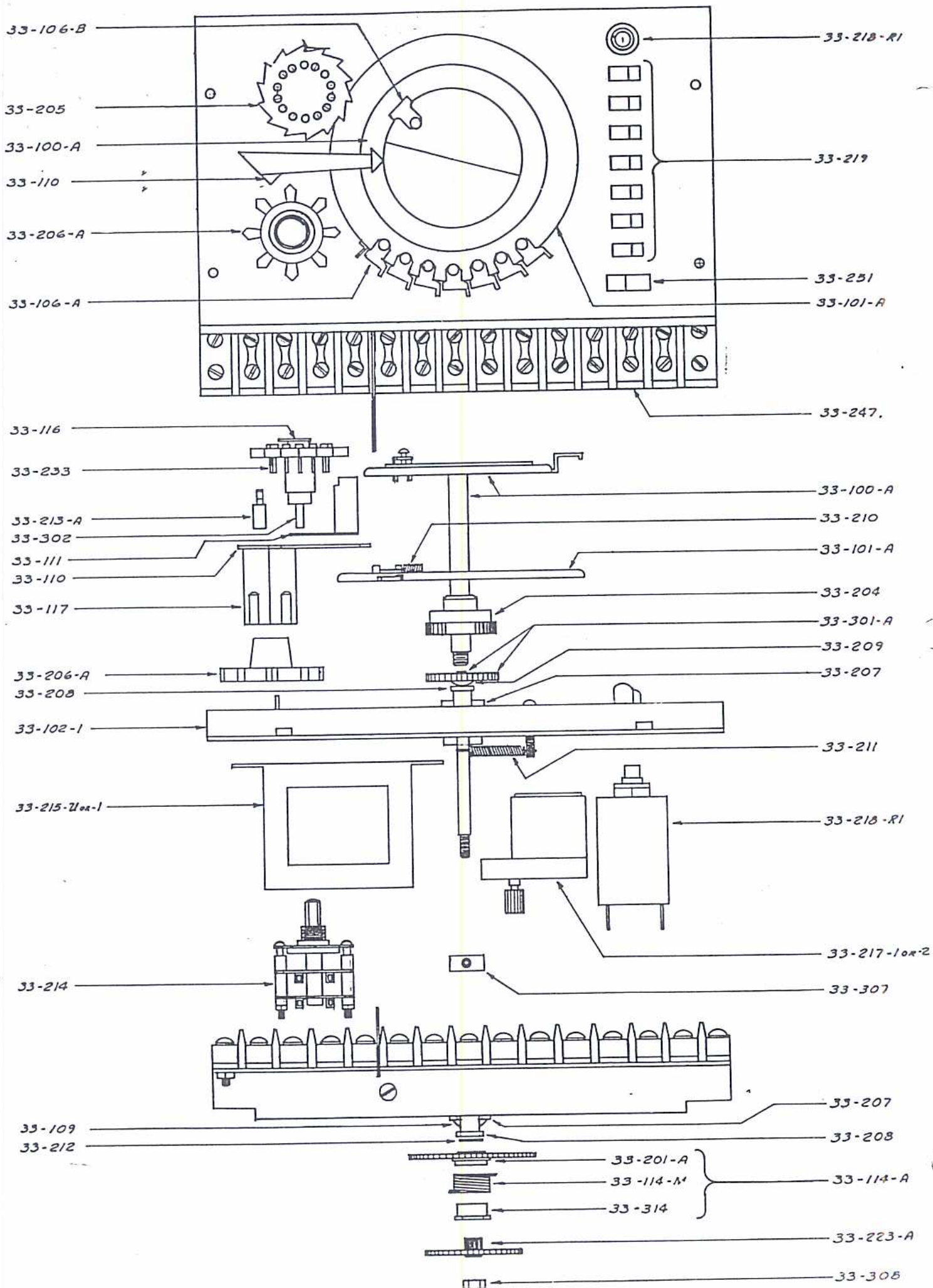
1. Use new clock gear assembly (33-201A), clutch spring (33-114M) and shaft hub (33-314).
- 1A. Assemble clutch spring to clock gear assembly by pressing spring firmly with thumb and rotating counter-clockwise simultaneously. (Extreme caution must be taken at this point so as to not warp the clutch spring.)
2. Assemble shaft hub (33-314) to the clutch spring using the same procedure as 1A. (Make certain backlash between shaft hub and clock gear assembly is kept to absolute minimum.)
3. Put clutch spring assembly (33-114A) onto clock shaft by rotating counter-clockwise. Make certain spring washer (33-209) is under clock gear assembly (33-201A) before performing this procedure.
4. Check timing dial assembly (33-101A) for having approximately .005 inch up and down movement. (If this free movement has been lost, loosen shaft collar (33-307). Press firmly on shaft hub until timer wheel gear (33-204) moves up for this clearance with clock bearing (33-207 and hold. Pull shaft collar (33-307) back against clock bearing (33-207) protruding through back panel and tighten.)
5. Make certain flat washer (33-212) is down past step on shaft of timer shaft and gear assembly (33-301A). Assemble pinion drive gear assembly (33-223A) onto timer shaft by rotating clockwise until it engages with motor pinion. Turn timer shaft and gear assembly (33-301A) until pinion drive gear assembly is tight. Put retainer nut on timer shaft and tighten.

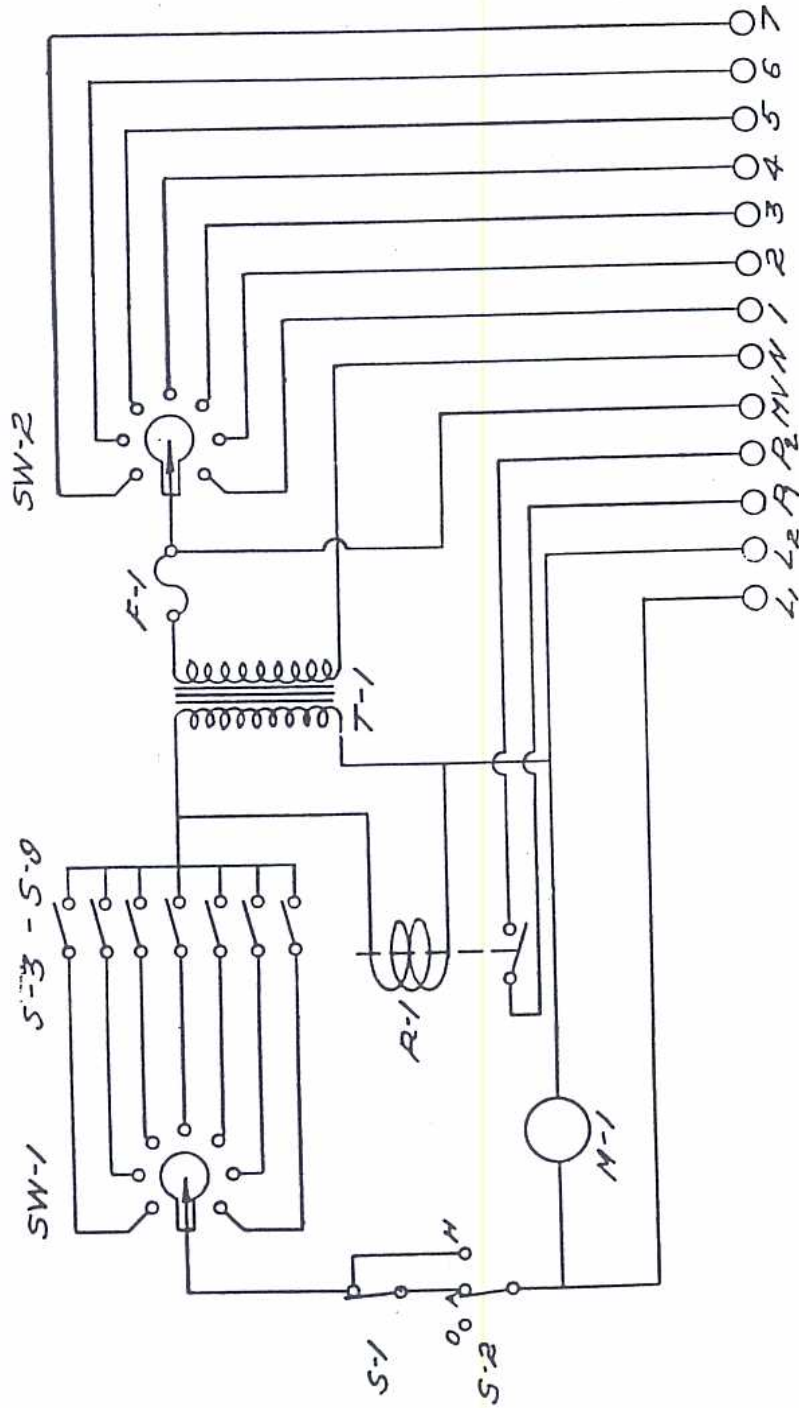
6. Make certain gear of timer shaft and gear assembly is engaged and properly aligned with timer wheel gear (33-204).

#### FACTORY RETURNS

1. Control should be secure in housing and properly packaged prior to shipping. Do not ship without being housed.

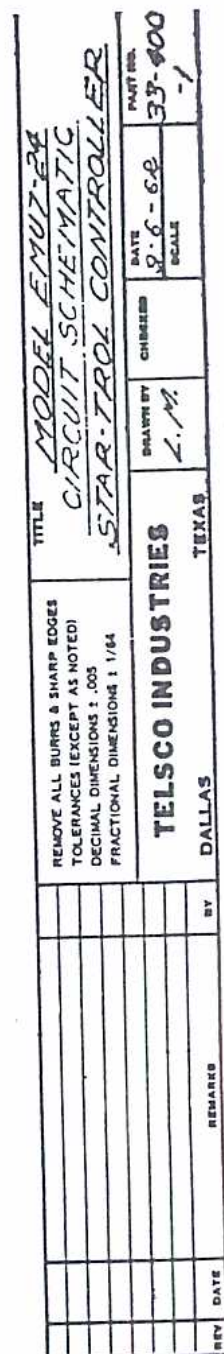






REV		DATE	REMARKS	BY
1	10-18-65	10-18-65	10-18-65	10-18-65
2	10-18-65	10-18-65	10-18-65	10-18-65
TITLE: MODEL EMU7-24P CIRCUIT SCHEMATIC STAR-TROL CONTROLLER				
REMOVE ALL BURRS & SHARP EDGES TOLERANCES (EXCEPT AS NOTED): DECIMAL DIMENSIONS ± .005 FRACTIONAL DIMENSIONS ± 1/64 ANGULAR DIMENSIONS ± 15 MIN.			DRAWN BY: L.M. CHECKED: L.M. DATE: 10-18-65 PART NO.: 33-100-2	
TELSCO INDUSTRIES DALLAS, TEXAS				





REMOVE ALL BURRS & SHARP EDGES TOLERANCES (EXCEPT AS NOTED) DECIMAL DIMENSIONS : .005 FRACTIONAL DIMENSIONS : 1/64	TITLE <u>MODEL EMUL-EX</u> <u>CIRCUIT SCHEMATIC</u> <u>STAR-TROL CONTROLLER</u>		DATE <u>8-6-62</u> SCALE	PART NO. <u>33-400</u> <u>-1</u>
	DRAWN BY <u>L.M.</u> CHECKED			
TELSCO INDUSTRIES DALLAS TEXAS				