INDEX

TACH-DWELL TESTER REPAIR SECTION

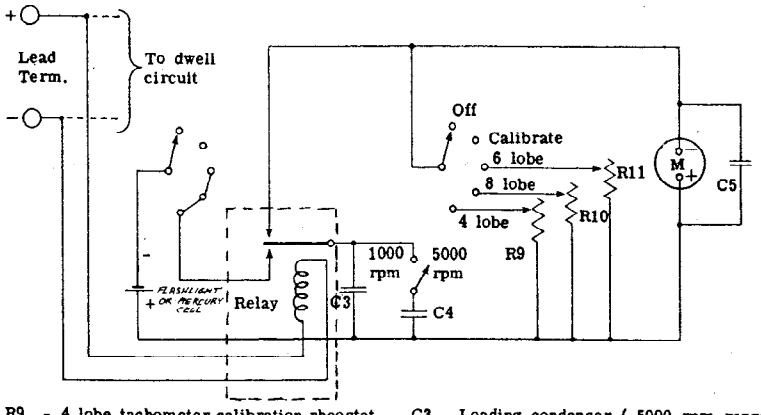
DESCRIPTION AND OPERATION OF TACH-DWELL UNITS

This explanation covers combination Tach-Dwell units. Even though the Tachometer and Dwell meter of most testers operate by means of a common set of leads, their operation will be described separately.

THE TACHOMETER

The Tachometer is basically a speed indicating instrument and operates by charging a condenser with a flashlight or mercury cell and then discharging this condenser through a meter. To accomplish this action, a high speed, single pole, double throw relay is used, and the meter reading depends on the frequency of relay operation. See Figure 1.

When used to measure engine speed, the relay winding or actuating coil is connected to the distributor primary terminal and to ground on the vehicle to be tested. When the distributor points open, full battery voltage from the vehicle will be applied to the relay winding, thus energizing the relay. The relay armature will contact the lower point and the flashlight cell will charge the condenser. When the breaker points in the distributor are closed, practically no voltage is applied to the relay winding and the relay armature returns to its normal position (in contact with the upper point). This position allows the condenser to discharge through the meter. With the vehicle's engine running, this action is repeated each time the distributor contacts open and close.



R9 - 4 lobe tachometer calibration rheostat
R10 - 8 lobe tachometer calibration rheostat
R11 - 6 lobe tachometer calibration rheostat

C3 - Loading condenser (5000 rpm range)
C4 - Loading condenser (1000 rpm range, plus C3)
C5 - Tachometer damping condenser

Relay - High speed, single pole, double throw

Figure 1. Basic Tachometer Circuit

The frequency of relay operation is governed by the engine speed and the number of lobes on the engine's distributor cam. For a given engine speed, the meter reading would depend entirely on the number of lobes. Rather than use a separate meter scale for each type of distributor cam, a lobe selector switch is provided. With this switch, a different degree of meter sensitivity is obtained in each of its positions, thereby providing accurate speed indication whether the tachometer is connected to a 4, 6 or 8 lobe distributor. Meter sensitivity is controlled through the use of rheostats, connected across the meter; one rheostat for each lobe position.

The Tachometers used on some testers feature two scale ranges, and in order to provide accurate speed indication throughout both ranges, requires the use of two charging condensers. In the High speed range only one charging condenser is in operation; but when the switch is set for the Low speed range, another condenser of greater capacity is connected in parallel to the charging condenser. This increases the total condenser capacity and results in a greater meter deflection for a given speed.

Once the tachometer has been calibrated, it will remain accurate as long as the flashlight or mercury cell maintains its original voltage. On tachometers incorporating conventional flashlight cells, a battery check circuit is provided for measuring this voltage. With the selector switch in the calibrate position, the tachometer should read in the black bar at the right of the scale if this voltage is satisfactory. When mercury cells are used in the tachometer, such a battery check is not required. This is because mercury cells will maintain a practically constant voltage throughout their useful life.

On units such as Distributor Testers, a mechanical relay is employed rather than an electrical relay. The mechanical relay is actuated by a non metalic push rod which follows a cam mounted on the spindle shaft of the drive unit.

THE DWELL METER

The dwell meter is a unit capable of measuring "Dwell Angle". Dwell Angle being the period during which the distributor contacts are closed, is measured in degrees of distributor rotation.

In the operation of an engine, a definite amount of distributor cam rotation (measured in degrees) is alloted to the firing of each cylinder. The dwell meter actually measures what percent of the total alloted period the points remain closed. For example, on a 6 cylinder engine the alloted period per cylinder is 60 degrees and if during operation the points remain closed for 50% of this period the dwell meter would indicate 30 degrees.

The dwell meter is operated by the voltage which appears across the distributor points of the vehicle being tested. With the test leads of the meter connected in proper polarity to the distributor primary terminal and to ground, opening the distributor points causes full vehicle battery voltage to be applied to the dwell meter. Under this condition the dwell meter will indicate 0% of dwell. On the other hand, with the distributor points closed, practically no voltage is applied and the meter will read 100% of dwell. See Figure 2.

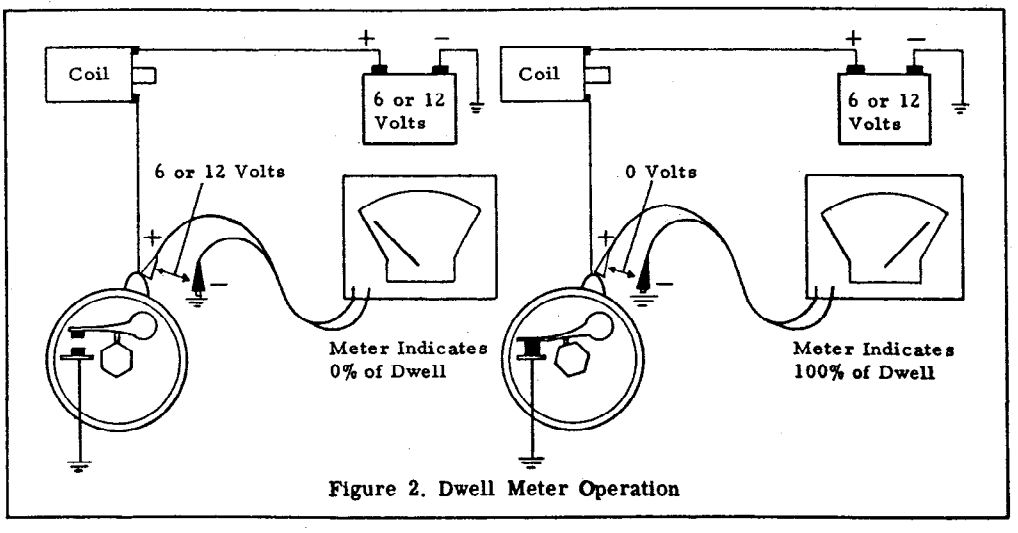


Figure 2. Dwell Meter Operation

In terms of degrees, 100 per cent of dwell, depends upon the number of lobes on the distributor cam. For a 6 lobe cam 100 per cent of dwell is equal to 60 degrees; 45 degrees for 8 lobe cam, and 90 degrees for 4 lobe cam. Therefore, when the points are closed, the dwell meter attempts to indicate 45, 60 or 90 degrees of dwell, depending on the position of the Lobe Selector Switch.

As the distributor cam rotates and the breaker points alternately open and close the dwell meter will attempt to indicate, alternately, Zero and 100 per cent of dwell. The inertia of the meter, plus a high capacity dampening condenser connected across the meter, will prevent this rapid fluctuation. As a result, the meter will indicate the average value. This average value will vary, depending on how long the points remain closed. If the points remain closed longer than they remain open, this average value will be closer to 100% of dwell. The meter will show this average value as the degrees of dwell for that particular distributor (assuming the selector switch is in the proper lobe position).

Early type dwell meter circuits basically consisted of a voltage divider, a 1-1/2 volt flashlight cell, a rectifier, a dwell regulator, a meter, and various calibrating rheostats. See Figure 3.

Current from the flashlight cell flows through a calibrating rheostat, the dwell regulator, the rectifier, the meter, the voltage divider and back to the flashlight cell. With the selector switch in the CALIBRATE position the current through the meter is adjusted by means of the Dwell Regulator until the meter reads on the SET LINE. When the selector switch is then turned to the 6 lobe position the amount of current which flows through the meter will cause it to read off scale to the right. If the meter scale could be extended it would be seen that the pointer would read 60 degrees of dwell. In the 8 lobe position only enough current will flow to cause the meter to read 45 degrees of dwell.

When a voltage of proper polarity is applied to the test leads, the voltage at the center of the voltage divider will be approximately one-half of the voltage applied to the test leads. This voltage at the center of the voltage divider is of such a polarity that it tends to buck or counteract the voltage of the flashlight cell.

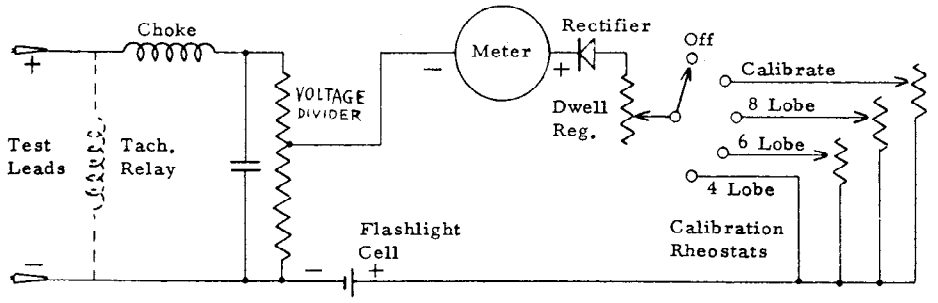


Figure 3. Basic Dwell Meter Circuit

If 6 volts were applied to the tester leads, as would be the case when the distributor points are open, there would be a potential of approximately 3 volts at the center of the voltage divider. This voltage would more than counteract the voltage of the flashlight cell and current would attempt to flow in a reverse direction through the dwell meter. However, because of the blocking effect of the rectifier, current will not flow through the meter in this reverse direction and the meter will read Zero.

If no voltage were applied to the tester leads, as would be the case when the distributor points are closed, there would be no voltage at the center of the voltage divider to counteract the voltage of the flashlight cell and the meter would read 100% dwell for that particular position of the lobe selector switch.

CALIBRATE: - The CALIBRATE position and the Dwell Regulator are provided so that the dwell meter circuit can be accurately adjusted by the operator to compensate for any reasonable change in voltage from the flashlight cell during its useful life.

DISTRIBUTOR RESISTANCE: - If resistance exists in the vehicle's distributor circuit, a slight voltage will be applied to the tester even though the distributor points are closed. This voltage, however slight, will counteract the flashlight cell voltage enough to reduce the current flow through the dwell meter. With the selector switch in the CALIBRATE position, this would be indicated by the meter pointer reading to the left of the Set Line.

Providing the meter does not read outside the Black Bar on the dwell scale, the slight resistance that exists in the distributor can be compensated for by recalibrating the meter to the Set Line.

On the other hand, should the meter pointer read to the left of the Black Bar, excessive distributor resistance is indicated. This resistance must be eliminated before any dwell tests are conducted to insure efficient ignition system operation.

FILTER: - The choke and condenser that are shown connected to the test leads in the schematic diagram are for the purpose of filtering out the high frequency oscillations that exist in the primary circuit of an automobile. By filtering out these oscillations, the dwell meter becomes more stable.

LOBE POSITIONS: - The dwell meter circuit is internally calibrated to indicate accurately when connected to either 4, 6 or 8 lobe distributors. Calibration is accomplished through the use of calibrating rheostats; one for each lobe position as well as one for the Calibrate position.

Most dwell meters are responsive to two ignition conditions other than actual breaker point dwell. These are breaker point resistance, and secondary loading or resistance effects. In normal situations they do not noticeably affect the dwell reading and the readings obtained are essentially the dwell of the breaker points.

However, when these other conditions vary, the dwell meter reading usually varies. A varying dwell meter reading can be caused by a worn distributor which is actually changing the dwell, or by changes in the secondary system being reflected back into the primary. The latter situation will not give a true dwell reading.

Changes in the secondary loads occur in all engines and may be brought about by defective secondary wires, wide rotor gap, etc. Even increasing the speed beyond a certain point on a normally operating engine will sometimes vary the secondary load enough to be noticed on a dwell meter. Unfortunately, the degree to which secondary loads will affect the dwell meter reading will vary with various makes of cars; some causing relatively little effect while others, even with normal secondary loads, causing very noticeable changes.

In the Sun dwell meters, prior to the "N" circuit, the filter was incorporated into the circuit to minimize and in some cases to eliminate secondary loading effects. However, a filter, being a "brute force" type of device, could not always eliminate this effect; especially at higher engine speeds or when secondary resistance or loads became excessive.

THE "N" CIRCUIT

In order to obtain a dwell meter which would read true dwell at all speeds and to respond only to mechanical changes in dwell, the "N" circuit was developed (so named because it was first incorporated in the 10N Tach-Dwell Unit). When dwell variation is observed with a tester incorporating the "N" circuit, it is due to wear or malfunctioning of the distributor and not to conditions elsewhere in the ignition system.

It was mentioned earlier that point resistance could also affect the dwell reading. In the dwell meters prior to the "N" circuit this was compensated for during the point resistance test by manually adjusting the dwell calibrator. However, if the point resistance changed while the engine was running the result would be a change in the dwell reading.

In the "N" circuit, point resistance is automatically compensated for even though it may change while the engine is running. Actually the "N" circuit accomplishes (1) automatic compensation for point resistance and (2) immunity to secondary loading effects.

AUTOMATIC POINT RESISTANCE COMPENSATION

The circuit which accomplishes this is not in effect in the CALIBRATE position so that the point resistance test may be made in the same manner as with former dwell meters. Figure 4 shows a simplified version of the "N" circuit with the selector switch in the CALIBRATE position. The input rectifier is shown as a single, half wave rectifier. Actually, as will be explained later, it is a full wave bridge rectifier.

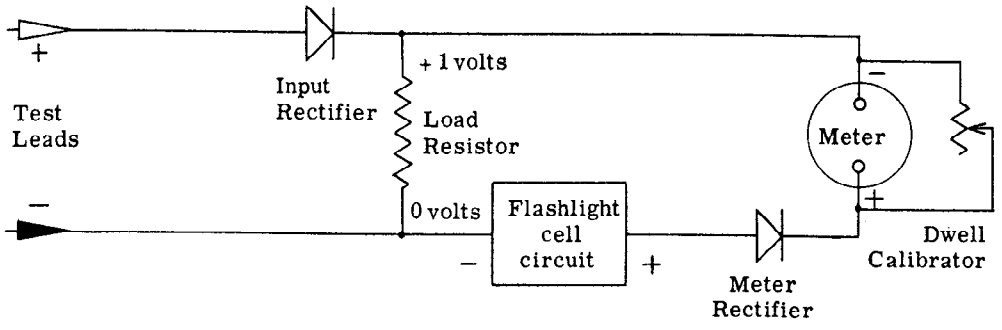


Figure 4. Basic "N" Circuit

Assume that the dwell calibrator has been properly adjusted and the tester has been switched to a lobe position. Current will flow from the flashlight cell through the meter rectifier (which offers little resistance to current flow from the flashlight cell), through the meter and back to the cell through the load resistor. The current through the meter causes it to read 100% of dwell (45, 60 or 90 degrees, depending on the lobe position).

The voltage across the load resistor, due to the flashlight cell current, will be on the order of 1 volt and of the polarity indicated in Figure 4. If the test leads are connected to a voltage of less than 1 volt, such as the voltage drop across a set of contact points due to point resistance, it will have no effect on the current through the meter. (This is because the input rectifier will keep the meter circuit isolated from the external circuit until the voltage of the external circuit exceeds approximately 1 volt.)

When the points open, full vehicle voltage will be applied to the test leads. This will more then exceed the voltage across the load resistor and as a result current will flow through the input rectifier and into the dwell circuit. The voltage which is applied from the ignition system, will attempt to flow current through the meter in a reversed direction. However, the meter rectifier prevents this and as a result no current flows through the meter. Under this condition the dwell meter indicates Zero degrees.

As the points alternately open and close the dwell meter is attempting to read 0% and 100% of dwell. The actual reading is the average of these two extremes. If the points are closed for a longer period than they are open, the average reading will be closer to 100% of dwell and vice versa.

To summarize -- The "N" circuit is unaffected by point resistance if it does not create more than approximately 1 volt. The input rectifier is switched out of the circuit in the CALIBRATE position to permit the point resistance test to be made in the conventional manner.

ELIMINATING SECONDARY LOADING EFFECTS

In addition to the 6 or 12 volts DC which appear across the points when they open, there is also an AC voltage. The value or amplitude of this AC voltage depends, in part, on the secondary requirements; being greatest when the secondary voltage requirements are greatest.

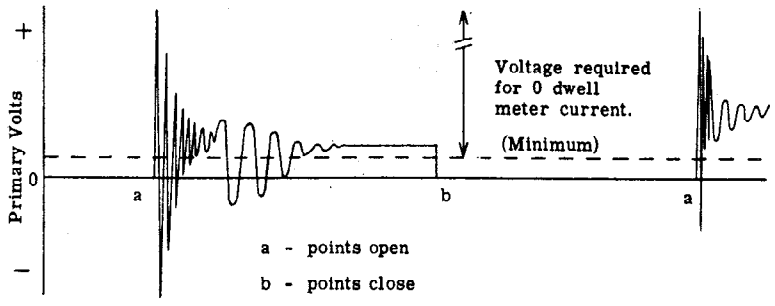


Figure 5. Primary Voltage

In order for the dwell meter to indicate true dwell, the meter current must be kept at zero during the time the points are open. To do this requires that the voltage applied to the dwell circuit be above several volts and in the proper polarity. This is shown as the dashed line in Figure 5. As long as the voltage between "a" and "b" is above this line, dwell meter current will be zero. But notice that certain alternations of the voltage go below the minimum voltage line and actually change polarity. When this happens, the dwell meter current is no longer held at zero. In fact this negative voltage adds to the meter current. The result is that the average dwell current is higher than normal and the dwell meter therefore indicates a greater-than-actual dwell.

In former Sun dwell meters the filter was designed to filter or smooth out this AC voltage so as to keep the voltage applied to the dwell circuit above the minimum voltage line; especially the negative alternations. This was satisfactorily handled for normal amounts of AC voltage. But, since this voltage was a reflection of the secondary voltage or load, it would increase when the secondary load increased. If it increased beyond a certain amount the filter could not completely filter out the alternations and the dwell meter reading would consequently rise.

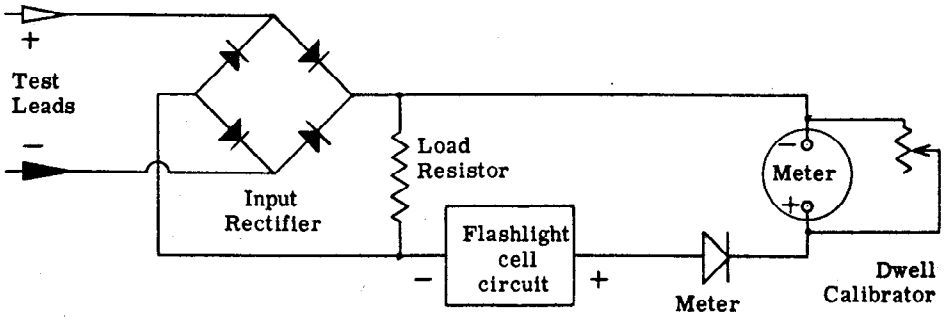


Figure 6

The "N" circuit contains a full wave bridge rectifier in place of the filter formerly used. This is shown in Figure 6. Because of the way in which the rectifier is connected, this AC voltage will appear as a DC voltage of proper polarity to the dwell circuit. Those negative alternations, which before tended to cause dwell meter current to flow during the points open period, are rectified and applied to the dwell circuit as a positive voltage and help to keep the meter current at zero. The rectified voltage as it applied to the "N" circuit is shown in Figure 7.

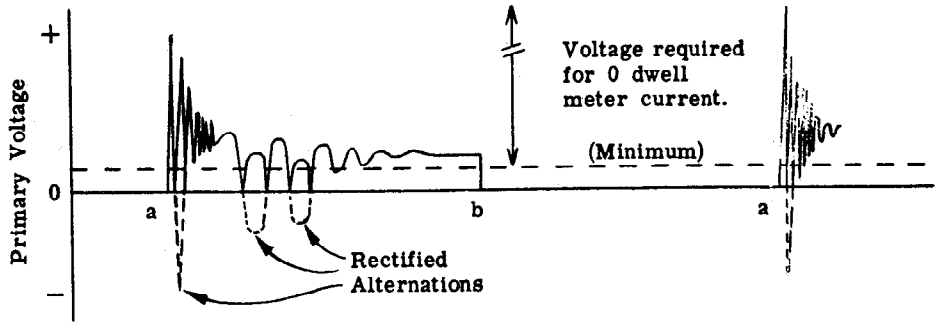


Figure 7. Rectified Voltage applied to dwell circuit.

ADDITIONAL INFORMATION ON TACH-DWELL UNITS

In a few instances it might appear that the conventional Tach-Dwell Tester cannot be used on certain vehicles, such as tractors or motorcycles, because of insufficient dwell range or lobe switch positions. However, by remembering how the Tach-Dwell operates, these problems can be overcome.

For example, if the dwell specifications of a 4 lobe distributor exceeds 50 degrees it can still be measured in the 8 lobe position by doubling the scale reading. This is possible because the dwell meter actually measures per cent of dwell. Late model Sun Tach-Dwell Testers incorporate a 90 degree dwell scale for use on 4 lobe distributors, making the scale doubling method unnecessary.

Also, it is possible to use the tachometer on a 2 lobe distributor by using the 4 lobe position and doubling the reading. However, if this distributor is driven at 1:1 ratio with the crankshaft, the 4 lobe position will give the actual engine speed.

VARIABLE VOLTAGE SUPPLY

Equipment needed:

Potentiometer	Approximately 80 ohms 25 watts. (Sun model SX-3)
Voltmeter	0-16 volts.
6 volt batteries	Three
3 amp. fuse	

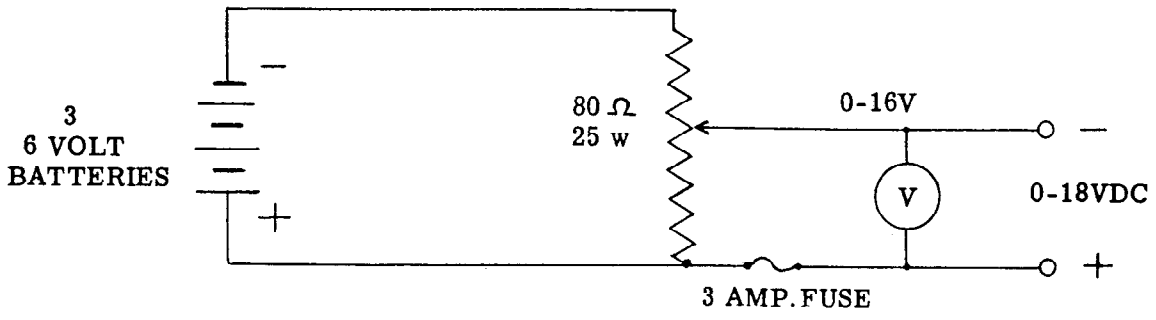


FIGURE 1

DISTRIBUTOR BENCH SET UP FOR CALIBRATING TACH-DWELL UNITS

Equipment needed:

Distributor Tester	Sun Standard or Master model
Distributor	1 (Sun no. 2-1160), 4, 6 or 8 lobe.
6 volt battery	For distributor tester and ignition coil.
Spark gap	Spark plug gapped at .030 inch.
6 volt coil	Delco-Remy, Auto-Lite or Ford.

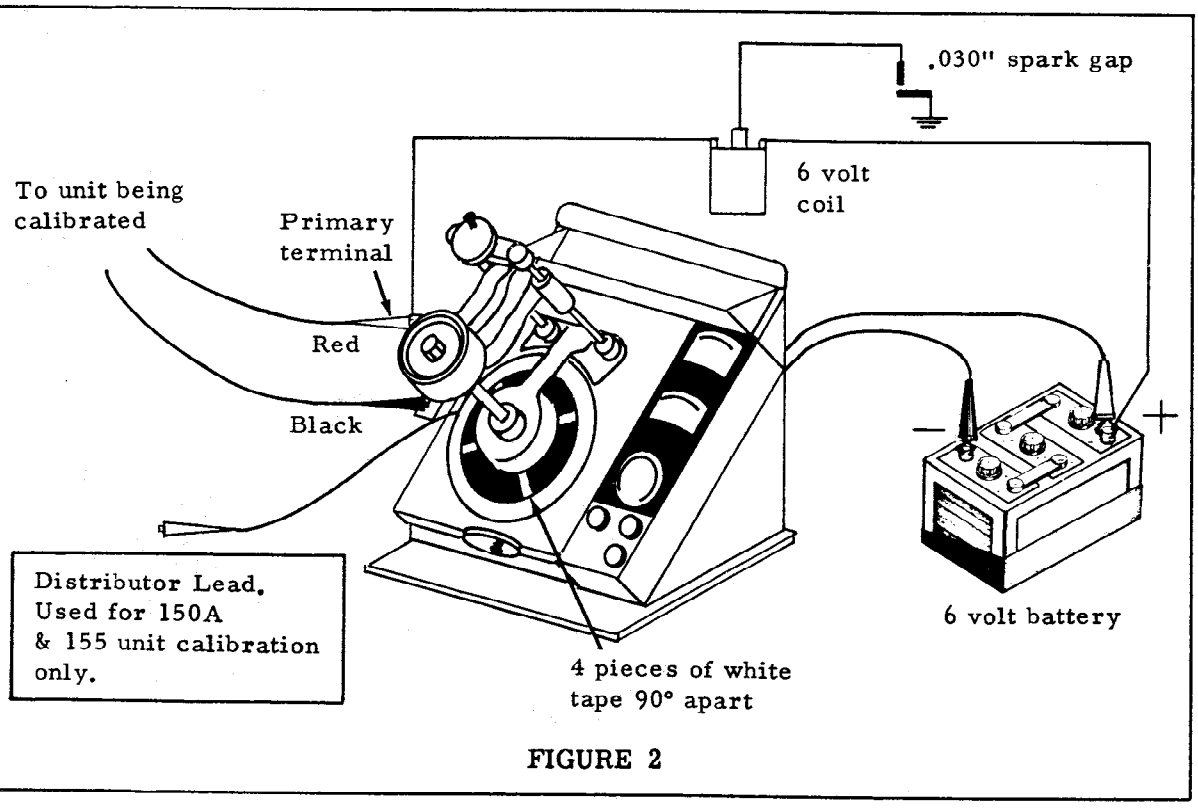


FIGURE 2

3-5 PRONG ADAPTER PLUG
(For 310 units)

Equipment needed:

5 prong plug	Amphenol	86-CP5	Sun no. 2-105-52
3 conductor cable			
3 prong plug	Amphenol	71-3S	

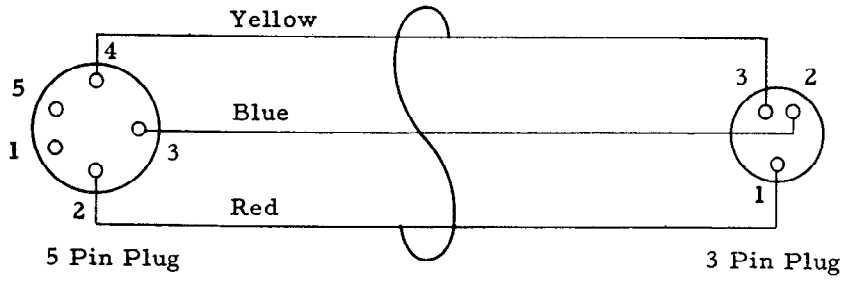


FIGURE 3

TESTING MERCURY CELLS IN 10M UNITS

Equipment needed:

Sun Mercury Cell Tester, Model V-20A

NOTE: If mercury cell tests bad by this method, remove cell and retest. If cell now tests good, poor circuit connections within the unit are indicated.

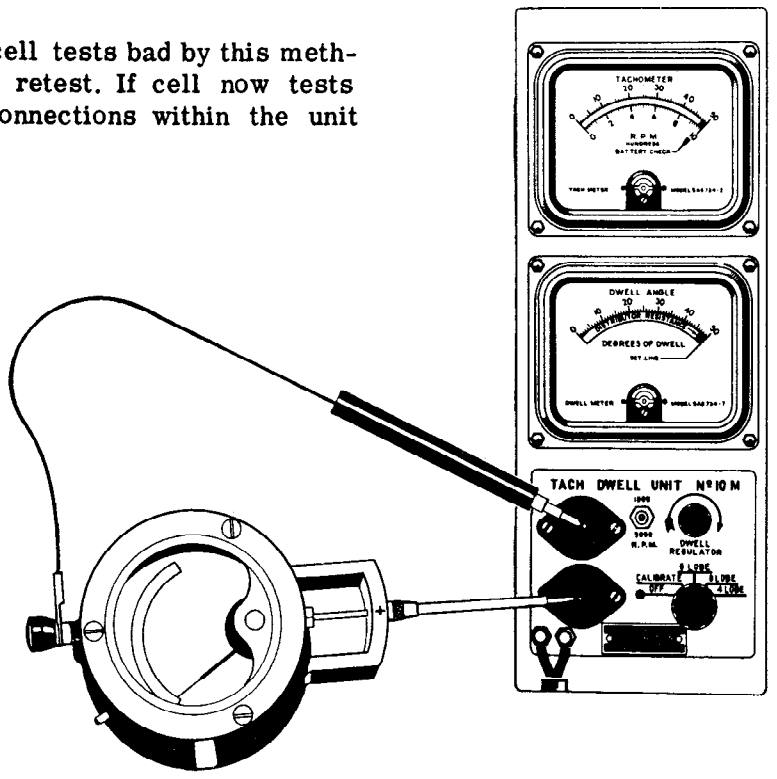


FIGURE 4

PRELIMINARY INSPECTION

Inspect for physical damage such as cracked meter cases, bent or stuck pointers, loose switches, etc.

1. Meter Condition
   - Zero corrector -- Rotate zero corrector one full revolution. Pointer should move at least 1-1/2 division above and below zero.
   - Pointer balance-- Hold meter horizontal and adjust pointer to zero. Hold meter vertical and rotate from left to right. Pointer should not move off zero more than 1 division.
   - Pointer action -- Turn selector switch to CALIBRATE position. Connect a 0-1.5K ohm rheostat across each meter, in turn, and note meter action as the rheostat is rotated. For 10M tachmeters, observe meter reaction during calibration.

2. Flashlight Battery Voltage (Except 10M Units)
   Turn switch to CALIBRATE position and observe tachometer. If meter does not read in the upper half of the black bar marked BATTERY CHECK, even with fresh cells, adjust the battery check circuit. See page 5 of this section.

3. Mercury Cell Test (10M Units Only)
   Use the Sun Tachometer Mercury Cell Tester, model V-20A. Place the positive prod in the center of the lower cell cover. Place the other prod in the center of the upper cell cover. Meter should read in the black bar marked NO LOAD. When the red button is pressed, the meter should read in the lower GOOD band (RG-4).

4. Dwell Regulator (or Calibrator) Action
   With switch in CALIBRATE position, rotate Dwell Regulator thru its full range. If meter does not sweep at least 3 divisions above and below the SET LINE, even with fresh cells, adjust the dwell regulator sweep. See page 5 of this section.

5. Balance Voltage Test
   With switch in CALIBRATE position, connect test leads to a variable DC voltage supply (see figure 1) and vary the voltage from 4 to 15 volts. If dwell meter does not remain on zero ($\pm$ 1 division), adjust balance resistor. See page 5 of this section.

After making the preliminary inspection, calibrate the dwell meter as shown in the procedure manual and connect the unit to the distributor shown in figure 2. Check the tester's reaction in all lobe positions and tachometer ranges. After making any necessary repairs, calibrate the unit as shown on page 6 & 7 of this section.

RESISTANCE MEASUREMENTS

All 6-12 volt units

Selector switch in OFF position:

Between test leads ---------- 45 ohms

Across each half of
center tapped strip resistor ----------550 ohms

TROUBLE SHOOTING CHART

The following chart lists only the more common causes for inoperative tach-dwell units. The meter reactions shown in the LOBE POSITIONS column are those observed with the unit connected to an operating ignition system; either on a vehicle or simulated (see figure 2).

	CALIBRATE POSITION	LOBE POSITIONS	CAUSE or CONDITION
TACHOMETER	Normal	No meter response.	Open test leads. Open relay coil (dwell meter will not calibrate).
	Normal	Meter reading drifts.	Oxidized calibration rheostats. Burned relay contacts.
	Normal	Meter vibrates rapidly at very low rpm's.	Open tachometer dampening condenser.
	Normal	Vehicle stalls when unit is connected.	Shorted relay coil. Shorting test lead clasp.
	Low or no meter response.	Low or no meter response.	Defective flashlight cell(s) or cell contacts. Defective meter.
	Low or no meter response.	Normal	Defective battery check multiplier resistor.
DWELL METER	Normal	Meter reads beyond full scale in all lobe positions.	Incorrect test lead polarity.
	Normal	Meter reading drifts.	Oxidized calibration rheostats.
	Normal	Meter reads lower than actual dwell.	Defective rectifier. (See balance voltage test).
	Low or erratic meter response.	Normal	Oxidized calibrate rheostat.
	Low or erratic meter response.	Low or erratic meter response.	Oxidized Dwell Calibrator (or Regulator). Defective flashlight cells (s) or cell contacts.
	Low meter readings.	Meter reads lower than actual dwell.	Defective meter. Open relay coil (tachometer inoperative).
	TDT's only Meter reads beyond full scale.	Meter readings higher than normal and/or erratic.	Oxidized meter rheostat.

ADJUSTMENTS

BATTERY CHECK CIRCUIT (except 10 M units)

1. Install fresh flashlight cell(s).
2. Turn selector switch to CALIBRATE position and note whether tachometer reads in upper 50% of the black bar.

   If meter reading is low, shunt the battery check multiplier resistor (typical value -- 465k ohms).

   If meter reading is high, add a resistor in series with the battery check multiplier resistor (typical value -- 100 ohms). NOTE: Attach this resistor to the upper tach meter terminal on GA and 10 units.

BALANCE VOLTAGE (balance resistor adjustment)

1. Turn selector switch to CALIBRATE position.
2. Connect test leads to a variable DC voltage supply observing proper polarity. See figure 1.
3. The dwell meter should fall back to zero by 4 VDC and remain on zero, ± 1 division, up to 15 VDC (5-7 VDC for 150 and 155 units).

   If dwell meter reads to right of zero, increase balance resistance.

   If dwell meter reads to left of zero, decrease balance resistance. NOTE: If the balance resistor must be decreased below 75k ohms to achieve balance, replace the rectifier.

DWELL REGULATOR (CALIBRATOR) SWEEP (after dwell circuit calibration only)

1. Turn selector switch to CALIBRATE position.
2. Rotate dwell regulator thru its full range.

   If the dwell meter cannot be adjusted to 47° or less, add a 50 ohm resistor in series with the dwell regulator.

   If the meter cannot be adjusted to 3 divisions above the SET LINE, shunt a resistor across the narrow section (1.15k) of the voltage divider strip (typical value -- 5k ohms). NOTE: Check dwell regulator sweep after installing new regulator.

TACHOMETER RELAY ADJUSTMENT

1. Connect unit to ignition system shown in figure 2.
2. Turn selector switch to 8 LOBE position.
3. Operate an 8 lobe distributor at 2500 rpm.
4. Remove cover from relay and increase relay armature spring tension (by turning the brass, hexhead adjusting screw) until the tachometer reading starts to drop off. Decrease spring tension until meter reading again drops off. Adjust spring tension to a point half way between these two settings.

   NOTE: When installing a new relay, check relay point gap. Should be .003 inch.

TACHOMETER CALIBRATION FOR GA-10E-10D-10M-TDT-TDT 1 & 2-KE

Before begining tachometer calibration, check: cell voltage, meter zero, meter balance. If relay has been installed, check relay adjustment as shown on page 5 of this section.

1. Connect unit to be calibrated to the distributor set-up shown in figure 2.
2. Turn unit's switches to 4 LOBE and 5000 RPM positions.
3. Operate distributor tester at a speed which will cause the unit being calibrated to read 900 rpm.
4. Switch to the 1000 RPM position. Meter should read 900 ± 20 rpm on the 0-1000 rpm scale.

   For every 1 division (20 rpm) below 900 rpm shunt (parallel) .2 mfd across the large 6 mfd condenser.

   For every 1 division (20 rpm) above 900 rpm shunt (parallel) .05 mfd across the metal clad 1.5 mfd condenser. Repeat steps 2, 3 and 4.
5. Attach four pieces of white tape at equal intervals (90° apart) to the turntable of the distributor tester. Use a florescent light to strobe the distributor tester speed at 1800 rpm for 60 cycles and 1500 rpm for 50 cycles. The tachometer on the distributor tester will show when this speed is approached. At the exact speed, the pieces of tape will appear stationary. See figure 2.
6. Refer to the table below for the proper meter reading. Adjust the corresponding calibration rheostat to effect proper calibration.

   It is desirable to use a 1 lobe distributor (Sun part number 2-1160) and calibrate the unit on the 1000 RPM range when two scale ranges are provided. For single range tachometers, choose a distributor which gives calibration points of about 1/2 to 3/4 scale deflection.

Line frequency	Lobe positions	No. of lobes on distributor			
		1	4	6	8
60 cps.	4	900	3600	5400	7200
	6	600	2400	3600	4800
	8	450	1800	2700	3600
50 cps.	4	750	3000	4500	6000
	6	500	2000	3000	4000
	8	375	1500	2250	3000

Tachometer calibration points in engine rpm's

TACHOMETER CALIBRATION FOR 155, 150A & 310 UNITS

Before begining tachometer calibration, check: cell voltage, meter zero and meter balance. The external coil and spark gap and are not used when calibrating these units.

1. 150A-155 units --- Plug the 5 prong plug of the unit being calibrated into the socket at the rear of the distributor tester (140A or 145 units).

   310 units --- Use the 3-5 prong adapter plug (see figure 3) to connect the unit being calibrated to the distributor tester.
2. Attach four pieces of white tape at equal intervals (90° apart) to the turntable of the distributor tester. Use a florescent light to strobe the distributor tester speed at 1800 rpm for 60 cycles or 1500 rpm for 50 cycles.
3. Adjust the tachometer calibration rheostat for the readings shown below.

   NOTE: 310 unit must be in DIRECT DRIVE position.

Unit / Freq.	155 150A	310
60 cy.	1800	3600
50 cy.	1500	3000

DWELL METER CALIBRATION

Before begining dwell calibration, check: meter zero, meter balance and balance voltage. The following procedure can be combined with the tachometer calibration shown on the previous page to effect simultaneous calibration of both circuits.

GA, TDT's and 10 UNITS

1. Use the distributor tester set-up shown in figure 2.
2. Be sure the distributor breaker points are closed and current is flowing through the coil.
3. Connect unit to be calibrated to the distributor primary terminal and ground (negative ground).

150A and 155 UNITS

1. Use the distributor set-up shown in figure 2 without the external coil. Connect the distributor and ground leads to the distributor
2. Adjust the turntable until the distributor points are closed. Turn ON the battery switch (pilot light should be on).
3. Plug the 5 prong plug of the unit being calibrated into the rear of the distributor tester.

4. Turn selector switch to CALIBRATE position and adjust dwell regulator (or calibrator) so that dwell meter reads on the SET LINE.
5. Operate the distributor tester at about 1000 rpm and adjust the breaker points in the distributor until the dwell meter shows 25°. The distributor will now be adjusted to 50% of dwell.
6. All, except TDT's --- Switch to the 4 LOBE position and adjust the dwell regulator (or calibrator) on the front panel so that the dwell meter indicates 45°. Do not change this adjustment after switching from the 4 LOBE position.

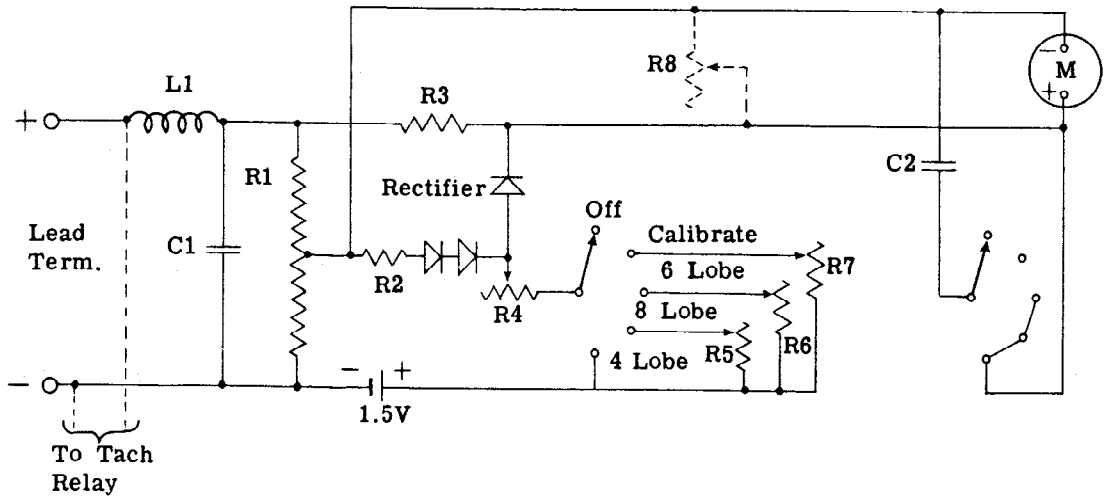
   TDT's only --- Adjust the dwell calibrator on the front panel to the mid-point of its range. Adjust the meter rheostat so that the dwell meter indicates 45°. Do not change either of these adjustments after switching from the 4 LOBE position.
7. Switch to the 8 and 6 LOBE position respectively and adjust the corresponding calibration rheostat for the following readings.

   8 LOBE -- 22.5°
   6 LOBE -- 30.0°
8. Stop the distributor tester and adjust the turntable until the breaker points are closed. Do not disconnect the coil.

   NOTE: For 150A and 155 units, leave the pilot light ON.
9. Turn the selector switch to the CALIBRATE position and adjust the calibrate rheostat so that the dwell meter reads on the SET LINE.
10. After completing the calibration, check the dwell regulator (or calibrator) sweep. See page 5 of this section.

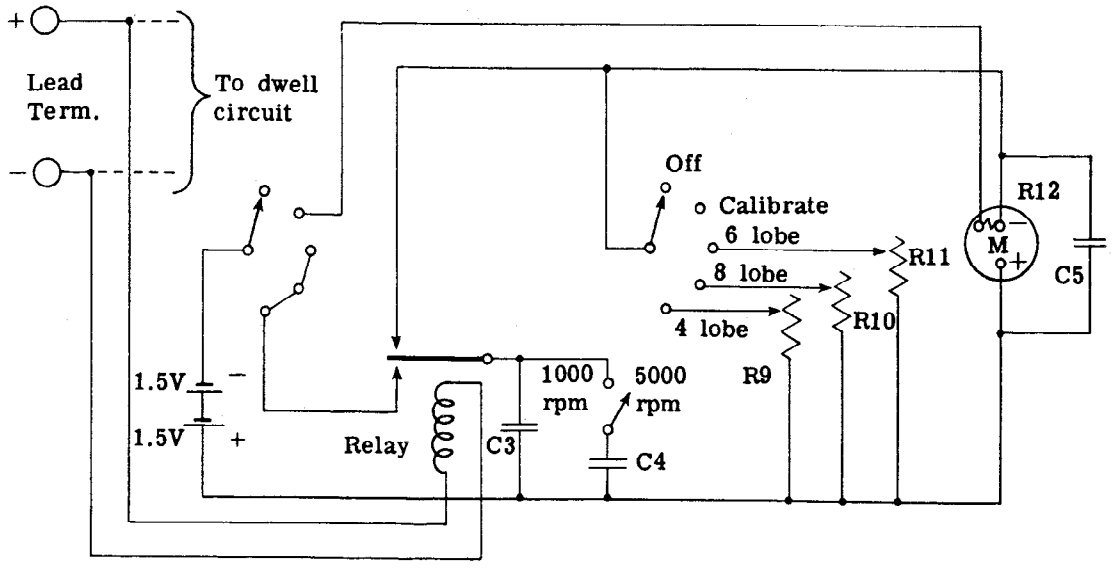
BASIC TACH-DWELL CIRCUITS

Refer to the schematics in Section I-C for correct values and part numbers.



R1 - Tapped strip resistor (voltage divider)
R2 - Rectifier series resistor
R3 - Balance Resistor
R4 - Dwell Regulator (Calibrator)
R5 - 8 lobe dwell calibration rheostat
R6 - 6 lobe dwell calibration rheostat
R7 - Calibrate rheostat
R8 - Meter rheostat (TDT's only)
C1 - Filter condenser
C2 - Dwell meter damping condenser
L1 - Filter choke

DWELL METER CIRCUIT



R9 - 4 lobe tachometer calibration rheostat
R10 - 8 lobe tachometer calibration rheostat
R11 - 6 lobe tachometer calibration rheostat
R12 - Battery check multiplier resistor
C3 - Loading condenser (5000 rpm range)
C4 - Loading condenser (1000 rpm range, plus C3)
C5 - Tachometer damping condenser

Relay - High speed, single pole, double throw

TACHOMETER CIRCUIT

CALIBRATION OF
10N, DTT, 150N, 150S, 155E and TDT-5

TACHOMETER CALIBRATION

Tachometer calibration follows the same procedure shown on page 6 of this section.

DWELL METER CALIBRATION

Calibration of the "N" circuit Tach-Dwell units must be done with a simulated ignition set-up like that shown on page 1, Figure 2 of this section. For 150 and 155 units, omit the coil and spark gap and connect the distributor tester leads to the distributor. Plug 5 prong plug of these units into corresponding socket in rear of distributor tester.

Before beginning any calibration be sure the flashlight cell is fresh and the meter checked for balance and properly zeroed.

1. Install in the test set-up of Figure 2 a distributor previously adjusted to 50% of dwell.

   OR

   Turn switch of unit being calibrated to the 8 LOBE position and adjust dwell calibrator on front panel so that dwell meter indicates 45 degrees. Connect the test leads from this unit to the distributor in the test set-up. (For 150 and 155 units, plug 5 prong plug into back of distributor tester and connect distributor tester leads to distributor. Pilot light must be on.) Operate the distributor at 1000 rpm and then adjust the distributor breaker points until dwell meter indicates 22.5 degrees.

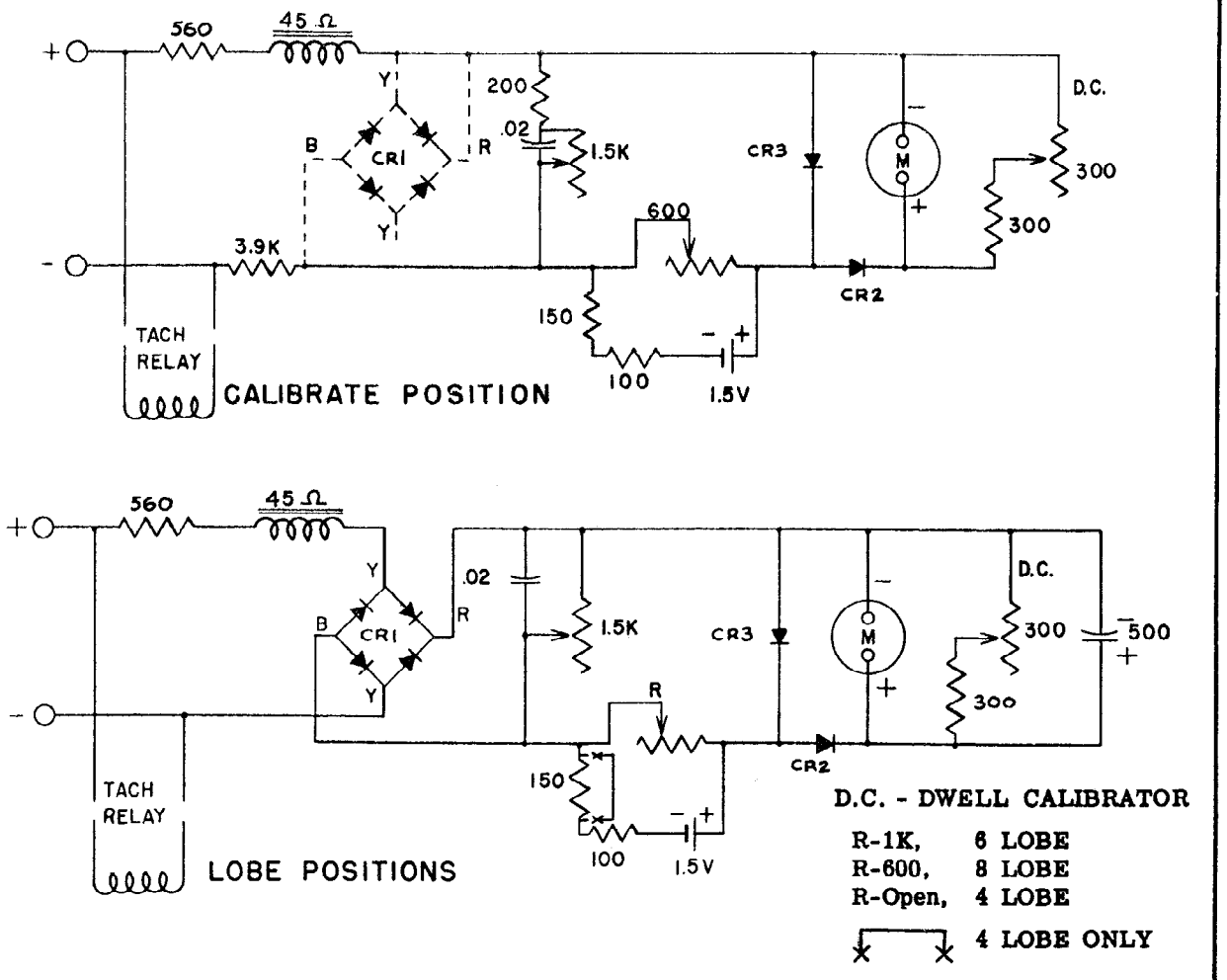
2. With test leads connected and distributor operating at about 1000 rpm, turn selector switch of unit being calibrated to the 4 LOBE position and the front panel Dwell Calibrator fully counter-clockwise. Adjust the load rheostat so that dwell meter indicates 42 degrees. Then, turn front panel Dwell Calibrator until dwell meter indicates 45 degrees.

3. Switch to the 8 and 6 LOBE positions and adjust the corresponding calibration rheostats for 22.5 and 30.0 degrees, respectively.

4. Turn selector switch to the CALIBRATE position, disconnect the test leads (for 150 and 155 units, remove 5 prong plug), and adjust the calibrate rheostat until dwell meter reads on the SET LINE.

5. (All, except 150 and 155 units) Reconnect the test leads to the distributor in reversed polarity and recheck the dwell calibration in the 6, 8 and 4 LOBE positions using both 6 and 12 volt simulated ignition systems. If meter readings differ at all from those obtained in steps 2 and 3, check for defective meter diodes CR2 and CR3.

BASIC "N" DWELL CIRCUITS



CALIBRATE POSITION

In this position the input rectifier, CR1, is not a part of the circuit, although it is still physically connected to it. This circuit arrangement permits distributor resistance to be measured in much the same way as with former dwell circuits. To achieve the same degree of sensitivity during the distributor resistance test as was obtained with the former dwell circuit, two additional resistors are switched into the circuit which are not in effect in the LOBE positions.

LOBE POSITIONS

The only circuit change between the three LOBE positions is in the value of R and the 150 ohm fixed resistor (which is shorted out in the 4 LOBE position). The .02 mfd condenser is not always used. It's installed at the factory, when necessary, to eliminate a tendency for the dwell reading to change at higher speeds. Faulty diodes or rectifiers, CR1, CR2 and CR3, can also cause a similar condition in addition to other effects. These may be comparitively checked for forward and back resistance with an ohmmeter or by direct substitution in the circuit.

ADJUSTMENT AND CALIBRATION OF TACH DWELL UNIT, MODEL 410

See Repair Manual, Section I-B, Page 1, for test bench setup.

BATTERY CHECK

1. Install fresh flashlight cell.
2. Test Mercury cell with Mercury Cell Tester, Model V-20A.

BALANCE VOLTAGE TEST

1. Turn Selector switch to 6 cylinder position.
2. Connect test leads to variable D.C. voltage supply, observing proper polarity.
3. The Dwell Meter should fall back to zero at a 4.5 volt D.C. reading, and remain on zero ±1/2 division, up to a 14 volt reading.

   NOTE: If reading is off scale to the left, replace Diodes #772-101 and #774-103.

TACHOMETER CALIBRATION

Before beginning tachometer calibration, conduct the Preliminary Inspection as outlined in Section I-B, Page 3, Paragraph 1. If relay has been installed, check relay adjustment as shown in Section I-B, Page 5.

1. Connect unit being calibrated to Distributor Tester setup as shown in Section I-B, Page 1, Figure 2.
2. Attach four pieces of white tape at equal intervals (90° apart) to the turntable of the Distributor Tester. Use a fluorescent light to strobe the Distributor Tester speed at 1800 RPM for 60 cycles and 1500 RPM for 50 cycles. The tachometer on the Distributor Tester will show when this speed is approached. At the exact speed, the pieces of tape will appear stationary.
3. Adjust the corresponding calibration rheostat for the readings shown in the following table:

Line Frequency	Lobe Positions	No. of Lobes on Distributor			
		1	4	6	8
60 Cycle	4	900	3600	5400	7200
	6	600	2400	3600	4800
	8	450	1800	2700	3600
50 Cycle	4	750	3000	4500	6000
	6	500	2000	3000	4000
	8	375	1500	2250	3000

CALIBRATION OF DWELL METER, MODEL 410

DWELL METER CALIBRATION

Before beginning dwell calibration, conduct the Preliminary Inspection as outlined in Section I-B, Page 3, Paragraph 1. The following procedure may be combined with the tachometer calibration listed on Page 11 to effect simultaneous calibration of both circuits.

1. Use Distributor Tester setup as shown in Section I-B, Page 1, Figure 2.
2. Be sure the distributor breaker points are closed and current is flowing through the coil.
3. Connect unit to be calibrated to distributor primary terminal and to ground (negative ground).
4. Turn selector switch to CALIBRATE position, and adjust dwell regulator (or calibrator) so that dwell meter reads on SET LINE.
5. Operate Distributor Tester at about 1000 RPM, and adjust breaker points in distributor until dwell meter reads 45° (mid-scale) on 90° scale. The distributor will now be adjusted to 50% of dwell.
6. Set selector switch to 6 cylinder position and set dwell regulator (front panel) to mid position. Adjust 6 lobe dwell calibrator so that dwell meter reads 30° on 45° scale.
7. Disconnect leads. Turn selector switch to CALIBRATE position, and adjust the calibration rheostat (rear panel) so that the dwell meter reads on SET LINE.
8. Turn selector switch to 8 cylinder position, and adjust the 8 lobe calibration rheostat (rear panel) so that the dwell meter reads on the SET LINE.
9. After completing the calibration, check the dwell regulator (calibrator) sweep. Dwell calibrator control should adjust the dwell meter 3 division + and - from the SET LINE.

ADJUSTMENT AND CALIBRATION OF TACH-DWELL UNIT, MODEL 610 AND TACH-DWELL UNIT, MODEL 730

EQUIPMENT NEEDED

Voltmeter	0-16 Volt Scale
Distributor Tester	Model 600
Distributor	6 Lobe Cam
Variable D.C. Voltage Supply	Variac

BATTERY CHECK

1. Install fresh flashlight cell.
2. See Section I-B, Page 2, for mercury cell test procedure.

BALANCE VOLTAGE TEST

1. Turn Selector Switch to 6 cylinder position.
2. Connect variable D.C. voltage supply to top two terminals on inner panel of unit. (See Model 610 Repair Manual, Page 2).
3. The dwell meter should fall back to zero at 4.0 volt D.C. reading and remain on zero, plus or minus 1/2 division, up to a 14 volt reading.

TACHOMETER CALIBRATION

Before beginning tachometer calibration, conduct the Preliminary Inspection as outlined in Section I-B, Page 3, paragraphs 1 and 2.

1. Connect the five-prong plug of the unit being calibrated into the socket at the rear of the distributor tester (Model 600).
2. Attach four pieces of white tape at equal intervals (90° apart) to the turntable of the distributor tester. Use a florescent light to strobe the distributor tester speed at 1800 RPM for 60 cycles, or at 1500 RPM for 50 cycles. The tachometer on the distributor tester will show when this speed is approached. At the exact speed, the pieces of tape will appear stationary.
3. Adjust the tachometer calibration rheostat for the readings shown in the following table:

LINE FREQUENCY	R.P.M.
60 Cycle	1800
50 Cycle	1500

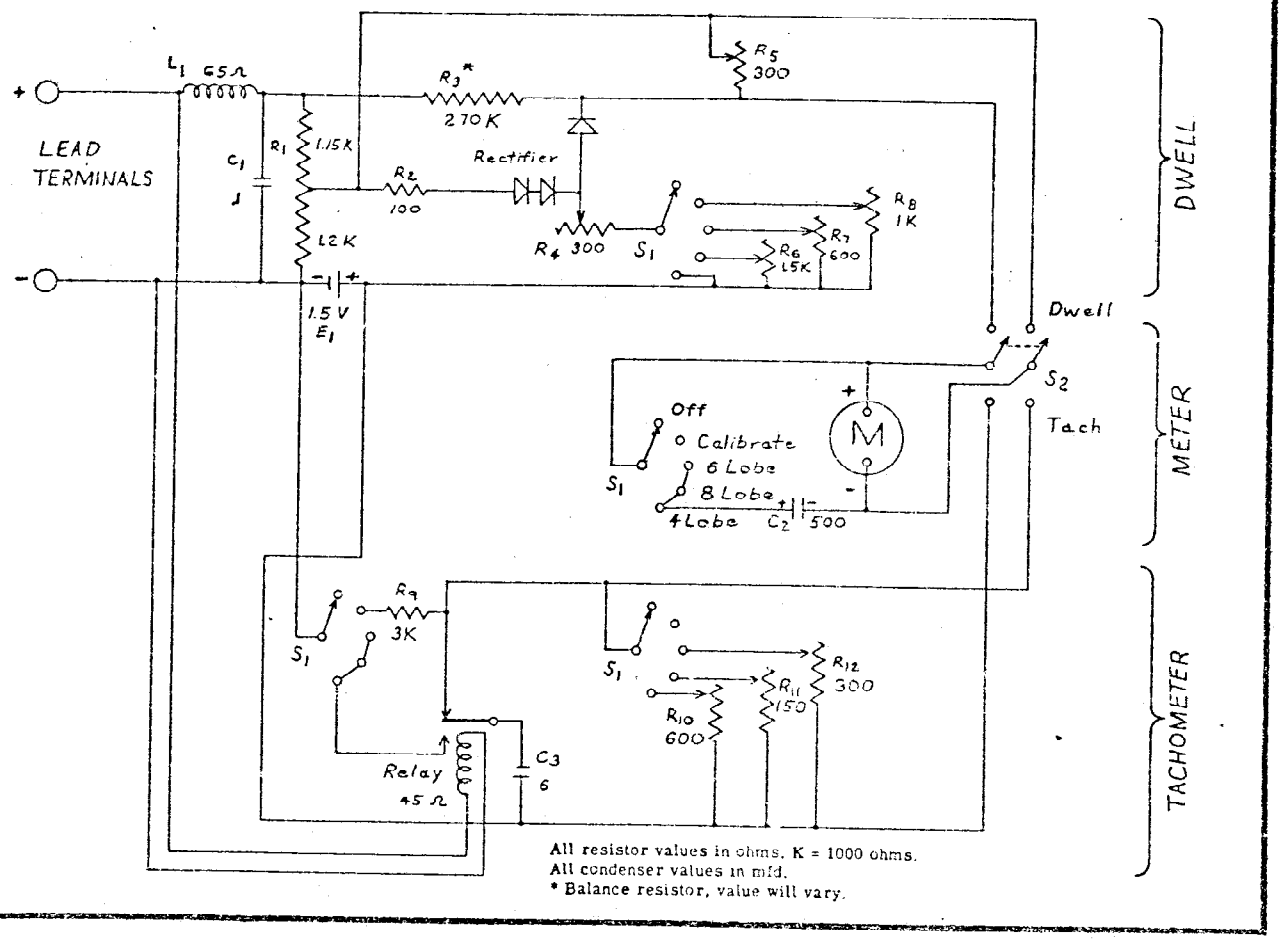
ADJUSTMENT AND CALIBRATION OF TACH-DWELL UNIT, MODEL 610 AND TACH-DWELL UNIT, MODEL 730

DWELL METER CALIBRATION

Before beginning dwell calibration, conduct the Preliminary Inspection as outlined in Section I-B, Page 3, paragraphs 1 and 2. The following procedure may be combined with the tachometer calibration (see Page 13) to effect simultaneous calibration of both circuits.

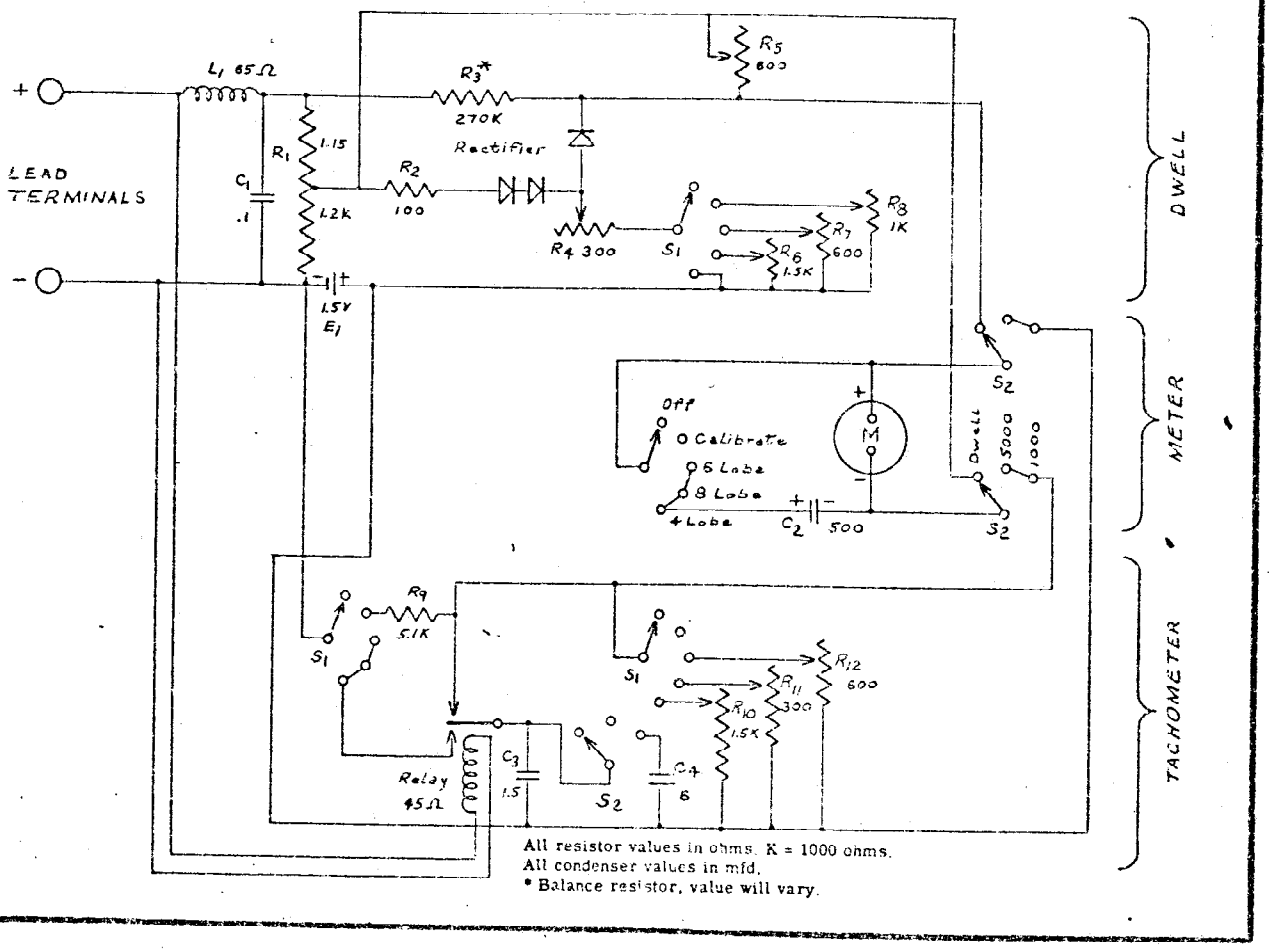
1. Turn Selector Knob to the 6 Cylinder position.
2. Move the dwell Calibrator Knob on the front panel of unit to 1/4 of its full range.
3. Adjust the 6 cylinder rheostat on rear panel until the dwell meter reads on Set Line.
4. Using the Model 600 Distributor Tester, mount distributor and connect leads. Turn ON power supply switch.
5. Attach the five-prong plug of unit being calibrated into the rear of the distributor tester.
6. Operate distributor tester at 1000 RPM and adjust breaker points in distributor until dwell meter reads 22-1/2° on the 45° scale. The distributor will now be adjusted to 50% of dwell.
7. Re-adjust 6 cylinder rheostat on rear panel until meter reads 30° on the 45° scale.
8. Reduce speed on distributor tester and turn power supply switch to OFF position.
9. Place Selector Knob in Calibrate position, and adjust the calibrate control on rear panel until meter reads on Set Line.
10. Place Selector Knob in 8 cylinder position, and adjust the 4 and 8 cylinder calibrate control on the rear panel until meter reads on Set Line.
11. Recheck in 6 cylinder position for 30° on the 45° scale,
    8 cylinder position for 22-1/2° on the 45° scale,
    4 cylinder position for 45° on the 90° scale.
12. Remove five-prong plug of unit being calibrated from the rear of the distributor tester.

TDT



All resistor values in ohms. K = 1000 ohms.
All condenser values in mfd.
* Balance resistor, value will vary.

TDT-2



All resistor values in ohms. K = 1000 ohms.
All condenser values in mfd.
* Balance resistor, value will vary.

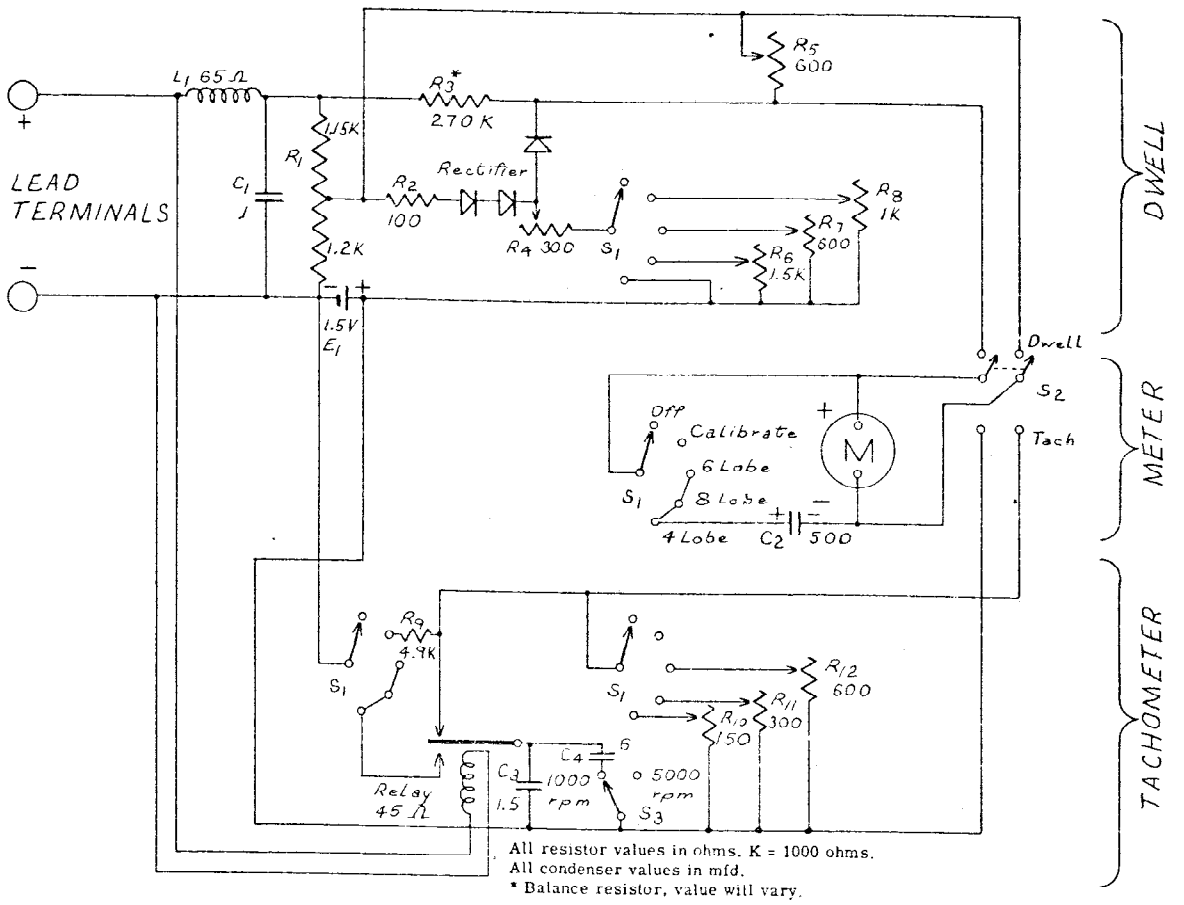
Code	Value and/or equivalent	Sun numbers	Remarks
C1	.1 mf 200 V	679-59	
C2	500 mf .2 V	679-58	
*C3	1.5 mf 100 V	553	Pad per Instructions
*C4	6 mf 150 V	679-54	Pad per Instructions
*R1	2.35K Tapped at 1.2K	687-7	
R2	100 1/2 w. carbon 10%	680-6	
R3	270K 1/2 w. carbon 10%	680-63	Balance Resistor
R4	0-300 2 w. wire wound	685-59	Dwell Regulator
*R5	0-600	685-7	Meter calib. Rheostat
*R6	0-1.5K	685-37	8 Lobe Dwell
*R7	0-600	685-7	6 Lobe Dwell
*R8	0-1K	685-1	Calibrate Rheostat
*R9	5.1K 1%	680-129	Battery Check Multiplier
*R10	0-1.5K	685-37	4 Lobe Tach
*R11	0-300	685-11	8 Lobe Tach
*R12	0-600	685-7	6 Lobe Tach
K - 1000 ohms.			
*M	Tach-Dwell .3 ma f. s.	678-146	** 290-350 ohms
S1	4 pole 5 pos., wafer	762-46	Lobe Selector
S2	3 pole 3 pos., wafer	762-52	Dwell 1000-5000 RPM
*Panel Assembly		2-1073-3A	

COMMON PARTS

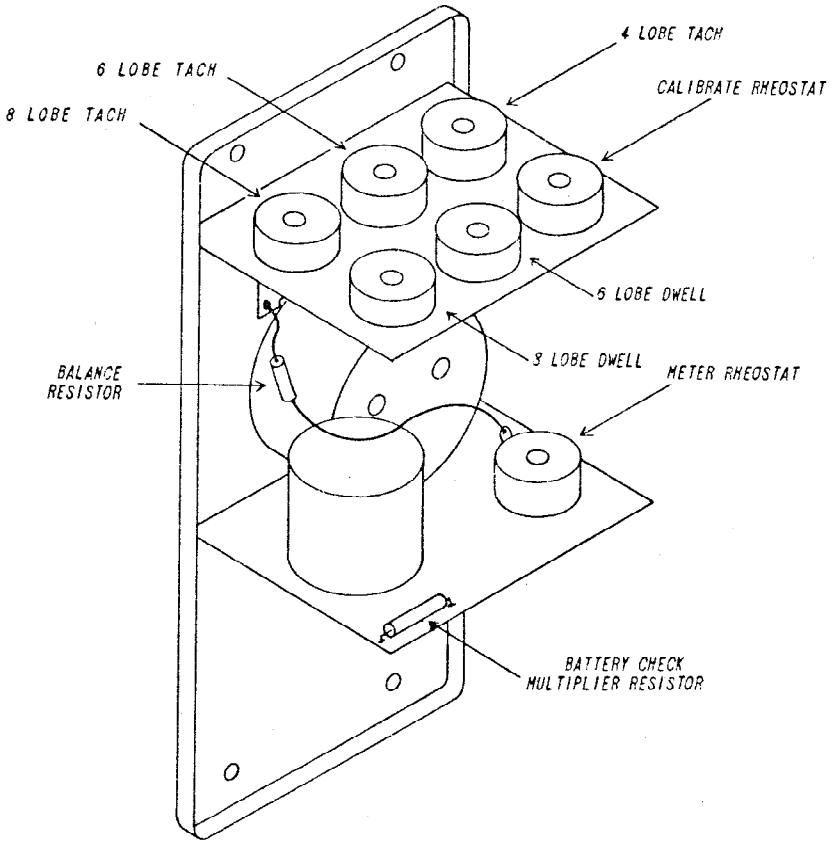
TDT, TDT-1, TDT-2

Code	Value and/or equivalent	Sun numbers	Remarks
*L1	Choke Assembly	851A	
E1	Flashlite Battery, Size D	768-1	
*Battery Contact Assembly		479-A	
*Battery Cover		240-A	
*Battery Holder		101-2	
*Box Assembly		4-445	
*Knobs		1492-2	
*Lead Assembly, complete		2-133-85	
Battery Clip, #27 Mueller		672-3	
*Clip Insulator, Black		190-1	
*Clip Insulator, Red		190-2	
*Lead Terminal		3853	2 Required
*Rectifier		510-6	
*Relay		482-22	

TDT-1



TDT, TDT-1, TDT-2



Those parts with an asterisk (*) are special components and are either not readily available from commercial sources or are parts made only by the Sun Electric Corporation. Replacements for these parts should be obtained from this company.

TDT

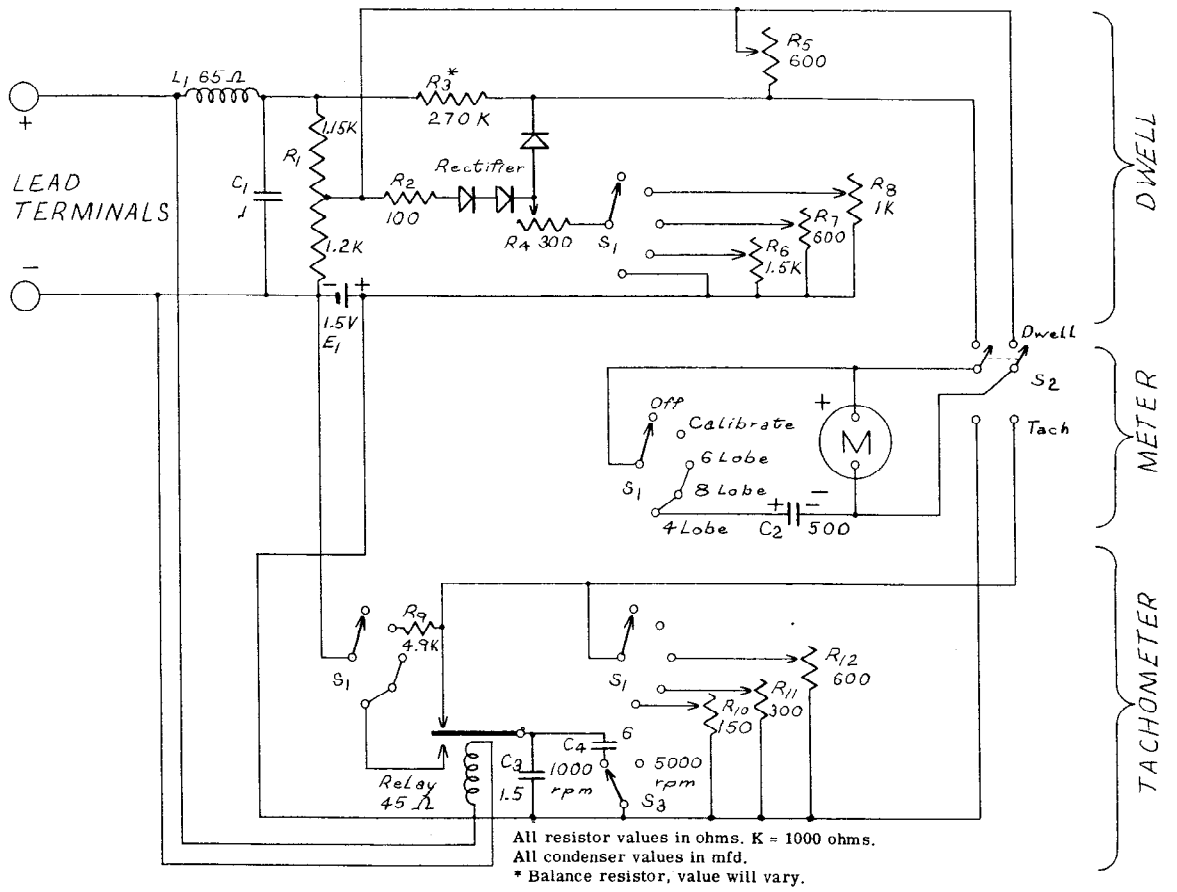
Code	Value and/or equivalent	Sun numbers	Remarks
C1	.1 mf 200 V	679-59	
C2	500 mf .2 V	679-58	
*C3	6 mf 150 V	679-54	Pad per Instructions
*R1	2.35K Tapped at 1.2K	687-7	
R2	100 1/2 w. carbon 10%	680-6	
R3	270K 1/2 w. carbon 10%	680-63	Balance Resistor
R4	0-300 2 w. wire wound	685-59	Dwell Regulator
*R5	0-300	685-11	Meter Calib. Rheostat
*R6	0-1.5K	685-37	8 Lobe Dwell
*R7	0-600	685-7	6 Lobe Dwell
*R8	0-1K	685-1	Calibrate Rheostat
R9	3K 1%	680-58	Battery Check Multiplier
*R10	0-600	685-7	4 Lobe Tach
*R11	0-150	685-6	8 Lobe Tach
*R12	0-300	685-11	6 Lobe Tach
K = 1000 ohms.			
M	Tach-Dwell .5 ma f. s.	678-139	** 175 ohms
S1	4 pole 5 position, wafer	762-46	Lobe Selector
S2	DPDT Toggle	689-1	Tach-Dwell
*Panel Assembly		2-1073-3A	

TDT-1

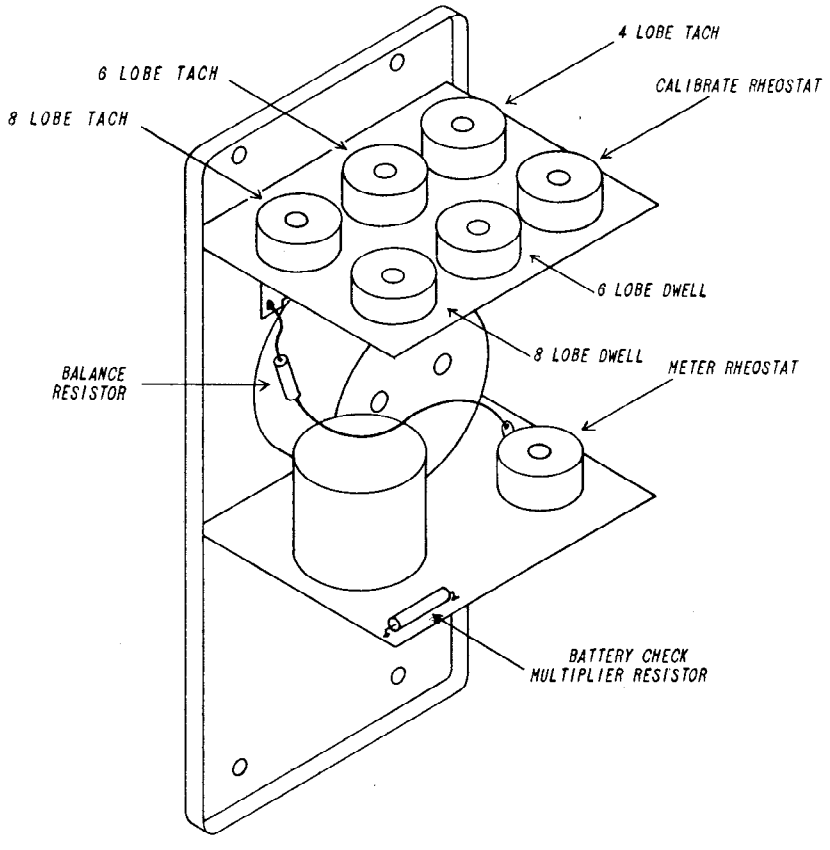
Code	Value and/or equivalent	Sun numbers	Remarks
C1	.1 mf 200 V	679-59	
C2	500 mf .1 V	679-58	
*C3	1.5 mf 100 V	553	Pad per Instructions
*C4	6 mf 150 V	679-54	Pad per Instructions
*R1	2.35K Tapped at 1.2K	687-7	
R2	100 1/2 w. carbon 10%	680-6	
R3	270K 1/2 w. carbon 10%	680-63	Balance Resistor
R4	0-300 2 w. wire wound	685-59	Dwell Regulator
*R5	0-600	685-7	Meter Calib. Rheostat
*R6	0-1.5K	685-37	8 Lobe Dwell
*R7	0-600	685-7	6 Lobe Dwell
*R8	0-1K	685-1	Calibrate Rheostat
*R9	4.9K 1%	680-121	Battery Check Multiplier
*R10	0-1.5K	685-37	4 Lobe Tach
*R11	0-300	685-11	8 Lobe Tach
*R12	0-600	685-7	6 Lobe Tach
K = 1000 ohms.			
*M1	Tach-Dwell .3 ma. f. s.	678-146	** 290-350 ohms
S1	4 pole 5 position, wafer	762-46	Lobe Selector
S2	DPDT, Toggle	689-1	Tach-Dwell
S3	SPST, Toggle	689-12	1000-5000 RPM
*Panel Assembly		2-1073-8A	

** Meter resistance measured on OHM scale of a Sun Condenser Tester.

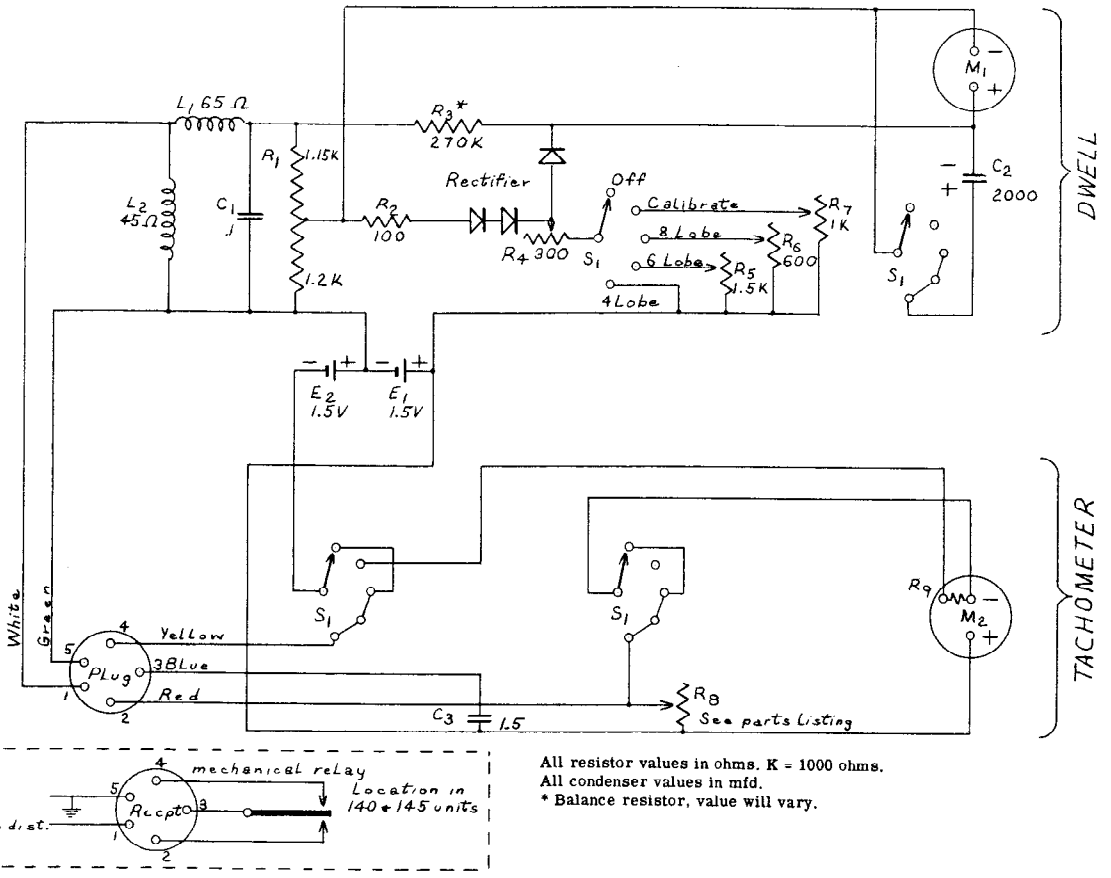
T D T-1



T D T, T D T-1, T D T-2

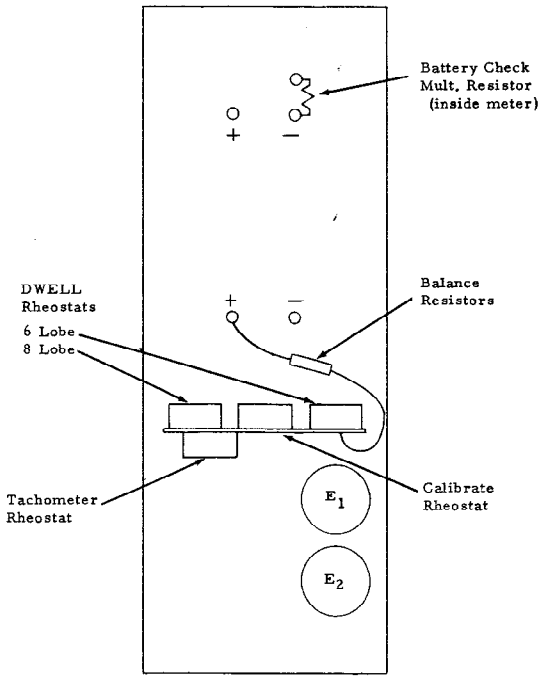


155-150A



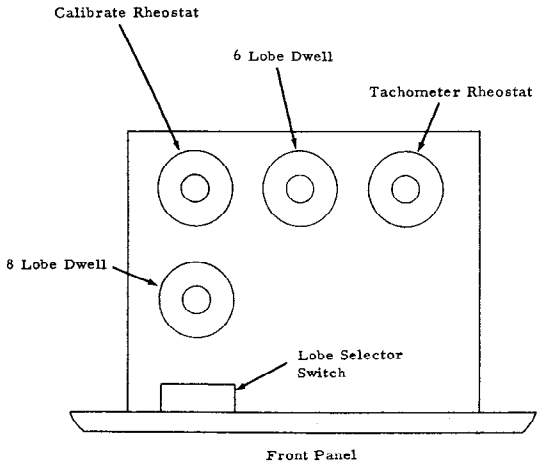
All resistor values in ohms. K = 1000 ohms.
All condenser values in mfd.
* Balance resistor, value will vary.

MODEL 150 A



Rear View

MODEL 155



Front Panel

Viewed from Bottom

Those parts with an asterisk (*) are special components and are either not readily available from commercial sources or are parts made only by the Sun Electric Corporation. Replacements for these parts should be obtained from this company.

UNITS 150 & 155

Code	Value and/or equivalent	Sun numbers	Remarks
C1	.1 mf 200 V	679-59	
C2	2000 mf .01 V	679-11	
*C3	1.5 mf 100 V	553	Pad per Instructions
*R1	2.35K Tapped at 1.2K	687-7	
R2	100 1/2 w. carbon 10%	680-6	
R3	270K 1/2 w. carbon 10%	680-63	Balance Resistor
*R4	0-300 2 w. wire wound	685-59	Dwell Regulator
*R5	0-1.5K	685-37	8 Lobe Dwell
*R6	0-600	685-7	6 Lobe Dwell
*R7	0-1K	685-1	Calibrate Rheostat
*R8	0-600 (Unit 150)	685-7	Tach Rheostat
*R8	0-1K (Unit 155)	685-1	Tach Rheostat
*R9	5965	None	Battery Check Mult. Res.
K = 1000 ohms.			
E1 & E2	Flashlite Battery, Size D	768-1	
*L1	Choke Assembly	851-A	
*L2	Choke Assembly	484-2	
*Battery Holder		101-2	
*Battery Contact Assembly		479-A	
*Rectifier		510-6	
*5 Prong Plug and Cable		2-105-52	

UNIT 150

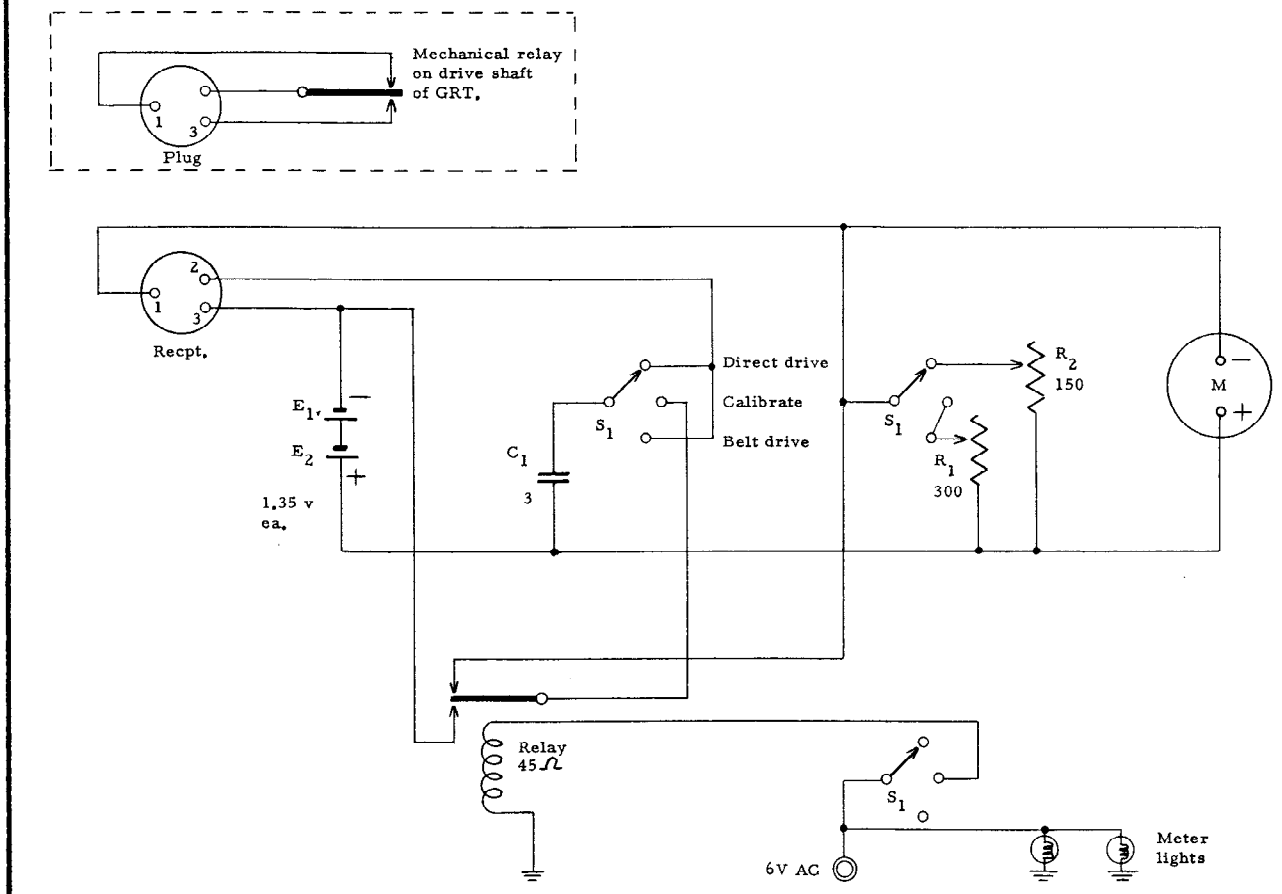
*M1	Dwell Meter 1 ma f. s.	678-37	** 41-46 ohms
*M2	Tach Meter .5 ma f. s.	678-77	** 175 ohms
Lite Bulb	6 V, Type 51	910-2	
*Cover, rear		2-128	
*Knob		1492	
*Unit Panel		4-190-1	
S1	4 pole 5 pos, wafer	762-13	

UNIT 155

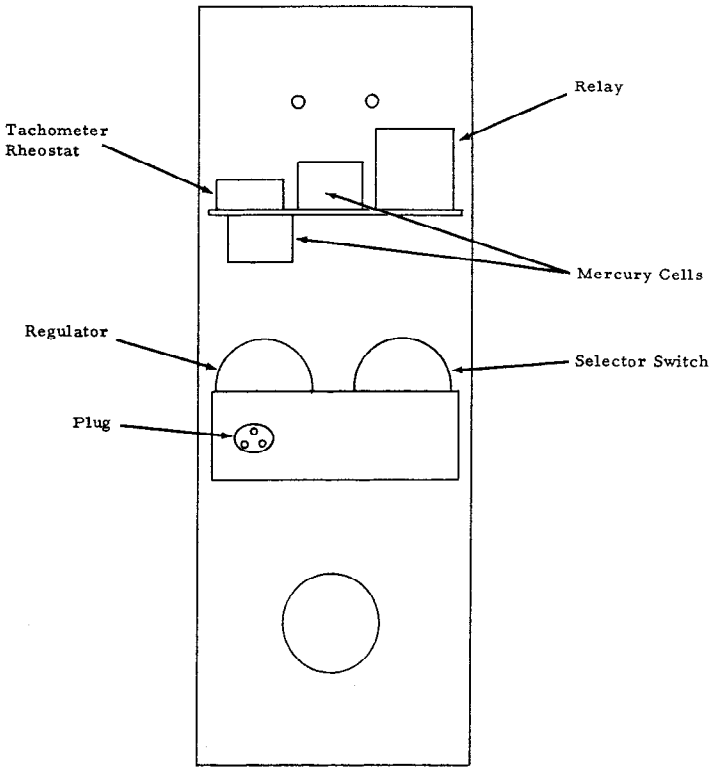
*M1	Dwell Meter 1 ma f. s.	678-144	** 41-46 ohms
*M2	Tach Meter .5 ma f. s.	678-145	** 175 ohms
*Knob		1492-2	
*Panel		4-455-3A	
*Steel Box		4-458	
S1	4 pole 5 pos. wafer	762-46	

** Meter resistance measured on OHM scale of a Sun Condenser Tester.

310



MODEL 310



Rear View

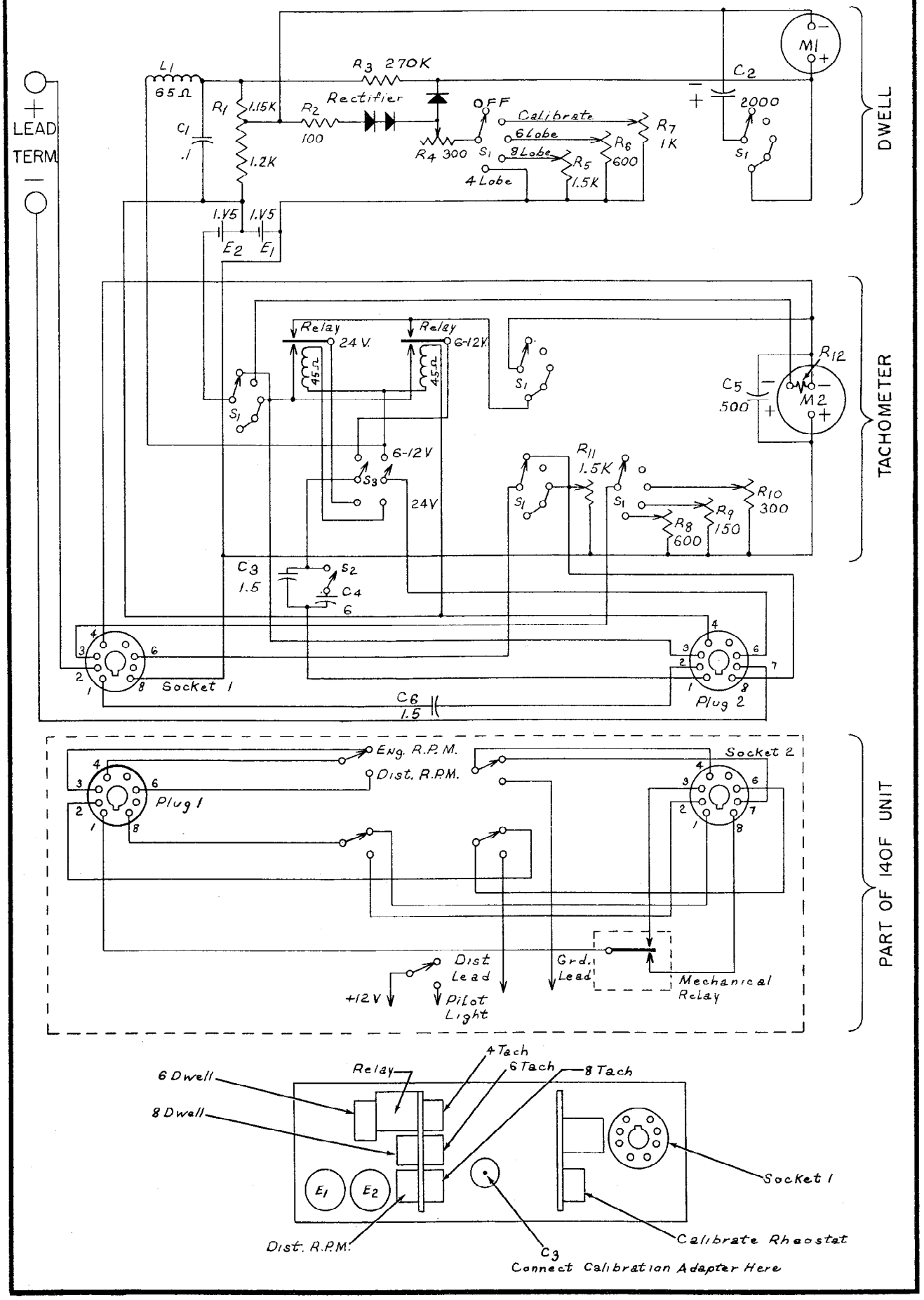
Those parts with an asterisk (*) are special components and are either not readily available from commercial sources or are parts made only by the Sun Electric Corporation. Replacements for these parts should be obtained from this company.

UNIT 310

Code	Value and/or equivalent	Sun numbers	Remarks
C1	3 mf 100 V	679-80	
R1	0-300	685-59	Drive Ratio Calibrator
*R2	0-150	685-6	Tach Rheostat
E1 & E2	Mercury Cell, Size #4	1766-3	
S1	3 pole 3 pos. wafer switch	762-6	
*M	Tach Meter .5 f. s.	678-72	** 175 ohms.
Lite Bulb	6 V, Type 51	910-2	
*Knob		1492-2	
*Mercury Cell Mounting Rings		1907	
*Relay		482-22	
Terminal Socket	3 prong	1918	
*Unit Cover, Rear		4-165	
*Unit Panel Assembly		4-187	

**Meter resistance measured on OHM scale of a Sun Condenser Tester.

10F

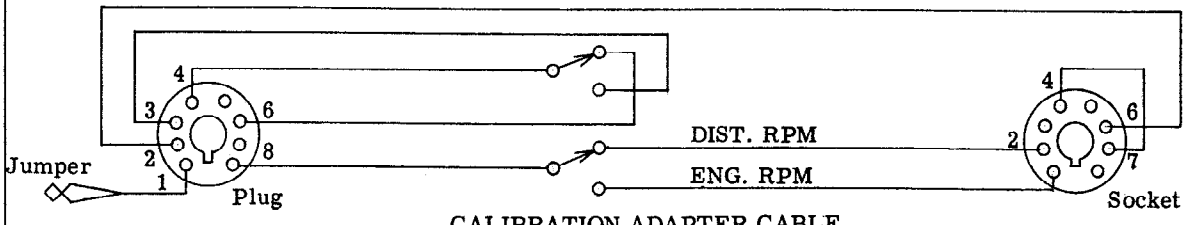

DWELL
TACHOMETER
PART OF 140F UNIT
LEAD TERM
L1 65Ω
C1 .1
R1 1.15K
1.2K
R2 100
R3 270K
Rectifier
R4 300
S1
OFF
Calibrate
6 Lobe
8 Lobe
4 Lobe
R5 1.5K
R6 600
R7 1K
M1
C2 2000
1.V5 1.V5
E2 E1
Relay 24 V.
Relay 6-12V.
45Ω
45Ω
S1
6-12 V
S3
24V
R11 1.5K
R8 600
R9 150
R10 300
C5 500
R12
M2
C3 1.5
S2
C4 6
C6 1.5
Socket 1
Plug 2
Plug 1
Socket 2
Eng. R.P.M.
Dist. R.P.M.
+12V
Dist Lead
Pilot Light
Grd. Lead
Mechanical Relay
6 Dwell
8 Dwell
Relay
4 Tach
6 Tach
8 Tach
E1
E2
Dist. R.P.M.
C3
Connect Calibration Adapter Here
Calibrate Rheostat
Socket 1

Those parts with an asterisk (*) are special components and are either not readily available from commercial sources or are parts made only by the Sun Electric Corporation. Replacements for these parts should be obtained from this company.

10F

Code	Value and/or equivalent		Sun number	Remarks
C1	.1 mf	200 V	679-59	
C2	2000 mf	.01 V	679-11	
*C3 and C6	1.5 mf	100 V	553	Pad per Instructions
*C4	6 mf	150 V	679-54	Pad per Instructions
C5	500 mf	.2 V	679-58	
*R1	2.35K	Tapped at 1.2K	687-7	
R2	100	1/2 w carbon 10%	680-6	
R3	270K	1/2 w carbon 10%	680-63	Balance Resistor
R4	0-300	2 w wire wound	685-59	Dwell Regulator
*R5	0-1.5K		685-37	8 Lobe Dwell
*R6	0-600		685-7	6 Lobe Dwell
*R7	0-1K		685-1	Calibrate Rheostat
*R8	0-600		685-7	4 Lobe Tach
*R9	0-150		685-6	8 Lobe Tach
*R10	0-300		685-11	6 Lobe Tach
*R11	0-1.5K		685-37	Distributor RPM Rheostat
*R12 K= 1000 ohms	5965		None	Battery check multiplier
*M1	Dwell Meter	1 ma f.s.	678-37	** 41-46 ohms
*M2	Tach Meter	.5 ma f.s.	678-104	** 175 ohms
*L1	Choke Assembly		851A	
E1 and E2	1.5V Flash Lite Batt. Size D		768-1	
S1	6 pole 5 pos. wafer switch		762-24	
S2	SPST Toggle Switch		689-12	
S3	DPDT Toggle Switch		689-1	
*Relays			482-22	
*Rectifier			510-6	
*Battery Holder			101-2	Flash Lite
*Battery Contact Assembly			479-A	
*Battery Cover			240-A	"Flash Lite"
*Socket Bracket Assembly			1951-1A	
Lite Bulb	12V, Type 53		910-5	
*Knob			1492	
*Lead Assembly, complete			2-133-45	
Battery Clip, #27 Mueller			672-3	
*Clip Insulator, Black			190-1	
*Clip Insulator, Red			190-2	
*Unit Panel			4-182-6	
*Rear Cover			2-128	
*6 Conductor Lead 41" long 8 prong plug			2-134-38	

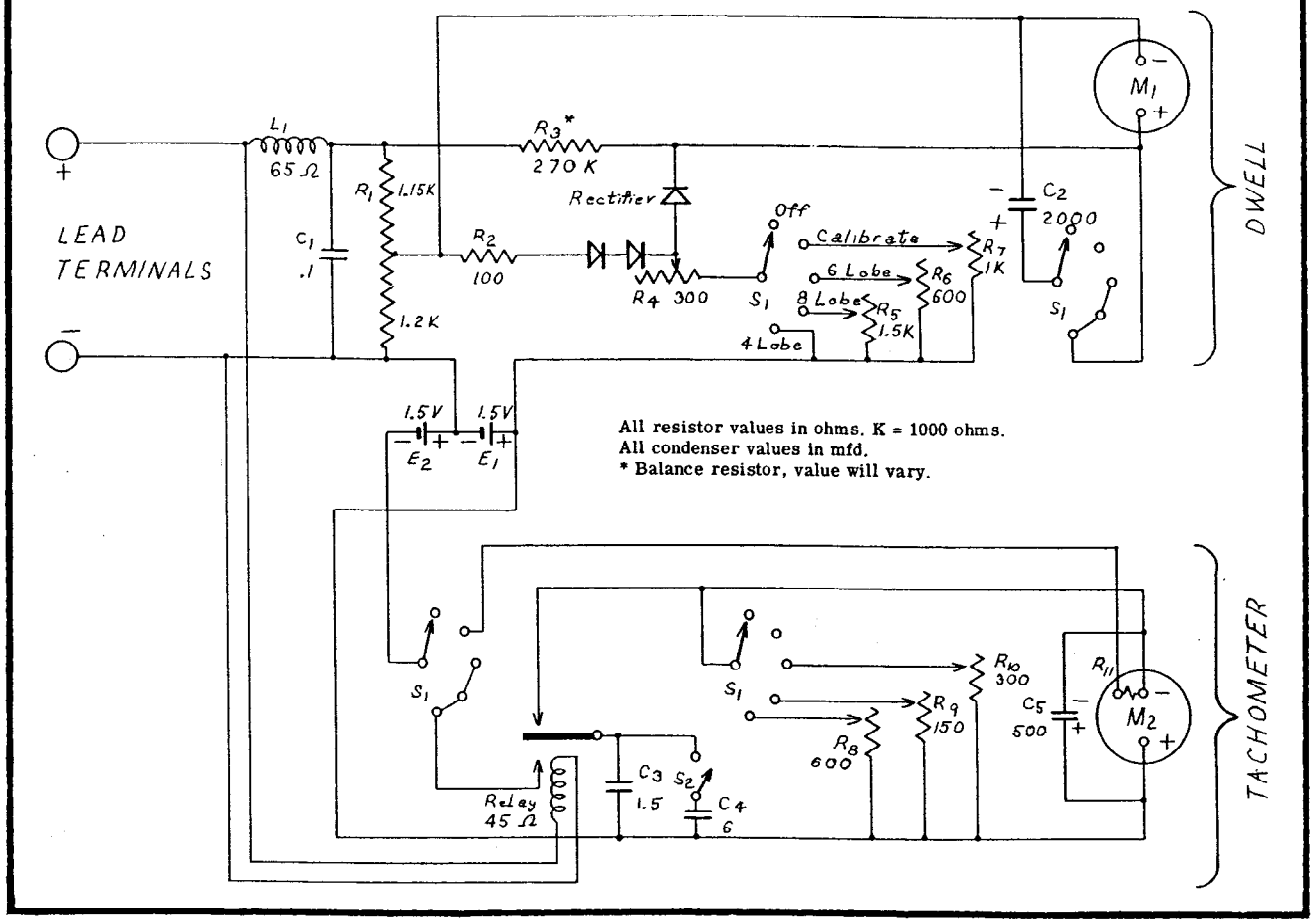
** Meter resistance measured on OHM scale of a Sun Condenser Tester.



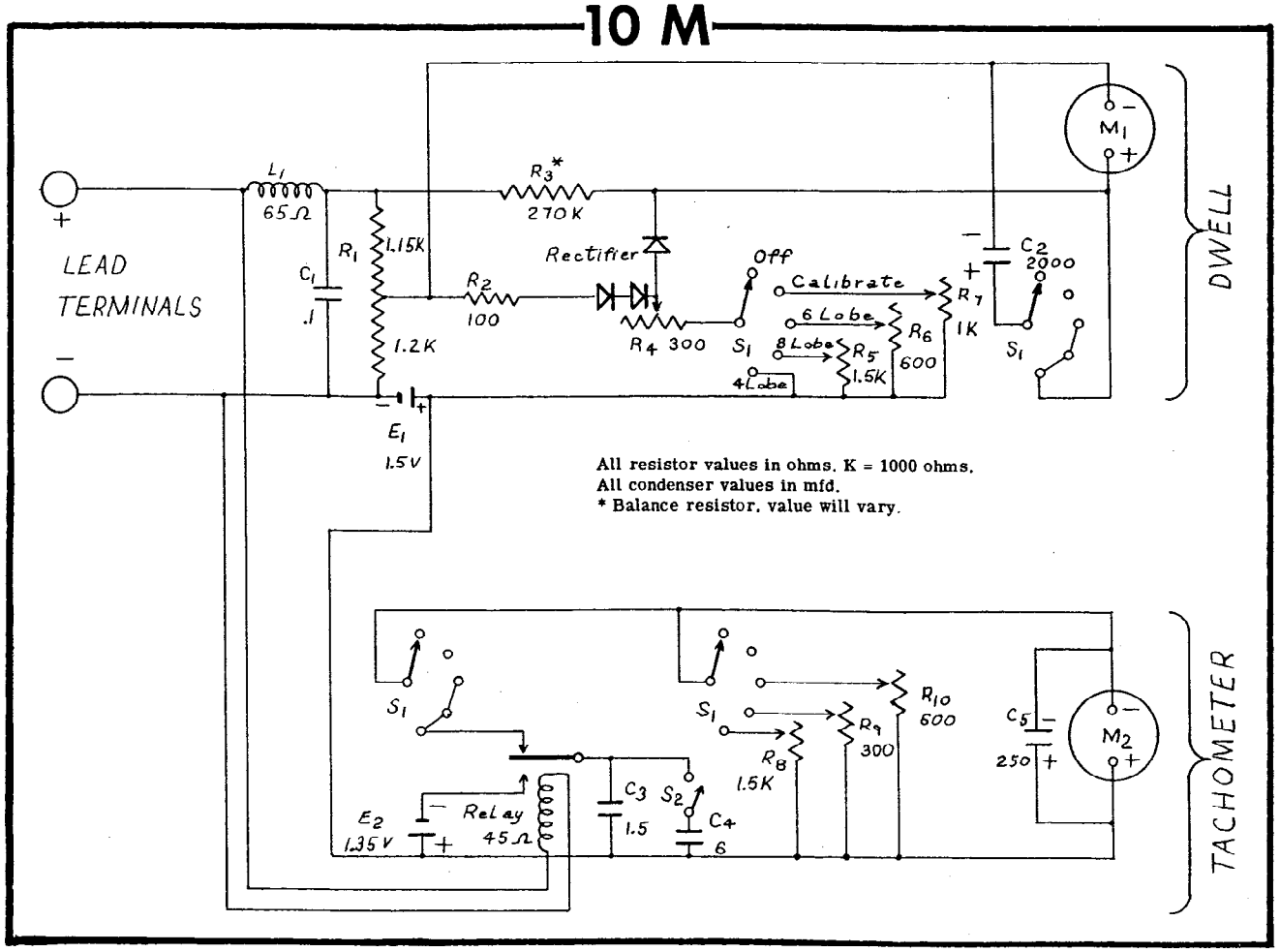
CALIBRATION ADAPTER CABLE
Part No. 2-105-64

1. Connect Cable between socket and plug of 10F unit. Connect jumper to insulated side of C3.
2. Use ENG. RPM position to test and calibrate unit in the conventional manner. Note exact tachometer deflection in 4 LOBE and 5000 RPM positions.
3. With same operating frequency as in step 2, switch Cable to DIST. RPM position. Adjust dist. rpm rheostat for the same tachometer deflection as noted in step 2.

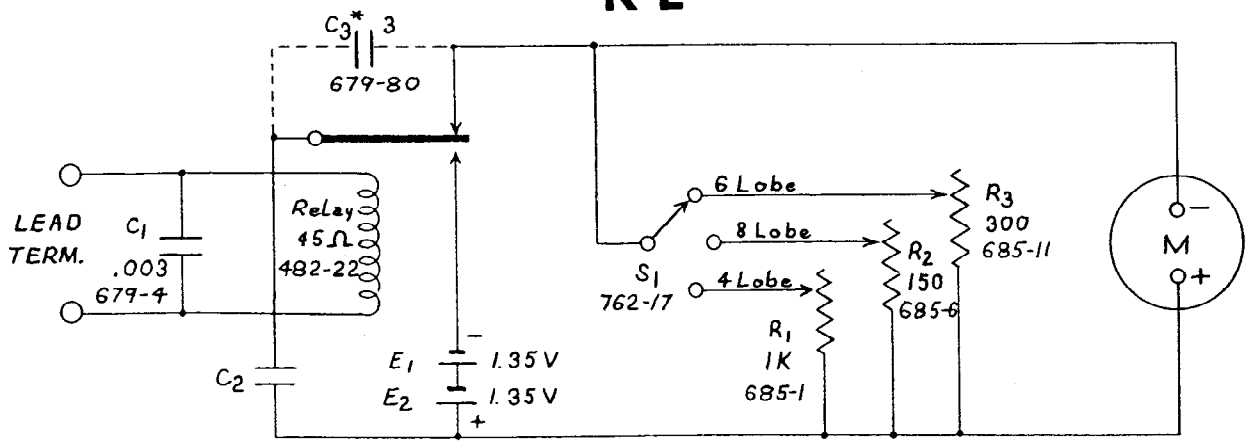
10 E-10 D-G A



10 M



K E

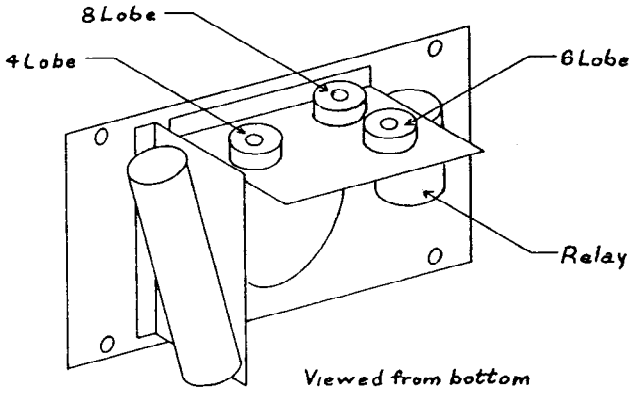


All resistor values in ohms K=1000 ohms
All condenser values in mfd.
*Used in KE-1 only

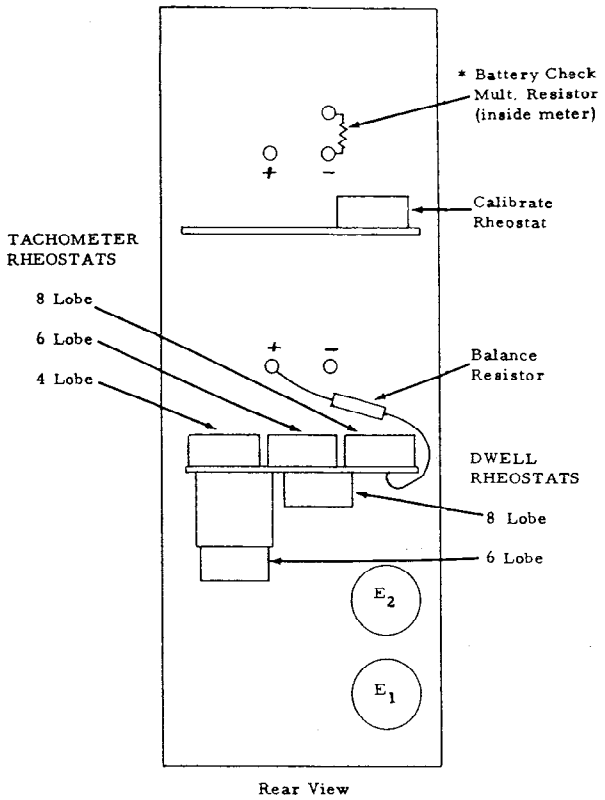
PARTS LISTINGS
FOR INDIVIDUAL KE MODELS

	C2		Meter	
Model	Value	Part No.	Value	Part No.
KE-1	3 mf	679-80	All meters 175 ohms resistance. .5 mf f. s.	678-80
KE-2	6 mf	679-54		678-81
KE-3	3 mf	679-80		678-82
KE-4	1.95 mf	553-4x		678-83
KE-5	1.5 mf	553		678-84
KE-6	1.5 mf	553-1x		678-85

E1 & E2 Mercury cell #4	1766-3
Lead assembly, complete	2-133-10
Panel assembly	2-614
Case, less window	5-121
Window, plastic	2321
Knob	916-1



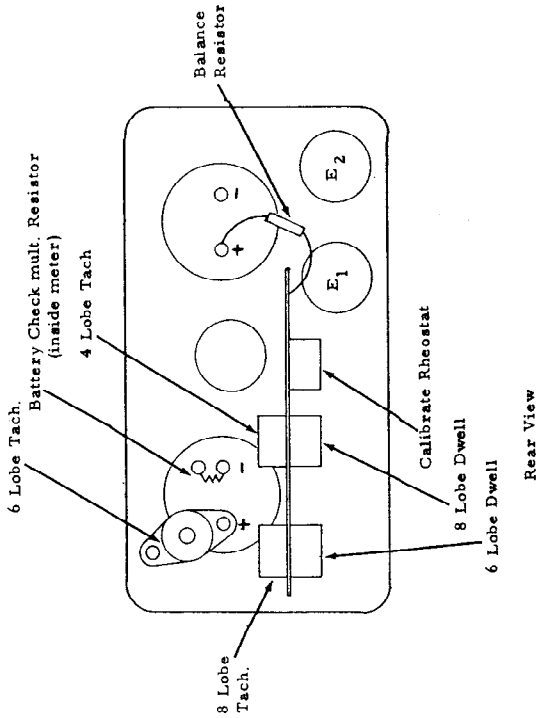
MODEL 10 A-10 D-10 E-10 M



Rear View

*Omitted on Model 10M

MODEL GA



Those parts with an asterisk (*) are special components and are either not readily available from commercial sources or are parts made only by the Sun Electric Corporation. Replacements for these parts should be obtained from this company.

10M

Code	Value and/or equivalent	Sun number	Remarks
C1	.1 mf 200 V	679-59	
C2	2000 mf .01 V	679-11	
*C3	1.5 mf 100 V	553	Pad per Instructions
*C4	6 mf 150 V	679-54	Pad per Instructions
C5	250 mf 6 V	679-130	
*R1	2.35K Tapped at 1.2K	687-7	
R2	100 1/2 w. carbon 10%	680-6	
R3	270K 1/2 w. carbon 10%	680-63	Balance Resistor
R4	0-300 2 w. wire wound	685-59	Dwell Calibrator
*R5	0-1.5K	685-37	8 Lobe Dwell
*R6	0-600	685-7	6 Lobe Dwell
*R7	0-1K	685-1	Calibrate Rheostat
*R8	0-1.5K	685-37	4 Lobe Tach
*R9	0-300	685-11	8 Lobe Tach
*R10	0-600	685-7	6 Lobe Tach
K = 1000 ohms			
*M1	Dwell Meter 1 ma f. s.	678-37	** 41-46 ohms
*M2	Tach Meter .3 ma f. s.	678-163	** 250 ohms
*L1	Choke Assembly	851A	
E1	1.5V Flash Lite Batt. Size D	768-1	
E2	1.35V Mercury Cell Size #4	1766-3	
S1	4 pole 5 pos. Wafer Switch	762-46	
S2	SPST Toggle Switch	689-12	
*Relay		482-22	
*Rectifier		510-6	
*Battery Holder		101-2	Flash Lite
*Battery Holder		101-4	Mercury Cell
*Battery Contact Assembly		479-A	
*Battery Cover		240-A	"Flash Lite"
*Battery Cover		240-4A	"Plain"
*Mercury Cell. Insul. Tube		643-50	
*Lead Terminal		3853	
Lite Bulb	12V, Type 53	910-5	
*Knob		1492-2	
*Lead Assembly, complete		2-133-85	
Battery Clip, #27 Mueller		672-3	
*Clip Insulator, Black		190-1	
*Clip Insulator, Red		190-2	
*Unit Panel		4-182-8	
*Rear Cover		2-128	

**Meter resistance measured on OHM scale of a Sun Condenser Tester.

GA-10E-10D

Code	Value and/or equivalent	Sun numbers	Remarks
C1	.1 mf 200 V	679-59	
C2	2000 mf .01 V	679-11	
*C3	1.5 mf 100 V	553	Pad per Instructions
*C4	6 mf 150 V	679-54	Pad per Instructions
C5	500 mf .2 V	679-58	
*R1	2.35K Tapped at 1.2K	687-7	
R2	100 1/2 w. carbon 10%	680-6	
R3	270K 1/2 w. carbon 10%	680-63	Balance Resistor
R4	0-300 2 w. wire wound	685-59	Dwell Regulator
*R5	0-1.5K	685-37	8 Lobe Dwell
*R6	0-600	685-7	6 Lobe Dwell
*R7	0-1K	685-1	Calibrate Rheostat
*R8	0-600	685-7	4 Lobe Tach
*R9	0-150	685-6	8 Lobe Tach
*R10	0-300	685-11	6 Lobe Tach
*R11	5965	None	Battery Check Multiplier
K = 1000 ohms			
*L1	Choke Assembly	851A	
E1 & E2	Flashlite Battery, Size D	768-1	
S1	4 pole 5 pos. wafer	762-13	Lobe Selector
S2	SPST, Toggle	689-12	1000-5000 RPM
*Rectifier		510-6	
*Relay		482-22	
*Battery Holder		101-2	
*Battery Covers		240-A	
*Battery Contact Assembly		479-A	
*Knob		1492	

INDIVIDUAL MODEL PARTS LISTING

GA

Code	Value and/or equivalent	Sun numbers	Remarks
M1	Dwell Meter 1 ma f. s.	677-32	** 41-46 ohms
M2	Tach Meter .5 ma f. s.	677-11	** 175 ohms
Panel		2-222-15	
Lead Assembly, complete		2-133-7	
Steel Box		4-113-1A	

10E

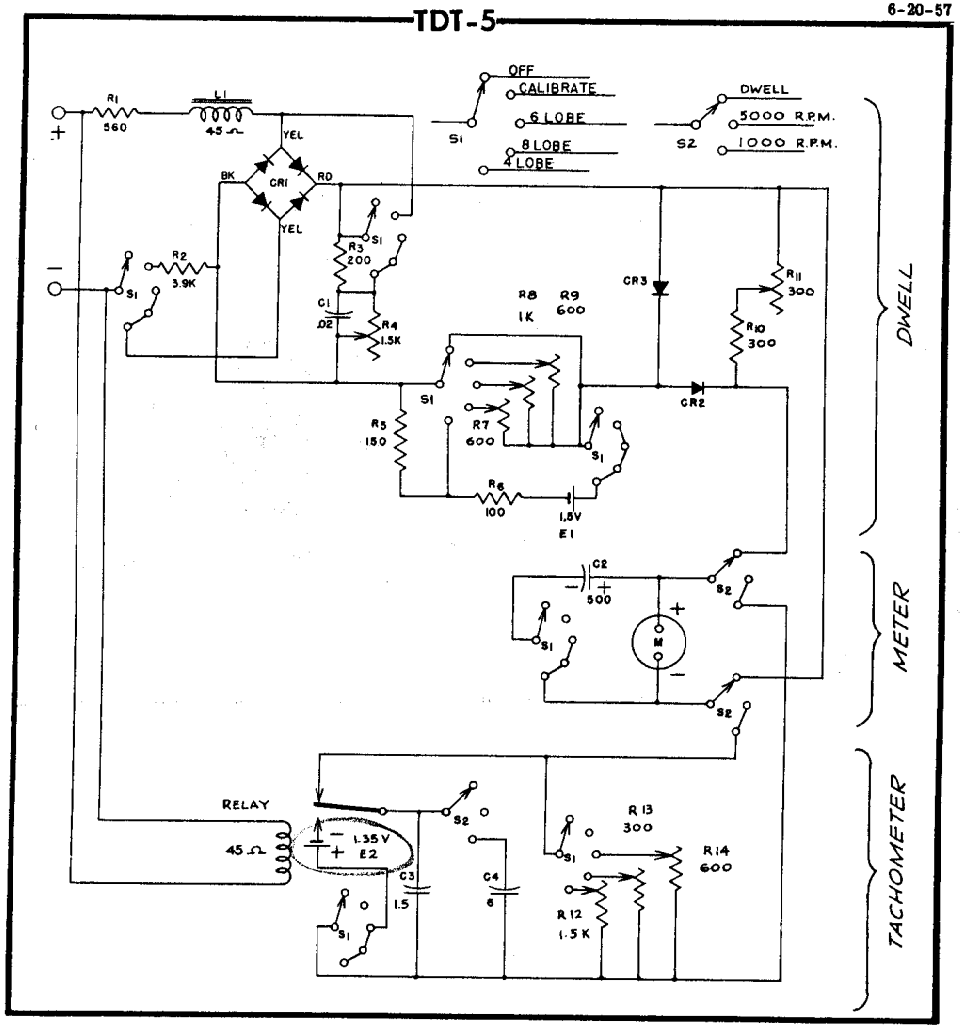
M1	Dwell Meter 1 ma f. s.	678-37	** 41-46 ohms
M2	Tach Meter .5 ma f. s.	678-21	** 175 ohms
Unit Panel		4-182-1	
Unit Cover		2-128	
Set of Leads		2-133-43	
Lite Bulbs	6 V	910-2	

10D

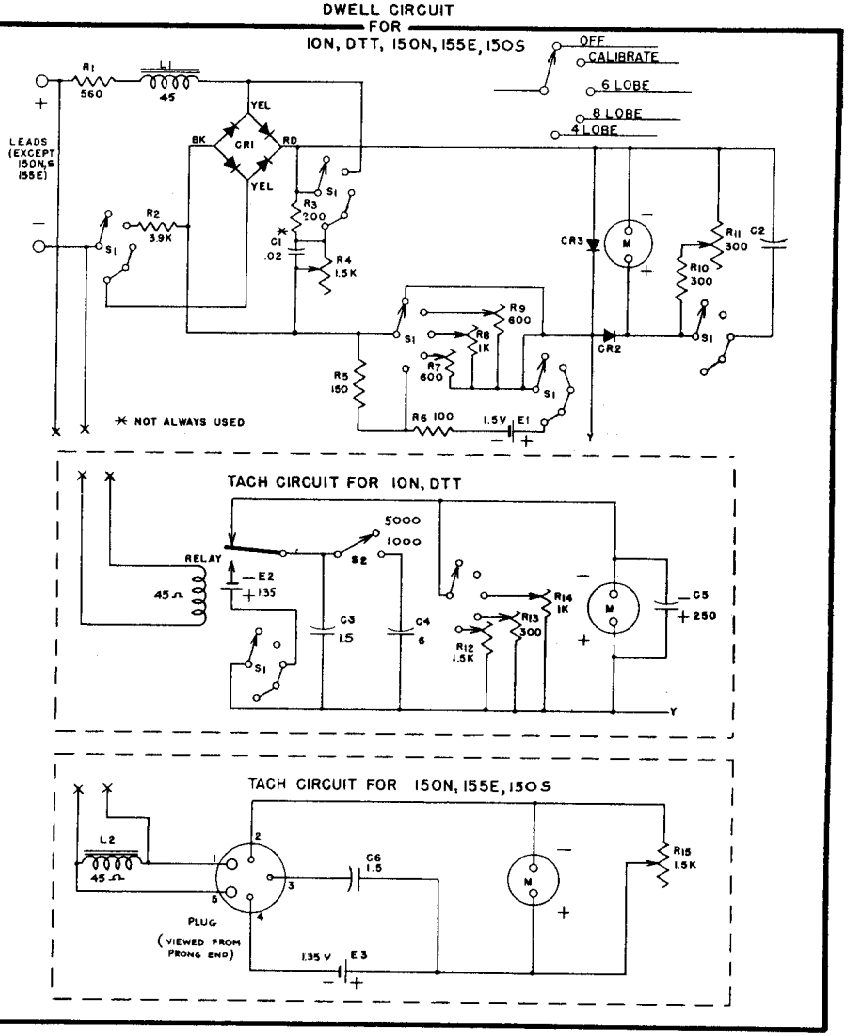
M1	Dwell Meter 1 ma f. s.	678-37	** 41-46 ohms
M2	Tach Meter .5 ma f. s.	678-21	** 175 ohms
Unit Panel		4-182-5	
Rear Cover		2-128	
Lead Assembly, complete		2-133-43	
Lite Bulbs	12 V, type 53	910-5	

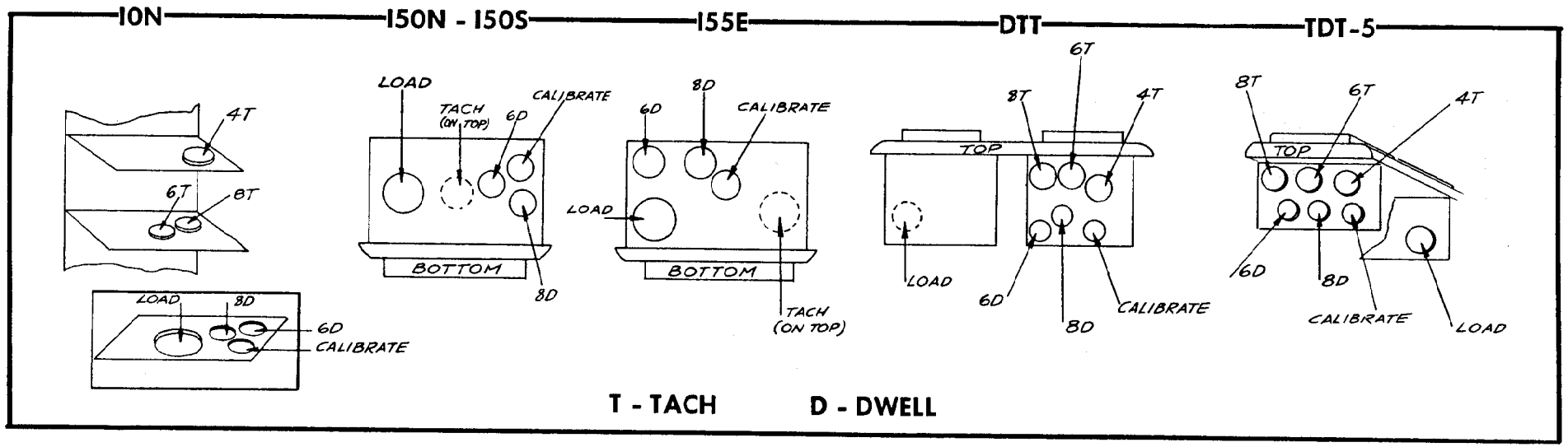
** Meter resistance measured on OHM scale of a Sun Condenser Tester.

TDT-5



DWELL CIRCUIT FOR ION, DTT, 150N, 155E, 150S




10N
4T
6T
8T
LOAD
8D
6D
CALIBRATE
150N - 150S
LOAD
TACH (ON TOP)
6D
CALIBRATE
BOTTOM
8D
155E
6D
8D
CALIBRATE
LOAD
BOTTOM
TACH (ON TOP)
DTT
6T
8T
4T
TOP
LOAD
6D
8D
CALIBRATE
TDT-5
8T
6T
4T
TOP
6D
8D
CALIBRATE
LOAD
T - TACH
D - DWELL

PARTS LIST

TDT-5

Code	Value and/or equivalent	Sun numbers	Remarks
C1	.02 mfd 200 V	679-51	Not always used
C2	500 mfd .2 V	679-58	
C3	1.5 mfd	553	
C4	6 mfd 150 V	679-54	
R1	560 1/2 w. carbon 10%	680-142	
R2	3.9K 1/2 w. carbon 5%	680-65	
R3	200 1/2 w. carbon 5%	680-2	
R4, R12	0-1.5K w.w. rheostat	685-37	
R5	150 1/2 w. carbon 10%	680-3	
R6	100 1/2 w. carbon 10%	680-6	
R7, R9	0-600 w.w. rheostat	685-89	
R8	0-1K w.w. rheostat	685-80	
R10	300 1/2 w. carbon 5%	680-9	
R11	0-300 w.w. potentiometer	685-59	
R13	0-300 w.w. rheostat	685-11	
R14	0-600 w.w. rheostat	685-7	
CR1	Selenium rectifier, full wave	1569-8	
CR2	Germanium diode, glass	1569-9	
CR3	Selenium diode Type 1Y1	1569-11	
E1	Flashlight cell, size "D"	768-1	
E2	Mercury cell, 1.35 volts	1766-2	
L1	Choke coil	484-2	
S1	8 pole 5 position wafer	762-51	
S2	3 pole 3 position wafer	762-52	
Battery holder		101-2	
Battery holder cover		240-A	
Battery holder contact, lower		479-A	
Knob		1492	
Lead Assembly, complete		2-133-85	
Meter	.3 ma f.s. 240 ohm armature*	678-183	
Relay		482-22	
Panel, front		2-1073-3A	
Box assembly		4-445	

*Measured on OHM scale of a Sun Condenser Tester

155E VACUUM PUMP PARTS

Part	Sun numbers
Vacuum Gage 0-21 inch	2-461-1
Vacuum Pump, with motor	2-139-3
Vacuum Hose Assembly, complete 40 in.	2-105-7
Manifold Assembly, 4 connection	297-1A
Vacuum Regulator Assembly	151-1
Toggle Switch spst	689-12

PARTS LIST

10N, DTT, 150N, 150S and 155E

Code	Value and/or equivalent	Sun numbers	Remarks
C1	.02 mfd 200 V	679-51	Not always used
C2	500 mfd .2 V	679-58	
C3, C6	1.5 mfd	553	
C4	6 mfd 150 V	679-54	
C5	250 mfd 6 V	679-130	
R1	560 1/2 w. carbon 10%	680-142	
R2	3.9K 1/2 w. carbon 10%	680-65	
R3	200 1/2 w. carbon 10%	680-2	
R4,R12,R15	0-1.5K w.w. rheostat	685-37	
R5	150 1/2 w. carbon 10%	680-3	
R6	100 1/2 w. carbon 10%	680-6	
R7, R9	0-600 w.w. rheostat	685-89	
R8, R14	0-1K w.w. rheostat	685-80	
R10	300 1/2 w. carbon 10%	680-9	
R11	0-300 w.w. potentiometer	685-59	
R13	0-300 w.w. rheostat	685-11	
CR1	Selenium rect., full wave	1569-8	
CR2	Germanium diode (glass)	1569-9	
CR3	Selenium diode	1569-11	
E1	1.5V flashlight cell size D	768-1	
E2	1.35V mercury cell	1766-3	DTT only
E2, E3	1.35V mercury cell	1766-5	except DTT
L1, L2	Choke coil assembly 45 ohms	484-2	
S1	8 pole, 5 pos. wafer	762-51	
S2	spst toggle	689-12	
Battery holder	Flashlight cell	101-2	
Battery holder	Mercury cell	101-4	Not used in DTT
Battery holder cover	Flashlight cell	240-A	
Battery holder cover	Mercury cell	240-4A	Not used in DTT
Battery holder contact, lower			
Bulbs	Meter lights 6 volt #51	910-2	150N, 150S
Bulbs	Meter lights 12 volt #53	910-5	10N
Knob		1492	
Lead Assembly, complete 8' black		2-133-85	10N, DTT only
Relay	Tach relay	482-22	
Plug	5 prong with cable	2-105-19	For 150N, 150S
Plug	5 prong with cable	2-105-52	For 155E

Meters

Unit	Tachometer	Dwell
10N	678-163	678-176
DTT	677-110	677-111
150N	678-181	678-176
150S	678-210	678-176
155E	678-197	678-198

All meters .3 ma f.s. 240 ohm armature *

* Measured on OHM scale of a Sun Condenser Tester.

I-D
No. 1
Revised 4-1-59

PRODUCTION CHANGE BULLETIN

SUBJECT: TDT DWELL-CALIBRATE position

If a TDT-1 or TDT-2 is encountered in which the meter reads off scale in the DWELL and CALIBRATE positions and cannot be brought back to the set line with the dwell calibrator control, it can be corrected by replacing the 600 ohm meter rheostat (R5) with a 300 ohm rheostat. After replacement, calibrate the dwell circuit.

Altho, "wiping" the original 600 ohm rheostat will usually correct the trouble, it may develop the same trouble again. Current production TDT-2 units now incorporate the 300 ohm meter rheostat.

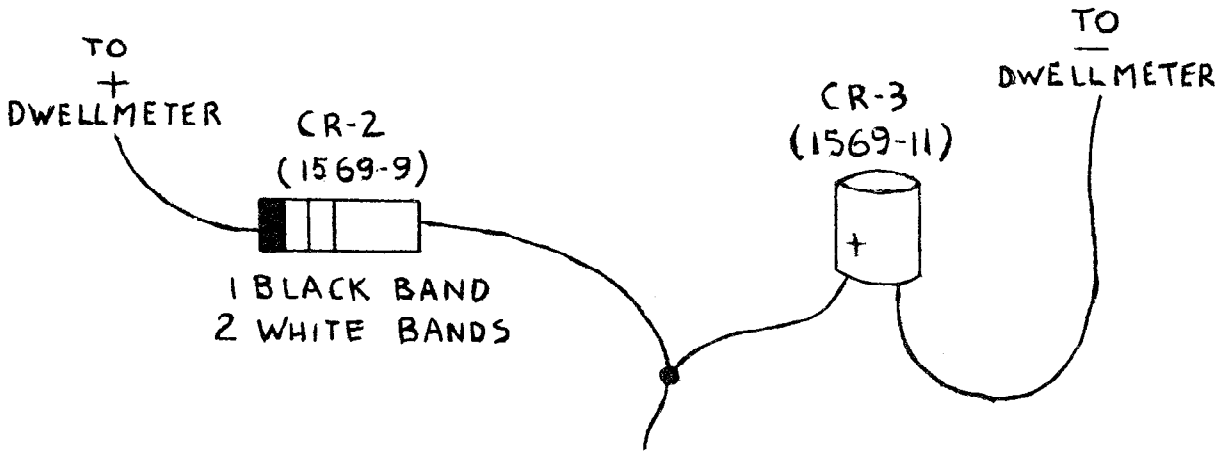
SUBJECT: 10N diode trouble (dwell circuit)

If a 10N unit is encountered in which it is not possible to calibrate it to the set line or, in which it calibrates normally but registers unusually low dwell readings, the meter diodes have probably failed.

For a quick test of this condition, connect the 10N test leads in proper polarity across a 12 volt source. Turn selector switch to the CALIBRATE position and observe the dwell meter. If the meter reads to the left of 0, one or both of the meter diodes have failed. When replacing these diodes, both diodes should always be replaced. After replacement, calibrate the dwell meter circuit.

Note: Diode CR3, early production part #1569-10 which is identified by a yellow dot, must always be replaced with a selenium type part #1569-11.

Meter Diode Connections



IMPORTANT

Do not reduce lead length of CR2 for installation. When soldering, grip diode leads with a #27 Mueller clip or with long nose pliers to minimize heat transfer to diode proper.

PRODUCTION CHANGE BULLETIN

SUBJECT: 10N DWELL CALIBRATION

The 10N unit must be calibrated in the test set-up shown in section I-B, page 1, figure 2. Tachometer calibration follows the same procedure shown on page 6 of the above section. Be sure the flashlight cell is fresh before calibrating the unit.

1. Install in the test set-up mentioned above a distributor previously adjusted to 50% of dwell.

OR

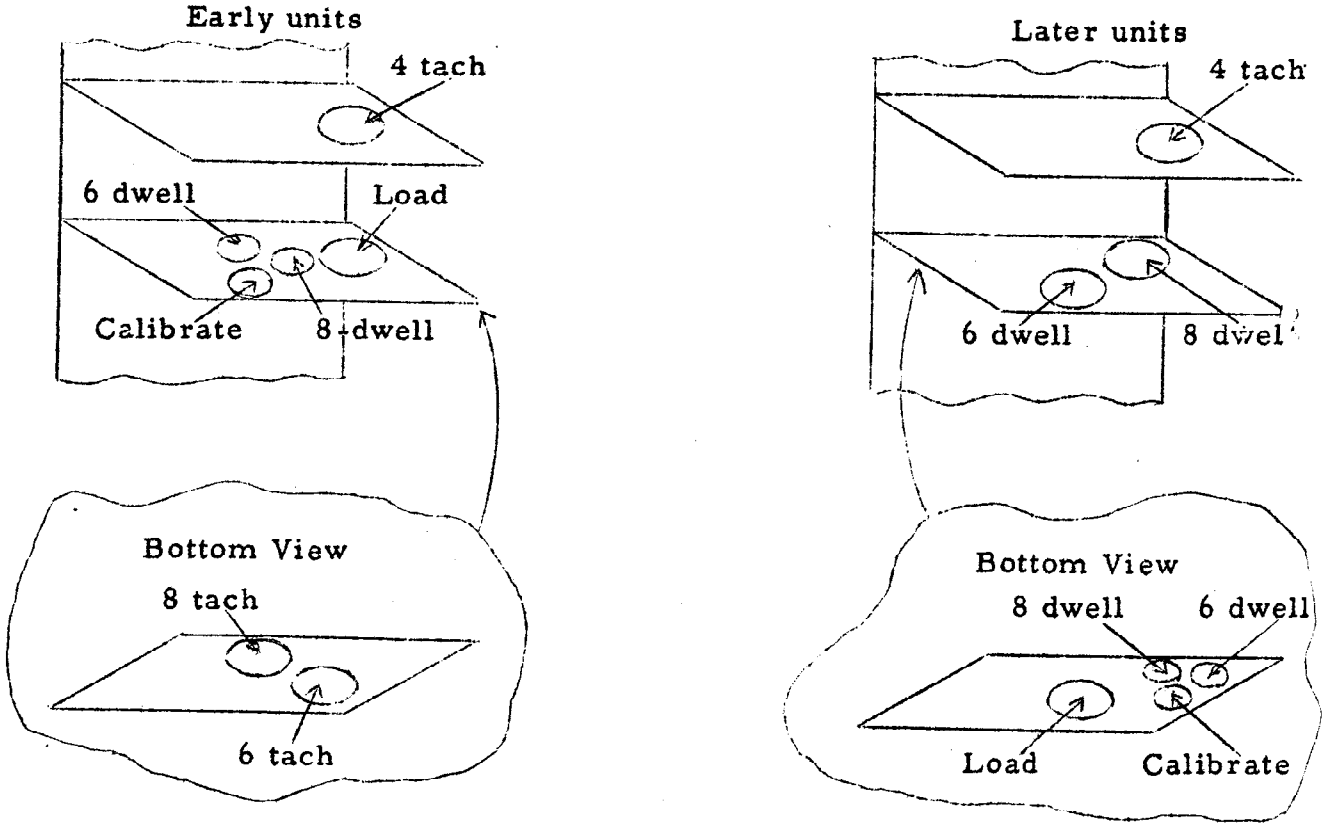
Turn switch of unit being calibrated to the 8 LOBE position and adjust dwell calibrator (on front panel) so that dwell meter indicates 45 degrees. Connect test leads to distributor in test set-up. Operate distributor tester at 1000 rpm and adjust the distributor breaker points until dwell meter indicates 22.5 degrees.

2. With test leads connected and distributor operating at about 1000 rpm, turn selector switch to the 4 LOBE position and the dwell calibrator fully counter-clockwise. Adjust the load rheostat so that dwell meter indicates 42 degrees. Then turn dwell calibrator (on front panel) so that meter indicates 45 degrees.

3. Switch to the 8 and 6 LOBE positions and adjust the corresponding calibration rheostats for 22.5 and 30.0 degrees, respectively.

4. Switch to the CALIBRATE position, disconnect the test leads, and adjust the calibrate rheostat so that meter reads on the SET LINE.

PARTS LOCATION



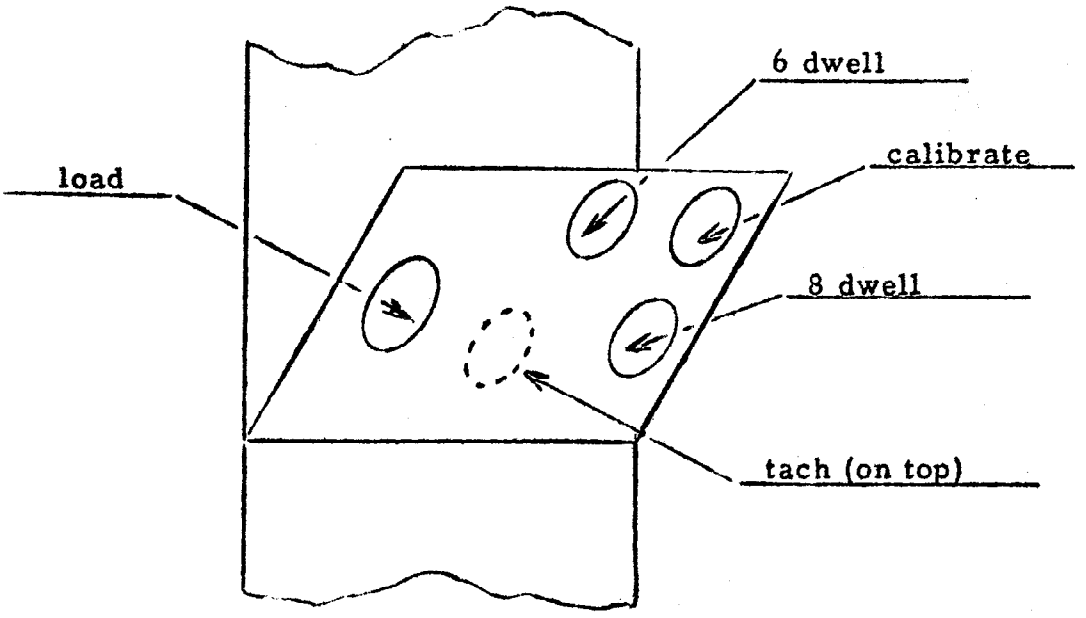
PRODUCTION CHANGE BULLETIN

SUBJECT: 150N CALIBRATION

The 150N unit must be calibrated in the test set-up shown in section I-B page 1, figure 2. Plug the unit to be calibrated into the rear of the distributor tester (140 or 145 unit). Omit the external coil and gap circuit. Tachometer calibration follows the same procedure shown on page 6 of the above section.

1. Install a distributor adjusted to 50% of dwell in the above test set-up. Connect the distributor and ground leads to this distributor. (See section I-D, No. 2 for method of adjusting distributor to 50% of dwell.)
2. Operate the distributor at about 1000 rpm. Turn selector switch to the 4 LOBE position and the dwell calibrator fully counter-clockwise. Adjust the load rheostat so that dwell meter indicates 42 degrees. Then turn dwell calibrator (on front panel) so that meter indicates 45 degrees.
3. Switch to the 8 and 6 LOBE positions and adjust the corresponding calibration rheostats for 22.5 and 30.0 degrees, respectively.
4. Switch to the CALIBRATE position, turn the battery switch on the distributor tester OFF and adjust the calibrate rheostat so that dwell meter reads on the set line.

PARTS LOCATION



CORRECTION
for
Section I-D, No. 2, 4-3-56

The right hand (later units) parts location diagram should be corrected as follows: The two calibration rheostats on the top of the lower sub-panel, which are identified as "6 dwell" and "8 dwell", should be changed to read "6 tach" and "8 tach", respectively.

PRODUCTION CHANGE BULLETIN

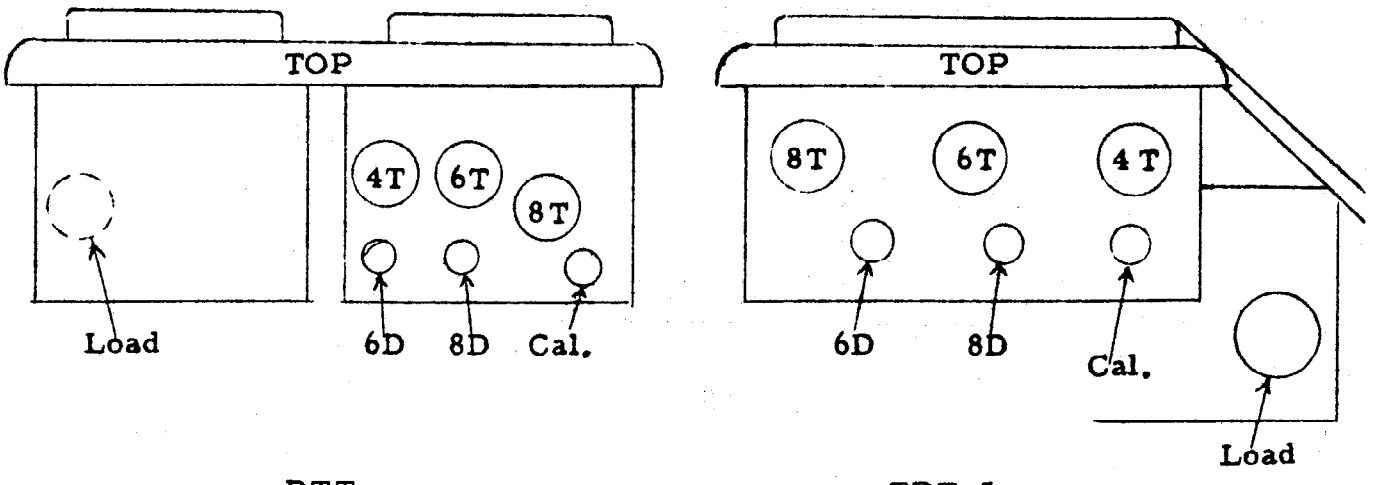
SUBJECT: TDT-5 and DTT CALIBRATION

Aside from the use of only one meter on the TDT-5, these units are tested and calibrated in the same manner. It will be noted that both of these units contain an internal mercury cell for tachometer operation and a flashlight cell (accessable from front panel) for dwell meter operation.

Both of these units must be calibrated in the test set-up shown in section I-B, page 1, figure 2. Tachometer calibration follows the same procedure shown in section I-B, page 6.

1. Install a distributor adjusted to 50% of dwell in the above test set-up, and connect the test leads of the unit being calibrated to this distributor. (See section I-D, No. 2 for method of adjusting distributor.)
2. With distributor operating at about 1000 rpm, turn selector switch to the 4 LOBE position and the dwell calibrator on the front panel fully counter clockwise. Adjust the load rheostat so that dwell meter indicates 42 degrees. Then turn dwell calibrator (on front panel) so that dwell meter indicates 45 degrees.
3. Switch to the 8 and 6 LOBE positions and adjust the corresponding calibration rheostats for 22,5 and 30 degrees, respectively.
4. Switch to the CALIBRATE position, disconnect the test leads, and adjust the calibrate rheostat so that meter reads on the SET LINE.
5. Reconnect the test leads in reversed polarity and recheck the dwell calibration in the 6, 8 and 4 LOBE positions using both 6 and 12 volt simulated ignition systems. If the meter readings differ at all from those in steps 2 and 3 the meter diodes are probably defective. (See section I-D, No. 1, diode trouble)

PARTS LOCATION



DTT

T - Tach
D - Dwell

TDT-5

PRODUCTION CHANGE BULLETIN

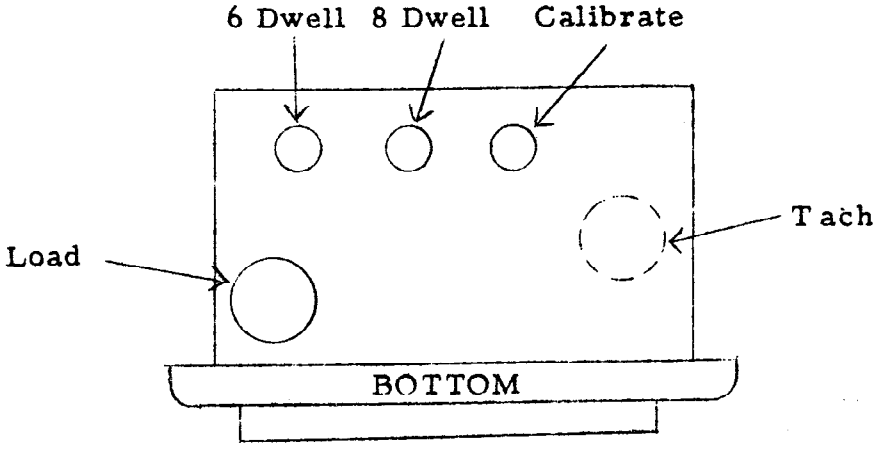
SUBJECT: 155E CALIBRATION

The tach-dwell portion of these units is identical to that of the 150N units. They differ from previous 155 units in that they contain the new dwell circuit and that the tachometer is powered from a mercury cell (accessable from the front panel)

The 155E unit must be calibrated in the test set-up shown in section I-B, page1, figure 2. Plug the unit to be calibrated into the rear of the distributor tester. Omit the external coil and gap circuit. Tachometer calibration follows the same procedure shown in section I-B, page 6.

1. Install a distributor adjusted to 50% of dwell in the above test set-up. Connect the distributor and ground leads to this distributor. (See section I-D, No. 2 for method of adjusting distributor.)
2. With distributor operating at about 1000 rpm, turn the selector switch to the 4 LOBE position and the dwell calibrator on the front panel fully counter-clockwise. Adjust the load rheostat so that dwell meter indicates 42 degrees. Then turn the dwell calibrator on the front panel so that dwell meter indicates 45 degrees.
3. Switch to the 8 and 6 LOBE positions and adjust the corresponding calibration rheostats for 22.5 and 30.0 degrees, respectively.
4. Switch to the CALIBRATE position, turn the battery switch on the distributor tester OFF and adjust the calibrate rheostat so that dwell meter reads on the SET LINE.

PARTS LOCATION



155 E