SERVICE INSTRUCTIONS
REFERENCE SERIES

MASTER CLOCK SYSTEMS
TYPE 37

Simplex Time Recorder Co.

G

Printed in USA
575-111

RADIO SUPERVISED TIME CONTROL

Type 37

THE RADIO Supervised Time Control consists of a spring-driven, pendulum-controlled movement, timer assembly, superheterodyne receiver and speaker (Figure 1). The power transformer and rectifier are optional. All the components are mounted in a grey cabinet having a full glass door.

This master time control can be used to regulate electronic, synchronous-wired, or 3-wire self-regulating equipment by the connection of optional circuits.

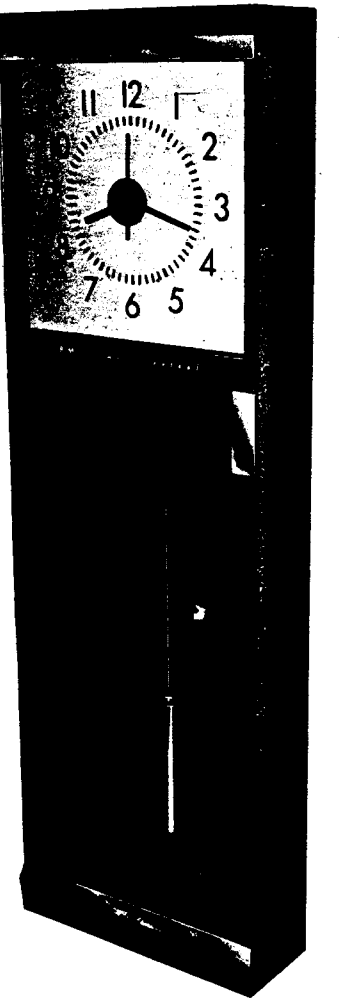
Supervision of the master movement is accomplished by the combined action of the radio receiver and the timer assembly. This combination establishes the circuits used to initiate the mechanical correction of the movement to within the limits of ± 10 seconds.

The United States Bureau of Standards broadcasts extremely accurate time signals by short-wave radio. The radio-supervised master clock receives these signals and automatically corrects itself hourly. If the radio signal is weak, or fades out during the correction cycle, the clock rejects the correction and makes another attempt ten minutes later, when the next signal is broadcast. It continues this process until a satisfactory correction is made.

WWV Radio Time Signals

Station WWV, of the Central Radio Propagation Laboratory of the Bureau of Standards, broadcasts standard audio and radio frequencies as shown.

Frequency, Megacycles	Audio Freq., Cps.
2.5	1, 440, 600
5.0	1, 440, 600
10.0	1, 440, 600
15.0	1, 440, 600
20.0	1, 440, 600
25.0	1, 440, 600
30.0	1
35.0	1



Radio Supervised Time Control, Type 37

Figure 1

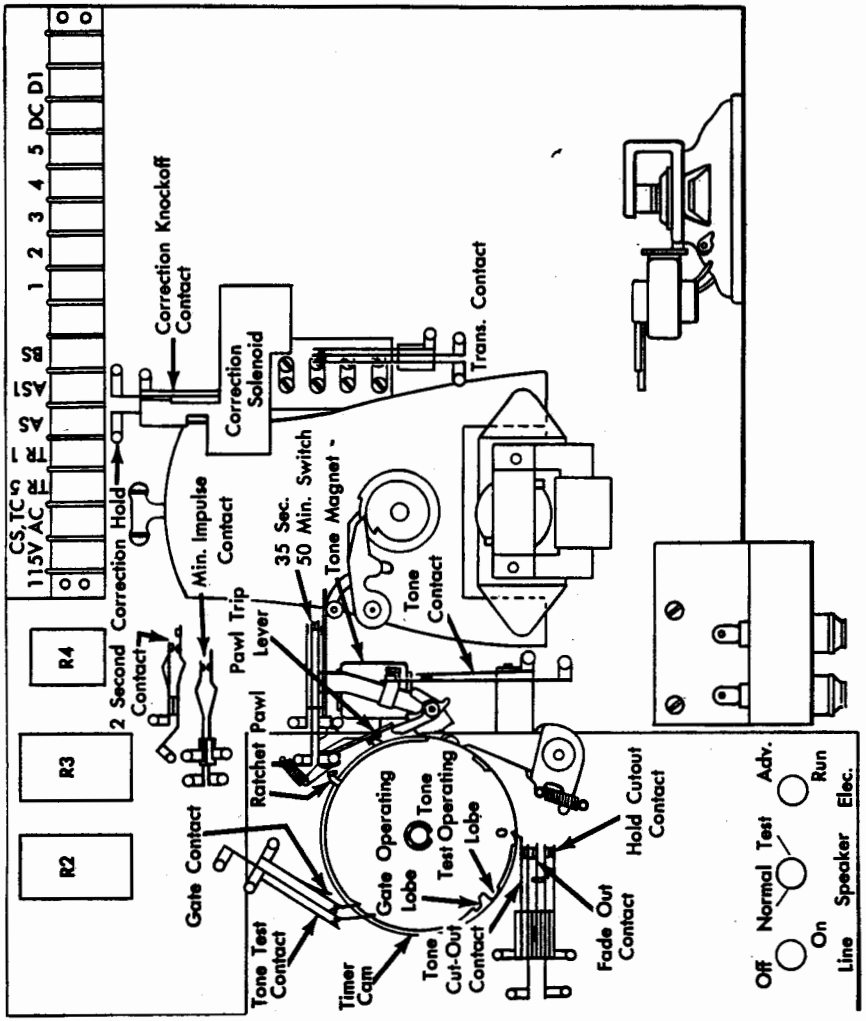


Figure 2 Assembly View, Radio Supervised Time Control

WWV TIME SIGNAL MODULATION CHART

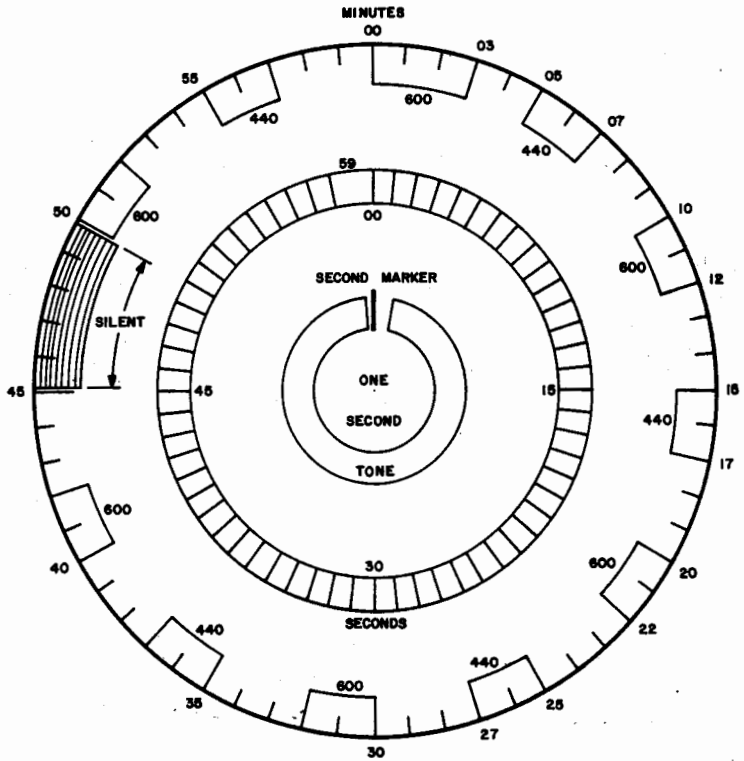


Figure 3

Carrier frequencies used by IBM are 2.5, 5.0, and 10.0 mc. Also, a second marker is transmitted which is a 5-millisecond pulse. This pulse marks the beginning of each second to an accuracy of one part in 1,000,000. Audio tones are interrupted each second for 40-milliseconds to allow the transmission of the second marker pulse. The pulse is omitted on the 59th second of each minute. During the fifth minute, the time is transmitted in code and announced by voice. Precisely on the hour, the carriers are modulated with a 600-cycle tone (minus the delay required for the injection of the marker pulse) which is transmitted for exactly three minutes. At five minutes past the hour, the 440-cycle tone begins and is transmitted for two minutes. The 600-cycle tone is resumed at exactly ten minutes past the hour, again at 20 minutes past, and also at 30, 40 and 50 minutes past the hour for two minutes. A silent period of four minutes each hour occurs on WWV at 45 minutes past the hour and on WWVH at 15 minutes past the hour. All audio periods at WWVH are three minutes.

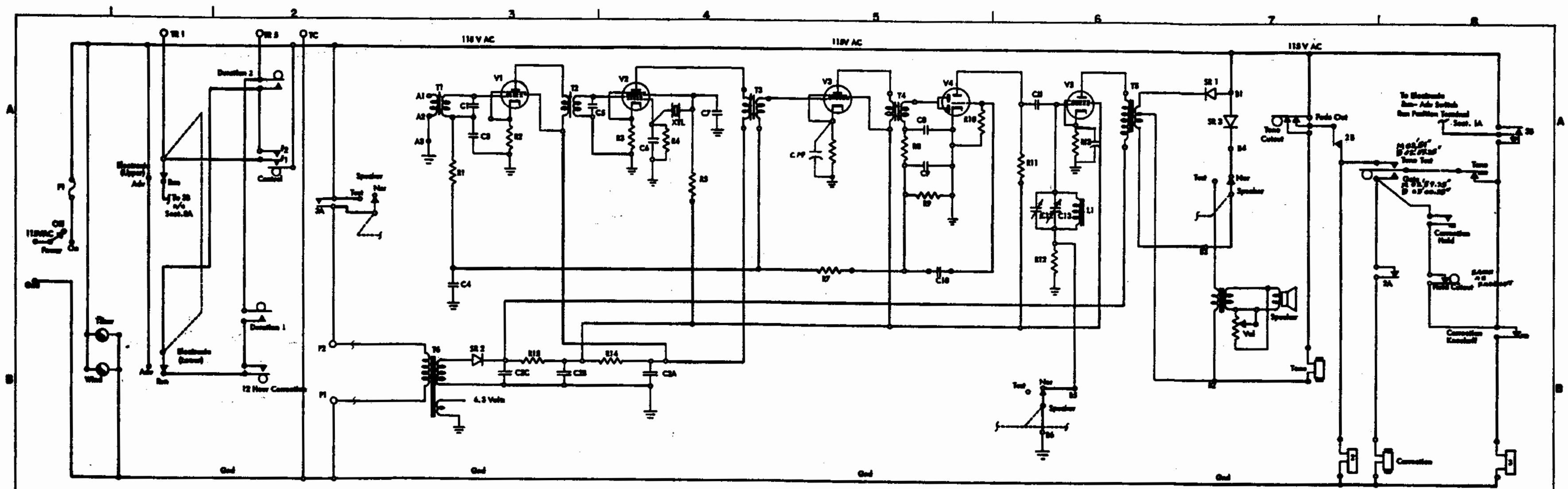


Figure 4D Individual Drawing, Schematic Wiring Diagram, Type 57

PARTS LIST * of Figure 4

ITEM	DESCRIPTION	ITEM	DESCRIPTION
A1-A3	ANTENNA TERMINAL STRIP BIRNBACH T16A	L1	AUDIO REACTOR
B1-B6	OUTPUT TERMINAL STRIP CINCH-JONES NO.17-6	P1-P2	POWER TERMINAL STRIP CINCH-JONES NO. 17-2
C1	68 MMF SILVER MICA EL MENCO TYPE CM-15E-680-J	R1	100K 1/2 W OHMITE "LITTLE DEVIL" ORALLEN BRADLEY
C2	1400-3055 MMF MICA PADDER	R2	150 1/2 W OHMITE "LITTLE DEVIL" OR ALLEN BRADLEY
C3	.05 MF 400V WVDC PAPER TO BE TYPE TK	R3	150 1/2 W. OHMITE "LITTLE DEVIL" OR ALLEN BRADLEY
C4	.05 MF 400V WVDC PAPER	R4	22 K 1/2 W. OHMITE "LITTLE DEVIL" OR ALLEN BRADLEY
C5	62MMF SILVER MICA EL MENCO TYPE CM15-E-620-J	R5	15K 1/2 W. OHMITE "LITTLE DEVIL" OR ALLEN BRADLEY
C6	39MMF SILVER MICA EL MENCO TYPE CM-15-E-390-J	R6	150 1/2 W. OHMITE "LITTLE DEVIL" OR ALLEN BRADLEY
C7	470MMF SILVER MICA EL MENCO TYPE CM-15-E-471-J	R7	470 K 1/2 W. OHMITE "LITTLE DEVIL" OR ALLEN BRADLEY
C8	220 MMF SILVER MICA EL MENCO TYPE CM-15-E-221-J	R8	47K 1/2 W. OHMITE "LITTLE DEVIL" OR ALLEN BRADLEY
C9	220 MMF SILVER MICA EL MENCO TYPE CM-15-E-221-J	R9	220 K 1/2 W. OHMITE OR ALLEN BRADLEY
C10	.002 MF 600V. DISC HI-KAP CENTRALAB DD-202	R10	2.2 MEG 1/2 W. OHMITE "LITTLE DEVIL" OR ALLEN BRADLEY
C11	82 MMF SILVER MICA EL MENCO TYPE CM-15-E-101-J	R11	220 K 1/2 W. OHMITE "LITTLE DEVIL" OR ALLEN BRADLEY
C12	1400-3055 MMF MICA PADDER EL MENCO TYPE 30 No. 312	R12	470 K 1/2 W. OHMITE "LITTLE DEVIL" OR ALLEN BRADLEY
C13	4700 MMF SILVER MICA EL MENCO TYPE CM-15-E-471-J	R13	560 1/2 W. OHMITE "LITTLE DEVIL" OR ALLEN BRADLEY
C14	1000 MMF SILVER MICA	R14	1K 1/2 W. OHMITE "LITTLE DEVIL" OR ALLEN BRADLEY
C15	10 MF-25 WVDC ELECTROLYTIC		
C2A		R15	1K 1W OHMITE "LITTLE DEVIL" OR ALLEN BRADLEY
C2B	40-40-40MFD 150V ELECTROLYTIC		
C2C	CORNELL DUBILIER NO.BBRT	SR-1 SR-3	AUDIO RECTIFIER FULL WAVE (2 UNITS FEDERAL NO. 102D 7164-S)

ITEM	DESCRIPTION
SR-2	POWER RECTIFIER 115V @100MA (FEDERAL NO. 179116X)
T1	ANTENNA TRANSFORMER MILLER B-320-A
T2	R.F. TRANSFORMER MILLER B-320-RF
T3	INPUT I.F. TRANSFORMER 455 KC AUTOMATIC MFG. CO. NO.1655-6
T4	OUTPUT I.F. TRANSFORMER 455 KC AUTO MFG CO. NO. 1655-12
T5	OUTPUT TRANSFORMER HALLDORSON D 6003
T6	POWER TRANSFORMER PR1 115V 60 CY SEC 125V 50 MA 6.3V 2A HALLDORSON NO. P9162
V1	6BH6
V2	6BE6
V3	6BA6
V4	6AT 6
V5	6AQ5
XTL	5455 .00KC CRYSTAL BLILEY ELEC. CO. TYPE BH6

* PARTS TO BE AS LISTED OR APPROVED EQUIVALENT

COMPONENTS AND FUNCTIONS

Master Clock Correction :

The Radio Supervised Time Control utilizes the 600-cycle tones to correct itself to the standard signals transmitted by WWV. The clock contains a superheterodyne receiver tuned to the 5-megacycle broadcast frequency. 3 minutes before each hour, the clock switches on the receiver. The receiver has four minutes to reach operating conditions before the time signal starts a correction cycle.

Exactly on the hour, WWV begins a 3-minute transmission of 600-cycle tone. A tuned circuit allows the 600-cycle tone to start a timer in the clock. The timer causes the signal to be tested for proper duration and strength. Thus, if a spurious signal should start the timer, it is extremely unlikely that it would last for exactly 3 minutes. The timer sets up a circuit so the end of the tone causes the clock to be corrected at 3 minutes past the hour. If the signal should fade, or if the end of the tone is not within one second of 3 minutes after the beginning, the clock rejects the signal. The receiver remains on and another attempt is made six minutes later, when WWV again begins a 3-minute transmission of 600-cycle tone. The clock attempts to correct itself until a satisfactory correction is obtained. The receiver is then switched off until four minutes before the next hour, when another correction cycle is started.

Rodio Receiver (Figures (4 and 5)

The heart of the radio supervised system is the WWV receiver. This is a 5-tube superheterodyne tuned to the 5-megacycle WWV transmission. The circuits of the receiver are similar to the circuits of a standard broadcast receiver, except that the circuits of this device are permanently tuned to the one station.

When the 600-cycle signal is amplified, it is caused to appear across a selenium rectifier in the output circuit. This selenium rectifier connects the 600-cycle AC to DC. The DC is supplied to the timer circuits to cause correction of the Master Clock.

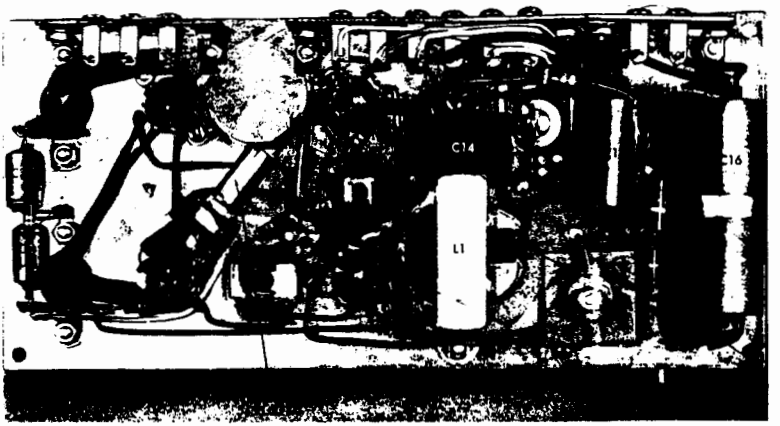


Figure 5 Bottom Assembly View, Radio Receiver

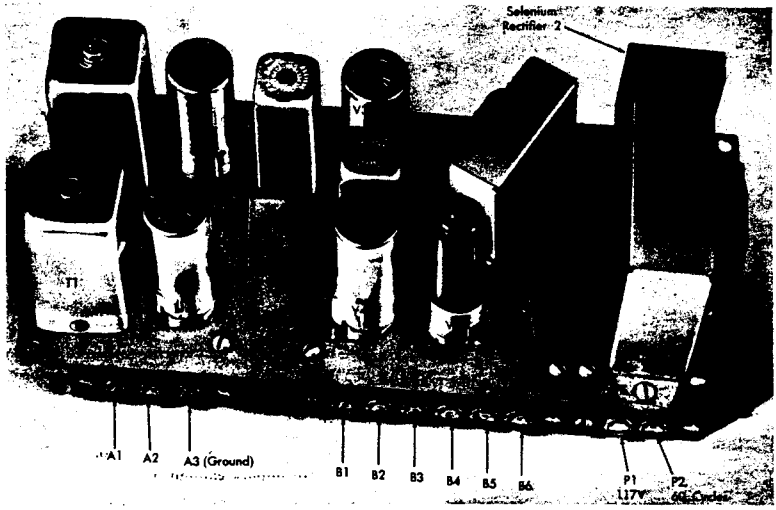


Figure 6 Top Assembly View, Radio Receiver

Correction Cycle — Acceptable Signal: (Figures 7)

1. The clock contact is closed four minutes before the hour by the clock. It completes a circuit through R3B N/C and the correction knockoff contact to energize R3. When R3B transfers, R3 is held through this point and the correction knockoff contact. (The R3B points are arranged so that the N/O points close before the N/C points open.) The R3A points close to turn on the receiver. This timing allows the receiver to warm up for four minutes before the tone signal begins.

2. Precisely on the hour, WWV begins broadcasting the 600-cycle tone. The receiver detects and amplifies this tone signal, which is then rectified and caused to energize the tone magnet through the tone cut-out contact. After a 3-second mechanical delay, introduced to de-sensitize the device to "static," the tone magnet trips the timer clutch, which starts the timer on a 5-minute cycle. It also opens the tone contact, but this has no effect at this time.

3. Seven seconds after the timer is energized, it opens the tone cut-out contact. This contact de-energizes the tone magnet to prevent overheating it. The contact remains open until eight seconds before the tone is due to be interrupted by WWV.

4. The timer closes the gate contact one-half second before the tone is due to be interrupted. The gate contact is opened again one second later. The tone contact must close during this second for a correction to occur.

5. When the 600-cycle tone is interrupted (precisely at 3 minutes past the hour) the tone contact closes. The correction solenoid is then energized through 3B, tone contact, gate contact and 2A. The correction solenoid trips a heart-shaped cam to correct the clock at 3 minutes past the hour.

6. The correction solenoid also opens the correction knockoff contact. This drops R3, and the 3A points open to switch off the receiver. The receiver will not be energized again until just before the next hour, when the clock contact closes to pick R3.

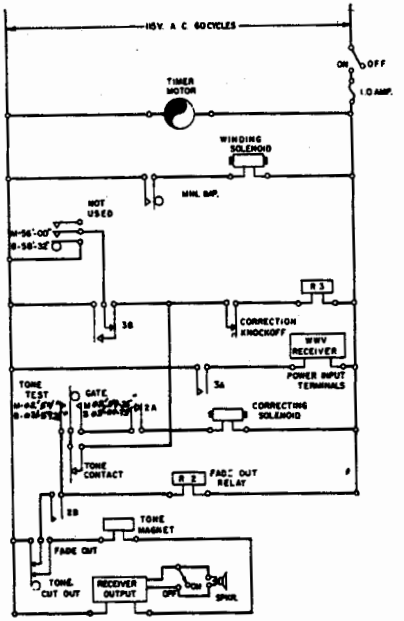


Figure 7 Wiring Diagram, Radio Supervised Master Clock

Correction Cycle — Fading Signal (Figure 7) :

Provision is made to test the receiver output for presence of the 600-cycle signal for the last 5½ seconds of the transmission. Assume that the correction cycle has progressed through steps 1, 2 and 3 above. The tone magnet has been energized for the second time, opening the tone contact.

4. Two seconds after the tone cut-out contact closes, the tone-test contact is closed by the timer. This contact monitors the last 5½ seconds of tone to insure that the signal does not fade or end too soon, which might happen if the timer clutch was energized prematurely by a spurious signal. Under either condition, the tone magnet will be de-energized while the tone test contact is closed.

5. The fade-out relay, R2 is picked through 3B N/O, tone contact and tone test contact. Relay 2 holds through 2B and the fade-out contact for ten seconds past the anticipated interruption of the tone. The 2A points open to prevent energization of the correcting solenoid when the gate contact closes.

6. Because the correcting solenoid is not energized, the correction knockoff remains closed, holding R3 and maintaining the receiver power circuit. When the 600-cycle tone begins again at ten minutes past the hour, the tone magnet will again be ready to start the timer and repeat the test. If a satisfactory signal is received, the clock will be corrected at fourteen minutes past the hour, R3 will be dropped and no further correction will occur until the next hour. If the signal fails again, the attempt will be made every ten minutes until a satisfactory correction occurs.

Type 037 Movement :

The Type 037 movement consists of the following:

1. A 60 beat Invar pendulum-controlled escapement.
2. Two-second contact assembly (optional) to send out rapid impulses for hourly correction of impulse equipment.
3. A minute contact to control minute impulse equipment.
4. A 35 second, 50 minute switch assembly to establish correction circuits for self-regulating secondary equipment. This contact assembly and its operating cam can be replaced by a standard transmitter switch and operating cam when the master clock is to control an electronic system exclusively.
5. A transmitter switch assembly to control the operation of an electronic transmitter. When the master clock is used to control both impulse and electronic equipment, the transmitter switch is mounted on its own support bracket to the right of the movement.
6. Duration contact #2 is used for transmitter signal duration at hourly correction period.
7. Duration contact #1 is used to extend the hourly transmitter signal duration for 12 hour correction.

Figure 9. Correction Knockoff Contact

MECHANICAL PRINCIPLES

Winding:

See Synchronous Motor Wind Mechanism, Page B-9.

Correction (Figures 8, 9, 10):

The mechanical correction of the clock movement is accomplished by a cam and lever assembly operated by a slide connected to the armature of the correction solenoid. This correction is limited to ± 10 seconds. Should the movement time rate be greater or less than the correction limits, then the master clock would have to be manually set to time.

The heart-shaped correction cam is operated with the movement seconds shaft and is held in place by a collar and set screws. The cam and shaft are driven by a ball clutch attached to the escape wheel. As the movement is allowed to escape by the action of the verge, the ball clutch keeps the correction cam and seconds shaft in step with the escapement.

The ball clutch (Figure 10) is made up of a small steel ball riding against a 60 tooth ratchet. A spring and arm attached to the correction cam holds the ball against the ratchet. If the correction cam is moved, the steel ball is moved around the clutch ratchet without effecting the rotation of the ratchet or the escape wheel.

When the correction solenoid is energized, it moves a stud in the slide against the correction cam, pushing the cam forward or backward according to the cor-

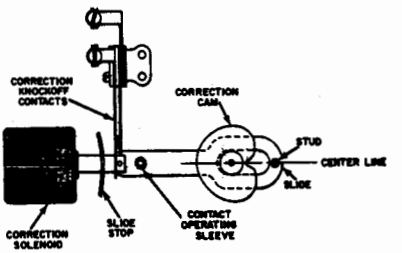


Figure 8 Correction Cam and Slide Assembly

Figure 10 Movement Mechanism, Type 047

rection. The neutral or reference position of the cam is with the detent part of the cam on the center line with the seconds shaft and the slide stud (Figure 8), when the seconds hand is set at the 60th second.

A ratchet is attached to the back of the escape wheel (Figures 10 and 11). Its purpose is to momentarily hold the escape wheel and the ball clutch ratchet in position if the correction cam is moved. When the slide on the correction solenoid is moved, a second stud in the slide allows a ratchet detent to drop against the escape wheel ratchet, stopping it momentarily. This action takes place just before the slide moves the correction cam, preventing the verge pallets from binding against a tooth on the escape wheel.

Resetting the correction cam also drives the movement gear train, moving all the hands and operating cams a proportionate amount. Since correction takes place at the 60th second, the minute impulse operating arm may have dropped off the impulse cam if the movement is running fast. To prevent binding the operating arm if the cam is reversed, the minute cam shaft is spring loaded at its drive pinion.

Each time the correction solenoid is energized, a stud mounted on the slide opens the correction knockoff contacts. Relay R3 in the receiver power circuit is dropped out and the receiver is turned off until the first correction period of the next hour.

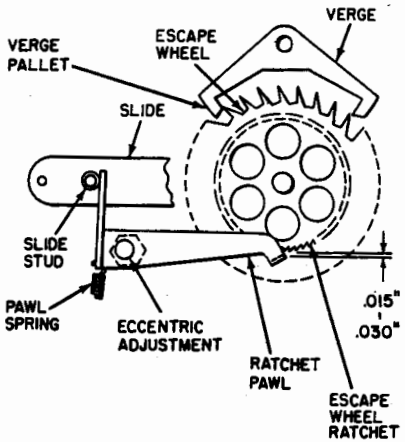


Figure 11 Escape Wheel Ratchet

Timer Assembly (Figures 2)

The timer assembly consists of a continuously running 1 RPM synchronous motor, a drive ratchet, tone magnet, timing cam, and contact assemblies.

The drive ratchet is operated continuously by a 5 to 1 gear reduction from the drive motor. When the 600 cycle tone is received, the radio receiver output energizes the tone magnet through the tone-cutout contact. The tone magnet armature engages the delay sector with the drive ratchet. After a three second delay, the delay cam releases the pawl trip lever, allowing the ratchet pawl to drop into the ratchet. The ratchet pawl is attached to the timing cam, and when the pawl is engaged with the continuously running ratchet, it causes the timing cam to be operated through its five minute timing cycle. At the end of the cycle the pawl trip lever disengages the ratchet pawl from the ratchet, and the detent roller drops behind a lobe on the back of the timing cam. The pawl trip lever and the detent roller then prevent the timing cam from rotating in either direction in any operation other than the regular timing cycle.

CIRCUIT ANALYSIS

THE STANDARD correction circuit for the Radio Supervised Time Control is shown in Figure 7 and the analysis of that circuit is given in the section on components and functions under *Master Clock Correction*.

The circuits used to control external equipment are shown and described in the following sections.

The operation of the Type 37 Master Control to self-regulate minute impulse, Electronic and Synchronous remote units is the same as the Type 25 or 35 Master Control. For circuit analysis see Section B.

Type 37
Timer Cam Operation

Chart 1
Zero Position

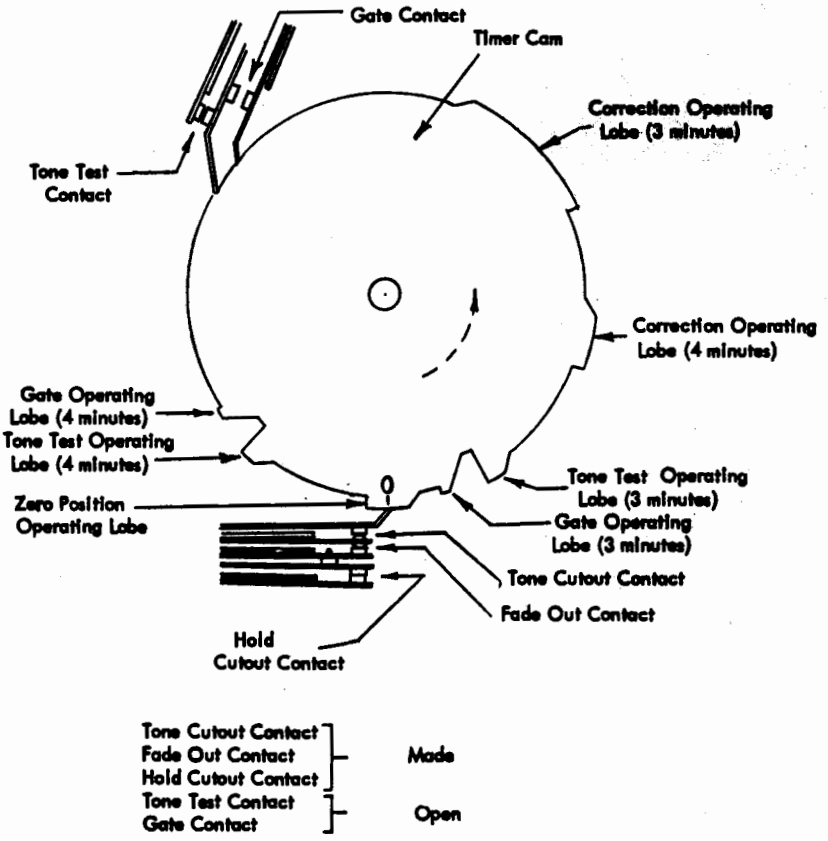


Figure 12

Type 37
Timer Cam Operation

Chart 2
Preparation for Tone Testing

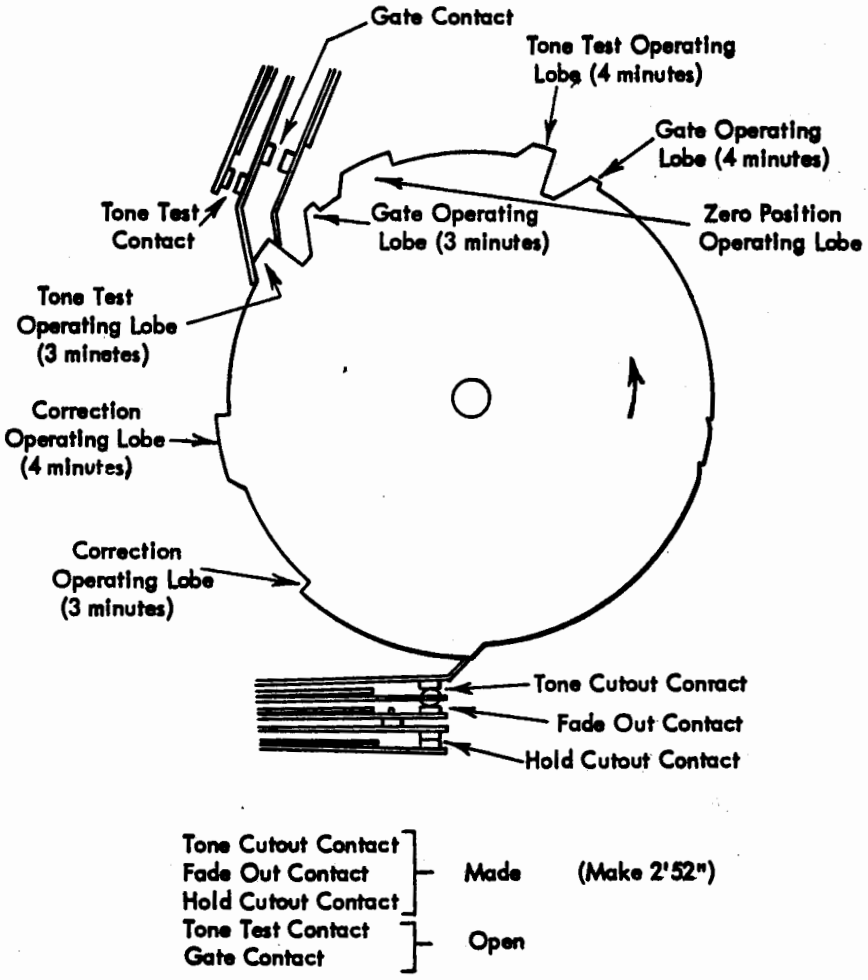
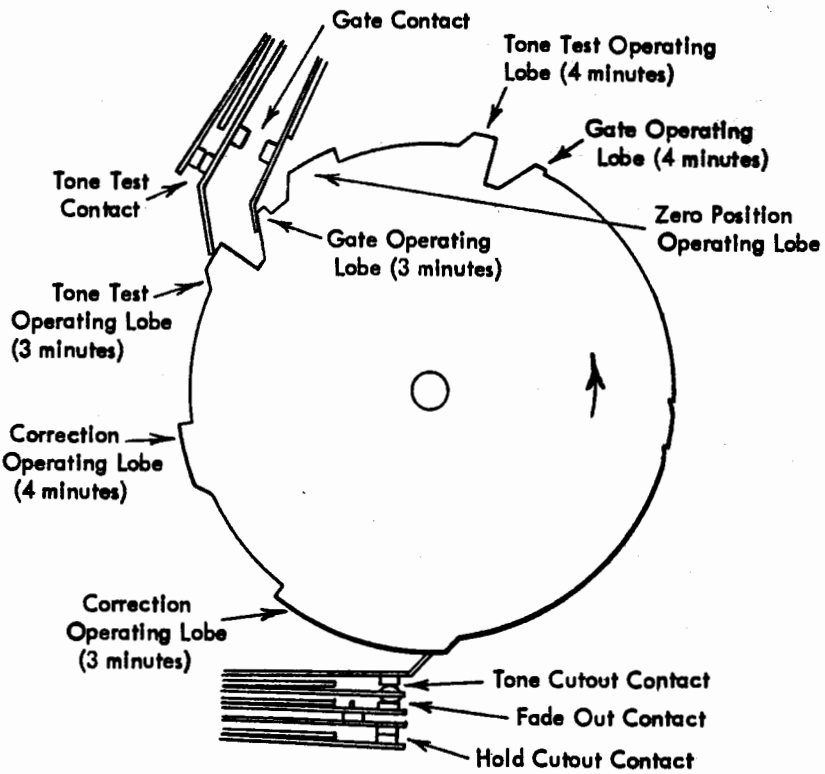


Figure 13

Type 37
Timer Cam Operation

Chart 3
Tone Test Time

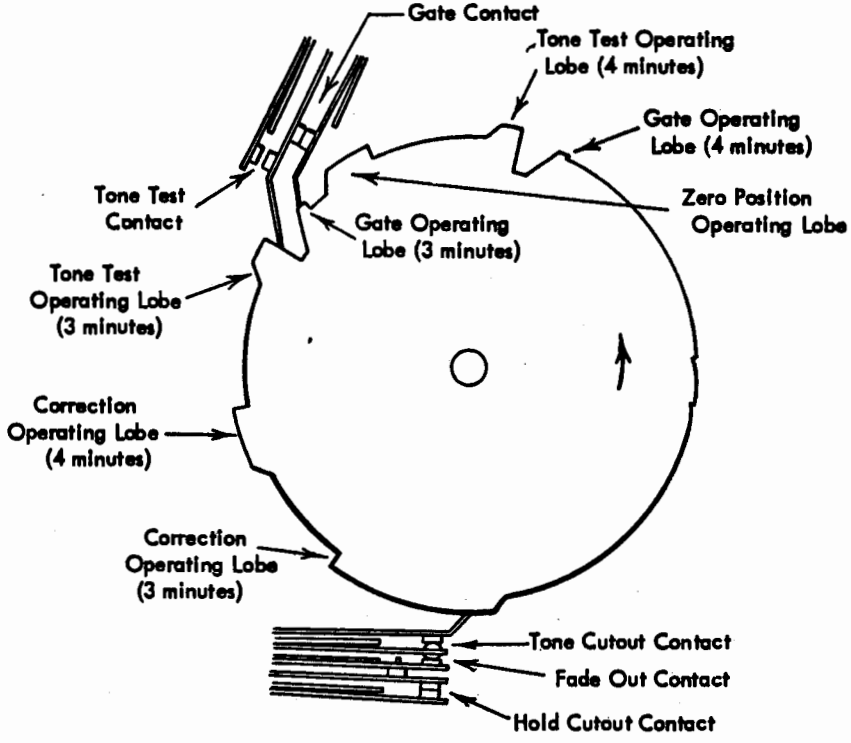


Tone Test Contact	Made (Make 2'54")
Tone Cutout Contact	Made
Fade Out Contact	Made
Hold Cutout Contact	Made
Gate Contact	Open

Figure 14

Type 37
Timer Cam Operation

Chart 4
Correction Time



Tone Cutout Contact Fade Out Contact Hold Cutout Contact	Made
Tone Test Contact	Just Opened (Break 2' 59.25")
Gate Contact	Just Closed (Make 2'59.25")

Figure 15

CHECK LIST FOR CONTACT OPERATION
Type 37

1. With the power off, check the tone test contact, gate contact, fade-out contact, tone cut-out, and hold cut-out contact for the following conditions.

   A. With the timer cam in the 0 position, the fade-out contact, tone cut-out contact and hold cut-out contact should be closed; and the tone test contact and gate contact should be open.

   B. Manually operate the pawl trip lever to release the ratchet pawl, and turn the timer cam in the counterclockwise direction until the fade-out contact operating strap drops off the first drop-off point past 0. At this point the fade-out contact, tone cut-out contact and hold cut-out contact should open. The tone-test contact and gate contact should remain open.

   C. Manually turn the timer cam to the position where the tone-test contact operating strap is just starting to rise on the tone test operating lobe. At this point the fade-out contact, tone cut-out contact, and hold cut-out contact should close. The gate contact and tone-test contact should remain open. Turn the timer cam until the tone-test operating strap rides on top of the tone-test operating lobe. At this point the tone-test operating contact should be made. It is permissible for the tone-test contact to make before the operating strap is on top of the lobe. The gate contact should remain open. The fade-out contact, tone cut-out contact, and hold cut-out contact should remain closed.

   D. Manually turn the timer cam slowly until the tone-test operating strap falls off the tone test operating lobe, and the gate contact operating strap rides on the gate operating lobe. At this point the gate contact should be made, and the tone test contact should be open. The fade-out contact, tone cut-out contact and hold cut-out contact should also be made.

   E. Turn on the power and allow the timer cam to rotate to the 0 position. NOTE: The fade-out contact, tone cut-out contact, hold cut-out contact and tone-test contact operates at times other than those just mentioned. However, these are non-functional operations and have no effect on the circuit.

2. With the power off, check the tone contact for the following conditions:

   A. With the tone magnet armature in the de-energized position, the tone contact should be closed.

   B. Manually operate the tone magnet armature; the tone contact should open.

3. With the power off, check the correction hold contact and correction knock-off contact for the following conditions:

   A. With the correction solenoid in the de-energized position, the correction hold contact should be open, and the correction knock-off contact should be closed.

   B. Manually operate the correction solenoid plunger. The correction hold contact should make after approximately .020" travel of plunger. The correction knock-off contact should open just before the plunger bottoms in the solenoid.

4. To check the correction solenoid, perform the following operations:

   With the power off, block the tone magnet armature in the de-energized position with a piece of folded paper. This is to prevent possible opening of tone contact. Also slip a piece of paper in the tone test contact to prevent it from making. Turn on the power; then manually depress the armature of R3. Relay 3 should remain energized through its own holding contact. Manually operate the gate contact; the correction solenoid should be energized and R3 should drop out. Remove the paper from the tone test contact and unblock the armature of the tone magnet.

5. The minute impulse contact, 2-second contact, 35-second, 50-minute contact, and the control contacts operate as in any master time control movement as per wiring diagram timing.

The most critical adjustment involved the tone-test and gate contacts. The gate contact should break 1 1/2 seconds after the tone-test contact breaks. The tone-test contact should break at 2:59 1/4" for a three minute signal and 3:59 1/4" for a four minute signal. Therefore, the gate contact should break at 3:00 3/4" for a three minute signal and 4:00 3/4" for a four minute signal. As an added check, it should be observed that the lower gate contact strap should be approximately in the center of the Gate Operating Lobe when the WWV signal ceases.

After all adjustments have been checked, it is recommended that some actual corrections be observed.

NOTE: Do not attempt to check correction solenoid operation by manually closing the gate contact when the Control #1 Contact (M 56'20" - B 58'20") is closed. Relay 3 will be picked and not allowed to drop out when the correction solenoid operates. The solenoid will stay energized as long as the gate contact is closed.

Timer Adjustment Procedure

1. Tone Magnet
   Adjust the tone magnet bracket so an air gap of .005" - .008" exists between the tone magnet armature and its pole when the delay sector is engaged with the ratchet disc.

2. Tone Contact
   With 6.5 volts applied to the tone magnet, adjust the tension of the operating strap of the tone contact so that the tone magnet will pick up and allow the delay sector to engage with the ratchet disc. With the tone magnet energized, the air gap of the tone contact should be .015" to .020". Adjust the support strap for this condition. With the tone magnet in the de-energized position, the normally closed contact strap should rise .015" from its support strap. The tone magnet should drop out at approximately 2.0 volts. Drop out voltage may vary from 1.5 to 6.0 volts, the higher voltage being preferred. It may be necessary to increase the tension on the left hand strap (O/P) or open up the armature air gap to .010" to obtain the correct drop out voltage. Pick up voltage may vary from 6.0 to 7.0 volts. A low pick up voltage and a high drop out voltage being preferred.

3. Pawl Trip Lever
   With the ratchet pawl in engagement with the pawl trip lever, form the tail of the powl trip lever so that it overlaps the ratchet pawl by 1/32".

4. Ratchet Pawl
   With the pawl trip lever latched, adjust the eccentric pivot so that the engaging edge of the ratchet pawl clears the teeth of the ratchet disc by .010" to .015".

5. Delay Sector
   The delay sector should be adjusted for a 3 second delay between pick up of the tone magnet and the release of the ratchet pawl trip lever. Loosen the retaining nut and adjust the sector.

6. Tone Cut-out, Fade-out, Hold Cutout Contacts
   With the operating strap of the whole contact assembly resting in the shallow detent ("0" Position) on the timer cam, adjust the contact assembly so the operated straps are raised .015" from their support straps. Set the timer cam to a position where the contacts are open. Adjust the support straps for a .020" to .030" air gap.

7. Tone Test and Gate Contacts
   With the contacts resting in the shallow detent positions, adjust the assembly so that the tone test contact has a .015" air gap with the operating strap raised .015" from its support. The gate contact should have a .030" air gap, and when operated by the timer cam, the operated strap should rise .015" from its support strap.

Setting :

The Radio Supervised Time Control can be set to time by the following procedure:

1. Stop the pendulum just after the second hand has passed the 60th second marker. This allows the minute impulse contact time to open, leaving the external impulse equipment, if used, de-energized during the setting procedure.

2. Move the minute hand forward to the minute marker just ahead of correct time. If the clock is slow by several hours, advance the minute hand until the hour hand indicates the correct time, and manually wind the drive spring.

3. Move the seconds hand to within ten seconds of accurate time; this action will move the entire gear train the right amount to keep all three of the hands in step with each other.

4. Start the pendulum at the correct time. It should swing between 2 1/4 and 3 degrees of zero when in operation.

   The external system equipment regulated by the time control can be set to time in the regular manner, using the impulse or electronic run-advance switch, whichever applies to the circuit.

ADJUSTMENT PROCEDURES

Type 037 Movement :

1. The detent notch of the correction cam should be on the horizontal center line with the seconds hand shaft and the slide stud (Figure 8) when the second hand is over the zero second marker. Loosen the second hand set screw, manually operate the slide and stud to center the correction cam, and then set the second hand to zero seconds and tighten the set screw.

2. Form the escape wheel ratchet. Adjust the eccentric so the pawl will bottom in a ratchet tooth, with the pendulum stopped, and with a minimum amount of reverse motion of the ratchet wheel.

3. The ratchet pawl spring, (Figure 11) should have enough tension to retain the ratchet in position if the correction cam is moved backwards for fast correction. The spring should also have enough tension to operate the ratchet pawl to the ratchet during the first portion of the correction slide operation. The pawl should stop the ratchet before the slide stud operates the correction cam.

4. Adjust the verge bridges so the escape wheel teeth strike the verge pallet about .005" from the end of the pallet.

5. The wind ratchet feed pawl should feed one tooth at a time and have a .010" overlap. (Adjust the retaining pawl bracket and the wind solenoid mounting bracket. Same as Type 25 Master Movement, See Section B Page 25)

Type 037 Movement Contacts :

See Contact Adjustment, Section B Pages 32-36.

INSTALLATION AND SERVICING

Antenna (Figures 16 and 17) :

The recommended antenna for the WWV receiver is a half-wave dipole. The reception for a particular frequency is made highly efficient by making the length of the antenna about one-half the wave length of the station to be received. Under this condition, the antenna is resonant at the desired frequency, and develops a maximum radio signal voltage at that frequency. For the 5-megacycle signal a resonant antenna should have a length of 94 feet.

The antenna should be installed broadside to the direction of maximum pickup which is usually the direction of the station.

When the radio waves pass the antenna, they generate a tiny rf voltage in the antenna wire. Thus, the wire becomes a generator, and the receiver is its load. For optimum coupling between antenna and receiver, the transmission line should match the impedance of the generator and the receiver.

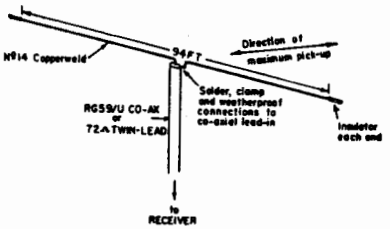


Figure 16 Dipole Antenna for 5 Megacycles

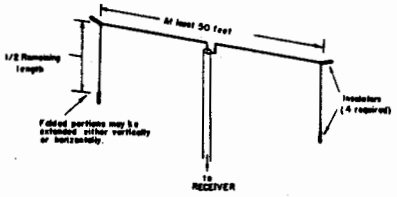


Figure 17 Folded Arrangement for Restricted Space

The characteristic impedence at the center of a half-wave antenna is about 72 ohms. Thus, if 72 ohm transmission line is connected to the center of the dipole, the antenna will send its energy into the line with minimum losses. The 72-ohm line also matches the antenna coil in the receiver to insure optimum transfer of the energy to the radio circuits.

Although no ground is needed with the dipole antenna, the receiver chassis should be grounded to prevent chassis pickup.

If limited space prevents the installation of the antenna in a straight span, the ends may be folded as in Figure 25B. All parts of the antenna and lead-in must be insulated from ground. All connections should be soldered and clamped, because loose connections produce crackling noise in the receiver. The antenna should be placed as far as possible from power lines and electric machinery.

Antenna Connections :

The transmission line from the antenna is connected between binder posts A1 and A2 of the receiver chassis. Post A3 should be connectedto a reliable ground.