

**MASTER TIMING CIRCUIT SD-25633-01  
TALKING EQUIPMENT OUT OF SERVICE  
NO. 1 CROSSBAR OFFICES**

**1. GENERAL**

**1.01** This section covers the method to be followed in taking master timing circuit SD-25633-01 out of service. Part 3 of this section covers the method of taking master timing circuits and individual pieces of apparatus associated with these circuits out of service. Part 4 covers the precautions to be followed when working on the apparatus associated with these circuits.

**1.02** This section is reissued to incorporate material from the addendum in its proper location. In this process marginal arrows have been omitted.

**1.03** Two master timing circuits are provided in the office, one designated as the even and the other as the odd master timing circuit. Each master timing circuit is provided with a synchronous motor-driven timer which furnishes pulses every 6 seconds for stepping its associated selectors. In addition, one of these timers supplies the pulses for stepping the selectors of all the recorders. When the TT (timer transfer) key is in the E position the even master timing circuit controls the stepping of the recorder selectors and when the TT key is in the O position the odd master timing circuit controls the stepping of the recorder selectors.

**1.04** With the TT key in the E position, the relation of the selectors of all recorders and the selectors of the odd master timing circuit is checked once each minute for synchronism with the selectors of the even master timing circuit. With the TT key in the O position, the relation of the selectors of all recorders and the selectors of the even master timing circuit is checked once each minute for synchronism with the selectors of the odd master timing circuit.

**1.05** The position of the TT key also determines whether the even or the odd control circuit supplies the month, day, and hour information to the recorders. With the TT key in the E position, the even control circuit supplies this information and with the TT key in the O position, the odd control circuit supplies this information.

**1.06** The even recorder record controller controls the perforation of end-of-tape information for the even recorders and the odd recorder record controller controls the perforation for the odd and emergency recorders. The operation of the CMBE (controller make-busy even) or CMBO (controller make-busy odd) key makes the corresponding controller busy. The other controller then controls the perforation of the end-of-tape information for all recorders.

**1.07** Only one controller can be made busy at any time by the operation of the CMBE or CMBO keys, the fuse alarm circuits, or a combination of the CMB- key and fuse alarm operation. Any attempt to make busy both controllers at the same time will sound a major alarm with both the CMBE and CMBO lamps lighted as an indication of the nature of the alarm. When this occurs, the controller first made busy will remain busy and the make-busy feature of the other controller is locked out.

**1.08** All keys and lamps mentioned in Parts 3 and 4 of this section are located on the master timing frame unless otherwise specified.

**2. APPARATUS**

**2.01** No. 322A (make-busy) plugs, as required.

**2.02** No. 893 cord, 3 feet long, equipped with two No. 360A tools (No. 1W13A cord) and two No. 419A tools (for use when removing the ST- or the EST relay from service).

**3. METHOD OF TAKING EQUIPMENT OUT OF SERVICE**

**Time Pulse Recorder Controller, Make-busy, and Synchronizing Check Circuits and All Individual Pieces of Apparatus in These Circuits**

**3.01** To remove the even time pulse recorder controller, make-busy, and synchronizing check circuit from service, operate the TT key to its O position and operate the CMBE key.

**3.02** To remove the odd time pulse recorder controller, make-busy, and synchronizing check circuit from service, operate the TT key to its E position and operate the CMBO key.

**Check Lamp Circuit and All Individual Pieces of Apparatus in This Circuit**

**3.03** This circuit and the associated apparatus are continually in service while either the even or odd master timing circuit is in control of the time pulses to the recorders. This circuit is operated once each minute while checking the selector synchronism.

**Month, Day, and Hour Control Circuits and All Individual Pieces of Apparatus in These Circuits**

**3.04** To remove the even month, day, and hour control circuit from service, operate the TT key to its O position.

**3.05** To remove the odd month, day, and hour control circuit from service, operate the TT key to its E position.

**Hour Time Controller Circuits and All Individual Pieces of Apparatus in These Circuits**

**3.06** To remove the even hour time controller circuit from service, operate the TT key to its O position.

**3.07** To remove the odd hour time controller circuit from service, operate the TT key to its E position.

**Grouping Circuits and All Individual Pieces of Apparatus in These Circuits**

**3.08** To remove the grouping circuit for even recorders from service, operate the CMBE key.

**3.09** To remove the grouping circuit for odd recorders from service, operate the CMBO key.

**Recorder Record Controller Circuits and All Individual Pieces of Apparatus in These Circuits**

**3.10** To remove the even recorder record controller circuit from service, operate the CMBE key.

**3.11** To remove the odd recorder record controller circuit from service, operate the CMBO key.

**Start Circuits**

**ST Relays**

**3.12** Remove from service the district junctors or trunks served by the associated recorder as follows:

At the subscriber sender link frame, insert make-busy plugs into each of the MB jacks that are associated with the subscriber district junctor groups served by the associated recorder.

**3.13** *If the ST-relay to be removed from service is to remain out of service during the 3:00 a.m. end-of-tape period* — Block the ST-relay nonoperated and proceed as follows:

(a) Highest Numbered ST- Relay of Odd Timer: Connect together 4T and 5T terminals of second highest numbered ST-relay.

(b) Highest Numbered ST- Relay of Even Timer: If CMBE and CMBO lamps are dark, proceed as above for odd timer.

If CMBE or CMBO lamps are lighted, proceed as for all other ST-relays as follows.

(c) All Other ST- Relays of Both Timers: Connect together 1B and 13TR terminals of the ST-relay being removed from service.

The 3:00 a.m. record will not be perforated on the tape of the recorder associated with the ST-relay which is blocked nonoperated.

**Emergency Start Circuit****EST Relay**

**3.14** If the EW (emergency working) lamp at the recorder frame is extinguished, the emergency start circuit is not in use. If the EW lamp is lighted, determine if it is satisfactory to restore the transferred regular recorder to service and, if so, remove the make-busy plug from the associated R-TN or RCDR-TN jack at the transverter trouble indicator frame, trouble recorder frame, master test frame, or trouble ticketer frame.

**3.15** *If the EST relay is to remain out of service during the 3:00 a.m. end-of-tape entry period* — Block nonoperated the EST relay and connect its 1B and 13TR terminals together. The 3:00 a.m. record will not be perforated on the emergency recorder.

**Time-out and Trouble Release Circuits and All Individual Pieces of Apparatus in These Circuits**

**3.16** To remove the even time-out and trouble release circuit from service, operate the CMBE key.

**3.17** To remove the odd time-out and trouble release circuit from service, operate the CMBO key.

**Pulse Failure Alarm Circuit and All Individual Pieces of Apparatus in This Circuit**

**3.18** Block operated the PF and PF1 relays. Under this condition, the pulse failure alarm will not operate.

*Caution: Prompt action is necessary in restoring this circuit to service in order that the unguarded interval may be reduced to a minimum.*

**Check Failure Alarm Relays**

**3.19** **ALM Relay:** Block nonoperated the ALM relay. Under this condition, the pulse failure, selector synchronism failure, timer synchronism failure, end-of-tape failure, and make-busy alarms will not operate.

*Caution: Prompt action is necessary in restoring this relay to service in order that the unguarded interval may be reduced to a minimum.*

**3.20** **SSF Relay:** Block nonoperated the SSF relay. Under this condition, the selector synchronism failure alarm will not operate.

*Caution: Prompt action is necessary in restoring this relay to service in order that the unguarded interval may be reduced to a minimum.*

**3.21** **TSF Relay:** Block nonoperated the TSF relay. Under this condition, the timer synchronism failure alarm will not operate.

*Caution: Prompt action is necessary in restoring this relay to service in order that the unguarded interval may be reduced to a minimum.*

**Recorder Test and Test Pattern Relays and All Individual Pieces of Apparatus in These Circuits**

**3.22** These circuits are not normally in service since they are used only for testing recorders.

**Perforator Lead Test Circuit and All Individual Pieces of Apparatus in This Circuit**

**3.23** **Perforator Lead Test Circuit:** Block operated the COM relay. This makes the perforator lead test circuit and associated alarm inoperative.

*Caution: Prompt action is necessary in restoring this circuit to service in order that the time that the perforator lead test is inoperative may be reduced to a minimum.*

**3.24** **CO1E, CO10, CO2E, CO20, CO3E, CO30, CO4E, CO40, CO5E, CO50, CO6E, CO60, and COM Relays:** Block operated the relay involved.

**3.25** **PLXE Relay:** Block nonoperated the XPE and XPE1 relays.

**3.26** **PLXO Relay:** Block nonoperated the XPO and XPO1 relays.

**3.27** **XPE Relay:** Block operated the CO1E relay.

- 3.28 **XPE1 Relay:** Block operated the CO4E relay.
- 3.29 **XPO Relay:** Block operated the CO10 relay.
- 3.30 **XPO1 Relay:** Block operated the CO40 relay.

**Timer Transfer Control Relays**

- 3.31 **CSY Relay:** The CSY relay is normally operated as long as the TE and TO timers are operating in synchronism. In case of a trouble which prevents this relay from operating, block it operated to prevent sounding the major alarm. If it is necessary to transfer the controls from one master timing circuit to the other, remove the blocking tool from the CSY relay until the transfer has been made. Then block operated the CSY relay.
- 3.32 **CTS Relay:** If while this relay is out of service it is necessary to transfer the controls from one master timing circuit to the other, block operated the CTS relay until the transfer has been made. Then remove the blocking tool from this relay.
- 3.33 **DRP Relay:** If while this relay is out of service it is necessary to transfer the controls from one master timing circuit to the other, block operated the DRP relay until the transfer has been made. Then remove the blocking tool from this relay.
- 3.34 **ORP Relay:** If while this relay is out of service it is necessary to transfer the controls from one master timing circuit to the other, block operated the ORP relay until the transfer has been made. Then remove the blocking tool from this relay.
- 3.35 **TSC Relay:** The TE and TO timers cannot be resynchronized with each other if the TSC relay is not operated.

- 3.36 **TT Relay:** If while this relay is out of service it is necessary to transfer the controls from the even to the odd master timing circuit at a time while this relay is inoperative, operate the TT key to its O position and then block operated the TT relay.

- 3.37 **TTS Relay:** If while this relay is out of service it is necessary to transfer the controls from the even to the odd master timing circuit at a time while this relay is inoperative, operate the TT key to its O position and then block operated the TTS relay.

**Fuse Alarm Circuits and All Individual Pieces of Apparatus in These Circuits**

- 3.38 **FA Relay:** Block nonoperated the FA relay.

*Caution: The fuse guard lamp will not light in case a fuse operates under this condition and the associated master timing circuit will not be made busy. Prompt action in restoring this relay to service is therefore necessary.*

- 3.39 **FA1 Relay:** Block nonoperated the FA1 relay.

*Caution: The fuse guard lamp will not light in case a fuse operates under this condition. Prompt action in restoring this relay to service is therefore necessary.*

- 3.40 **MTE or MTO Relay:** Block operated the relay involved.

*Caution: The associated master timing circuit will not be made busy if the associated 130-volt supply is opened. Prompt action in restoring this relay to service is therefore necessary.*

#### 4. PRECAUTIONS TO BE FOLLOWED WHEN WORKING ON THE APPARATUS

##### Time Pulse Recorder Controller, Make-busy, and Synchronizing Check Circuit for Even Recorders

**4.01** Operate the TT key to its O position. Observe the following precautions when working on the relays or apparatus noted in 4.02 to 4.13, inclusive.

**4.02 CE or CE1 Relay:** When the odd master timing circuit is in control, the operation of either of these relays disables the selector synchronism check feature of this timing circuit and may operate the selector synchronism failure (SSF) alarm. To retire the alarm, momentarily operate the AR key.

**4.03 CKE Relay:** Insulate the 9T contact of the PE relay to prevent operating the selector synchronism failure alarm.

**4.04 ECH Relay:** When "N" wiring option is used, do not operate this relay during the first or last 5 minutes of any hour since this may throw the even master timing circuit selectors out of synchronism with the odd master timing circuit selectors.

**4.05 ETE Relay:** The major alarm will sound and the aisle pilot and ETFE lamps will light while this relay is operated.

**4.06 MBE Relay:** Check the position of the CMBE and CMBO keys and proceed as follows:

- (a) If the CMBE and CMBO keys are released, block nonoperated the GOE and GRO relays.
- (b) If the CMBE key is operated, block operated the GOE and GRO relays before insulating the 1T contact of the TFE relay as specified on the circuit requirement table. Then block nonoperated the MBO relay.
- (c) If the CMBO key is operated, do not work on the MBE relay until it is satisfactory to restore the odd master timing circuit to control the odd recorders. Then restore the CMBO key and block nonoperated the GOE and GRO relays.

**4.07 PE Relay:** Block operated the CSY relay and operate the CMBE key. Before restoring this circuit to service after working on

this relay, operate the CKL key. Then momentarily operate the S (synchronize) key to synchronize the even master timing circuit selectors. When the selectors are synchronized, restore the CKL key.

**4.08 SE Relay:** Block nonoperated the P2E relay.

**4.09 TEA Relay:** Block operated the BE1 relay.

**4.10 TOB Relay:** Block operated the BE2 relay.

**4.11 TFE Relay:** Block nonoperated the MBE relay.

**4.12 TTE Relay:** Block nonoperated the TEA and TOB relays. When "N" wiring option is used, do not operate this relay during the first or last 5 minutes of any hour.

**4.13 TE Timer:** When "N" wiring option is used, do not work on this timer during the first or last 5 minutes of any hour. Block operated the CSY relay and operate the CMBE key. Before restoring this circuit to service after working on this timer, resynchronize the TE and TO timers and also the even master timing circuit selectors as follows:

- (a) Operate the CKL key.
- (b) Operate the MSE key to its STP (stop) position, thereby stopping the TE timer.
- (c) At the TE timer, grasp the hub and manually turn the camshaft very slowly in the direction in which it normally rotates until the small cam passes under and beyond the contact operating finger and clears it by approximately 3/32 inch.
- (d) At any time except when the U8 or U9 check lamp is lighted, operate the MSE key to the ST (start) position. Within one minute the TE timer will start, then operate this key to the R (run) position.
- (e) Momentarily operate the S key. The SO lamp will be lighted while the even master timing circuit selectors are stepping to their synchronized positions.
- (f) When the SO lamp is extinguished, remove the blocking tool from the CSY relay and restore the CKL and CMBE keys.

**Time Pulse Recorder Controller, Make-busy, and Synchronizing Check Circuit for Odd Recorders**

**4.14** Operate the TT key to its E position. Observe the following precautions when working on the apparatus noted in 4.15 to 4.26, inclusive.

**4.15 CO or CO1 Relay:** When the even master timing circuit is in control, the operation of either of these relays disables the selector synchronism check feature of this timing circuit and may operate the selector synchronism failure (SSF) alarm. To retire the alarm, momentarily operate the AR key.

**4.16 CKO Relay:** Insulate the 9T contact of the PO relay to prevent operating the selector synchronism failure alarm.

**4.17 OCH Relay:** When "N" wiring option is used, do not operate this relay during the first or last 5 minutes of any hour since this may throw the odd master timing circuit selectors out of synchronism with the even master timing circuit selectors.

**4.18 ETO Relay:** The major alarm sounds and the aisle pilot and the ETFO lamps light while this relay is operated.

**4.19 MBO Relay:** Check the position of the CMBO and CMBE keys and proceed as follows:

(a) If the CMBO and CMBE keys are released, block nonoperated the GEO and GRE relays.

(b) If the CMBO key is operated, block operated the GEO and GRE relays before insulating the 1T contact of the TFO relay as specified on the circuit requirement table. Then block nonoperated the MBE relay.

(c) If the CMBE key is operated, do not work on this relay until it is satisfactory to restore the even master timing circuit to control the even recorders. Then restore the CMBE key and block nonoperated the GEO and GRE keys.

**4.20 PO Relay:** Block operated the CSY relay and operate the CMBO key. Before restoring this circuit to service after working on this relay, operate the CKL key. Then momentarily operate the S key to synchronize the odd master timing circuit selectors. When the selectors are synchronized, restore the CKL key.

**4.21 SO Relay:** Block nonoperated the P20 relay.

**4.22 TOA Relay:** Block operated the BO2 relay.

**4.23 TEB Relay:** Block operated the BO1 relay.

**4.24 TFO Relay:** Block nonoperated the MBO relay.

**4.25 TTO Relay:** Block nonoperated the TOA and TEB relays. When "N" wiring option is used, do not operate this relay during the first or last 5 minutes of any hour.

**4.26 TO Timer:** When "N" wiring option is used, do not work on this timer during the first or last 5 minutes of any hour. Block operated the CSY relay and operate the CMBO key. Before restoring this circuit to service after working on this timer, resynchronize the TE and TO timers and also the odd master timing selectors as follows:

(a) Operate the CKL key.

(b) Operate the MSO key to its STP position, thereby stopping the TO timer.

(c) At the TO timer, grasp the hub and manually turn the camshaft very slowly in the direction in which it normally rotates until the small cam passes under and beyond the contact operating finger and clears it by approximately 3/32 inch.

(d) At any time except when the U8 or U9 check lamp is lighted, operate the MSO key to the ST position. Within one minute the TO timer will start, then operate this key to its R position.

(e) Momentarily operate the S key. The SE lamp will be lighted while the odd master timing circuit selectors are stepping to their synchronized positions.

(f) When the SE lamp is extinguished, remove the blocking tool from the CSY relay and restore the CKL and CMBO keys.

**Check Lamp Circuit**

**4.27** Do not operate the CKL key while working on any of the relays in this circuit.

**Month, Day, and Hour Control Circuit (Even or Odd)**

**4.28** Operate the TT key to its O position to take the even month, day, and hour control circuit out of service. Operate the TT key to its E position to take the odd month, day, and hour control circuit out of service. Observe the following precautions when working on the apparatus noted in 4.29.

**4.29** *ADV, DAT, DH, DTH, EXD, EXH, EXM, HA, HH, HRT, HTH, HUA, HUH, MDA, MOH, P, SR, TA, TH, or UH Relay and Selector Magnets:* Before working on any of these relays or magnets, operate the CMBE key for apparatus associated with the even master timing circuit or the CMBO key for apparatus associated with the odd master timing circuit. Before restoring this circuit to service after working on this apparatus, operate the CKL key and then momentarily operate the S key to synchronize the selectors. The SE lamp will light while the odd selectors are stepping or the SO lamp will light while the even selectors are stepping. When the selectors are synchronized, the lamps will be extinguished.

**Hour Time Control Circuit (Even)**

**4.30** Operate the TT key to its O position.

**4.31** Do not operate any of the relays in the hour time control circuit during the first or last 5 minutes of any hour.

**4.32** To avoid perforating a false hour in case a splice in any tape is encountered, examine approximately 3 feet of the unperforated tape nearest to the perforator drum of each regular recorder and the emergency recorder if it is in use. If any splices are found, advance the tape of the recorder by inserting and removing a make-busy plug into the associated RCDR-MB or R-MB jack at the master test frame, transverter trouble indicator, trouble recorder, or trouble ticketer frame until the splice has advanced beyond the drum. To insure that there are no splices in that part of the tape which is not visible on inspection, insert a make-busy plug into the RCDR-MB or R-MB jack of each recorder in turn and then remove this plug. This will advance the tape approximately 6 inches.

**4.33** Do not transfer or make busy any recorder while working on relays in the hour time control circuit.

*Note:* If any of the relays in this circuit are operated while a trouble record card is being punched, an incorrect or mutilated hour may be indicated in the time-of-day entry.

**Hour Time Control Circuit (Odd)**

**4.34** Operate the TT key to its E position, then follow the procedures described in 4.31 to 4.33, inclusive.

**Grouping Circuit for Odd Recorders**

**4.35** Operate the CMBO key. Observe the following precautions when working on the relays noted in 4.36 to 4.39, inclusive.

**4.36** *ERO or ORO Relay:* Block nonoperated the RS relay of the odd master timing circuit to prevent sounding an alarm.

**4.37** *GEO and GRE Relays:* These relays are in the operated position when the circuit is removed from service by the operation of the CMBO key. Before working on these relays, follow the procedures described in 4.32 and 4.33 to prevent the printing of false records on the tapes, then restore the CMBO key. Do not work on these relays during the interval from 2:55 a.m. to 3:30 a.m.

**4.38** *SCO Relay:* Before operating this relay, follow the procedures described in 4.31 to 4.33, inclusive, for the odd and emergency recorders. Then insulate the 6B contact of the SCO relay and the 5T and 8T contacts of the GEO relay.

**4.39** *TFT Relay:* Before operating this relay, follow the procedures described in 4.31 to 4.33, inclusive, for the odd and emergency recorders. Block nonoperated the RCO relay of the even master timing circuit.

**Recorder Record Controller Circuit (Even or Odd)**

**4.40** Take the even recorder record controller circuit out of service when working on the relays in the even controller by operating the CMBE key. Take the odd recorder record controller circuit out of service when working on

the relays in the odd controller by operating the CMBO key. Observe the following precautions when working on the relays noted in 4.41 to 4.51, inclusive.

- 4.41 A, B, or DRL Relay:** Block nonoperated the associated even or odd RS relay to prevent sounding an alarm.
- 4.42 DA, DC, HRE, HRN, LC1, LC2, MC, MGE, MGN, MO, P4, RN, SC, SC1, SKA, SKP, SPA, or SPT Relay:** Block nonoperated the PLXE relay when working on any of these relays in the even master timing circuit. Block nonoperated the PLXO relay when working on any of these relays in the odd master timing circuit.
- 4.43 ET Relay:** Do not operate this relay during the interval from 2:55 a.m. to 3:30 a.m. Block nonoperated the associated even or odd ET1 and MD relays.
- 4.44 ET1 Relay:** Block nonoperated the associated even or odd TM1 relay to prevent sounding the alarm. Insulate 2T of ET1 relay.
- 4.45 ETS Relay:** Do not work on this relay between 11:55 p.m. of the last calendar day of the month and 3:30 a.m. of the succeeding day. Before working on this relay, block nonoperated the associated even or odd TM1 relay to prevent sounding an alarm.
- 4.46 OC Relay:** Block nonoperated the associated even or odd ET1 relay to prevent sounding an alarm.
- 4.47 PTO Relay:** Block nonoperated the associated even or odd TM1 relay to prevent sounding an alarm.
- 4.48 RCE or RCO Relay:** Before working on either of these relays, follow the procedures described in 4.32 and 4.33. Then block nonoperated the RSC relay of the associated master timing circuit to prevent sounding an alarm.
- 4.49 RET Relay:** Do not operate this relay during the interval from 2:55 a.m. to 3:30 a.m.
- 4.50 RS or SS Relay:** Block nonoperated the associated even or odd PTO relay to prevent sounding an alarm.
- 4.51 RSC Relay:** Block nonoperated the associated even or odd DRL and TM1 relays to prevent sounding an alarm.

#### Grouping Circuit for Even Recorders

- 4.52** Operate the CMBE key. Observe the following precautions when working on the relays noted in 4.53 to 4.55, inclusive.
- 4.53 ERE or ORE Relay:** Block nonoperated the RS relay of the even master timing circuit.
- 4.54 GOE, GR, GR1, or GRO Relay:** These relays are in the operated position when the circuit is removed from service by the operation of the CMBE key. Before working on these relays, follow the procedures described in 4.32 and 4.33 to prevent the perforating of false records on the tapes, then restore the CMBE key. Do not work on these relays during the interval from 2:55 a.m. to 3:30 a.m.
- 4.55 SCE Relay:** Before working on this relay, follow the procedures described in 4.31 to 4.33, inclusive, for the even recorders. Then insulate the 6B contact of the SCE relay and the 5T and 8T contacts of the GOE relay.

#### Start Circuit for Even Recorders

- 4.56 ST- Relays:** Before working on any of these relays, follow the procedures described in 4.31 to 4.33, inclusive, for the even recorders. Then block nonoperated the SCE relay.

#### Emergency Start Circuit

- 4.57 EST Relay:** Before working on this relay, follow the procedures described in 4.31 to 4.33, inclusive, for the emergency and all odd recorders. Then block nonoperated the SCO relay.

#### Start Circuit for Odd Recorders

- 4.58 ST- Relays:** Before working on any of these relays, follow the procedures described in 4.31 to 4.33, inclusive, for the emergency and all odd recorders. Then block nonoperated the SCO relay.

#### Time-out and Trouble Release Circuit

- 4.59** Operate the CMBE key to take the even time-out and trouble release circuit out of service when working on the relays of the even master timing circuit. Operate the CMBO key to take the odd time-out and trouble release circuit out of service when working on the relays of the odd master timing circuit. Observe the

**Month, Day, and Hour Control Circuit (Even or Odd)**

**4.28** Operate the TT key to its O position to take the even month, day, and hour control circuit out of service. Operate the TT key to its E position to take the odd month, day, and hour control circuit out of service. Observe the following precautions when working on the apparatus noted in 4.29.

**4.29** *ADV, DAT, DH, DTH, EXD, EXH, EXM, HA, HH, HRT, HTH, HUA, HUH, MDA, MOH, P, SR, TA, TH, or UH Relay and Selector Magnets:* Before working on any of these relays or magnets, operate the CMBE key for apparatus associated with the even master timing circuit or the CMBO key for apparatus associated with the odd master timing circuit. Before restoring this circuit to service after working on this apparatus, operate the CKL key and then momentarily operate the S key to synchronize the selectors. The SE lamp will light while the odd selectors are stepping or the SO lamp will light while the even selectors are stepping. When the selectors are synchronized, the lamps will be extinguished.

**Hour Time Control Circuit (Even)**

**4.30** Operate the TT key to its O position.

**4.31** Do not operate any of the relays in the hour time control circuit during the first or last 5 minutes of any hour.

**4.32** To avoid perforating a false hour in case a splice in any tape is encountered, examine approximately 3 feet of the unperforated tape nearest to the perforator drum of each regular recorder and the emergency recorder if it is in use. If any splices are found, advance the tape of the recorder by inserting and removing a make-busy plug into the associated RCDR-MB or R-MB jack at the master test frame, transverter trouble indicator, trouble recorder, or trouble ticketer frame until the splice has advanced beyond the drum. To insure that there are no splices in that part of the tape which is not visible on inspection, insert a make-busy plug into the RCDR-MB or R-MB jack of each recorder in turn and then remove this plug. This will advance the tape approximately 6 inches.

**4.33** Do not transfer or make busy any recorder while working on relays in the hour time control circuit.

*Note:* If any of the relays in this circuit are operated while a trouble record card is being punched, an incorrect or mutilated hour may be indicated in the time-of-day entry.

**Hour Time Control Circuit (Odd)**

**4.34** Operate the TT key to its E position, then follow the procedures described in 4.31 to 4.33, inclusive.

**Grouping Circuit for Odd Recorders**

**4.35** Operate the CMBO key. Observe the following precautions when working on the relays noted in 4.36 to 4.39, inclusive.

**4.36** *ERO or ORO Relay:* Block nonoperated the RS relay of the odd master timing circuit to prevent sounding an alarm.

**4.37** *GEO and GRE Relays:* These relays are in the operated position when the circuit is removed from service by the operation of the CMBO key. Before working on these relays, follow the procedures described in 4.32 and 4.33 to prevent the printing of false records on the tapes, then restore the CMBO key. Do not work on these relays during the interval from 2:55 a.m. to 3:30 a.m.

**4.38** *SCO Relay:* Before operating this relay, follow the procedures described in 4.31 to 4.33, inclusive, for the odd and emergency recorders. Then insulate the 6B contact of the SCO relay and the 5T and 8T contacts of the GEO relay.

**4.39** *TFT Relay:* Before operating this relay, follow the procedures described in 4.31 to 4.33, inclusive, for the odd and emergency recorders. Block nonoperated the RCO relay of the even master timing circuit.

**Recorder Record Controller Circuit (Even or Odd)**

**4.40** Take the even recorder record controller circuit out of service when working on the relays in the even controller by operating the CMBE key. Take the odd recorder record controller circuit out of service when working on

the relays in the odd controller by operating the CMBO key. Observe the following precautions when working on the relays noted in 4.41 to 4.51, inclusive.

**4.41 A, B, or DRL Relay:** Block nonoperated the associated even or odd RS relay to prevent sounding an alarm.

**4.42 DA, DC, HRE, HRN, LC1, LC2, MC, MGE, MGN, MO, P4, RN, SC, SC1, SKA, SKP, SPA, or SPT Relay:** Block nonoperated the PLXE relay when working on any of these relays in the even master timing circuit. Block nonoperated the PLXO relay when working on any of these relays in the odd master timing circuit.

**4.43 ET Relay:** Do not operate this relay during the interval from 2:55 a.m. to 3:30 a.m. Block nonoperated the associated even or odd ET1 and MD relays.

**4.44 ET1 Relay:** Block nonoperated the associated even or odd TM1 relay to prevent sounding the alarm. Insulate 2T of ET1 relay.

**4.45 ETS Relay:** Do not work on this relay between 11:55 p.m. of the last calendar day of the month and 3:30 a.m. of the succeeding day. Before working on this relay, block nonoperated the associated even or odd TM1 relay to prevent sounding an alarm.

**4.46 OC Relay:** Block nonoperated the associated even or odd ET1 relay to prevent sounding an alarm.

**4.47 PTO Relay:** Block nonoperated the associated even or odd TM1 relay to prevent sounding an alarm.

**4.48 RCE or RCO Relay:** Before working on either of these relays, follow the procedures described in 4.32 and 4.33. Then block nonoperated the RSC relay of the associated master timing circuit to prevent sounding an alarm.

**4.49 RET Relay:** Do not operate this relay during the interval from 2:55 a.m. to 3:30 a.m.

**4.50 RS or SS Relay:** Block nonoperated the associated even or odd PTO relay to prevent sounding an alarm.

**4.51 RSC Relay:** Block nonoperated the associated even or odd DRL and TM1 relays to prevent sounding an alarm.

#### Grouping Circuit for Even Recorders

**4.52** Operate the CMBE key. Observe the following precautions when working on the relays noted in 4.53 to 4.55, inclusive.

**4.53 ERE or ORE Relay:** Block nonoperated the RS relay of the even master timing circuit.

**4.54 GOE, GR, GR1, or GRO Relay:** These relays are in the operated position when the circuit is removed from service by the operation of the CMBE key. Before working on these relays, follow the procedures described in 4.32 and 4.33 to prevent the perforating of false records on the tapes, then restore the CMBE key. Do not work on these relays during the interval from 2:55 a.m. to 3:30 a.m.

**4.55 SCE Relay:** Before working on this relay, follow the procedures described in 4.31 to 4.33, inclusive, for the even recorders. Then insulate the 6B contact of the SCE relay and the 5T and 8T contacts of the GOE relay.

#### Start Circuit for Even Recorders

**4.56 ST- Relays:** Before working on any of these relays, follow the procedures described in 4.31 to 4.33, inclusive, for the even recorders. Then block nonoperated the SCE relay.

#### Emergency Start Circuit

**4.57 EST Relay:** Before working on this relay, follow the procedures described in 4.31 to 4.33, inclusive, for the emergency and all odd recorders. Then block nonoperated the SCO relay.

#### Start Circuit for Odd Recorders

**4.58 ST- Relays:** Before working on any of these relays, follow the procedures described in 4.31 to 4.33, inclusive, for the emergency and all odd recorders. Then block nonoperated the SCO relay.

#### Time-out and Trouble Release Circuit

**4.59** Operate the CMBE key to take the even time-out and trouble release circuit out of service when working on the relays of the even master timing circuit. Operate the CMBO key to take the odd time-out and trouble release circuit out of service when working on the relays of the odd master timing circuit. Observe the

following precautions when working on the relays noted in 4.60 to 4.64, inclusive.

**4.60 CKR Relay:** When "K" wiring option is used, block nonoperated the LC1 relay to prevent sounding an alarm.

**4.61 LT4 or LTB Relay:** Block nonoperated the TM6 relay to prevent sounding an alarm.

**4.62 TM1 Relay:** Block nonoperated RKA relay to prevent sounding an alarm.

**4.63 TM6 Relay:** When working on the even circuit and "B" wiring option is used, block nonoperated the ETE relay. When working on the odd circuit and "B" wiring option is used, block nonoperated the ETO relay. The TT lamp if provided and the MTE or MTO lamp will light at the transverter trouble indicator, and if "E" wiring option is used, the major alarm will sound while the TM6 relay is operated. Also, the TAE or TAO lamp will light at the master timing frame while this relay is operated.

**4.64 TMR Relay:** Insulate the 5T contact of the TIB relay and the 8T contact of the TMR relay. Block operated the TIB relay. The minor or major alarm will sound and the MTTRO or MTTRE register will operate at the transverter trouble indicator each time this relay is operated.

#### Pulse Failure Alarm

**4.65 PF or PF1 Relay:** Insulate the 1B contact of the PFA relay to prevent sounding an alarm.

**4.66 PFA Relay:** The major alarm will sound and the PF lamp will light while this relay is operated.

#### Check Failure Alarm

**4.67** Insulate the 1B and 3T contacts of the ALM relay.

**4.68 SSF Relay:** When "N" wiring option is used, insulate the 5T contact of the SSF relay to prevent an interlocking condition occurring in connection with the selector synchronism failure alarm.

#### Recorder Test and Test Pattern Relay Circuits

**4.69** Although these circuits are not normally in service, being used only for testing recorders, they are closely associated with the odd recorder record controller circuit. Therefore, before working on relays associated with these circuits, operate the CMBO key. Observe the following precautions when working on the relays noted in 4.70 to 4.78, inclusive.

**4.70 37, AP2, AP3, AP5, AP7, AP8, AP10, AP12, AP13, AP14, AP15, and PN1 to PN15 Relays:** Block nonoperated the PLXO relay to prevent sounding an alarm.

**4.71 ER Relay:** Insulate the 1B contact of the ER relay to prevent operating the grouping circuit for even recorders.

**4.72 ON Relay:** When "ZW" wiring option is used, block nonoperated the TST1 relay to prevent sounding an alarm.

**4.73 OST and STE Relays:** Block nonoperated the ER relay to prevent operating the grouping circuit for even recorders.

**4.74 P, RW, and RW1 Relays:** Insulate the 2B contact of the CA relay to prevent stepping the TS selector.

**4.75 PH Relay:** Insulate the 4T contact of the PH relay to prevent stepping the TS selector.

**4.76 SLO Relay:** When "ZW" wiring option is used, block nonoperated the ON relay to prevent sounding an alarm.

**4.77 TE Relay:** Block nonoperated the PH relay to prevent stepping the TS selector.

**4.78 TST1 Relay:** Insulate the 2B contact of the RW relay to prevent sounding an alarm.

#### Perforator Lead Test

**4.79** Operate the CMBE key before working on the relays associated with the even master timing circuit. Operate the CMBO key before working on the relays associated with the odd master timing circuit. Observe the following precautions when working on the relays noted in 4.80 to 4.84, inclusive.

**4.80 CO1E to CO6E or CO10 to CO60 Relays:**

Before working on these relays, follow the procedure described in 4.32 and 4.33 for all recorders. Also, do not work on these relays during the interval from 2:55 a.m. to 3:30 a.m.

**4.81 PLXE Relay:** Insulate the 6T contact of this relay to prevent it from locking.

**4.82 PLXO Relay:** Insulate the 6T contact of this relay to prevent it from locking.

**4.83 XPE or XPE1 Relay:** Block nonoperated the PLXE relay.

**4.84 XPO or XPO1 Relay:** Block nonoperated the PLXO relay.

**Timer Transfer Control Circuit**

**4.85** Observe the following precautions when working on the relays noted in 4.86 to 4.89, inclusive.

**4.86 CSY Relay:** Block nonoperated the TSF relay to prevent sounding the major alarm.

**4.87 ORP Relay:** Insulate the 1T contact of the TTS relay to prevent false stepping of the recorder selectors.

**4.88 TT Relay:** Check that the TT key is in the E position. Block operated the TTE relay and block nonoperated the TTO relay.

**4.89 TTS Relay:** Check that the TT key is in the E position. Block nonoperated the CTS relay.

**Fuse Alarm Circuit**

**4.90** When working on the fuse alarm relays associated with the even master timing circuit, operate the CMBE key. When working on the fuse alarm relays associated with the odd master timing circuit, operate the CMBO key. Observe the following precautions when working on the relays noted in 4.91.

*Caution: Prompt action is necessary in restoring this circuit to service in order that the unguarded interval may be reduced to a minimum.*

**4.91 FA1, MTE, or MTO Relay:** Block nonoperated the FA relay to prevent sounding an alarm when working on the FA1 relay or when working on the MTE or MTO relay and "S" wiring option is used in the fuse alarm circuit.