

MASTER TIMING CIRCUIT SD-25633-01
METHODS OF HANDLING ALARMS
WITH ONE-SECOND TIMING
NO. 5 CROSSBAR OFFICES

1. GENERAL

PAGE

1.01 This section describes the procedures to be followed when responding to alarms associated with the master timing circuit SD-25633-01. Where an office has been converted to No. 5 crossbar ETS, local automatic message accounting-computerized (LAMA-C), centralized automatic message accounting-computerized (CAMA-C), billing data transmitter (BDT), or a LAMA to ANI conversion, refer to paragraph 1.04.

1.02 This section is issued to separate the 6-second timing from the one-second timing features and to add the 4E timer. This issue does not affect the Equipment Test Lists.

1.03 The alarms covered are:

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1.04 On drawing issue 55B of SD-25633-01 options are added to disable the following:

- Timer synchronization alarm
- Timer recorder selector switch synchronization alarm
- The standing tests on the perforator magnet leads
- The paper jam alarm.

The master timer selector switch synchronization alarm is arranged to allow a thirty second difference in positions of corresponding selector switches.

These options are added to reduce maintenance where recorder timing functions and/or no recorder functions are required. E.G. No. 5 XBAR ETS, local automatic message accounting-computerized (LAMA-C), centralized automatic message accounting-computerized (CAMA-C), billing data transmitter (BDT), or a LAMA to ANI conversion.

Refer to Table E.

1.05 Information concerning precautions to limit stoppages at the accounting center caused by central office tape irregularities is included in

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the section on Central Office AMA Equipment—
Precautions to Limit Stoppages in No. 1 Accounting
Center—No. 5 Crossbar Offices.

Timer Synchronism Failure Alarms

Refer to paragraph 1.04.

1.06 Two conditions may cause a timer synchronism failure (TSF) alarm:

- (1) The outputs of the active and standby timers (4B or 4E) may differ by approximately 1/4 of a second (0.25) or more.
- (2) The outputs of each timer must be synchronized with the respective counter and selector of the master timing circuit. In either case, the major alarm will sound and the TSF and aisle pilot lamps will light at the master timing frame (MTF).

Selector Synchronism Failure Alarm

Refer to paragraph 1.04.

1.07 If a counter or selector of a recorder or standby (SMTC) master timing circuit is not synchronized with the active master timing circuit (AMTC), a major alarm will sound and the selector synchronism failure (SSF) and aisle pilot lamps will light at the MTF.

Pulse Failure Alarm

1.08 If the AMTC fails to receive CH pulses from the active timer for 6 to 11 seconds, the PF lamp will light and the major alarm will sound.

End-of-Tape Failure—Short Time-Out

1.09 While controlling the perforation of a make-busy, recorder transfer, window splice, or 3:00 a.m. end-of-tape pattern, the master timing circuit short time-out feature times the various functions of these end-of-tape patterns, with the exception of the splice pattern for 3:00 a.m. end-of-tape. If any of the timed functions are not completed within the 4- to 7-second time intervals, the master timing circuit seizes the trouble recorder to make a trouble record and causes the major alarm to sound.

1.10 After the trouble record is taken or if a lost record indication occurs because the trouble recorder is busy, the master timing circuit attempts to complete under local control, the perforation of the pattern that was blocked.

1.11 If perforation of the pattern under local control is successful for make-busy, transfer, window splice entries, or for 3:00 a.m. end-of-tape entries when the recorder in trouble is the last in the series, the master timing circuit is released after completion of its functions. If the recorder is not the last in the series for 3:00 a.m. end-of-tape entries, the master timing circuit advances to control the perforation of the 3:00 a.m. end-of-tape pattern on the tape of the next recorder in succession.

1.12 If perforation of the pattern under local control is not successful within the short time-out interval, the master timing circuit and the recorder are automatically made busy under control of the AR (alarm release) keys on their respective frames and each of these circuits also maintains a connection to sound the major alarm. The connection between the master timing circuit and the recorder is released and the progression of the master timing circuit for the control of the 3:00 a.m. end-of-tape entries on the tapes of the next recorders in succession is stopped.

1.13 If the master timing circuit fails to release after the trouble record is taken because of unsuccessful local control operation or for any other reason, lighted lamps indicate the circuit conditions at the following locations.

At master timing frame—

- TAE OR TAO (time alarm even or odd)
- ETFE or ETFO (end-of-tape failure even or odd)
- CMBE or CMBO (controller make-busy even or odd)
- Aisle pilot

At trouble recorder frame—

- CMBE or CMBO (controller make-busy even or odd)
- MTE or MTO (master timing even or odd—in use)
- R_ or RCDR_ (recorder—in use)

At recorder frame—

MTR (master timing release)
Aisle pilot

1.14 Since the lighted lamps at the master timing frame and other frames indicate only the circuit conditions after the time-out, it will be necessary to refer to the trouble record to determine the type of entry involved, the progress of the call when blocked, and also the connecting circuit involved as an aid in determining the source of the trouble causing the time-out.

1.15 The master timing circuit short time-out feature may be inoperative when the master timer is called upon to control the perforation of a make-busy, transfer, or window splice pattern. In this case, the long time-out feature checks that the functions from the start of recorder seizure to start of splice pattern are completed within 19- to 29-seconds. The functions from the start of splice pattern to the end of perforation are also checked for completion within a second 19- to 29-seconds timing period. If any of these timed functions are not completed within their allowable time intervals, the master timing circuit and the recorder are automatically made busy, the major alarm sounds, and the connection between the master timing circuit and the recorder is released. Also, the lamps as described in 1.13 are lighted.

1.16 The master timing circuit short time-out feature may be inoperative when the master timing circuit is called upon to control the perforation of 3:00 a.m. end-of-tape patterns. In this case, the master timing circuit long time-out feature checks that the functions from the start of recorder seizure to the start of the splice pattern are completed within a 60- to 69-second period. After timing the length of splice pattern for a second 60- to 69-seconds, the long time-out feature checks that the functions from end-of-splice pattern to the end of perforation are completed within the next 10 seconds. If any of these timed functions are not completed within their allowable time intervals, the long time-out feature calls on the short time-out feature to seize the trouble recorder to take a trouble record. The master timing circuit then attempts to complete, under local control, the perforation of the blocked pattern.

1.17 If the trouble record is taken and perforation under local control is successful, and the recorder in trouble is not the last in the series, the master timing circuit advances to start perforation

of the 3:00 a.m. end-of-tape pattern on the tape of the next recorder in succession.

1.18 If the short time-out feature is also inoperative at this time, the auxiliary long time-out feature functions in 2 to 5 minutes (when E wiring option is used) to take a trouble record and attempt completion of the pattern under local control, or (when B wiring option is used) to make busy the master timing circuit and the recorder, release the connection between the master timing circuit and the recorder, and to light the lamps as described in 1.13.

1.19 When E wiring option is used and if the short time-out feature is inoperative when called upon by the auxiliary long time-out feature, the progression of the master timing circuit to control the perforation of the 3:00 a.m. end-of-tape patterns on the tapes of the next recorders in succession is blocked. The steadily lighted MTE or MTO and RCDR_ or R_ lamps, not accompanied by other lighted lamps at the trouble recorder, indicate this condition.

End-of-Tape Failure to Start

1.20 If a master timing circuit fails to start the perforation of the 3:00 a.m. end-of-tape patterns, the major alarm will sound, the master timing circuit will be automatically made busy, and the ETFE and CMBE (or ETFO and CMBO) lamps and aisle pilot lamp will light at the master timing frame for the master timing circuit in trouble. The control of perforation for the 3:00 a.m. end-of-tape patterns on the tapes of the readers normally served by the master timing circuit in trouble is transferred when this circuit is made busy; therefore, the master timing circuit not in trouble will control the perforation of the end-of-tape recordings on the tapes of all recorders. In this case, the recorders will be selected in succession starting at the highest odd-numbered recorder to the lowest odd-numbered recorder, the emergency recorder, and then the highest even-numbered recorder to the lowest even-numbered recorder.

Fuse Alarm

1.21 If a 48-volt fuse or a 130-volt fuse associated with either master timing circuit is operated, the major alarm will sound and the master timing circuit will be automatically made busy under control of the AR (alarm release) key on the master timing

frame. The FA or 20A lamp will light at the fuse panel on the OGT jack bay or miscellaneous relay rack and the CMBE or CMBO lamps will light at the master timing frame and the trouble recorder frame. When the operated fuse is removed, the ALE or ALO, or FGE or FGO lamp will light at the master timing frame to serve as a guard lamp indicating that the make-busy condition has not been released after replacement of an operated fuse.

Double Make-Busy Condition

1.22 If both master timing circuit make-busy keys are operated at the same time, the major alarm will sound, the CMBE, CMBO, and aisle pilot lamps will light at the master timing frame, and the CMBE and CMBO lamps will light at trouble recorder frame. The same alarm conditions will occur if one of the master timing circuits is automatically made busy because of a trouble condition such as a grounded perforator lead, and an attempt is made to make the other master timing circuit busy by the operation of its make-busy key.

Crossed or Grounded Perforator Leads

1.23 If false battery or ground on any of the perforator leads to the recorders, or false ground on any of the perforator leads within the master timing circuit is detected by the standing test feature in the master timing circuit, the master timing circuit seizes the trouble recorder to take a trouble record.

1.24 After the trouble record is taken, or a lost record indication is registered, the master timing circuit is automatically made busy under control of the AR key at the master timing frame. The CMBE or CMBO lamps will light at the master timing frame and trouble recorder frame.

Paper Take-Up Alarm

Refer to paragraph 1.04.

1.25 If the paper tape in an AMA perforator cabinet fails to be taken up properly on the storage reel, the major alarm will sound and the PTU_ and aisle pilot lamps will light at the master test frame. This alarm condition cannot be retired until the trouble in the perforator cabinet has been corrected.

Silencing and Restoring Alarms

1.26 The audible portion of timer synchronism, selector synchronism, and pulse failure alarms may be silenced by momentarily operating the ACO (alarm cutoff) key at the master timing frame.

1.27 Timer synchronism, selector synchronism, and pulse failure alarms may be restored by momentarily operating the AR key at the master timing frame. The controller portion of a master timing circuit that has been automatically made busy because of a time-out, fuse alarm, or perforator lead standing test alarm may also be restored by momentarily operating the AR key.

1.28 An option has been added to the master timing circuit which provides monitoring lamps for the timer output signals. These lamps permit observation of the relative positions of the TP and CH outputs when the positions must be known during synchronism. Offices equipped with the sync lamps will not require the use of the KS-16751 dry reed reader for timer observations.

1.29 A general outline for the maintenance procedures for a dual timing system is as follows:

- (a) Identify the alarm
- (b) Identify the circuit at fault as soon as possible
- (c) Transfer the circuit at fault to the standby mode
- (d) Attempt to synchronize the active timer and the faulty circuit and the timers and the counters and selectors of the master timing circuit
- (e) Either perform corrective maintenance or keep the faulty circuit in the standby mode for observation.

2. APPARATUS

2.01 The apparatus required for each type of alarm is shown in Table A. The details of items indicated by the number in parentheses are covered in the following paragraphs.

TABLE A

APPARATUS	ALARM PROCEDURE					
	A	B	C	D	E	H
322A (make-busy) Plugs	✓	✓	✓	✓	✓	—
KS-3008 Stopwatch, or equivalent	—	1	1	1	—	—
32A (Remote Control) Test Set	—	—	—	—	1	—
Red China Marking Pencil	—	—	—	—	1	—
KS-14343 Tape Reader	—	—	—	—	1	—
KS-16751 L1 Dry Reed Reader (2.02) Sync Lamps (1.28)	1	—	—	—	—	—
Cord (2.03)	2	—	—	—	—	—
Cord 2.04)	2	—	—	—	—	—

2.02 KS-16751 L1 dry reed reader (used to check synchronism of TE and TO motor timers) or synchronize lamps if provided (refer to paragraph 1.28).

2.03 Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord), one 607A tool, and one 419A tool (for use in establishing test connections to nonwire-spring-relay winding terminals from apparatus side of frame).

2.04 Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord), one 624A tool, and one 419A tool (for use in establishing test connections to wire-spring-relay winding terminals from apparatus side of frame).

3. METHOD

Note: Refer to paragraphs 1.05 through 1.29.

A Through D Alarms—Common Procedure

3.01 If, in response to a major alarm, lighted PF, TSF, SSF or a combination of PF, TSF, or SSF lamps are found at the master timing circuit (MTC), momentarily operate the alarm cut-off (ACO) key to silence the audible alarm. If the audible alarm occurs again in the process of clearing the trouble, momentarily operate the ACO key.

3.02 The following procedures are based on the premise that all keys and lamps were normal when the alarm condition occurred and only one circuit problem exists. For identification purposes the section of the master timing circuit that is in control as indicated by the lighted ET or OT lamp is designated active master timing circuit (AMTC). The noncontrol section is designated standby (SMTC). Proceed as in Table B.

TABLE B

LAMP INDICATION AND ASSOCIATED PROCEDURES

LAMPS LIGHTED	PROCEED AS IN PRAGRAPH
PF Only	3.03
TSF Only	3.44
SSF Only	3.72
Combination of PF, TSF, or SSF	3.109

A. Pulse Failure Alarm

3.03 The pulse failure (PF) lamp is lighted and the major alarm is sounding. Momentarily operate the ACO key to silence the audible alarm.

3.04 Observe that the TP and CH lamps of the 4E timers are lighting or the cam assembly of the 4B timers are rotating to verify that alternating current (AC) is being applied and the timers are functioning. Perform corrective maintenance if the timers are not functioning before proceeding further.

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- 3.05** Operate the check lamp (CKL) key. Observe the time on the check lamp display for the active master timing circuit (AMTC).
- 3.06** Momentarily operate check lamp transfer (CLT) key. Observe the lamp display time for the SMTC. Repeat paragraphs 3.05 and 3.06 to determine if the AMTC and the SMTC are displaying the same time.
- 3.07** If the AMTC and SMTC time are the same, this indicates that an AC power interruption caused both AMTC and SMTC to stop pulsing for at least six seconds. Proceed as in paragraphs 3.10 through 3.12.
- 3.08** If the AMTC time lags the SMTC time, this indicates that the ECHA or OCHA relay of the AMTC failed to operate for at least six seconds.
- 3.09** If only the AMTC failed, record if the even or odd MTC was functioning as the AMTC.
- 3.10** Momentarily operate the alarm release (AR) key to extinguish the PF lamp and restore the CKL key. The PF lamp extinguished. Proceed to paragraph 3.11 or 3.12 as appropriate.

TSF and SSF Lamps Not Lighted

- 3.11** If it has been previously determined that a circuit failure caused the PF alarm, operate the timer transfer (TT) key to the appropriate position to cause the faulty circuit to function in the standby mode. Perform corrective maintenance, if necessary and proceed to check for correct time indication as in paragraphs 3.13 through 3.18.

TSF or SSF Lamps Lighted

- 3.12** Assume that the PF alarm condition caused the TSF or SSF alarm and proceed to TSF sync procedure in paragraphs 3.54 through 3.71 or the SSF lighted lamp procedure in paragraphs 3.77 through 3.82.

Check For Correct Time Indication

- 3.13** At the MTC operate the CLK key and check that the month, day, and hour are correctly indicated by the lighted M_, DT_, DU_, HT_, and HU_ check lamps.

- 3.14** To check the H, T, and ST selectors, and the UA-UD counter relays, of the AMTC in comparison with the **actual** precise correct time, proceed as in paragraphs 3.15 through 3.17.

- 3.15** Check precise time source per local procedures and start the KS-3008 or equivalent stopwatch precisely at the beginning of any minute and record the time.

- 3.16** At the MTC, with the CKL key operated and when the U_ check lamp has just extinguished, stop timing and record the time indicated by the H_, T_, ST_, and U_ check lamps. Check that the sum of the elapsed time on the stopwatch agrees within 12 seconds (± 0.2 minute) of the time displayed on the H, T, ST, and U check lamps at the instant the stopwatch was stopped.

- 3.17** If the time is correctly indicated within the 12 seconds (± 0.2 minute), operate the AR key and restore the CKL key. The PF lamp is extinguished.

- 3.18** If the time indicated is incorrect by more than 12 seconds (± 0.2 minute), reset the selectors as in paragraphs 3.19 through 3.44.

Setting Selectors To the Correct Time

Note: If a PF, TSF, or SSF alarm exists the alarm should be retired before proceeding.

- 3.19** Operate the CKL key and determine if the even or odd circuit is functioning as the active MTC by observing if the ET or OT lamp is lighted. Momentarily operate the CLT key and observe which selectors of the standby MTC require resetting.

- 3.20** Operate the CMBE, O key associated with the SMTC. The CMBE, O lamp lighted.

- 3.21** Operate the MSE, O key associated with the SMTC to the STP (stop) position. The TSF and OSE, O lamp lights and the major alarm sounds.

- 3.22** Momentarily operate the ACO key to silence the alarm.

- 3.23** With the **4B** type timer in use, grasp the hub of the stopped timer and manually turn the camshaft very slowly in the direction in which

it normally rotates until the CH timing mark is centered beneath the CH cam follower.

Note: Refer to Fig. 1.

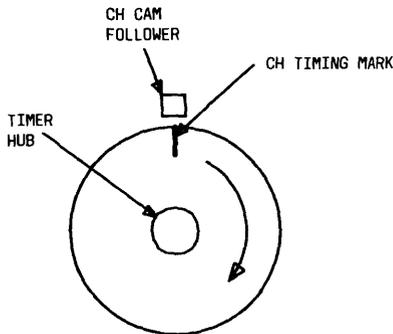


Fig. 1

With the 4E type timer in use, no action is required.

Note: After resetting any of the SMTC selectors the SSF lamp will light and the major alarm will sound. Momentarily operate the ACO key to silence the alarm.

3.24 Observe the lighted U₋ and ST₋ check lamps with the CLT key operated. Operate and release the PE/PO relay until the U9 lamp is lighted, and operate and release the STH relay until the ST5 lamp is lighted.

3.25 Observe the lighted T₋ and H₋ check lamps with the CLT key operated. Operate and release the TH and HH relays until the displayed minutes count is in advance of the actual minutes enough time to allow resetting of the rest of the SMTC selectors.

3.26 Observe the lighted HU₋ and HT₋ check lamps with the CLT key operated. If these lamps do not correctly indicate the hour units and the hour tens, step the HU or HT selector by manually operating and releasing the HUH or HTH

relay until the lighted HU₋ and HT₋ check lamps indicate the correct hour.

3.27 Observe the lighted DU₋ and DT₋ check lamps with the CLT key operated. If these lamps do not correctly indicate the day units and day tens step the DU or DT selector by manually operating and releasing the DH or DTH relay until the selector is in the proper position for the day. The DT selector must be in position 1, 2, 3, or 4 to light the day check lamps.

3.28 Observe the lighted M₋ check lamp with the CLT key operated. If this lamp does not correctly indicate the month, step the M selector by manually operating and releasing the MOH relay until the lighted M₋ check lamp indicates the correct month.

3.29 Operate the CLT key and check that the correct month, day, and hour is displayed on the check lamps. Also note the minutes displayed on the check lamps. When the actual minutes and displayed minutes are the same, prepare to start the SMTC. During the 59th second of that minute operate the MSE, O key associated with the SMTC from the STP (stop) to the R (run) position. Restore the CMBE, O key associated with the SMTC.

3.30 Operate the TT key to the opposite position to cause the SMTC with the correct time to now function as the AMTC. The ET, OT lamps will indicate timer transfer. The OS (out-of-sync) lamps associated with all recorders and the now SMTC will light.

3.31 Operate the CMBE, O key associated with the newly designated SMTC. The CMBE, O lamp will light.

3.32 Operate the MSE, O key to the STP position for the timer now off line.

3.33 4B Timer—Grasp the hub of the stopped timer and manually turn the camshaft very slowly in the direction in which it normally rotates until the CH timing mark is centered under the CH cam follower.

Note: Refer to Fig. 1.

3.34 4E Timer—no action is required except to allow 20 seconds for the electronic timer to automatically recycle to the starting position.

3.35 At any time except when the ST0 or ST5 check lamp is lighted, operate the MSE, O key of the SMTC to the ST position. Within 1 minute the timer will start, then operate the MSE, O key to the R position.

3.36 Momentarily operate the S key. The SE, O (sync to) lamp will be lighted while the standby master timing circuit selectors and counters are stepping to the synchronized position.

3.37 Restore the CMBE, O key for the SMTC and momentarily operate the AR key to extinguish the TSF lamp.

3.38 Make a final check for correct check lamp time indications with the CLT key operated and released.

3.39 At the master test frame insert a make-busy plug into the MB jack of the emergency recorder. Observe the MTE or MTO lamp which lights when the make-busy pattern is applied on the recorder tape. When this lamp remains extinguished, the make-busy pattern has been applied on the recorder tape.

3.40 Momentarily operate the S key to synchronize the selectors of the master timing circuit with the emergency recorder. The SO or SE lamp will be lighted while the selectors and counters are stepping to the synchronized position. The OS_ lamp will be extinguished when the selectors are synchronized.

3.41 Remove the make-busy plug from the MB jack of the emergency recorder and insert the plug into MB jack of next recorder. Operate S key to synchronize selectors of master timer with selectors of the recorder. Repeat this operation for each recorder until all recorder selectors are in synchronism with the master timing circuits.

3.42 Momentarily operate the AR key to extinguish the SSF lamp.

3.43 Restore the CKL key. If the reliability of the even or odd master timing circuit is in doubt, the TT key should be operated to the

appropriate position to cause that circuit to function in the standby mode.

B. Timer Synchronism Failure Alarm

Note: Refer to paragraph 1.04.

TSF (Timer Sync Failure) Lamp Lighted

Note: Refer to paragraph 1.06.

3.44 Momentarily operate the ACO key to silence the audible alarm. To identify TSF No. 1 or TSF No. 2 alarm, operate the CKL key and then momentarily operate the AR key at any time except the 59th second. If the TSF lamp remains lighted, the TSF No. 1 alarm condition exists. If the TSF lamp extinguishes and then relights during the 59th second, the TSF No. 2 alarm condition exists.

TSF No. 1 Alarm Condition

3.45 With the CKL key operated, observe the time on the check lamp display for the AMTC.

3.46 Momentarily operate CLT key, observe the time of the SMTC. Repeat paragraph 3.45 and 3.46 procedures to determine if the active (AMTC) and standby (SMTC) are displaying the same time.

3.47 If the time of AMTC and SMTC differ by one second or more, the timing circuit associated with the lagging time should be considered as the cause of the TSF No. 1 alarm.

3.48 If the time of the AMTC and SMTC are the same, the PE, ECHA, and PO, OCHA relays may differ by less than one second. Observe by comparing PE and PO, and ECHA and OCHA relays as to which relays lag in operating and caused the TSF No. 1 alarm (see paragraph 1.28).

3.49 Record which timing circuit caused the TSF No. 1 alarm. Release the CKL key and proceed to TSF sync procedure in paragraphs 3.54 through 3.71.

TSF No. 2 Alarm Condition

- 3.50** Operate the CKL key, determine if the E, OCHA relay of the AMTC operates during the 59th second.
- 3.51** Momentarily depress the CLT key, determine if the E, OCHA relay of the SMTC operates during the 59th second.
- 3.52** Release the CLT key, whichever relay is **not** operated during the 59th second is associated with the circuit that caused the TSF No. 2 alarm.
- 3.53** Release the CKL key and proceed to the TSF synchronization procedure in paragraphs 3.54 through 3.71.

TSF Synchronization Procedure

- 3.54** Operate the CKL key, observe that the ET or OT lamp is lighted for the AMTC in service.
- 3.55** Operate the CMBE, O key for the SMTC.
- 3.56** Operate the MSE, O key to the STP position for the timer now off-line.
- 3.57** **4B Timer**—Grasp the hub of the stopped timer and manually turn the camshaft very slowly in the direction in which it normally rotates until the CH timing mark is centered under the CH cam follower.

Note: Refer to Fig. 1.

- 3.58** **4E Timer**—No action is required except to allow 20 seconds for the electronic timer to automatically recycle to the starting position.
- 3.59** At any time except when the ST0 or ST5 lamp is lighted, operate the MSE, O key of the standby timer to the ST (start) position, verify that the standby timer starts within one minute by observing the pulsing TP and CH lamps of the 4E timer, or the rotating cam assembly of the 4B timer.
- 3.60** Note that the standby timer has started properly by verifying that the CH cam assembly on the 4B timer or the CH lamp on the

4E timer initially operate during the 59th second on the display lamps.

- 3.61** Operate the MSE, O key for the SMTC in the run (R) position.
- 3.62** Momentarily operate the sync (S) key. The SE, O (sync-to) lamp of the AMTC will light as the selectors of the SMTC step to the sync position. SE, O lamp extinguishes.
- 3.63** Restore the SMTC CMBE, O key. CMBE, O lamps extinguished.
- 3.64** Momentarily operate the AR key. If the TSF lamp **does not** relight within one minute, proceed to paragraph 3.65. If the TSF lamp relights, proceed to paragraph 3.66.
- 3.65** Restore the CKL key and proceed to paragraph 3.70 or 3.71 as appropriate.
- 3.66** Since the selectors of the AMTC and the SMTC have been previously synchronized and the SMTC has been restarted to cause the associated CH pulse to operate during the 59th second, the only remaining cause of the TSF alarm should be that the CH pulse of the AMTC **does not** occur during the 59th second. To correct this condition, block the CSY relay operated.
- 3.67** Operate the TT key to the opposite position, to cause the active timer to now become the standby timer.
- 3.68** After the ET and OT lamps indicate that control has been transferred, remove the blocking tool from the CSY relay.
- 3.69** Repeat paragraphs 3.54 through 3.68 for the newly designated SMTC to cause the CH pulse to occur during the 59th second and retire the TSF alarm.
- 3.70** SSF lamp not lighted. If it has been previously determined which circuit caused the TSF alarm and the faulty circuit is in the active mode, operate the TT key to the appropriate position to cause the faulty circuit to function as the standby. Perform corrective maintenance if necessary and proceed to the checking-for-correct time-indication section.

3.71 SSF lamp lighted. Assume that the timer sync failure condition caused the SSF alarm and proceed to the SSF-lamp-lighted section.

C. Selector Synchronization Failure Alarm

Note: Refer to paragraph 1.04.

SSF First and Second Parts

3.72 During the SS check, the positions of the counters and selectors of the AMTC are compared with the corresponding counter and selectors of the SMTC and recorders.

3.73 If a counter or selector of the SMTC or recorders is not synchronized with the AMTC, a major alarm is sounded and the SSF lamp will light at the MTC. Momentarily operate the ACO key to silence the audible alarm.

3.74 The two part sync check consists of first, comparing the position of the counters and selectors, and then reading the results of that comparison.

SSF First Part

3.75 A ground is applied through the counters and selectors of the AMTC to the corresponding counters and selectors of the SMTC and recorders. If the counters and selectors of the SMTC and recorders are properly synchronized, the respective sync check relays will operate during the 59th second when the ECHA and OCHA relays of the AMTC are operated.

SSF Second Part

3.76 During the 2nd second a check is made to verify that the sync check relays of the SMTC and recorders have operated from the first part of the SSF check. If any sync check relay failed to operate, the associated counter or selector is considered to be out-of-sync with the corresponding counter or selector of the AMTC and an SSF lamp will light and the major alarm will sound. Momentarily operate ACO key to silence the alarm. A manual version of the recorder selector sync check occurs when the CKL key is operated. Again if any recorder sync check relay failed to operate, the OS_ lamp associated with the out-of-sync recorder will light immediately.

SSF Lamp Lighted

3.77 If the SSF lamp is lighted, one or more recorders or the SMTC selectors are out-of-sync with the AMTC selectors. Operate the CKL key and observe which OS_ lamps are lighted. *Note:* If in the following tests two or more selectors of a particular circuit are out of sync, it is probably due to the progressive advancing structure of the counter and selectors. In this case the out-of-sync counter or selector that counts the smallest denomination of time is probably at fault. Proceed as indicated in Table C.

3.78 One recorder has an OS_ lamp lighted. Locate the recorder and determine which sync check relay (U, T, H) is not operated. This indicates that the associated counter or selector has failed to remain synchronized with the corresponding counter or selector of the AMTC. Record the faulty recorder and counter or selector and release the CKL key. Refer to SSF synchronization procedure, one recorder out-of-sync, paragraphs 3.83 through 3.95.

3.79 If only the OSE (O) lamp associated with the SMTC is lighted, the counters and selectors of the AMTC and recorders are synchronized while a counter or selector of the SMTC is out-of-sync. This indication can be caused by a fault in either the AMTC or SMTC. If a counter or selector of the SMTC fails to advance, the OSE (O) lamp associated with the SMTC will light. However, if the pulsing relays of the AMTC fail to operate, the counters and selectors of the AMTC and the recorders will not advance, yet remain synchronized. The SMTC will continue to advance normally, but will be out-of-sync with the AMTC. If it has been previously determined which circuit caused the SMTC to indicate an out-of-sync condition, proceed to the SSF synchronization procedure, SMTC out-of-sync, paragraphs 3.96 through 3.101, otherwise proceed as follows.

3.80 The following procedure is useful in determining which circuit caused the SMTC SSF alarm.

3.81 Observe the count on the lamp display for the AMTC. Depress the CLT key and observe the count for the SMTC. Repeat this procedure to determine which lamp and therefore which counter or selector is lagging in the count. Record which selector of the AMTC or SMTC failed and restore

the CKL key. Proceed to SSF synchronization procedure, SMTC out-of-sync, paragraphs 3.96 through 3.101.

3.82 If a counter or selector of the AMTC fails to advance, both the counters and selectors of the SMTC and all recorders will still advance normally. When the sync check is made through the AMTC counters and selectors, all recorders and the SMTC will indicate an out-of-sync condition. However, a counter or selector of the AMTC is at fault. To determine which counter or selector is at fault, observe the count on the lamp display for the AMTC. Momentarily depress the CLT key while observing the count for the SMTC. Repeat this procedure to determine which lamp and associated counter or selector of the AMTC is lagging. Record which counter or selector of the AMTC has failed to advance. Restore the CKL key and proceed to the SSF synchronization procedure, all recorders and SMTC out-of-sync, paragraphs 3.102 through 3.108.

SSF Synchronization Procedure

Recorder Out-of-Sync

3.83 Operate the CKL key.

3.84 If there is a make-busy plug in any recorder TN jack at the master test frame (MTF), and that transferred recorder OS_ lamp is lighted, momentarily operate the S key to synchronize the transferred recorder. The SE (O) lamp will be lighted while the recorder selectors are stepping to the synchronized position, followed by the transferred recorder OS_ and the SE (O) lamps extinguishing.

3.85 Determine if it is possible to restore the transferred recorder to service and, if so, remove the MB plug from the TN_ jack to make the emergency recorder available.

3.86 If the emergency recorder OS_ lamp is lighted, insert a MB plug into the MB jack of the emergency recorder.

3.87 Momentarily operate the S key.

3.88 The SE (O) lamp will be lighted as the emergency recorder selectors are stepping to the synchronized position, followed by the

extinguishing of the SE (O) and emergency recorder OS_ lamps.

3.89 Remove the MB plug from the emergency recorder MB jack.

3.90 If the emergency recorder is available, insert a MB plug into the recorder TN jack of one of the regular recorders which has an OS_ lamp lighted.

3.91 If the emergency recorder is not available, insert the MB plug into the recorder MB jack of the out-of-sync recorder.

3.92 Momentarily operate the S key to sync the recorder selectors, followed by the extinguishing of the OS and SE (O) lamps. Remove the MB plug from the MB or TN jack of the recorder.

3.93 Repeat paragraphs 3.90 through 3.92 for any other recorder(s) that has a lighted OS_ lamp.

3.94 If a faulty recorder has been identified and the emergency recorder is available, insert a MB plug into the TN jack of the faulty recorder. Perform corrective maintenance and repeat paragraphs 3.90 through 3.92 to return the recorder to service.

3.95 Momentarily operate AR key to retire the SSF alarm and restore the CKL key.

Standby MTC (SMTC) Out-of-Sync

3.96 Operate the CKL key.

3.97 Operate the CMBE (O) key of the SMTC.

3.98 Momentarily operate the S key. The SE (O) lamp of the AMTC will be lighted while the SMTC selectors are stepping to the sync position, followed by the extinguishing of the OSE (O) and SE (O) lamps when the selectors are synchronized.

3.99 If it has been previously determined which circuit caused the SMTC out-of-sync condition, operate the TT key to the correct position to cause the faulty MTC to operate in the standby mode.

3.100 Momentarily operate the AR key to extinguish the SSF lamp.

3.101 Perform corrective maintenance, if necessary, and proceed to the check for correct time indication, 3.13 through 3.18.

All Recorders and SMTC Out-of-Sync

3.102 Operate the CKL key.

3.103 Operate the TT key to the correct position to cause the faulty AMTC to be transferred to the standby position.

3.104 The recorders OS_ lamps and the OSE, O lamp associated with the now AMTC should extinguish. The OSE, O lamp associated with the now SMTC should light.

3.105 Operate the CMBE, O key associated with the SMTC. CMBE, O lamp lighted.

3.106 Momentarily operate the S key to step the standby selectors to the sync position.

3.107 Restore the CMBE, O key to normal. CMBE, O lamp extinguishes. Momentarily operate the AR key to extinguish the SSF lamp.

3.108 Perform corrective maintenance on the SMTC (if necessary) and proceed to the check for correct time indications, paragraphs 3.13 through 3.18.

D. Combination of Timer Synchronism Failure, Selector Synchronism Failure, And Pulse Failure Alarms

Note: Refer to paragraph 1.04.

3.109 Every section of the pulsing master timing circuit (MTC) depends upon the previous section to supply pulses from the division of the AC signal by the 4E (4B) timer to the advancing of the recorder selectors. The alarm circuitry checks at various points along the pulsing arrangement to verify that the sequential counting of pulses proceeds without interruption.

3.110 Due to the relationship of the counting and alarm arrangements, it is possible for a counting interruption early in the pulsing arrangement to cause multiple alarm indications.

3.111 The general rule to follow for handling multiple alarm indications is to identify the faulty circuit according to the alarm indication

that occurs first in the pulsing arrangement (PF lamp lighted first, TSF lamp lighted second, and SSF lamp lighted third).

3.112 Therefore, the BSP format has been written so that once the faulty MTC has been identified, the user will be directed to the appropriate sync procedure to retire the multiple alarm indications. The only exception to this routine is if a TSF, SSF, SMTC OSE (O), and all recorder OS lamps are lighted, then the user should ignore the TSF lamp and proceed to the SSF lamp lighted section first, paragraphs 3.77 through 3.82.

E. End-of-Tape Failures

3.113 If, in response to an alarm, lighted lamps indicating an end-of-tape failure as shown in Table D are found, proceed as the paragraphs indicate for the line corresponding to the lighted lamps.

Analysis of Trouble Indications

Indication 1

3.114 When using the trouble recorder, if the trouble record for the master timing circuit in trouble contains one of the A, B, D, E, SP, or ET indications, it indicates that the perforation of a recorder transfer, a make-busy, a window splice, or a 3:00 a.m. end-of-tape pattern was blocked. The master timing circuit then timed out after one of the short time-out intervals and the trouble record was taken. After the trouble record was taken, the perforation of the blocked pattern was completed by means of local control in the master timing circuit.

Indication 2

3.115 This trouble indication is the same as indication 1 except that the trouble record was lost.

Indication 3

3.116 This combination of lighted lamps indicates that the progression of a recorder transfer, make-busy, window splice, or 3:00 a.m. end-of-tape pattern was blocked, causing the master timing circuit after one of the short time-out intervals to time-out and call for a trouble record. However, after the trouble record was taken, the local control

feature of the master timing circuit was unable to complete the perforation of the blocked pattern. After a second short time-out interval, the master timing circuit and the associated recorder were automatically made busy, and then the connection between these circuits was released. If the blocked call is one of the 3:00 a.m. end-of-tape patterns, the tape of the recorder indicated on the trouble card contains an incomplete or mutilated end-of-tape pattern and the tapes of all lower numbered recorders normally served by the master timing circuit in trouble have no 3:00 a.m. end-of-tape pattern applied.

Indication 4

3.117 This combination of lighted lamps indicates trouble conditions similar to indication 3 except that the trouble record was lost.

Indication 5

3.118 This combination of lighted lamps indicates that shortly before the start of 3:00 a.m. end-of-tape operations, when an automatic check was made to determine if the master timing circuits were prepared to start the perforation of the 3:00 a.m. end-of-tape patterns, one of the master timing circuits was not prepared. Each master timing circuit checks its opposite circuit to determine whether their ET, ET1, and OC relays are operated as preparation for the start of the 3:00 a.m. end-of-tape entries. The master timing circuit in trouble was automatically made busy and the control of placing the end-of-tape entries on the tapes of all recorders was taken over by the other master timing circuit.

Indication 6

3.119 This indication is similar to indication 1 except that the recorder MTR lamp is also lighted. The master timing circuit blocked and timed out probably due to an open class lead (A, B, D, E, or SP), an open RK lead or failure to seize the recorder, or to crossed class leads (A, B, D, and E) while controlling a recorder transfer, make-busy, or window splice end-of-tape pattern. After a short time-out interval, a trouble record was taken and completion of the blocked pattern was made by means of the local control feature in the master timing circuit. The recorder was then automatically made busy and the connection between

the master timing circuit and the recorder was released.

Indication 7

3.120 If a recorder frame MTR lamp only is found lighted and no trouble record is taken associated with this trouble, it indicates that the perforation of a recorder transfer or make-busy pattern was completed on the recorder tape and no difficulty was encountered until the recorder and master timing circuit started to release. At this time, the class relay (A, B, D1, or E) failed to release due to a false ground on its associated class lead or for some other reason, causing the recorder to be automatically made busy, and in turn releasing the connection between the master timing circuit and the recorder.

Indication 8

3.121 This combination of lighted lamps indicates that an end-of-tape failure occurred while perforating a recorder transfer pattern, a make-busy pattern, a window splice pattern, or if "B" wiring option is used in the master timing circuit, a 3:00 a.m. end-of-tape pattern. It also indicates that the short time-out feature of the master timing circuit was inoperative and therefore the master timing circuit was unable to make a trouble record and attempt to complete the blocked pattern by means of local control. The master timing circuit then functioned as follows.

(a) For a recorder transfer, make-busy, or window splice pattern failure, the long time-out feature in 18 to 30 seconds caused the master timing circuit and the recorder to be automatically made busy and the connection between these two circuits to be released.

(b) For a 3:00 a.m. end-of-tape failure when "B" wiring option is used in the master timing circuit, the auxiliary long time-out feature in 2 to 5 minutes caused the master timing circuit and the recorder to be automatically made busy and the connection between these circuits to be released. The progression of the start circuits is stopped for controlling the perforation of the 3:00 a.m. end-of-tape records for all lower numbered recorders that are next in succession, and no 3:00 a.m. end-of-tape record was placed on the tapes of these recorders.

Indication 9

3.122 This combination of lamps will be lighted only when the master timing circuit uses "E" wiring option and it indicates that a failure occurred while perforating a 3:00 a.m. end-of-tape pattern. It also indicates that the short time-out feature of the master timing circuit was inoperative and therefore the master timing circuit was unable to take a trouble record and attempt to complete the blocked pattern by means of local control. The master timing circuit and the recorder remain blocked at the state where function could not be completed due to trouble, thereby preventing the perforation of the 3:00 a.m. end-of-tape patterns on the tapes of the lower even-numbered or lower odd-numbered recorders next in succession.

Procedure for Indication 1

3.123 Refer to the trouble record to determine the type of entry involved and the progress of the call when it was blocked.

3.124 Proceed to the perforator cabinet of the recorder involved. Raise the perforator cover and, using a red china marking pencil, draw a single line across the top of the unperforated tape where it enters the perforator tape chute.

3.125 Make busy the trunks associated with the recorder in trouble.

Caution: *The removal from service of the trunks associated with a recorder may result in a shortage of available trunks or junctors for handling service calls.*

3.126 Clear the trouble and then check that an end-of-tape pattern of the type indicated by the trouble record may be applied without causing a trouble record to be taken or a display lost indication.

3.127 After clearing the trouble, insert a make-busy plug into the MB jack for the recorder in trouble and then insert a make-busy plug into the recorder TST jack for this recorder.

3.128 Insert the plug of a 32A test set into the R jack. Operate and release the white key button on the 32A test set. Observe that the RUT (recorder under test) lamp lights while a

diamond pattern and other test entries are being perforated on the tape, and is then extinguished. Again operate and release the white key button to place a second diamond pattern and test entries on the tape.

Note: The application of the diamond pattern and other test entries will sound the alarm and light the TRR and recorder display lost lamps at the trouble recorder.

3.129 Remove the plug from the recorder TST jack of the recorder and disconnect the 32A test set from the R jack. Remove the plug from the recorder MB jack.

3.130 At the perforator, open the cabinet door. Raise the reel clutch release arm and hook it over the catch provided for this purpose. Disengage the tape from the tape guides.

3.131 Using a red china marking pencil, mark a large X on the smooth side of the tape over the two diamond patterns, that is, the diamond pattern farthest from the perforator drum.

3.132 Find the horizontal red mark placed on the tape when the alarm was answered. If necessary, pull the reel forward away from the friction drive and pull back some slack in the tape. Examine the portion of the tape from the horizontal red mark and in the direction away from the perforator drum and note whether a series of splice entries appear approximately 2-1/2 inches from the horizontal red mark. If a series of splice entries is found, then using a red china marking pencil, mark a large X on the smooth side of the tape in the splice entry area. If a series of splice entries is not found, mark a large X on the smooth side of the tape so that the center of this X is 4-1/2 inches from the red mark in a direction away from the perforator drum.

3.133 Replace the tape in the tape guides. If necessary, push the reel back into the notches in the mounting plates and wind the tape back on the reel. Lower the reel clutch release arm.

3.134 Record on Form E-4104 the recorder number, the date, and the time, and a note that this tape was marked with two red X's to indicate to the accounting center that all entries between these X's should be skipped.

3.135 Restore to service all trunks, served by the recorder in trouble, that were removed from service.

Procedure for Indication 2

3.136 This trouble indication is similar to trouble indication 1 except that the trouble recorder was busy and therefore unable to take a record of this trouble.

3.137 Due to the absence of a trouble record, no direct action toward clearing this trouble can be taken. Make a record of the lighted display lost lamps in accordance with local instructions.

Procedure for Indication 3

3.138 At the master timing frame, momentarily operate the AR key to extinguish the CMBE, ETFE and TAE or CMBO, ETFO and TAO lamps.

3.139 At the recorder frame, momentarily operate the AR key to extinguish the MTR lamp.

3.140 Refer to the trouble record to determine the type of entry involved and the progress of the call when it was blocked.

3.141 When using the trouble recorder, if the trouble record indicates by an A, B, D, E, or SP indication that the type of entry was for a recorder transfer, make-busy, or window splice pattern, proceed as in paragraphs 3.124 through 3.135.

3.142 When using the trouble recorder, if the trouble record indicates by an ET indication, that at 3:00 a.m. an end-of-tape pattern was in progress, proceed as in paragraphs 3.143 through 3.155 which includes marking the tape of the recorder indicated by the trouble record and also the tapes of all lower odd-numbered or all lower even-numbered recorders depending upon whether the odd or the even master timing circuit is indicated on the trouble record.

3.143 Check whether both the even and odd master timing circuits are in control of the perforation of end-of-tape patterns to determine the progression of their application as follows.

- (a) If either the CMBE or CMBO key is operated, the master timing circuit associated with

the unoperated key is in control and the progression of the application of 3:00 a.m. end-of-tape patterns is from the highest odd-numbered recorder to the lowest odd-numbered recorder, the emergency recorder, and then the highest even-numbered recorder to the lowest even-numbered recorder.

- (b) If both the CMBE and CMBO keys are released, each master timing circuit controls the application of the 3:00 a.m. end-of-tape patterns on their respective highest even-numbered or highest odd-numbered recorder to their lowest even-numbered or lowest odd-numbered recorder.

3.144 From the trouble record, determine the recorder number for the call that failed. Then determine by the position of this recorder in the progression chain which lower numbered recorders do not have 3:00 a.m. end-of-tape patterns applied for the current day.

3.145 On the recorder indicated in the trouble record, proceed as in paragraphs 3.124 through 3.135 except that for paragraph 3.128 apply nine diamond patterns and test entries instead of two.

3.146 On one of the recorders on which the 3:00 a.m. end-of-tape record has not been perforated, proceed as in paragraphs 3.127 through 3.135 except that for paragraph 3.128 apply nine diamond patterns and test entries instead of two.

3.147 Repeat paragraph 3.146 for each of the remaining recorders on which the 3:00 a.m. end-of-tape records have not been perforated.

Procedure for Indication 4

3.148 Make a record of the lighted display lost lamps in accordance with local instructions.

3.149 At the master timing frame, momentarily operate the AR key to extinguish the CMBE, ETFE and TAE or CMBO, ETFO, and TAO lamps.

3.150 At the recorder frame, momentarily operate the AR key to extinguish the MTR lamp and silence the alarm.

3.151 If this alarm occurred between 3:00 a.m. and 3:30 a.m., proceed as in paragraphs 3.152 through 3.155, or if this alarm occurred at a time of the day that eliminates the probability of

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a 3:00 a.m. end-of-tape failure, proceed as in paragraphs 3.124 through 3.135.

3.152 At the perforator cabinet for the recorder indicated by the lighted display lost lamp, examine the perforated part of the tape to determine whether an end-of-tape pattern 6 to 8 feet long has been placed on the tape for the 3:00 a.m. end-of-tape entry.

3.153 If the alarm is not answered before 4:00 a.m. or later, the tape might have advanced to a point where the 3:00 a.m. end-of-tape pattern is on the take-up reel. To examine the tape in a case of the kind, raise the reel clutch release arm and hook it over the catch, pull the take-up reel forward away from the friction drive and pull back some slack in the tape. Then, using the KS-14343 tape reader, locate the 281003 (3:00 a.m. hour) entry. The 3:00 a.m. end-of-tape pattern, if present, will appear on the tape adjacent to the 3:00 a.m. hour entry on the side nearest the perforator drum. Push the reel back into the notches of the mounting bars, wind the tape back on the take-up reel, and lower the reel clutch release arm.

3.154 On the recorder indicated by the display lost lamp, proceed as in paragraphs 3.124 through 3.135 except that for paragraph 3.128 apply nine diamond patterns and test entries instead of two.

3.155 If a 3:00 a.m. end-of-tape failure is found in examination as in 3.152, the end-of-tape entries are probably missing on the tapes of all lower even-numbered or all lower odd-numbered recorders depending upon whether the even or the odd master timing circuit is involved. In this case, check these recorder tapes as in paragraphs 3.152 and 3.153 and, if end-of-tape entries are missing, mark these tapes as in paragraphs 3.146 and 3.147.

Procedure for Indication 5

3.156 Operate CMBE or CMBO key corresponding to the lighted CMBE or CMBO lamp. Momentarily operate the AR key. Observe that the ETFE or ETFO lamp is extinguished and the alarm is silenced.

Note: Do not attempt to clear the trouble until after the 3:00 a.m. end-of-tape entries

have been placed on the tapes of all recorders. This may require as much as 30 minutes.

3.157 When the trouble has been found and cleared, restore the CMBE or CMBO key.

Procedure for Indication 6

3.158 At the recorder frame, momentarily operate the AR key to extinguish the MTR lamp and silence the alarm.

3.159 Refer to the trouble record to determine the type of entry and the nature of the trouble as follows.

(a) When using the trouble recorder, if none of the A, B, D, E, or SP indications are present, the trouble is probably due to an open class lead between the recorder and the master timing circuit or to the failure of the A, B, D1, E, or SP relays to operate in the master timing circuit for any other reason. The operation of these relays by means of the corresponding class leads normally occurs during recorder transfer, recorder make-busy, or window splice operations.

(b) When using the trouble recorder, if one of the A, B, D, E, or SP indications is present and no indication appears in the A to F line, the trouble is probably due to failure to seize the recorder, or to an open RK lead between the recorder and the master timing circuit. The open RK lead fails to furnish a recorder seizure check. The A, B, D, E, or SP indications reflect the type of entry involved as follows.

PUNCH	TYPE OF ENTRY
A	Transfer from regular to emergency recorder in progress
B	Transfer from emergency to regular recorder in progress
D	Make-busy recorder in progress
E	Recorder returned to service from make-busy condition
SP	Window splice encountered

(c) If more than one of the A, B, D, E, or SP indications are present, the trouble is probably

due to crossed class leads except when the A and D indications or the B and E indications appear at the same time. When these indications appear at the same time, the trouble may be due to the failure to seize the recorder or to an open RK lead in the second stage of a recorder transfer.

3.160 Proceed as in paragraphs 3.124 through 3.135 to clear the trouble and mark the recorder tape.

Procedure for Indication 7

3.161 Proceed to the perforator cabinet of the recorder involved. Raise the perforator cover, and using a red china marking pencil, draw a single line across the top of the unperforated tape where it enters the perforator tape chute.

3.162 Proceed as in paragraph 3.125 to make busy trunk units associated with the recorder in trouble.

3.163 At the recorder frame, momentarily operate the AR key to extinguish the MTR lamp and silence the alarm.

3.164 If the recorder in trouble is an even-numbered recorder, operate the CMBE key, or if an odd-numbered recorder, operate the CMBO key.

3.165 If any of the A, B, D1, or E relays in the associated even or odd master timing circuits are found operated, they probably are the source of the trouble record.

3.166 If none of the A, B, D1, or E relays are found operated, check for the presence of a false ground on any of the class leads (AT, B, D, and E) from the recorder to the master timing circuit and the connections to these leads within the recorder.

3.167 After clearing the trouble, restore the CMBE or CMBO key.

3.168 If the trouble condition was found on the AT or B lead or the A or B relay, insert a make-busy plug into the TN jack for the recorder, or if the trouble condition was found on the D and E lead or the D1 or E relay, insert a make-busy plug into the MB jack for the recorder. Insert a

make-busy plug into the recorder TST jack for the recorder.

3.169 Proceed as in paragraphs 3.128 through 3.135 except that in paragraph 3.129 remove the plug from the recorder MB, TN jack.

Procedure for Indication 8

3.170 At the master timing frame, momentarily operate the AR key to extinguish the CMBE, ETFE and TAE or CMBO, ETFO, and TAO lamps.

3.171 At the recorder frame, momentarily operate the AR key to extinguish the MTR lamp and silence the alarm.

3.172 If this alarm occurred between 3:00 a.m. and 3:30 a.m., proceed as in paragraphs 3.173 through 3.176 or if this alarm occurred at a time of the day that eliminates the probability of a 3:00 a.m. end-of-tape failure, proceed as in paragraphs 3.177 through 3.182.

3.173 At the perforator cabinet for the recorder indicated by the lighted MTR lamp, examine the perforated part of the tape to determine whether an end-of-tape pattern 6 to 8 feet long has been placed on the tape for the 3:00 a.m. end-of-tape entry.

3.174 If the alarm is not answered before 4:00 a.m. or later, the tape might have advanced to a point where the 3:00 a.m. end-of-tape pattern is on the take-up reel. To examine the tape in a case of this kind, raise the reel clutch release arm and hook it over the catch, pull the take-up reel forward away from the friction drive and pull back some slack in the tape. Then, using the KS-14343 tape reader, locate the 281003 (3:00 a.m. hour) entry. The 3:00 a.m. end-of-tape pattern, if present, will appear on the tape adjacent to the 3:00 a.m. hour entry on the side nearest the perforator drum. Push the reel back into the notches of the mounting bars, wind the tape back on the take-up reel and lower the reel clutch release arm.

3.175 On the recorder indicated by the lighted MTR lamp, proceed as in paragraphs 3.124 through 3.135 except that for paragraph 3.128 apply nine diamond patterns and test entries instead of two.

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3.176 If a completion 3:00 a.m. end-of-tape pattern is not found in 3.173, the end-of-tape entries are probably missing on the tapes of all lower even-numbered or all lower odd-numbered recorders depending upon whether the even or the odd master timing circuit is involved. In this case, check these recorder tapes as in paragraphs 3.173 and 3.174 and, if necessary, mark these tapes as in paragraphs 3.145 through 3.146.

3.177 Proceed to the perforator cabinet for the recorder whose MTR lamp was lighted. Raise the perforator cover, and using a red china marking pencil, draw a single line across the top of the unperforated tape where it enters the perforated tape chute.

3.178 Make busy the trunks associated with the recorder in trouble.

Caution: *The removal from service of the trunks associated with a recorder may result in a shortage of available trunks or junctors for handling service calls.*

3.179 Operate the CMBE or CMBO key for the master timing circuit in trouble.

3.180 Clear the trouble affecting the short time-out feature of the master timing circuit.

3.181 Restore the CMBE or CMBO key.

3.182 Proceed as in paragraphs 3.127 through 3.135.

Procedure for Indication 9

3.183 At the master timing circuit indicated by the lighted MTE or MTO lamp, operate the TM6 relay which locks. Observe that the lamps now lighted correspond to the lighted lamps for indication 8 in Table D.

3.184 Proceed as for trouble indication 8 and as in paragraphs 3.170, 3.171, and 3.173 through 3.176.

F. Fuse Alarm

3.185 If, in response to a major alarm, lighted FAE and CMBE or FAO and CMBO lamps are found at the master timing frame, this indicates

that a 48 volt or +130 volt fuse has operated at the master timing frame fuse panel.

3.186 When the operated fuse is removed, the FAE or FAO lamp is extinguished, the FGE or FGO lamp is lighted and the audible alarm is silenced.

3.187 Replace the operated fuse. If the fuse again operates, find the cause of the short circuit, clear the trouble, then replace the fuse.

3.188 Momentarily operate the AR key to extinguish the FGE and CMBE or FGO and CMBO lamps.

G. Major Alarm Due to Double Make-Busy Conditions

3.189 If, in response to a major alarm, both the CMBE and CMBO lamps are found lighted, it indicates an attempt to make busy both master timing circuits at the same time. This make-busy attempt may be due to the operation of both the CMBE and CMBO keys, or to the operation of one of these keys before or after the automatic make-busy of a master timing circuit as a result of a crossed or grounded perforator lead, or because of a trouble causing a long time-out in the master timing circuit.

3.190 Check the positions of the CMBE and CMBO keys and then proceed as follows.

(a) If both keys are operated, check the MBE and MBO relays, then release the key associated with the relay that is not operated. Observe that the audible alarm is silenced.

(b) If only one key is operated, other lamp indications as described under alarm E or alarm H will indicate alarms causing master timing circuit automatic make-busy conditions. Restore the operated key and proceed as described for the alarm condition indicated. The audible alarm in these cases will be under control of the alarm features described under alarms E and H.

H. Crossed or Grounded Perforator Leads

Note: Refer to paragraph 1.04.

3.191 When using the trouble recorder, if a trouble record is taken with the XPL

indication recorded, it indicates that a crossed or grounded perforator lead has been detected by the standing test feature in the master timing circuit. The cross-detecting circuit causes the master timing circuit to be automatically made busy and lights the CMBE or CMBO lamps at the master timing frame and trouble recorder frame.

3.192 Check the trouble record to determine whether the perforator lead or leads in trouble are indicated by the MA_ through MF_ indications.

3.193 If the trouble record does not indicate the perforator lead or leads in trouble, determine whether a cross-detecting relay is operated in the associated master timing circuit as follows. Check the positions of the XPE and XPE1 relays or XPO and XPO1 relays in their respective even or odd master timing circuit. The XPE or XPO relay when operated indicates a false battery or false ground on one or more perforator leads between its associated master timing circuit and the associated group of even or odd recorders. The XPE1 or XPO1 relay when operated indicates a false ground on one or more perforator leads within the associated master timing circuit. However, if neither of the cross-detecting relays is found operated in the master timing circuit in trouble, the cross or ground is of a transient nature.

3.194 After clearing the trouble, momentarily operate the AR key at the master timing frame. Observe that the CMBE or CMBO lamp is extinguished.

1. Paper Take-Up and Jammed Paper Alarms

Note: Refer to paragraph 1.04.

3.195 If the major alarm sounds and a PTU_ (paper take-up) lamp lights at the master timing frame, the punched paper tape has probably

failed to accumulate properly on the take-up reel. The lamp indicates which perforator is in trouble and the alarm cannot be retired until the trouble is corrected.

3.196 The most frequently reported troubles have been take-up motor failures, take-up reel jams, snagging of the paper tape on the inside of the perforator cabinet, and jammed paper tape.

3.197 If in response to a major alarm, a lighted NP (no paper) lamp is observed at a recorder, it indicates that a torn paper tape, an end of a paper tape, or a jammed paper tape has been encountered. Momentarily operate the AR (alarm release) key at the recorder to retire the alarm. If the alarm is not retired after operating the AR key, a jammed paper condition may be assumed and a make-busy plug should be inserted in the MB jack, at the master test frame, jack, lamp, and key circuit, associated with the recorder in trouble.

3.198 Check the perforator cabinet to determine the trouble that has developed with the paper tape, or, any part of the paper winding mechanism. Clear the trouble in the approved manner and remove the make-busy plug from the MB jack at the master test frame jack, lamp, and key circuit.

3.199 When the trouble has been cleared and the paper tape starts winding on the storage reel, hand feed the tape to prevent snagging or tearing the paper tape. Be sure that the movable control arm is in position to be engaged by the advancing paper tape.

3.200 As the paper tape is wound on the storage reel, the control arm is moved upward. The movement of the control arm stops the take-up motor, and the microswitch contacts on the control arm retires the audible and visual alarms.

TABLE C

SELECTOR SYNCHRONISM FAILURE PROCEDURE

LIGHTED OS LAMPS ASSOCIATED WITH			PROCEED AS IN PARAGRAPH
RECORDER	STANDBY MASTER TIMING CIRCUIT	ALL RECORDERS	
X			3.77
	X		3.96
	X	X	3.102

TABLE D
END-OF-TAPE FAILURE INDICATIONS

TROUBLE INDICATION NUMBER	TROUBLE ANALYSIS IN PARAGRAPH	AT MASTER TIMING FRAME						AT TROUBLE RECORDER FRAME			AT RECORDER FRAME	PROCEED AS COVERED IN PARAGRAPHS
		ATE or TAO	ETFE or ETFO	CMBE or CMBO	CMBE or CMBO	MTE or MTO	R-	MASTER TIMER DISPLAY LOST (NOTE 1)	RECORDER DISPLAY LOST (NOTE 1)	TROUBLE RECORD REQUEST (NOTE 1)	MTR	
1	3.114								✓	✓		3.123 through 3.135
2	3.115							✓	✓	✓		3.136 and 3.137
3	3.116	✓	✓	✓	✓	✓	✓		✓	✓	✓	3.138 through 3.147
4	3.117	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	3.148 through 3.155
5	3.118		✓	✓	✓							3.156 and 3.157
6	3.119								✓	✓	✓	3.158 through 3.160
7	3.120										✓	3.161 through 3.169
8	3.121	✓	✓	✓	✓	✓	✓				✓	3.170 through 3.18 2
9	3.122					✓	✓					3.183 through 3.184
Note 1: These lamps have various designations as follows.								NO. 5 CROSSBAR OFFICES				
Master Timer Display Lost								DL-MTE or DL MTO				
Recorder Display Lost								DLR-				
Trouble Record Request								TRR				

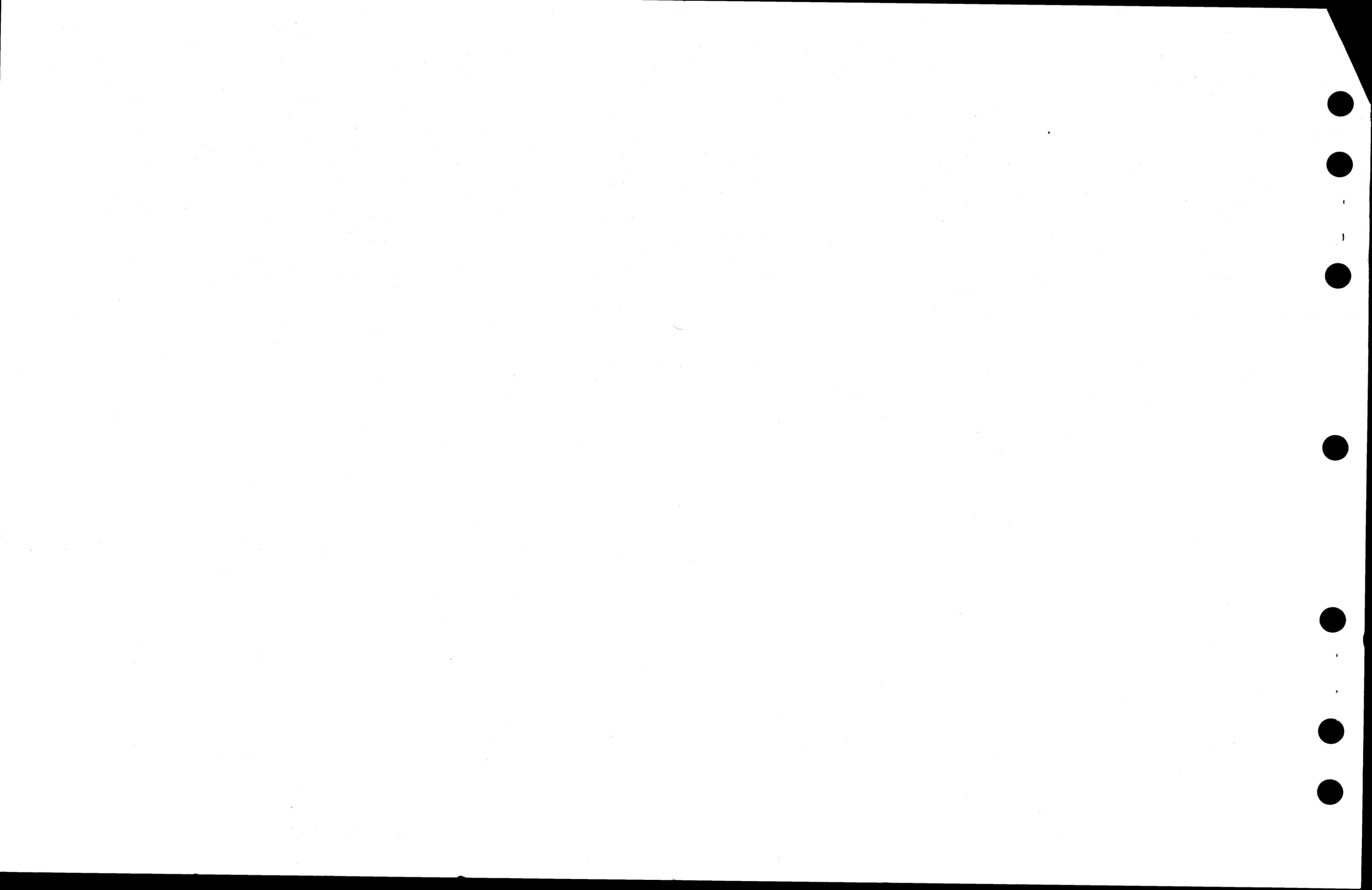


TABLE E

NO 5 XBAR OFFICE EQUIPPED WITH THE FOLLOWING FEATURES	TESTS TO BE PERFORMED									
	A	B	C	D	E	F	G	H	I	
ETS	✓					✓	✓			
LAMA-C	✓					✓	✓			
CAMA-C	✓					✓	✓			
BDT	✓					✓	✓			
LAMA to ANI Conversion	✓					✓	✓			
None of Above	✓	✓	✓	✓	✓	✓	✓	✓	✓	

