

## 83B3 TELETYPEWRITER SELECTIVE CALLING SYSTEM OVER-ALL TEST PROCEDURES

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### 1. GENERAL

1.01 This section covers the over-all test procedures for stations of the 83B3 selective calling system. These tests are intended to insure the proper operation of the system and are applicable to the following situations.

- (a) A complete system with all the stations installed and connected.
- (b) A partially installed system where the circuit is made good between the installed stations.
- (c) Individual stations. Section E12.776 (Long Lines, AT&TCo) indicates the test center procedures applicable in this case. There, the test center simulates the system equipment by sending the control codes from a keyboard.

1.02 The test procedures are based per standard 83B3 station arrangements as outlined in Section 581-100-103. In addition, the following is assumed.

- (a) The associated stunt box has been programmed with the CDC, TSC, etc, assigned to the station under test.
- (b) The procedures are on an out-of-service basis; that is, the station is terminated in a closed loop or line.
- (c) For the measuring of signal distortion of generated V character, it is assumed that the station being tested is on a loop to a test center and that at the test center this station is patched off from the rest of the system and terminated in a dummy loop. A monitoring teletypewriter may be provided in the loop at the test center. The distortion may be measured at the test center. However, it may also be measured at the station if suitable equipment, such as the 164C4 or equivalent telegraph transmission measuring set, is available there.
- (d) The individual circuit units and teletypewriter units have been previously tested on an individual basis and these procedures will apply when all equipment is assembled with all interconnection cords in place.

1.03 The tests on automatic cross office equipment are based on the loop-back connection as illustrated in Fig. 2A.

### 2. GLOSSARY OF TERMS AND ABBREVIATIONS

2.01 The terms and abbreviations used herein are:

- LS **Local Station:** This identifies the station under test.
- CDC **LS Code:** The 2-letter call directing code assigned to the LS.
- AY&BY **Cross-Office Codes:** The connect codes assigned to connect the right and left RTs.

- TSC **Transmitter-Start:** The 2-letter transmitter start code assigned to start the LS transmitter.
- TS-A&B **RT Transmitter Start:** The TSCs assigned to start the right and left cross-office RTs.
- V-AB **V Answer-Back:** The V that is generated when the station is connected.
- V-NTR **V No-Tape Response:** The V that is generated when the TSC is received and no tape is waiting to be sent.

**3. PRELIMINARY AND GENERAL PROCEDURES**

**Test Message**

**3.01** The test message refers to a prepunched tape or the sequence of characters typed on the test keyboard machine. Unless otherwise specified, the sequence should always be as follows.

- (1) Several LTRS characters.
- (2) The CDCs specified. Each CDC, whether punched in a tape or sent from the KSR, should be followed by one LTRS character.
- (3) The end-of-address code (EOA) CR-LF-LTRS should follow the last CDC.
- (4) The message text. This should preferably be a graphic description of the particular test tape.
- (5) The end-of-message code (EOM). This should be FIGS-H-LTRS.
- (6) When punched in a tape, at least ten LTRS characters should follow the EOM.

**Alarms Line Select, Nonselect**

**3.02** At the conclusion of each test, the transmitting or other alarm may operate as the result of an idle line time out. These alarms should always be restored by operation of the AR keys before proceeding.

**3.03** At the conclusion of each particular test sequence (or in the event of a test failure), the line may be left in a nonselect condition; therefore, it is suggested that the EOM code be sent from the keyboard prior to the start of each test sequence. When the transmitter start circuit is used, this will always be generated by the idle line time out or when polling is started.

**Programed Codes and Options**

**3.04** The CDCs, TSC, polling pattern, push-button key assignments, and other special codes programed for the station under test should be recorded.

**4. STATION CONTROL CIRCUIT FOR 28ASR OR 28KSR STATION**

**4.01** The transmitter start circuit may be used to send the local station TSC when provided with the station under test or when the tests are being performed on a system basis. The keyboard machine at the test center is required for individual station tests for the sending of all signals necessary for performing the tests.

**4.02** If the transmitter start circuit is used for the sending of TSCs, operate SP key to stop polling and operate all skip keys except for this station. If station is equipped with the push-button calling circuit, operate the CT L key.

**Operation of Station Transmitter (28ASR station)**

**4.03 Preliminary:** Prepare a test tape as described in 3.01.

**ACTION**

- (1) Release SP key to send TSC or have TSC sent from keyboard at test center.
- (2) With SP key released, TSC will be sent several times or have TSC sent several times from keyboard at test center.

**VERIFICATION**

With no tape in transmitter —  
V-NTR signal should be returned.

With TMS in series with local loop —  
Adjust VG potentiometer until a "V" is returned after each TSC and the distortion is less than 6 percent.

**ACTION****VERIFICATION**

- |  |  |
|--|--|
| (3) Stop polling.  |  |
| (4) Insert tape in transmitter and operate control lever of 28ASR to RUN position. | BID lamp should light.   |
| (5) Poll station as in (1):  |  |
| (a) Where station is arranged to send after receipt of first TSC —                 | Transmitter should start.<br>After LTRS character that follows first CDC is sent —<br>Transmitter stops and waits for V answer-back. 28ASR makes home copy of outgoing transmission.   |
| (b) Where station is arranged to send after receipt of second TSC —                | Station responds with "V."   |
| (c) Send TSC second time.  | Same as in 5(a).   |
| (6) V answer-back is sent from called station or from test center.                 | Next CDC should be sent and transmitter stops. Check to insure that LTRS character is fully transmitted after each CDC. This process is repeated for each CDC in the tape.<br>If an RT CDC is used which contains the character "Y" as second letter —<br>V answer-back should be received after transmission of the RT CDC, but transmission will proceed without awaiting an answer-back from subsequent CDCs. |
| (7) EOA is sent from tape.   | Transmitter should start and message text is sent without stopping.  |
| (8) EOM is sent from tape.   | Transmitter stops.<br>Station is disconnected.   |

**Transmitting Alarms**

- 4.04** The transmitting alarm marks an incomplete transmission. This will occur when sending is stopped by a line break, receipt of the double blank, or when tape tears. When in service, the control office will time-out in 3.5 seconds and send FIGS-H-LTRS M.
- 4.05** *Preliminary:* Prepare a test tape having a double blank in addition to the format described in 3.01. The blank characters should appear in the text of the message.

**ACTION****VERIFICATION**

- |  |  |
|--|--|
| (1) Place tape in TD.  | BID lamp should light.   |
| (2) Send TSC as described in 4.03(1).  | Tape should start, LS station should connect, and text should be received. |
| (3) When the double blank is reached —   | Tape stops.<br>AL lamp lights (leave tape in TD).                          |
| (4) EOM and TSC are sent from transmitter start circuit or have EOM and TSC sent from keyboard at test center. | V-NTR signal should be returned.   |

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<b>ACTION</b>	<b>VERIFICATION</b>
(5) Without restoring the alarm, remove the tape.	BID lamp should go out.
(6) With tape torn at edge that slides over the sixth pin, make a new send bid and then send TSC as described in 4.03(1). (Tear should appear before the double-blank characters.)	V-NTR signal is sent.
(7) Operate AR key.	AL lamp should extinguish.
(8) Send the TSC as described in 4.03(1).	Test message should be released.
(9) When tear in tape is over sixth pin — Pin should come up through the torn tape.	Tape stops. AL lamp lights.
(10) Repeat (4).	V-NTR signal is sent.
(11) Restore alarm.	

**Single-Message Tape Option**

**4.06** When the station is arranged with this option, the transmitting alarm will operate each time that the EOM code is sent. This prevents release of the LTRS in trailing end of tapes. When furnished with the pushbutton calling circuit, this feature is provided when the CT L key is in the non-operated position.

**4.07 Preliminary:** Prepare tape containing format as described in 3.01.

<b>ACTION</b>	<b>VERIFICATION</b>
(1) Place tape in TD.	BID lamp lights.
(2) Send TSC as described in 4.03(1).	Tape should start and message should be sent as described in 4.03.
(3) When EOM is sent —	Tape should stop and AL lamp should light.
(4) Repeat (2).	V-NTR signal should be returned. LTRS in the trailing end of tape should not be sent.
(5) Operate AR key and repeat (2).	LTRS in the trailing end of tape should be sent and stopped on the end of tape.
(6) EOM is sent from transmitter start circuit or from keyboard at test center.	AL lamp should light. Restore alarm.

**Station Connect**

**4.08** This tests the ability of the station to connect and return the V-AB on its assigned CDC.

<b>ACTION</b>	<b>VERIFICATION</b>
(1) Have the local station CDC followed by an LTRS character sent.	V answer-back should be returned. Station should connect and print the "V."
(2) Have the EOA sent and repeat (1).	CDC should print and V-AB should not be returned.

ACTION	VERIFICATION
(3) Have text sent.	Text should print.
(4) Have EOM sent.	Station should disconnect.

**4.09 28KSR Station**

ACTION	VERIFICATION
(1) Operate KS key.	BID lamp lights.
(2) Arrange to have station polled as in 4.03(1).	Buzzer sounds. AL lamp lights. BID lamp is extinguished.
(a) Sending after receipt of first TSC: Operate AR key.	Buzzer is silenced. AL lamp is extinguished.

**Note:** If keyboard sending is not started within 20 seconds, the transmitter start circuit, if used in testing, will time-out and send FIGS-H-LTRS M, causing an alarm condition.

Send text from keyboard at local station.	Station prints local copy.
Send EOM from keyboard at local station.	Buzzer sounds. AL lamp lights. Station disconnects.
(b) Sending after receipt of second TSC: Receive first TSC.	Station responds with "V".
Receive second TSC.	Same as described in (a).

**(3) Station Connect**

**Note:** The action of a 28KSR station in responding to its CDC is as described in 4.08.

**5. STATION CONTROL CIRCUIT FOR 28RO STATION**

**5.01** The transmitter start circuit may be used to send the local station TSC when provided with the station under test or when the tests are being performed on a system basis. The keyboard machine at the test center is required for individual station tests for the sending of all signals necessary for performing the tests.

**5.02 Station Connect**

ACTION	VERIFICATION
(1) Have local station CDC, followed by an LTRS character, sent.	V answer-back should be returned. Station should connect and print the "V."
(2) Have EOM and then CDC, followed by LTRS, sent. (Repeat sequence several times.)	With TMS in series with local loop — Adjust VG potentiometer until a "V" is returned after each CDC, followed by an LTRS character, and the distortion is less than 6 percent.
(3) Repeat (1).	Same as in (1).
(4) Have EOA sent and repeat (1).	CDC should print and V answer-back should not be returned.
(5) Have text sent.	Text should print.
(6) Have EOM sent.	Station should disconnect.

**6. INTERCONNECTING CONTROL CIRCUIT**

- 6.01 The transmitter start circuit may be used to send the local station TSC when provided with the station under test or when the tests are being performed on a system basis. The keyboard machine at the test center is required for individual station tests for the sending of all signals necessary for performing the tests.
- 6.02 This equipment provides:
  - (a) Features that are required at cross-office points for 2- or 3-line automatic or manual-tape relaying.
  - (b) Features that are required for terminating a customer-furnished business machine.
- 6.03 Two control circuits are provided as the interconnecting control circuit and are designated throughout the text as A and B.
- 6.04 The equipment is mounted, along with associated units in one universal-type RT cabinet, henceforth known as the apparatus cabinet.
- 6.05 If transmitter start circuit is used for the sending of TSCs, operate SP key to stop polling and operate all skip keys except for this station.

**Operation of Station Transmitter**

*Note:* Transmitter may be of type associated with either of the following equipment.

- (1) Reperforator-transmitter (see Part 9).
- (2) Transmitter-distributor at manual relay station.
- (3) Nonselective 28ASR teletypewriter.

6.06 *Preliminary:* Prepare a test tape as described in 3.01.

ACTION	VERIFICATION
(1) Release SP key to send TSC or have TSC sent from keyboard at test center.	With no tape in transmitter — V-NTR signal should be returned.
(2) With SP key released, TSC will be sent several times or have TSC sent several times from keyboard at test center.	With TMS in series with local loop — Adjust V potentiometer until a "V" is returned after each TSC and the distortion is less than 6 percent.
(3) Stop polling.	
(4) Insert tape in transmitter.	BID lamp lights if present.
(5) Operation of equipment in responding to TSCs is same as described in 4.03 except that no home copy is provided unless local station CDC is punched in tape or monitoring machine is used.	

**Transmitting Alarms**

6.07 The transmitting alarms occur when sending is stopped by a line break, receipt of double blank, or tape tears. When in service, the transmitter start circuit at the control office will time-out in 3.5 seconds and send FIGS-H-LTRS M.

**6.08 Preliminary:** Prepare test tape as in 4.05. The procedure for testing the transmitting alarms is as described in 4.05. The alarm indication is given by the lighting of the CAB ALM lamp and the sounding of the buzzer in the apparatus cabinet. The buzzer is silenced by operating the BR key in the cabinet. The alarm lamp is extinguished by operating the locally engineered AR key.

#### Station Connect

**Note:** The receiving unit may be either of the following equipment.

- (a) Reperforator-transmitter (see Part 9).
- (b) Receiving-only typing reperforator (ROTR) for manual-tape relay.
- (c) Nonselective 28ASR teletypewriter.

**6.09** This tests the ability of the station to connect on its assigned CDC.

ACTION	VERIFICATION
(1) Have the local station CDC followed by an LTRS character sent.	V answer-back should be returned. Station should connect.
(2) Have the EOA sent and repeat (1).	CDC should print. V answer-back should not be returned.
(3) Have text sent.	Text should print.
(4) Have EOM sent.	Station should disconnect.

#### Auxiliary Machines Connect With a CDC

**6.10** This test covers the auxiliary teletypewriter machines that connect with a CDC. Where the interconnecting control circuit is located at the control office, the auxiliary ROTR may be also used for intercept.

ACTION	VERIFICATION
(1) Have the CDC, followed by an LTRS character, sent.	Station should connect.
(2) If CDC is a group code — Send V answer-back from keyboard at test center.	Station under test may be arranged not to send the V answer-back.
(3) When not connected on a group code —	V answer-back should be sent from the station.
(4) Have text sent.	Text should print.
(5) Have EOM sent.	Station should disconnect.

### 7. TRANSMITTER START CIRCUIT

**7.01** This equipment, provided at the control station only, generates the sequential transmitter start codes, provides the intercept function, and times-out on an idle 3.5-second idle line condition to generate the trouble clearing EOM code.

**7.02** The codes generated on each key position are as shown in Fig. 1C. When the SK key is operated, the TSC assigned will be skipped, that is, deleted from the polling sequence. The lamp associated with each key will light when the selector reaches and stops on this key position.

**7.03** Prior to performing any of the following tests, operate SP key. Upon release of SP key, FIGS-H-LTRS M will be generated after a 3.5-second time out and polling will begin.

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**TSC Assigned to Each Key Position**

**7.04** This tests the ability of the circuit to generate transmitter start codes (TSCs).

**7.05 Preliminary:** Block operated K relay. This increases idle line time out from 3.5 to 20 seconds.

<b>ACTION</b>	<b>VERIFICATION</b>
(1) Release all SK keys.	
(2) Release SP key.	Polling should start. Lighted lamp will mark the position of the selector. TSC for this key position should be sent.
(3) Have V-NTR signal sent within 20 seconds from either outlying station or keyboard at test center.	Selector should step to next position and send assigned TSC.
<i>Note:</i> When the positions assigned to the station under test are reached, the station control circuit or the interconnecting control circuit will send the V-NTR.	
(4) Repeat (3) to test all positions to make at least four complete cycles for polling pattern A, two for polling pattern C, and one for polling pattern E.	Check each position to insure that the assigned 2-letter TSC is sent and that the lamp lights to mark each key position. This tests all 40 selector positions.

**Skip Polling Test**

**7.06** This checks the selector to insure that it self-steps past all key positions that are to be skipped.

**7.07 Preliminary**

- (a) Operate all but one SK key to skip position.
- (b) Block operated K relay.

<b>ACTION</b>	<b>VERIFICATION</b>
(1) Release SP key.	TSC for position 1 should be sent.
(2) Repeat 7.05(3).	Selector should self-step past all other positions and send TSC again.
(3) Release key 2 and skip key 1.	Selector should step to the next position and send TSC.
(4) Release next key and operate the lower-numbered key to the skip position.	Repeat to check each key position. Make four complete cycles for pattern A, two for pattern C, and 1 for pattern E.
(5) Operate SP key.	Polling should stop.

**Idle Line Time-Out Tests**

**7.08** The normal 3.5-second idle line time out will require the immediate return of the VAB, V-NTR or release of message tape; therefore, when making the tests, these functions must be quickly returned by sending the desired response from the test station under test or from the test center. Failure to respond in 2 seconds will cause the equipment to generate the EOM code and alarm.

**V-TST Time Out and Alarm**

**7.09** When a tape sending station upon being polled, fails to return to a V-NTR response after a 3.5-second time out, the EOM code will be generated and an alarm will be given. Where the polled station is a keyboard sending station, the time out is increased to 20 seconds, after which the alarm is given. For either of the above cases, polling will be resumed if the V-TST key is normal. Polling will stop if the V-TST key is operated.

**7.10 Preliminary:** As a result of the K relay being unblocked, the 2-second time out is in effect and the conditions described above apply.

**7.11 Tape Sending Station**

ACTION	VERIFICATION
(1) Release two SK keys of tape-sending stations and operate all others.	TSC assigned to first key position is sent.
(2) Release SP key.	After 3.5-second time out —
(3) V-NTR signal is not sent.	EOM code is sent. ALT lamp lights. Audible alarm is given and locks. Second TSC is sent.
(4) Operate V-TST key. V-NTR signal is sent.	Selector steps and sends first TSC.
(5) Operate AR key. <i>Note:</i> This should be done within 2 seconds because time out occurs in following step.	ALT lamp extinguishes. Audible alarm is silenced.
(6) V-NTR signal is not sent.	After 3.5-second time out — V-TST and ALT lamps light. Audible alarm is given and locks. Polling stops.
(7) Operate AR key.	ALT lamp extinguishes. Audible alarm is silenced.
(8) Release V-TST key.	V-TST lamp is extinguished. After 3.5-second time out — EOM is sent. Second TSC is sent.
(9) V-NTR signal is not sent for this and other TSCs that follow.	EOM should be generated 3.5 seconds after each TSC is sent. The alarms should also operate.
(10) Release alarm with AR key.	Alarm should be released and reoperated each time EOM is sent.
(11) Operate SP key.	Polling stops.
(12) Operate SK keys of tape-sending stations to skip.	

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**7.12 Keyboard Sending Stations**

<b>ACTION</b>	<b>VERIFICATION</b>
(1) Release SK key of keyboard sending station and SK key of any other station. All other skip keys remain operated.	
(2) Release SP key.	TSC assigned to first key positions is sent.
(3) V-NTR signal is not returned.	After 20-second time out — ALT lamp lights. Audible alarm is given and locks if circuit is so arranged. Second TSC is sent.
(4) Operate V-TST key. V-NTR signal is sent.	Selector steps and sends first TSC.
(5) V-NTR signal is not sent.	After 20-second time out — V-TST and ALT lamps light. Polling stops.
(6) Operate AR key if audible alarm is present.	ALT lamp extinguishes. Audible alarm is silenced if present.
(7) Release V-TST key.	V-TST and ALT lamps extinguish. Second TSC is sent.
(8) V-NTR signal is not sent for this and other TSCs that follow.	ALT lamp flashes after each TSC is sent if audible alarm is not present.
(9) Operate SP key.	Polling stops.

**LTRS Only Received**

**7.13** When the polled station sends LTRS only and then stops, the EOM should be generated in 3.5 seconds and polling should be resumed starting with the next station in the sequence.

**7.14 Preliminary**

- (a) Release LS skip key and the one assigned to the next higher-numbered position.
- (b) Place a tape with LTRS only in TD.

<b>ACTION</b>	<b>VERIFICATION</b>
(1) Release SP key.	LS should send the LTRS tape when TSC is sent.
(2) When transmission stops on end of tape —	EOM code should be sent in 3.5 seconds. Polling is resumed and the TSC assigned to the <i>next</i> key position should be sent.
(3) Stop polling.	

**Intercept Test**

**7.15** When this optional feature is provided, it will function to time-out in 3.5 seconds when the called station does not send the V-AB. This connects the ROTR and sends an M-AB to restart the message. Also, the ROTR will connect in the event CR is read without a preceding CDC.

**7.16 Preliminary:** Prepare test tape with an invalid CDC. Prepare a second test tape without any CDCs; that is, CR should be the first character sent. The LS- skip key should be released; all others operated.

ACTION	VERIFICATION
(1) Release the SP key.	Polling should start and V-NTR signal should be returned after receipt of TSC.
(2) Operate the MON key.	The intercept ROTR should connect and copy TSC and V-NTR. IAL lamp should light.
(3) Restore MON key.	
(4) Operate SP key.	Polling stops.
(5) Make a send bid with the invalid CDC test tape.	
(6) Release SP key.	ROTR should disconnect. IAL lamp should extinguish. Tape should start on receipt of TSC and stop on invalid code.
(7) After a 2-second time out —	ROTR should connect. M-AB should be sent. IAL and ALT lamps should light and audible alarm should be given.
(8) Tape should restart.	ROTR should print the M-AB and message text.
(9) When tape stops (after FIGS H-LTRS is sent) —	IAL lamp should go out and ROTR should be disconnected, that is, not copy TSC polls.
(10) Operate AR key.	Alarm should be restored.
(11) Make a send bid with CR test tape.	When tape is released — The intercept ROTR should connect and alarm should sound when CR-LF is sent.

#### Slow Polling

**7.17** During periods of light traffic, when the stepping selector makes one complete revolution, that is, positions 1 through 50 in order, and finds no tapes available for sending, the slow polling feature should occur. This inserts a 3.5-second delay between all selector steps. Fast polling will be resumed when a message is picked up or the AR key is operated.

**7.18 Preliminary:** Release all SK keys and prepare a test tape with LS CDC.

ACTION	VERIFICATION
(1) Release SP key and have V-NTR signal sent immediately after each TSC from either outlying station or keyboard at test center.	First TSC is sent with the following TSCs being sent after receipt of V-NTR signal.
(2) Continue sending V-NTR signal.	After one complete revolution of the stepping selector, beginning with the first station on the new revolution — The 3.5-second delay should be introduced between successive polls.

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<b>ACTION</b>	<b>VERIFICATION</b>
(3) Continue sending V-NTR signals while the selection steps through at least one complete polling cycle.	The 3.5-second delay should prevail.
(4) Place message tape in transmitter.	When TSC for local station is reached — Message tape should be sent.
(5) When tape is stopped by EOM — Send V-NTR signal immediately when next TSC is sent.	Fast polling should be resumed, that is, the next TSC sent immediately after V-NTR is sent.
(6) Continue sending V-NTR signals until slow polling condition is resumed.	The 3.5-second delay should function.
(7) Operate AR key.	Fast polling should be resumed.
(8) Stop polling.	

**Special 20-Second Time Out for Business Machine Connection**

**7.19** When this option is used, the normal 3.5-second idle line time out will be converted to 20 seconds when the H in all BMCs is read. The 3.5-second time out should be restored when the EOM is sent.

**7.20 Preliminary:** Prepare a test tape using HZ for the first CDC and a ZZ (that is, an invalid code) for the second CDC. Prepare a second test tape with the local station CDC. Release LS skip key, operate all others to skip position, place tape with HZ code in TD, and prepare to send the V-AB immediately after tape is stopped.

<b>ACTION</b>	<b>VERIFICATION</b>
(1) Release SP key.	EOM is generated. Test tape should start when TSC is sent and stop when HZ code is read.
(2) Have V-AB sent from either outlying station or keyboard at test center.	Tape should restart and then stop when non-valid code ZZ is sent.
(3) With line intercept —	After 20-second time out — The intercept should connect and send M-AB to restore tape.
(4) Without intercept — Repeat 1, 2, and 3 and send V-AB to start message.	After 20-second time out — EOM should be generated to disconnect and alarm the station.
(5) When message text is being transmitted — Open tape gate.	Transmission should stop. After 20 seconds — EOM should be sent to disconnect the station.
(6) Make a send bid with LS-CDC test tape.	Tape should start and connect local station.
(7) While text is being transmitted — Open tape gate.	EOM should be sent in 3.5 seconds.
(8) Stop polling.	

**Continuous Polling of Business Machine Station**

**7.21** When this option is used, the TSC position assigned to the BM station will be marked to repeat this TSC continuously as long as messages are released in response to the TSC poll. When the V-NTR is returned, sequential polling will be resumed.

**7.22 Preliminary:** The key position assigned to the BM station and a second key assigned to a higher-numbered polling position should be released. All others should be operated to the skip position. Provide 28KSR or have keyboard at test center simulate BM sending station.

ACTION	VERIFICATION
(1) Release SP key.	EOM is generated. Polling should start and the BM TSC should be transmitted.
(2) Send local station CDC.	Station should connect and send V-AB.
(3) Send CR-LF-LTRS, then a short message and EOM.	Station should disconnect on the EOM.
(4) Repeat (2) and (3) several times.	BM TSC should be repeated after each EOM code.
(5) Send V-NTR signal instead of a test message.	Selector should step and send the TSC assigned to the next open position; that is, sequential polling should be resumed.

**Option to Void Intercept When BM Station Sends or Receives**

**7.23** This option (only used when line intercept is provided) functions to cancel the intercept when the business machine is connected to receive or to send a data message. This action is performed by the H in all BMCs when receiving; therefore, a satisfactory test will be indicated when 7.20(4) is performed.

**7.24** To void intercept on a sending connection, the repeat polling option must also be used.

**7.25 Preliminary:** Provide 28KSR or have keyboard at test center simulate BM sending station. When the TSC is received, the test message must be quickly sent from the KSR to prevent a 3.5-second time out.

ACTION	VERIFICATION
(1) Release SP key.	EOM is generated. Polling should start and first TSC is sent.
(2) Send V-NTR signal.	Next TSC should be sent.
(3) When BM TSC is received — Send an invalid CDC.	After 20-second time out — EOM should be generated. Polling is resumed. BM TSC is sent again.
(4) Send V-NTR signal.	Next TSC is sent.
(5) When the other TSC, that is, not the BM TSC, is received — Send the invalid CDC.	After 3.5-second time out — The intercept should connect, sound the alarm, and send the M-AB.
(6) Stop polling.	

## SECTION 581-100-501

### Double Polling

**7.26** This option functions to allow the sending of the same TSC without the stepping of the selector switch. This feature may be applied to any line.

**7.27 Preliminary:** Release all SK keys.

ACTION	VERIFICATION
(1) Release SP key.	Polling should start and first TSC is sent.
(2) Have V-NTR signal sent within 3.5 seconds from either outlying station or keyboard at test center.	Same TSC is sent.
(3) Send V-NTR signal within 3.5 seconds.	Next TSC should be sent.
(4) Continue sending V-NTR signals.	(2) and (3) should be repeated.
(5) Stop polling.	

### 8. PUSHBUTTON CALLING CIRCUIT

**8.01** Fig. 1D gives the arrangement of the combined pushbutton and station control key and lamp panel. This lists the fixed second letters generated on each of the 20 or 40 key positions. The first letter and the cross-office codes must be programed to obtain the desired combination; therefore, the CDCs and cross-office codes that are assigned to each position should be recorded.

**8.02** The transmitter start circuit may be used to send the local station TSC when provided with the station under test or when the tests are being performed on a system basis. The keyboard machine at the test center is required for individual station tests for the sending of all signals necessary for performing the tests.

#### Station Lamps and Cancel Key

**8.03** If the transmitter start circuit is used for the sending of TSCs, operate SP key to stop polling and operate all skip keys except for this station.

ACTION	VERIFICATION
(1) Operate all pushbutton keys.	STA lamps should light as each key is operated.
(2) Release SP key to send TSC or have TSC sent from keyboard at test center.	V-NTR signal should be returned.
(3) Operate CA key.	Selector steps through all 50 positions. Lamps should go out.
(4) With SP key released, TSC will be sent from transmitter start circuit or have TSC sent from keyboard at test center.	V-NTR signal should be returned.
(5) Stop polling.	

#### On Line CDC Generation

**8.04** This tests the generation of CDCs that are validated on the line under test. See 8.10 through 8.18 for testing codes valid on a foreign line.

**8.05 Preliminary:** Operate all keys valid on the line. Prepare a test tape without a CDC.

ACTION	VERIFICATION
(1) Make a send bid with test tape.	BID lamp should light.
(2) Repeat 8.03(2).	First CDC should be sent.
(3) Have V-AB sent.	Next CDC should be sent.
(4) Repeat (3) until all selected codes are sent —	Check and verify each code with selected key positions.
(5) When V-AB for last code is sent —	CR-LF should be sent. All lamps go out. Test tape should release and be delivered to station.
(6) Stop polling.	

#### Multiple Message Noncoded Tapes

**8.06** When the station is equipped with pushbutton selection, the tape lock-out feature is provided. This will function to void a send bid when the previous message tape is stopped by the EOM code. After the codes for the next message are selected, a send bid will be made by operating the AR key.

**8.07 Preliminary:** Prepare a test tape with several messages. Do not prefix text with CR-LF but terminate each one with the EOM code and three LTRS characters.

ACTION	VERIFICATION
(1) Operate LS pushbutton key.	Corresponding STA lamp should light.
(2) Make send bid by placing tape in TD.	BID lamp should light.
(3) Repeat 8.03(2).	LS CDC signal should be sent to connect station.
(4) While message text is being sent —	Operate LS pushbutton key.
(5) When tape is stopped by EOM —	AL lamp should not light.
(6) With SP key released, TSC will be sent from transmitter start circuit or have TSC sent from keyboard at test center.	Station should connect and tape should be released.
(7) When tape stops —	AL lamp should light.
(8) Repeat (6).	V-NTR signal should be returned.
(9) Repeat (1).	Same as (1).
(10) Operate AR key.	AL lamp should be extinguished.
(11) Repeat (6).	Station should connect and test tape should be released.

#### Continuous Tape Operation

**8.08** The CT key, when operated, cancels the tape lock out upon the sending of the EOM. This provides for sending multiple message tapes without pushbutton selection.

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**8.09 Preliminary:** Prepare a test tape with several messages coded with CDC of local station.

<b>ACTION</b>	<b>VERIFICATION</b>
(1) Operate CT key.	CT lamp should light.
(2) Make a bid to send by placing test tape in TD.	BID lamp should light.
(3) Repeat 8.03(2).	First message should release and be received at the station.
(4) When EOM is sent —	Tape should stop and the AL lamp should not light.
(5) Repeat 8.07(6) and (7) to send several test messages.	
(6) Stop polling.	

**Cross-Office Codes**

**8.10** When programed for sending cross-office codes, that is, codes not valid on the originating line, the proper XOC code will be automatically generated whenever any foreign line key position is selected.

**8.11** A typical arrangement for these cross-office codes is such that the codes will precede pushbutton keys 14 through 26 and 27 through 40 when programed for a 3-line system. When used on a 2-line system, the XOC will precede key positions 22 through 40. Also, when programed for a 3-line tandem operation, two separate cross-office codes will be generated under certain combinations of key operations. This can be best understood by reviewing the program charts in Section 581-100-103 and making tests using the examples illustrated.

**8.12 Preliminary:** Prepare a test message tape containing several noncoded test messages.

<b>ACTION</b>	<b>VERIFICATION</b>
(1) Select key for the station under test, then select all keys assigned to stations on the second line.	Selected key lamps should light.
(2) Make a send bid with the test message.	BID lamp should light.
(3) Repeat 8.03(2).	Local station should connect. XOC code should be sent.
(4) Have V-AB sent. <i>Note:</i> If station under test is arranged for manual or automatic relay, V-AB may be returned automatically by the inter-connecting control circuit.	Selected codes for the B line should be transmitted without stopping, that is, without waiting for V-AB. The test message should be released.
(5) Repeat (1) through (4) but select only one second line key position.	Results should be same except that the single B line code should be sent.
(6) Repeat (5) to test each assigned B line code.	This test insures that each B line key is programed to send the XOC code.
(7) Stop polling.	

**8.13** When arranged for 3-line operation, the above tests should be repeated, but select keys that are valid on line C.

### 3-Line Delta or Manual-Type Relay Stems

**8.14** This tests for proper generation of XOCs when messages are directed to two other lines.

**8.15 Preliminary:** Prepare a noncoded test message.

ACTION	VERIFICATION
(1) Select keys for all stations assigned to both B and C lines and LS.	Corresponding STA lamps should light.
(2) Make a send bid and repeat 8.03(2).	A to B line XOC should be sent and transmission should be stopped.
(3) Have V-AB sent.	B line CDCs should be received. C line XOC and CDCs should then be sent and the test message released.

### Automatic Cross-Office 3-Line Tandem

**8.16** Three-line tandem systems involve relaying from line A via line B to reach stations on line C. When stations on both the B and C lines are selected, the A to C and B to C XOCs will function the same as covered above. However, when none of the B (middle) line codes are selected, both of the XOCs will be generated. The message will be relayed via the B line but no stations on this line will be connected. This same analogy will apply when relaying from line C (via line B) to line A.

**8.17** When relaying from line B to A or C, the B to A or B to C XOC must prefix the A or B line station CDCs. However, when relaying from B to stations on both the A and C lines, a special program will be required as follows.

- (a) The B to A XOC will precede the A line codes, that is, prefix key position 14 to 26.
- (b) The A to B, then the B to C XOCs will precede the C line codes, that is, prefix key positions 27 through 30.

**8.18 Preliminary:** Prepare a message tape containing several noncoded test messages with each message terminated with the EOM code.

### Pushbutton Boxes Assigned to Lines A and C

ACTION	VERIFICATION
(1) Select key assigned to station under test, then select key for a station on the C (or A) line. Do not select a station assigned to the B line.	Corresponding STA lamps should light.
(2) Make a send bid with test tape and repeat 8.03(2).	Local station should connect. A to B (or C to B) XOC should be received.
(3) Have V-AB sent.	B to C (or B to A) XOC should be received, followed by the selected C (or A) line station CDC. Test message should be released.

**Pushbutton Boxes Assigned to Line B**

ACTION	VERIFICATION
(1) Select key for station under test, then select keys assigned to a station on lines A and C.	Corresponding STA lamps should light.
(2) Make a send bid with test message and repeat 8.03(2).	Local station should connect. B to A XOC should be sent.
(3) Have V-AB sent.	A line station CDC should be sent. A to B and B to C line XOCs should be sent. C line station CDC should be sent and test tape released.
(4) Stop polling.	

**9. REPERFORATOR-TRANSMITTER CONTROL CIRCUIT**

**9.01** This equipment, provided at an automatic cross-office relay point, controls: (1) the transmitter side of one or two RTs relaying messages received from one to two other lines with which the circuit is associated with and (2) the receiving side of one or two other RTs for relaying messages to the one or two other lines.

**9.02** The equipment is mounted, along with associated units, in one universal-type RT cabinet, henceforth known as the apparatus cabinet.

**9.03** The lamp panel associated with the circuit, Fig. 2C, is mounted in the apparatus cabinet.

**9.04** The control keys and lamps, Fig. 2D, are associated with the right and left RTs and are mounted in the machine cabinet.

**9.05** The different cross-office arrangements that may be encountered are.

- 3-line delta
- 2- or 3-line tandem
- 3-line "WYE"

These over-all test procedures are based on the back-to-back arrangement as shown in Fig. 2A.

**9.06** When a 2-line system is being tested, the cross-office connection will use the B circuit of the interconnecting control circuit as illustrated in Fig. 6 of Section 581-100-103. The A circuit may be used to control a nonselective teletypewriter. However, it is suggested that the DX cord shown in Fig. 2A be obtained and that the back-to-back test be made.

**9.07** The following symbols are used in making the following tests.

- TS-A The TSC that is assigned to the Left RT (L-RT)
- TS-B The TSC that is assigned to the Right RT (R-RT)
- AY The CDC that connects the R-RT
- BY The CDC that connects the L-RT

**9.08** The following tests assume that the interconnecting control circuit has been tested since this circuit provides the control features and selecting functions at all cross-office stations.

**9.09** The transmitter start circuit may be used to send the local station TSC when provided with the station under test or when the tests are being performed on a system basis. The keyboard machine at the test center is required for individual station tests for the sending of all signals necessary for performing the tests.

**9.10** Prior to performing the following tests, the following preliminary operations should be performed.

- (a) If the transmitter start circuit is used for the sending of TSCs, stop polling by operating the SP key and operate all skip keys except for this station.
- (b) Operate apparatus cabinet and machine cabinet power switches.
- (c) Connect milliammeter to MON A and MON B jacks. The current should measure  $62.5 \pm 2.5$  ma. The RTs should run closed.

### 9.12 Preliminary

- (a) Prepare test tape as follows.
  - Tape A — test message with AY code
  - Tape B — test message with BY code
- (b) Operate left and right HOLD keys in machine cabinet. The BTA, BTB, STL, and STR lamps should light.

#### ACTION

- (1) Have test tape A or test message A sent.
- (2) Have test tape B or test message B sent.

#### VERIFICATION

R-RT should connect and receive test message. Tape should not punch the AY code or the V-AB. Test message should be stored in the R-RT. BRA lamp should flash.

Same results should be obtained but with reference to the L-RT. BRB lamp should flash.

### Busy Receiving

9.13 The HOLD IN keys busy-out the RT receive when operated. While a message is being received, the function will take place at EOM. Following this, all traffic directed to the RT will be intercepted.

#### ACTION

- (1) Have test tape A or test message A sent.
- (2) While message text is being transmitted — Operate R-HOLD IN key.
- (3) When a test message is stopped by EOM — Resend test tape A or test message A.
- (4) Release the R-HOLD IN key.
- (5) Repeat (1) to send and store several messages in the R-RT.
- (6) Repeat (1) through (5) using test tape B or test message B to connect and store several messages in L-RT.

#### VERIFICATION

R-RT should connect and BRA lamp should flash.

RTR and BRA lamps should light steadily.

The line intercept, if provided, should time-out and connect. R-RT should not connect.

RTR and BRA lamps should extinguish.

RT Sends

9.14 Preliminary

- (a) With the HOLD keys operated, the V-NTR signal should be returned in response to TSC polls.
- (b) Operate TR and BID HLD RLS keys in machine cabinet for both left and right RTs.

**ACTION**

**VERIFICATION**

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>(1) Release Left HOLD key.</li><li>(2) Skip TS-B, release SP key to send TS-A or have TS-A sent from keyboard at test center, and then stop polling when message tape is released.</li><li>(3) CR-LF sent.</li><li>(4) Release Right HOLD key.</li><li>(5) Skip TS-A and send TS-B, stop polling when tape is released.</li><li>(6) Have TS-A and TS-B sent alternately.</li><li>(7) When the last message is sent —</li><li>(8) Stop polling.</li></ul> | <p>BTA and STL lamps extinguish.</p> <p>First message stored in L-RT should be released. Since the message does not have a CDC, the intercept if provided will connect. If intercept is not provided — Send M answer-back from keyboard machine at test center.</p> <p>Message tape is released.</p> <p>BTB and STR lamps extinguish.</p> <p>First message stored in R-RT should be released as described in (3).</p> <p>Messages stored in both RTs should be released alternately.</p> <p>BTA lamp should flash when L-RT is sending. BTB lamp should flash when R-RT is sending.</p> <p>V-NTR signal should be sent on following TSCs.</p> |
|--|---|

**Distributor Stop Test**

9.15 This tests the distributor of the RT to insure that transmission is stopped after the LTRS character that follows all CDCs is fully transmitted.

9.16 Preliminary

- (a) Prepare test tape A with the AY code followed by several invalid CDCs with each CDC separated by one LTRS character.
- (b) Prepare test tape B the same as A with the BY code instead of the AY code.

**ACTION**

**VERIFICATION**

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>(1) Repeat 9.14(2).</li><li>(2) Prepare to watch tape closely.</li><li>(3) Have TS-B sent.</li></ul> | <p>Test tape A should release. R-RT should connect.</p> <p>Tape should stop after each invalid CDC and the intercept should connect in 2 seconds. If intercept is not present — Send M answer-back from keyboard at test center. Check to insure that LTRS is sent after each CDC.</p> <p>Test tape B should be released. L-RT should connect. Same as (2).</p> |
|--|---|

**Receiving Alarms**

9.17 These alarms will function in the event of a low-tape condition and when the receiving shaft of the RT stops after a receiving connection has been established.

9.18 *Preliminary:* Prepare both A and B test tapes.

<b>ACTION</b>	<b>VERIFICATION</b>
(1) Repeat 9.14(2).	Test tape A should release. R-RT should connect.
(2) While message text is being sent — Remove tape reel to close low tape contacts.	RTR and CMA lamps should light. Audible alarm is given. Message should be completed and stored.
(3) Operate R-HOLD IN key.	BRA lamp lights.
(4) Send test tape A again.	RT should not connect.
(5) Replace tape reel, release R-HOLD IN key, and operate BR key in apparatus cabinet.	Audible alarm and all lamps should be restored.
(6) Repeat (1) through (5) with test tape B using L-HOLD IN key.	L-RT should connect. Other results should be as above except RTL and BRB lamps light in place of RTR and BRA.
(7) Stop polling.	

**Machine Alarm**

<b>ACTION</b>	<b>VERIFICATION</b>
(1) Repeat 9.14(2).	Test tape A should release. R-RT should connect.
(2) While text is being received — Turn off R-RT power switch.	CMA and RTR lamps should light. Audible alarm is given.
(3) Operate R-HOLD IN key.	CMA and RTR lamps extinguish. BRA lamp should light.
(4) Operate BR key in apparatus cabinet.	Audible alarm is silenced.
(5) Remove interrupted tape from RT, turn on power switch, and release R-HOLD IN key.	BRA lamp should extinguish.
(6) Repeat (1) through (5) with test tape B using L-HOLD IN key.	L-RT should connect. Other results should be as above except that RTL and BRB lamps light in place of RTR and BRA.
(7) Stop polling.	

**Tape-Torn Alarm**

9.19 In the event of tape tearing while transmitting, the tape-out contact (sixth pin) will come up, stop transmission and alarm.

9.20 Preliminary

- (a) Prepare both test tapes A and B.
- (b) Make a slight tear at the edge of the tape which slides over the sixth pin of the RT.

ACTION	VERIFICATION
(1) Repeat 9.14(2).	Test tape A should release. R-RT should connect.
(2) The tape should proceed until the tear is over the sixth pin.	Sixth pin should come up through tape. Transmission should stop. CTO and STL lamps should light. Audible alarm is given.
(3) Within 2 seconds — Transmitter start circuit, if provided, will time-out and send FIGS-H-LTRS or have FIGS-H-LTRS sent from keyboard at test center.	
(4) Operate L-HOLD key.	BTA lamp lights.
(5) Have TS-A sent.	V-NTR signal is returned.
(6) Reset tape, operate BR key in apparatus cabinet, release L-HOLD key, operate TR and BID HOLD RLS key.	All lamps extinguish. Audible alarm is silenced. Bid is placed.
(7) Have TS-A sent.	Test tape should release.
(8) Repeat (1) through (7) with test tape B and with respect to R-HOLD key.	Test tape B should release. L-RT should connect. Other results as above except that RTL and BTB lamps light in place of STL and BTA.
(9) Stop polling.	

Stopping Outgoing Transmission

9.21 By operation of the BUSY key, transmission may be stopped while the outgoing message is in progress.

9.22 Preliminary: Prepare both test tapes A and B.

ACTION	VERIFICATION
(1) Repeat 9.14(2).	Test tape A should release. R-RT should connect.
(2) Operate R-BUSY key.	Transmission should stop. WBA lamp lights.
(3) Within 2 seconds — Transmitter start circuit, if provided, will time-out and send FIGS-H-LTRS or have FIGS-H-LTRS sent from keyboard at test center.	STL lamp lights.
(4) On next TS-A poll.	V-NTR signal is returned.

**ACTION****VERIFICATION**

- (5) Remove tape, release BUSY key, and operate TR key.
- (6) Repeat (1) through (5) with test tape B using L-BUSY key.

All lamps extinguish.

L-RT should connect.  
Other results should be as above except that WBB and STR lamps light.

**10. ASSOCIATED BELL SYSTEM PRACTICES**

**10.01** The following Bell System Practices provide additional information that may be required in connection with this section.

<b>Subject</b>	<b>Section</b>
83B3 Teletypewriter Selective Calling System	581-100-103
Description of Interface Connection to a Customer Owned Business Machine	581-100-104
Teletypewriter Stations, Orientation and Distortion Tests	P30.002



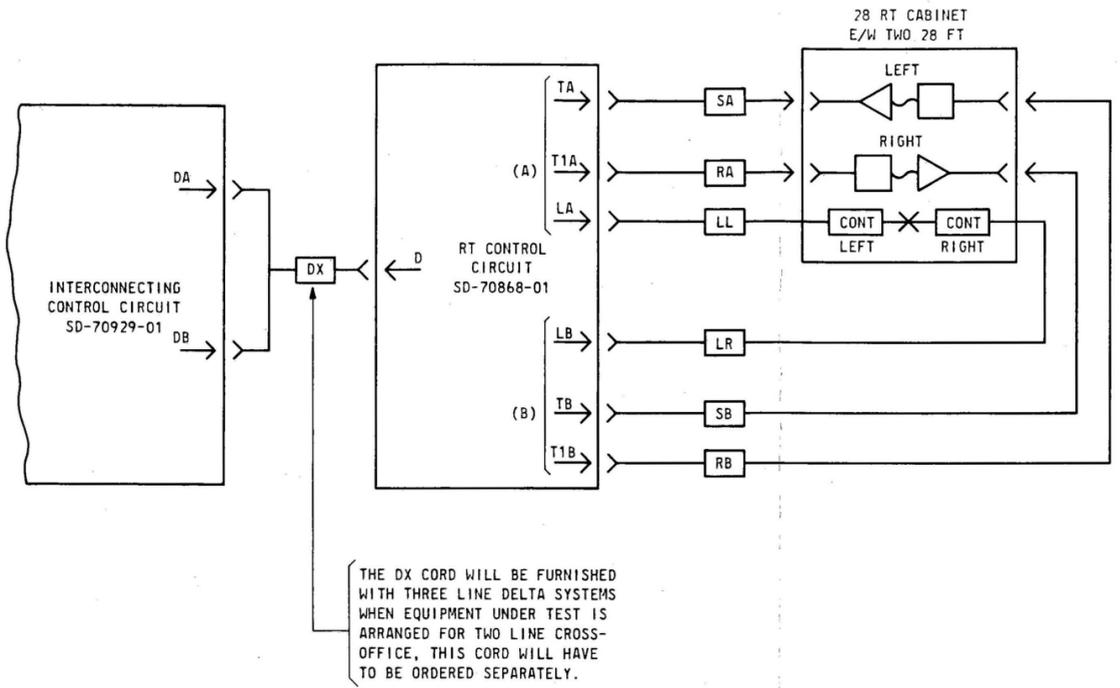


Fig. 2A - Test Connection for Interconnecting Control Circuit — Automatic Crossoffice Systems

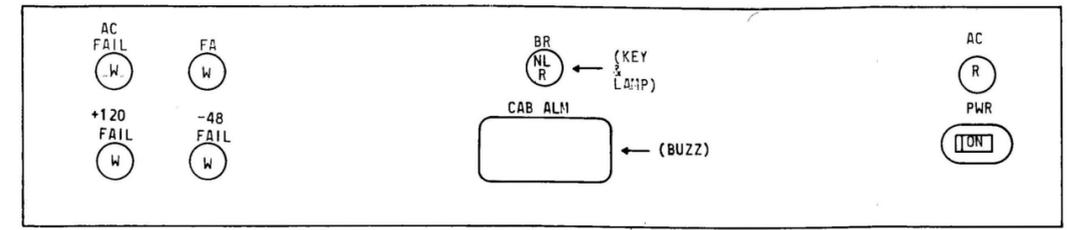


Fig. 2B - Key and Lamp Power Control Panel (mounted in apparatus cabinet)

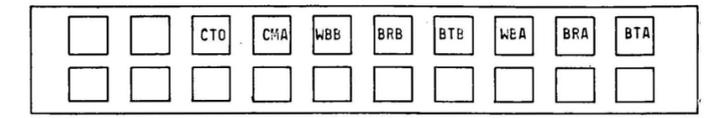


Fig. 2C - RT Control Circuit Lamp Panel (mounted in apparatus cabinet)

KEY TO SYMBOLS FIG. B&C  
 (W) LAMP & COLOR OF CAP  
 (⊖) TWO POSITION LOCKING KEY  
 (NL) NON LOCKING KEY

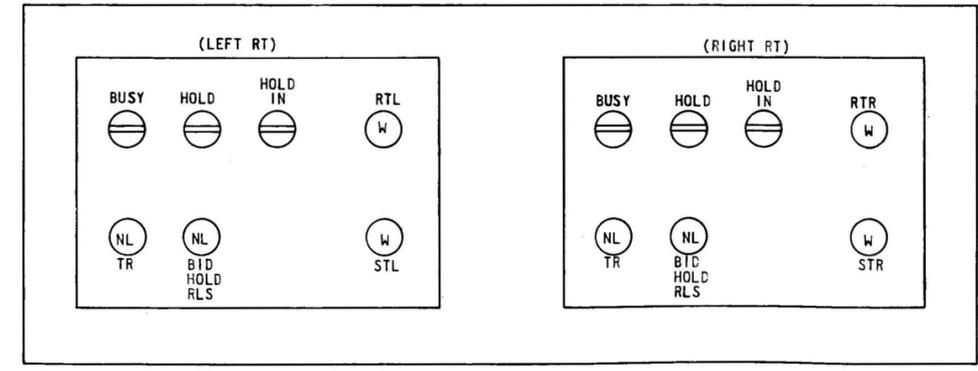


Fig. 2D - Key and Lamp Control Panel (mounted in 28 RT machine cabinet)