

DATASPEED TAPE-TO-TAPE SYSTEM

TAPE SENDERS 5A AND 5C

DESCRIPTION, OPERATING PROCEDURE, AND PRINCIPLES OF OPERATION

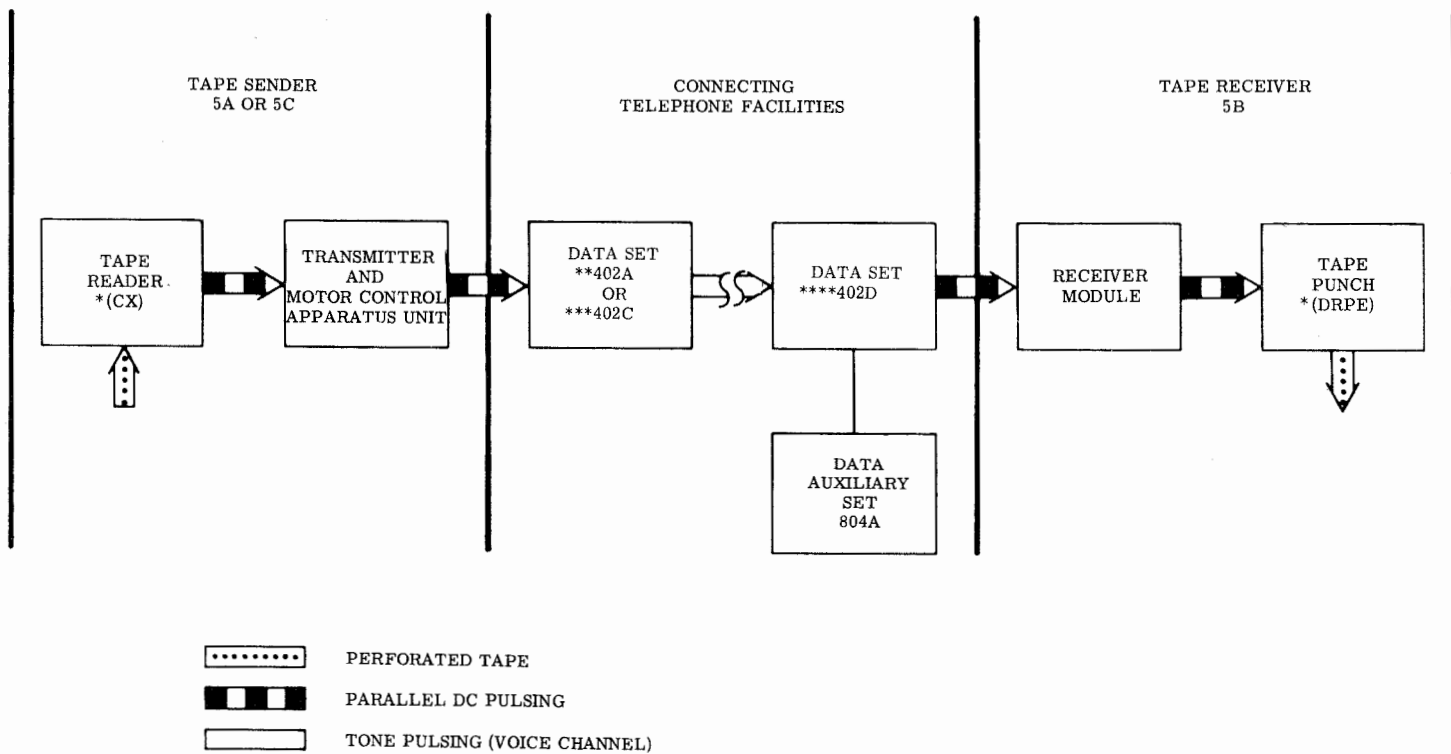
CONTENTS	PAGE	CONTENTS	PAGE
1. GENERAL. . . . .	1	CIRCUIT ASSURANCE AND BREAK OPTION . . . . .	12
2. DESCRIPTION. . . . .	3	A. Description. . . . .	12
3. OPERATING PROCEDURE . . . . .	4	B. Operating Procedure. . . . .	12
GENERAL. . . . .	4	C. Principles of Operation. . . . .	12
ENERGIZING. . . . .	4	D. Enabling Circuit Assurance and Break Option . . . . .	13
INSERTING TAPE . . . . .	4	TP198002 RECOGNIZER APPARATUS UNIT OPTION . . . . .	13
A. Tape Sender 5A . . . . .	4	TP199788 UNATTENDED SEND- RECEIVE APPARATUS UNIT OPTION . . . . .	13
B. Tape Sender 5C . . . . .	4	TP198021 AND TP199543 CABLE OPTIONS . . . . .	13
INITIATING CALLS . . . . .	5		
A. Send-Only Station. . . . .	5	1. GENERAL	
B. Send-Receive Station. . . . .	7	1.01 This section provides description, oper- ating procedure, and principles of opera- tion for DATASPEED Tape Senders 5A, 5A-1, 5C, and 5C-1. It is reissued to add a figure, information on the enabling circuit assurance and break option, service arrangements, and to change the letter prefixes of a relay and a con- nector. Since it is a general revision, marginal arrows ordinarily used to indicate changes and additions are omitted.	
ANSWERING A REQUEST FOR DATA. . . . .	7	1.02 Installation, trouble shooting, adjust- ments and lubrication information can be found in appropriate sections.	
4. PRINCIPLES OF OPERATION. . . . .	7	1.03 Table 1 indicates the various types of operation available with the Senders, and provides information on equipment required. The section covering installation and checkout for the Senders provides information on wiring options and strapping plugs.	
CABINETS . . . . .	7		
A. Tape Sender 5A . . . . .	7		
B. Tape Sender 5C . . . . .	7		
TAPE READERS . . . . .	7		
TRANSMITTER AND MOTOR CONTROL APPARATUS UNITS . . . . .	7		
A. General . . . . .	7		
B. Motor Operate Circuit. . . . .	8		
C. Reader Operate Circuit. . . . .	8		
D. Data Storage Circuit. . . . .	10		
E. Timing Pulse Circuit . . . . .	10		
POWER SUPPLY RECTIFIER . . . . .	10		
5. OPTIONAL FEATURES. . . . .	10		

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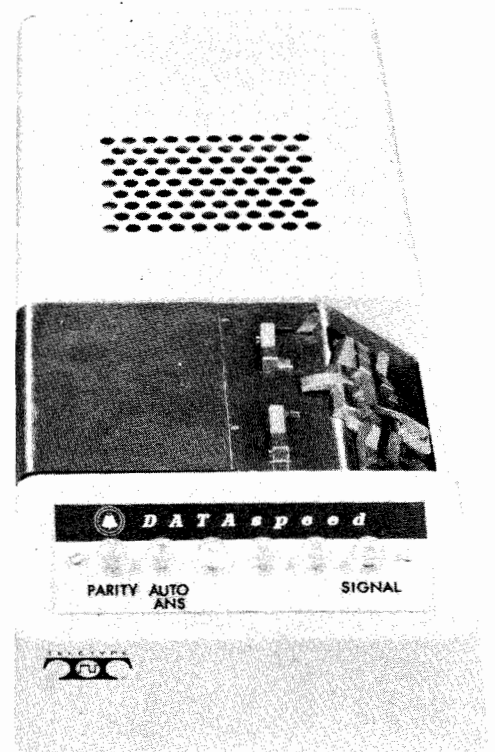


- \* VARIABLE 5, 6, 7, AND 8 LEVEL.  
 \*\* 402A - USED WITH MANUAL SEND STATION ONLY.  
 \*\*\* 402C1 - WITHOUT REVERSE CHANNEL RECEIVER.  
 402C2 - WITH REVERSE CHANNEL RECEIVER.  
 \*\*\*\* 402D1 - WITHOUT REVERSE CHANNEL TRANSMITTER.  
 402D2 - WITH REVERSE CHANNEL TRANSMITTER.

Figure 1 - System Block Diagram



402C DATA SET  
FOR 5A AND 5C SENDERS



TAPE READER SET  
FOR 5A SENDERS

Figure 2 - Data Set and Reader

## 2. DESCRIPTION

2.01 The 5A and 5C Tape Senders are used primarily as the input terminals in a medium speed (750 wpm) tape-to-tape data transmission system. These Tape Senders are particularly well suited to collective type data systems (a number of Senders operating with a single Receiver). Type 5A-1 and 5C-1 Senders are the same as the 5A and 5C except that they are equipped with the TP198002 recognizer apparatus unit option (5.06).

2.02 It is also possible to connect a Tape Sender and Tape Receiver, at a particular site, to a common telephone line. This arrangement constitutes a "send-receive" station.

2.03 Fundamentally, these systems operate in the following manner. Punched paper tape, in five, six, seven, or eight level format is placed in the tape reader at the Sender (Fig-

ure 1). The perforations in the tape are converted to parallel dc pulsing by the reader and applied to the transmitter circuit which lengthens each pulse to the required character width. The pulses are then routed from the Sender circuits to a data set 402A or C where they are converted to audio tone signals and applied to the telephone line. The tone signals are received at the Tape Receiver site, converted from tone to dc pulsing by a Bell System data set 402D, amplified, and used to drive the tape punch unit within the Tape Receiver.

2.04 Tape Sender 5A (Figures 2 and 3) comprises a table mounted tape reader set 5A, and a wall mounted apparatus box assembly. The box assembly mounts a rectifier apparatus unit, a transmitter circuit apparatus unit, and a motor control relay apparatus unit. A power cord, connecting cable, and two test tapes complete the 5A Tape Sender equipment. Note that several optional features are available (Part 5).

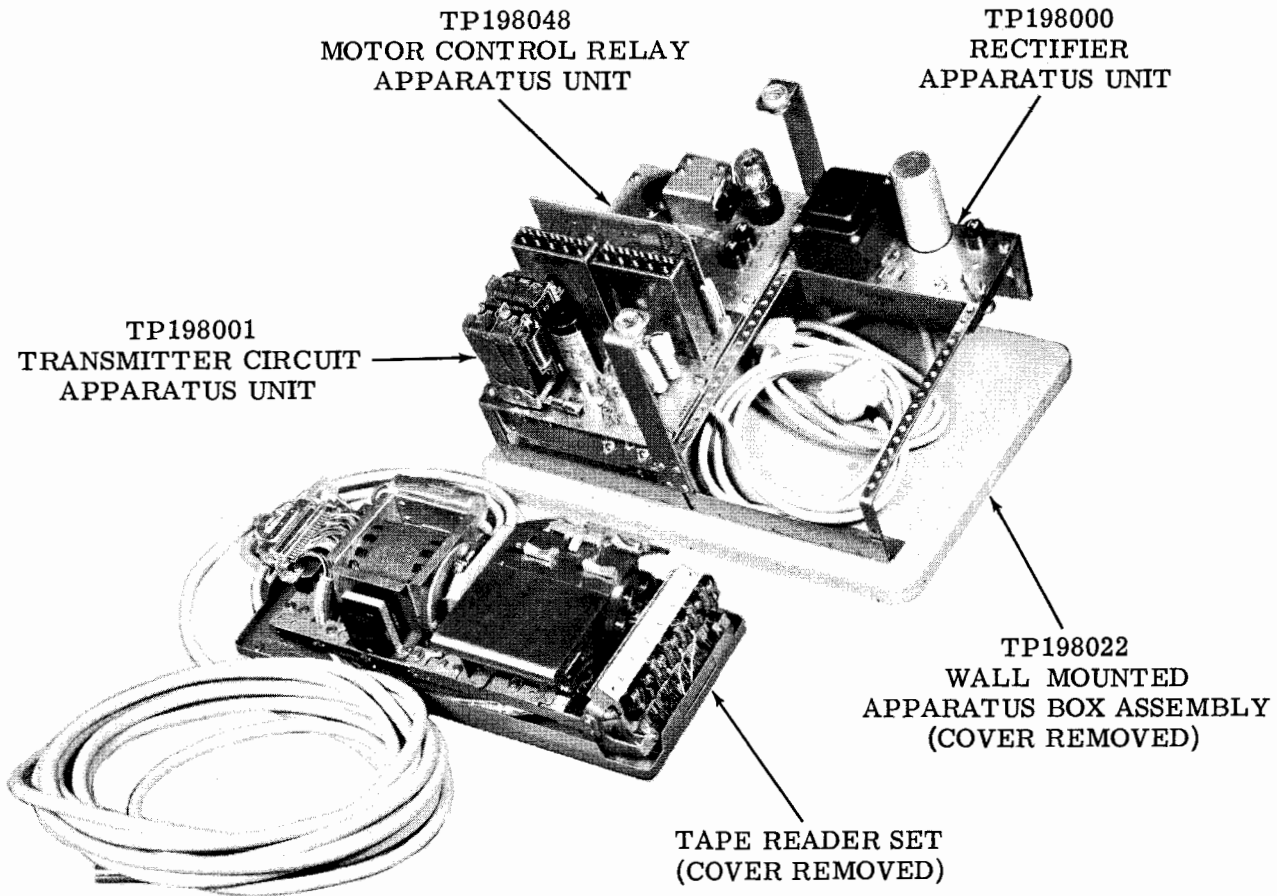


Figure 3 - Tape Sender 5A, Components

Certain of these features, when used in combination, may require a larger apparatus box. In other instances, an even larger apparatus box may be used to mount the apparatus units for two complete 5A Tape Senders.

2.05 Tape Sender 5C (Figure 4) is a floor mounted set which is essentially a re-packaged version of the table model Sender 5A discussed previously. The tape reader equipment is mounted together with tape spooling equipment on a sliding drawer at the top of the cabinet. The apparatus units are mounted at the bottom of the cabinet behind a hinged door. Space is provided near the center of the cabinet for a data set 402A or C.

### 3. OPERATING PROCEDURE

#### GENERAL

3.01 The following procedure assumes that the Tape Sender 5A or 5C is a standard model without optional accessories. Optional

features and related operating procedures are covered in Part 5.

#### ENERGIZING

3.02 The 5A Sender is energized as soon as the power cord is connected. To energize the floor mounted 5C Sender, press the white power (indicator) button on the data set mounting panel.

#### INSERTING TAPE

##### A. Tape Sender 5A

3.03 Place the tape reader control lever in the STOP position, and open the reader gate. Place the tape over the sprocket, close the reader gate, and return lever to RUN position.

##### B. Tape Sender 5C

3.04 The 5C Tape Sender is equipped with a supply reel and a take-up reel. The tape insertion procedure is as follows (see Figure 5).

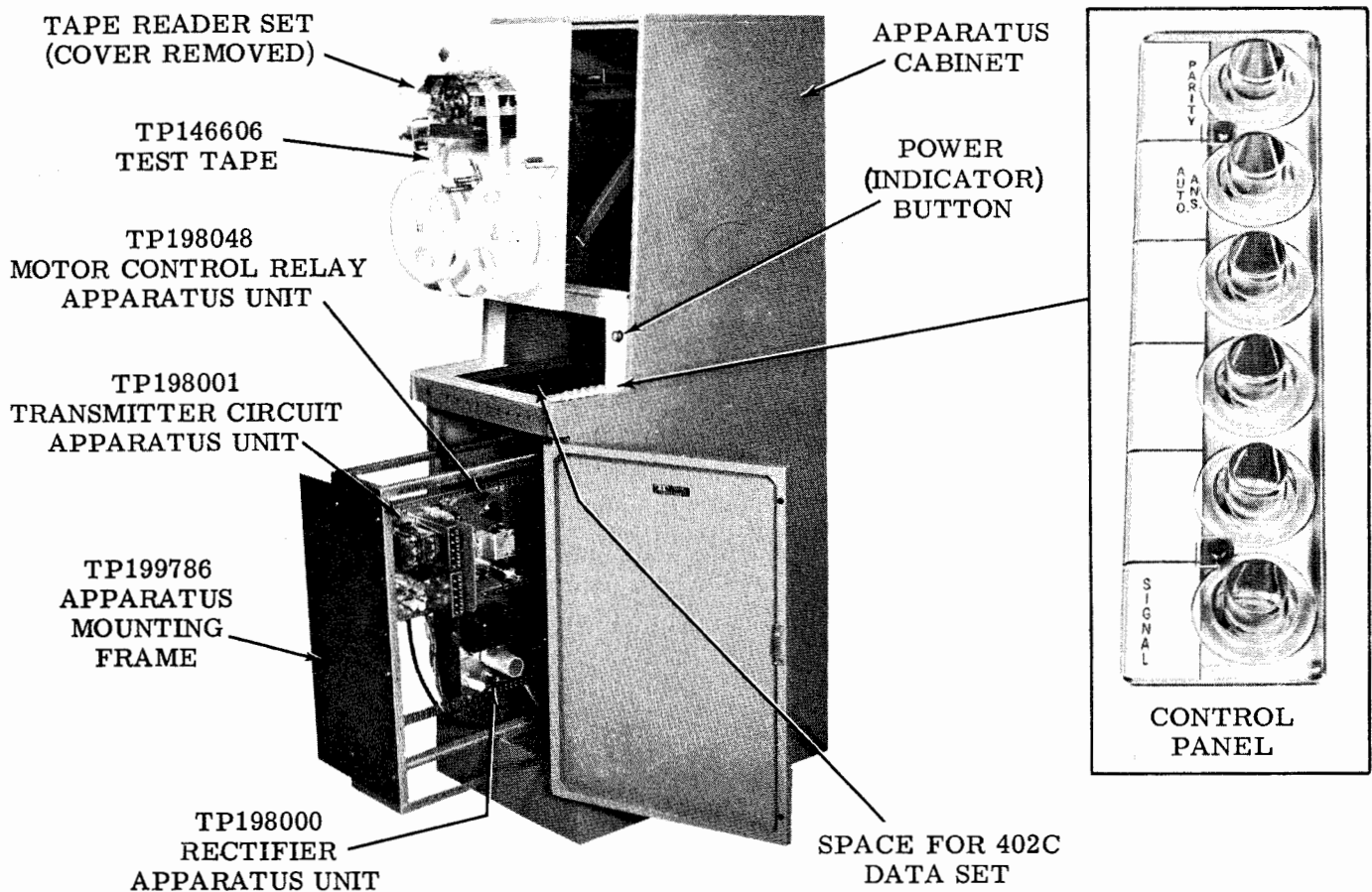


Figure 4 - Tape Sender 5C, Components

- (1) Place a roll of punched tape on the supply reel. Place the supply reel and the take-up reel on the right and left tape reel hubs, respectively. Chadless tape must be rewound before it is placed in the tape reader, since the reader cannot read chadless tape traveling in a reverse direction.
- (2) Thread the tape through the supply reel brake arm, and manually unwind approximately 3 feet of tape.
- (3) Place the tape reader control lever in the STOP position, and open the reader gate. Place the tape feed holes over the sprocket pins, close the reader gate, and return lever to RUN position.
- (4) Lift the chad depressor arm and move the tape-tension arm to the extreme left. Release the chad depressor to lock the tension arm in place.
- (5) Pass the tape between the stationary u-shaped post and the posts on the tension arm, and then upward between the chad depressor and its post.
- (6) Hold tension on the free end of the tape, and lift the chad depressor arm allowing the tension arm to fall to the right. Do not allow the arm to drop too far, or the winder motor will start.
- (7) Place the end of the tape in the take-up reel. Manually rotate the reel counter-clockwise two revolutions to secure the tape to the reel.
- (8) Allow the tape arm to rotate to the right. The winder motor will automatically start, taking up all slack, and then stop.

#### INITIATING CALLS

##### A. Send-Only Station

3.05 The following steps outline the procedure used in initiating data transmission.

- (1) With the POWER (indicator) button illuminated, establish connection with the desired Tape Receiver by pressing the TALK

button at the data set and dialing the appropriate number. With the TALK button depressed the data set TALK key will illuminate.

(2) When voice contact has been made with the Tape Receiver, request the operator to press the DATA button on the data set at the Receiver site.

(3) Pressing the DATA button at the Tape Receiver will initiate an audible tone on the telephone lines. (The 402D2 data set sends a 2025 cps "beep tone" signal for 3 to 5 seconds and then shifts to the 387 cps reverse channel signal.) Wait until this tone has stopped, then press the DATA button at the Sender data set. This will cause the tape reader motor to start in about 5 seconds, and

will initiate data transmission a few seconds later. Hang up the handset.

Note: If the called Receiver is operating in the unattended mode no voice contact need be made with the operator. Merely dial the Receiver number and listen for tone. When the tone has stopped, press the DATA button and hang up the handset. Transmission will start within a few seconds.

(4) To stop the reader without losing the line connection, place the tape reader control lever in the STOP position.

(5) To terminate the call press the TALK button, lift the handset and hang up. This will light the SIGNAL lamp and close an auxiliary signal circuit contact at the Receiver site to advise the Receiver operator of the end of transmission.

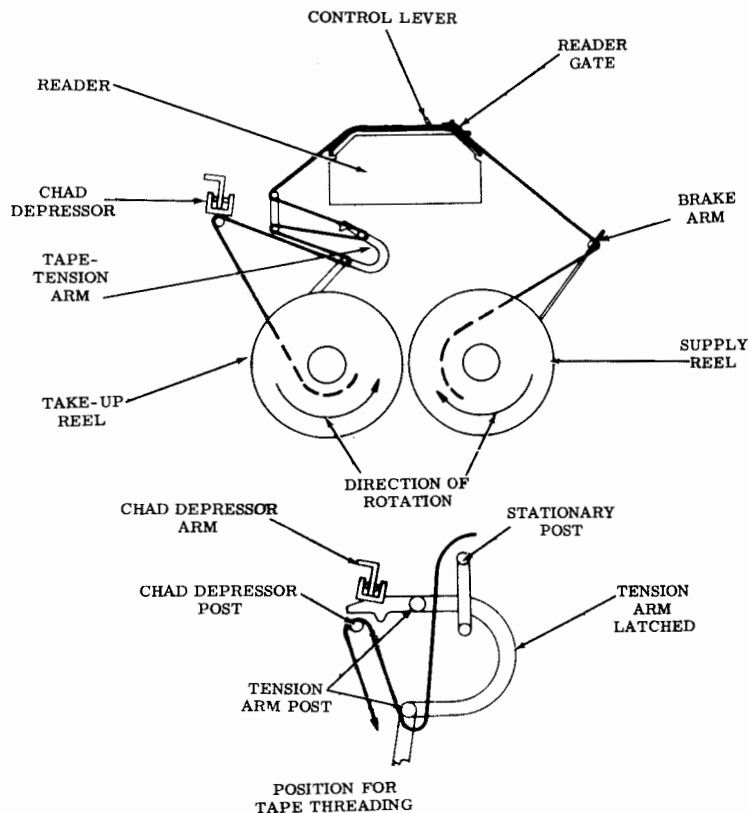


Figure 5 - Tape Path for Sender 5C

## B. Send-Receive Station

**CAUTION: WHEN TERMINAL IS USED AS AN UNATTENDED SEND-RECEIVE STATION AND TRANSMITTER HAS GONE TO THE TAPE OUT CONDITION, A NEW MESSAGE TAPE MAY BE PLACED IN THE READER WHILE THE RECEIVER IS PUNCHING TAPE ONLY IF:**

- (1) TAPE READER CONTROL LEVER IS PLACED IN STOP POSITION BEFORE PUTTING TAPE IN THE READER.
- (2) TAPE READER CONTROL LEVER MUST BE RETURNED TO THE RUN POSITION AFTER PUNCH HAS STOPPED PUNCHING.

3.06 The procedure for initiating calls from a send-receive station Sender (Paragraph 2.02) is essentially the same as that outlined in Paragraph A. The SEND button at the companion Receiver must be depressed however, before beginning.

### ANSWERING A REQUEST FOR DATA

3.07 In answering a Receiver request for data, the same procedure outlined in Paragraphs A or B above is followed except that the voice contact is made by the Receiver operator.

## 4. PRINCIPLES OF OPERATION

### CABINETS

#### A. Tape Sender 5A

4.01 The apparatus box and cable assembly used in the table mounted Sender provides mounting and interconnection for three apparatus units. Diagram 6447WD appearing in the "Schematic and Actual Wiring Diagrams" section shows the interconnection made within the apparatus box.

#### B. Tape Sender 5C

4.02 The cabinet housing the Tape Sender 5C is a floor mounted unit. The tape reader, motor, and tape spooling mechanisms are mounted in the upper half of the cabinet. The lower half of the cabinet is fitted with a mounting frame. The apparatus units are mounted to this frame. In-cabinet cabling is shown on diagram 7101WD and cabinet schematic 6413WD within the "Schematic and Actual Wiring Diagrams" section.

4.03 The tape take-up reel is driven by a motor and reduction gear assembly mounted on the rear of the drawer panel. A mercury switch on the tape-tension arm (Figure 5) controls the take up spool motor. Perforated tape is pulled from the supply reel by the tape reader, introducing slack at the left side of the reader. This slack allows the tape-tension arm to drop. The mercury switch is adjusted to complete the motor operate circuit when the tape-tension arm drops to a predetermined level. The take-up reel then rotates to take up slack and shuts off as the slack tape is taken up.

### TAPE READERS

4.04 The tape reader used in the Tape Senders is a standard CX Type and is covered in the standard tape reader literature. Refer to the appropriate High Speed Tape Reader (CX Type) sections for information regarding the tape reader.

### TRANSMITTER AND MOTOR CONTROL APPARATUS UNITS

#### A. General

4.05 The transmitter and motor control circuit performs the following functions:

- (a) Starts the tape reader motor when the data set is placed in the DATA mode and stops the motor when the data set is returned to the TALK mode.
- (b) Opens all data and timing leads so that an all-space signal is generated in the interval from the time the reader motor is started until the motor reaches operating speed.
- (c) Starts the reader transmitting when the motor reaches rated speed (provided there is tape in the reader, a tight tape condition does not exist, and the reader control switch is in the RUN position). The control circuits will stop the reader when the data set is returned to the TALK mode.
- (d) Stores the mark and space signals from the reader, repeating these in the format required by the data set.
- (e) Generates an alternating timing pulse for use by the data set.

4.06 The transmitter and motor control apparatus units can be broken down functionally into four circuits, the motor operate



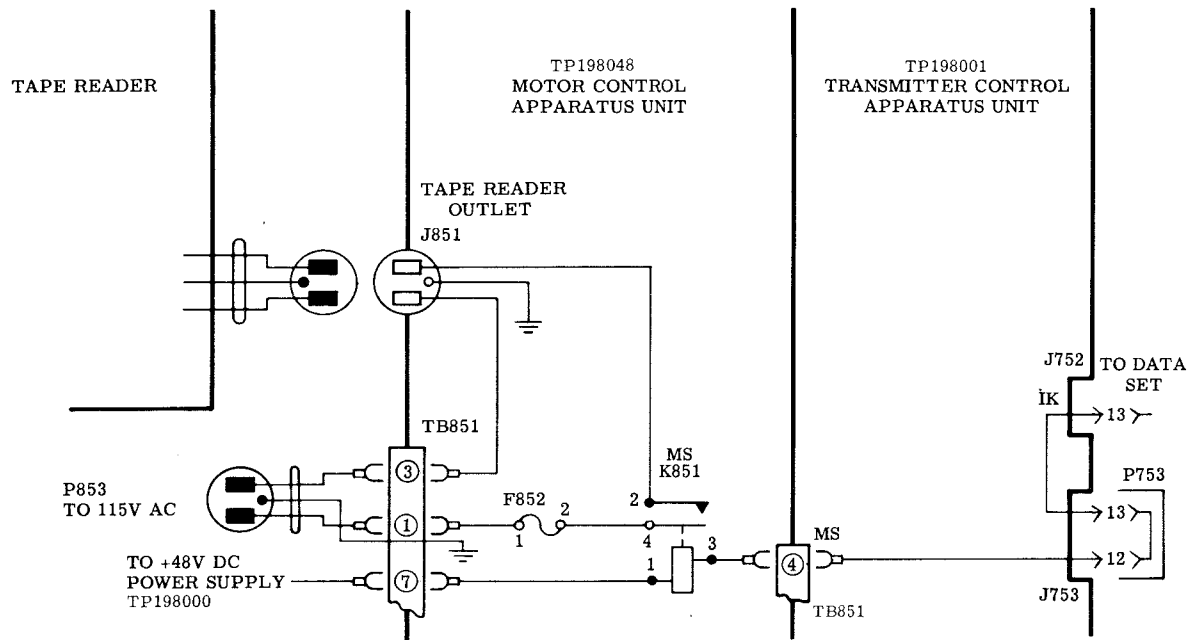


Figure 6 - Motor Operate Circuit

circuit, reader operate circuit, data storage circuit, and timing pulse circuit. These circuits are discussed separately in the following paragraphs. The partial schematics included in this section were taken directly from the overall schematic diagram 6442WD which is found in the "Schematic and Actual Wiring Diagrams" section.

#### B. Motor Operate Circuit (Figure 6)

4.07 Pressing the DATA button at the data set causes the data set to transmit a 2025 cps tone for approximately 3 seconds. At the end of this time the data set shifts to the simultaneous transmission of the 9 carrier tones. The data set then applies a ground to the IK lead (interlock), pin 13 of J752 which is carried through pins 13 and 12 of J753 to the coil (pin 3) of the MS (motor start) relay K851. The MS relay is thus energized completing the ac path from P853 through fuse F852, and connector J851 to the reader power plug. Returning the data set to the TALK mode will remove the ground from pin 13 of J752 allowing the MS relay to de-energize breaking the ac path to the motor.

#### C. Reader Operate Circuit (Figure 7)

4.08 The interlock ground (IK) originated by the data set (Paragraph B) is also applied to pin 1 of thermal delay R751 and

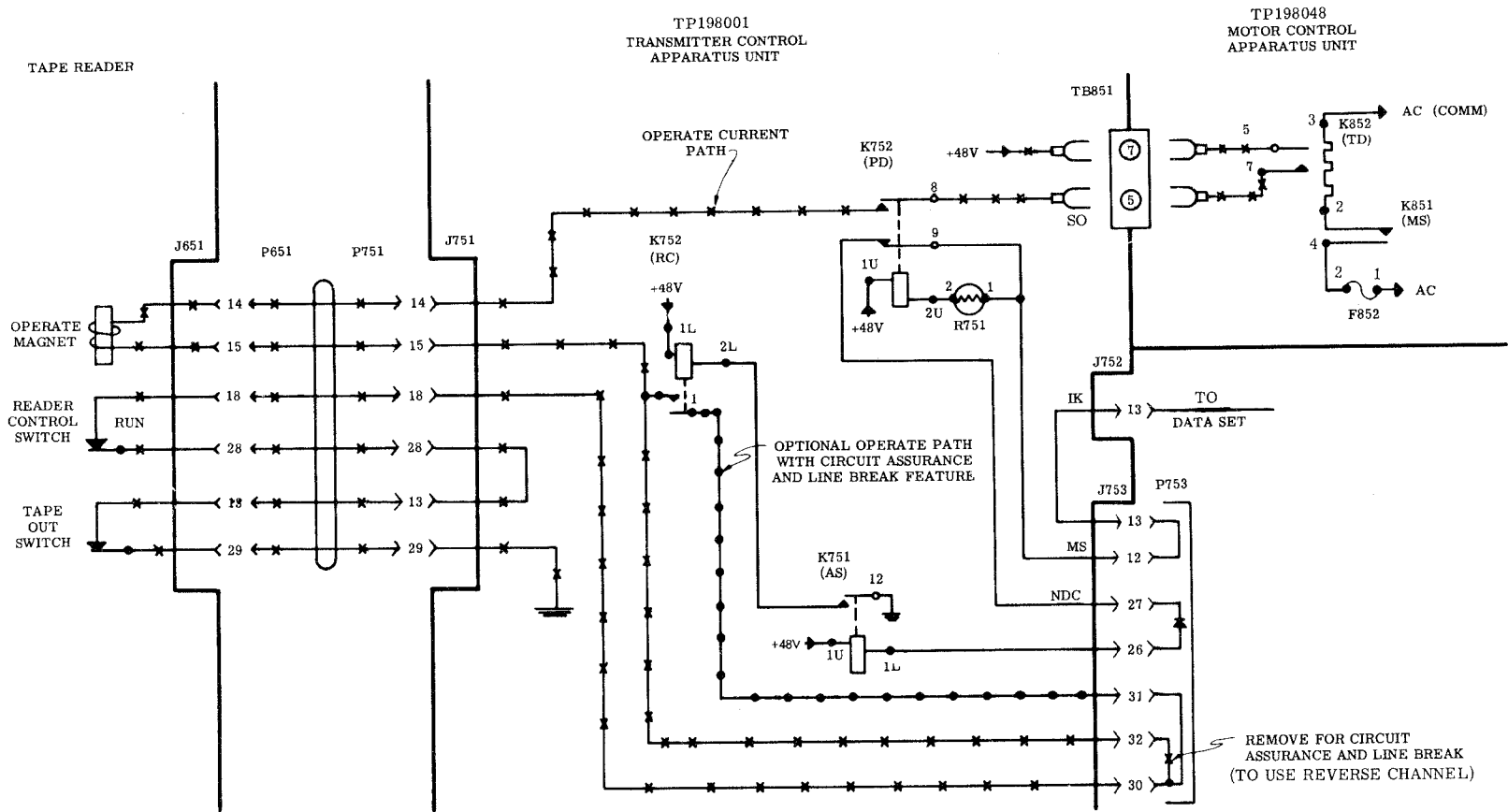
through contact 9 of the PD (pulse delay) relay K752, through pins 27 and 26 of J753-P753 to the coil of the AS (all-space) relay K751. Thus the MS relay (Paragraph B) and the AS relay are energized simultaneously.

4.09 Contacts 1 through 9 (see 6442WD) of the AS relay shift position to open the data lines to the data set, thus representing an all-space condition. Contact 12 of the AS relay provides a ground to pin 2L of the RC (reverse channel) relay K752. The RC relay performs no function however, unless the unit is operated with the optional circuit assurance and breakfeature (Part 5). In addition to providing current to the reader motor (Paragraph B), contacts 2 and 4 of the MS relay also complete the ac path through the TD (time delay) relay, K852, heater.

4.10 About 300 milliseconds after the DATA button is pressed, the PD (pulse delay) relay K752 is energized through thermistor R751. Contact 9 opens to release the AS relay, terminating the all space signal. Contact 8 of the PD relay closes to set up the current path to the reader operate magnet. About 2 seconds later, contacts 5 and 7 of the TD relay close to



Figure 7 - Reader Operate Circuit



complete a current path to the reader operate magnets. The 2 second delay allows the reader motor to attain operating speed. Note that completion of the reader operate current path (Figure 7) requires that the reader control switch at the reader be in the RUN position and that there is tape available to the reader. Returning the data set to the TALK mode will remove the motor start ground allowing the MS relay, the PD relay, and the TD relay to release.

#### D. Data Storage Circuit (Figure 8 and 9)

4.11 When the reader operate magnets energize, the code reading contacts associated with each data level open or close depending upon whether a space (no perforation) or mark (perforation) is sensed in a given level of the tape. Each code reading contact is associated with a relay coil. Closure of a code reading contact (mark) will set up the associated relay. When all levels are sensed, the universal contact closes providing a ground to all relay coils whose related code reading contacts are in the mark (closed) condition. These relays will energize. As the universal contact opens, the ground path to the base of the relay control transistor is interrupted. The transistor is thus biased into conduction by the +48 volts supplied through a 2K resistor to the base of the transistor. A holding path for all energized data relays is thereby established through the transistor, the relay holding contacts, and the relay coil to the 48 volt supply.

4.12 This holding path will be broken after the succeeding character is sensed and the universal contact again closes, restoring the ground to the base of the transistor. All data relays not associated with a second marking input will then release. In this manner data relays will remain energized as long as marking closures from the reader are continuous, and are released by closure of the universal contact in the presence of a spacing input.

4.13 A set of contacts (aside from the holding contacts) at each of the data relays provides a ground or open circuit to the data set via J752, depending upon whether the code reading contacts are sensing a mark or space condition. Note that each data level is carried through a contact of the all space relay K751.

4.14 Returning the data set to the TALK mode will have little effect on the data storage circuit except that the PD relay will release. The data relays may or may not be energized, depending upon the position in which the tape reader stops.

#### E. Timing Pulse Circuit (Figure 10)

4.15 A second function of the universal contact is to generate a timing pulse for use by the data set. The timing pulse is generated as follows. Closure of the universal contact provides a ground to the coil (pin 35) of K753(A) and K754(B) (pin 35), through contacts 1 and 2 of de-energized relay K755(C). Relay K753(A) energizes closing contacts 32 and 33. With the transistor cut off (base grounded) however, no current will flow through these contacts. Contacts 32 and 33 of K754 close to provide the necessary timing ground to the data set via pin 6 of J752. When the universal contact opens, the transistor is biased into conduction. Current now flows through the coil (pins 7 and 8) of K755(C) via contacts 32 and 33 of K753.

4.16 Relay K755(C) energizes. Contacts 1 and 2 of K755C open breaking the energizing current path through K753 and K754. However, a holding current path is now established through contacts 32 and 33 of K753 and the transistor keeping both K753 and K754 energized. When the universal contacts close on the next (2nd) character cycle, the transistor is again biased off, releasing all three relays and providing an open circuit timing signal to the data set. Closure of the universal contact on the next (3rd) character cycle will start the entire sequence anew. In this manner the timing signal output is made to alternate in unison with the character cycles of the reader, providing a ground for one character and an open circuit for the following character etc. Returning the data set to the TALK mode has little effect on the timing pulse circuit other than stopping the tape reader. The three relays involved in timing pulse generation may or may not be energized, depending upon the position in which the tape reader stops.

#### POWER SUPPLY RECTIFIER (See 6444WD)

4.17 The power supply rectifier circuit is a typical full wave bridge circuit driven from the secondary of a step down transformer. A filter capacitor and bleeder resistor complete the circuit. The circuit will supply 48 volts dc.

#### 5. OPTIONAL FEATURES

5.01 The following paragraphs cover a number of optional features available with the Sender. These optional features are also covered in tabular form in the descriptive section on the system and in the installation and checkout section on the Sender.

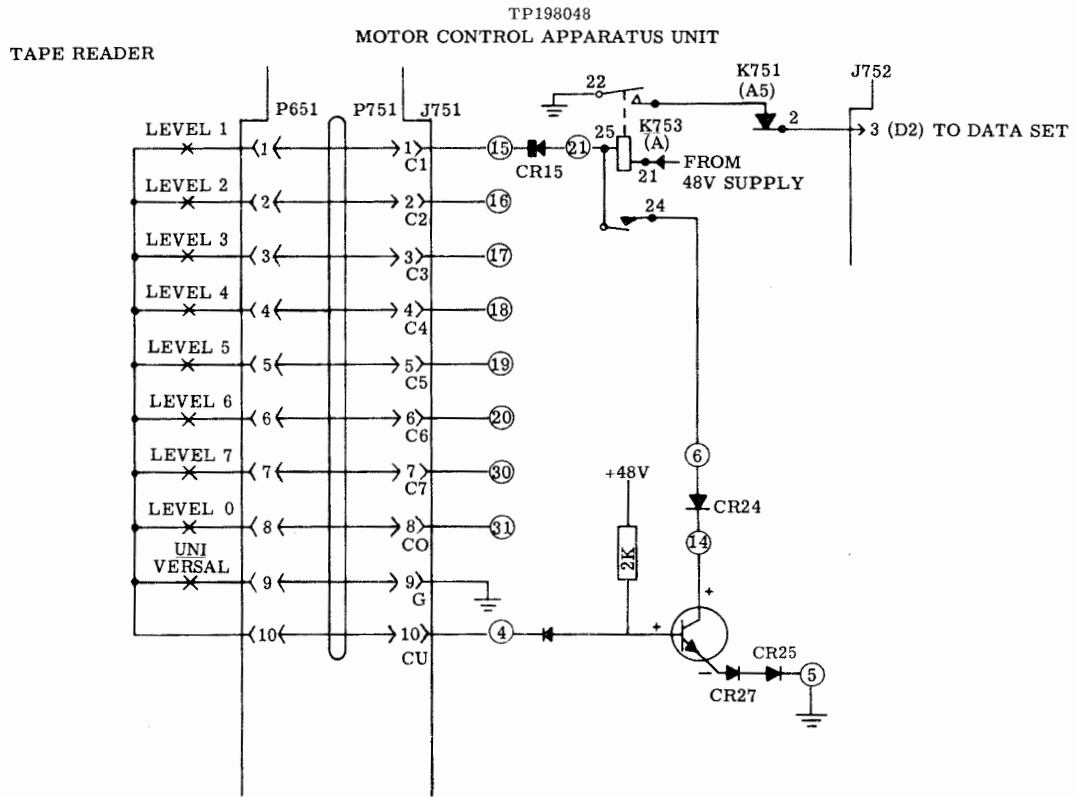


Figure 8 - Data Storage Circuit

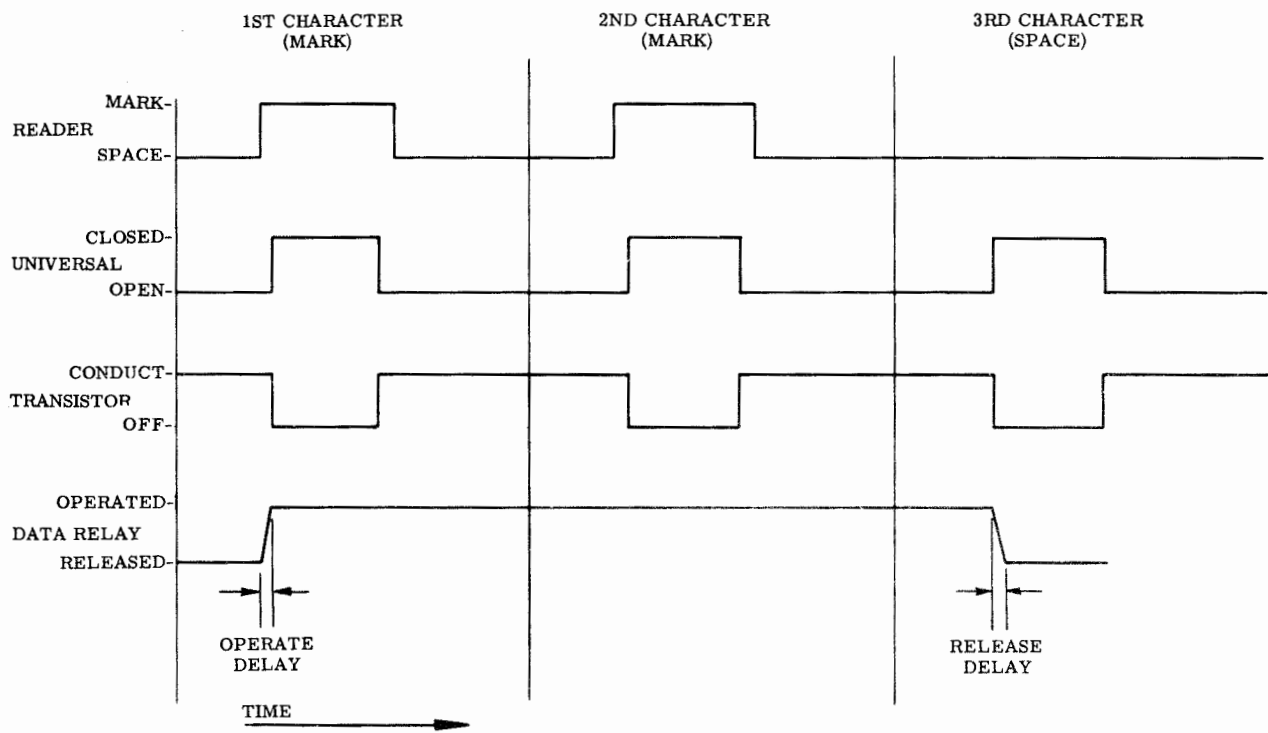


Figure 9 - Data Pulse Timing

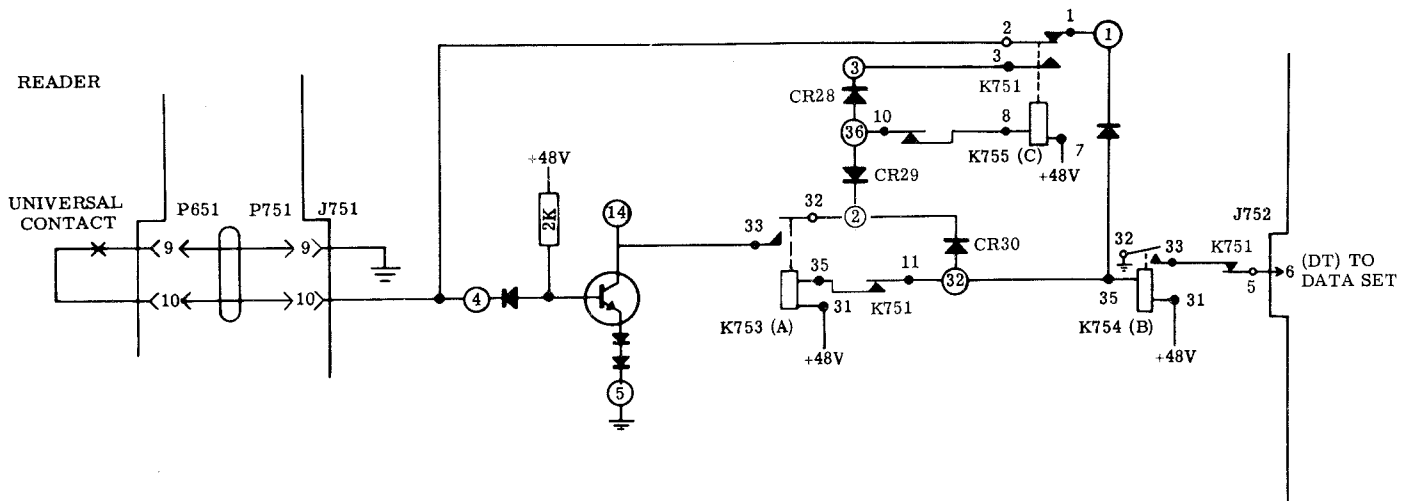
TP198001  
TRANSMITTER CONTROL APPARATUS UNIT

Figure 10 - Timing Pulse Circuit

## CIRCUIT ASSURANCE AND BREAK OPTION

## A. Description

5.02 The circuit assurance and break feature is built into all Senders, requiring only the removal of a jumper. This option will shut down the Sender automatically if a line break occurs. It will also permit the Receiver operator to stop the Sender should it be necessary to do so. In either of these instances, a signal lamp at the Sender will light, and an auxiliary signal circuit will be closed to advise the Sender operator of the shutdown. Note that this option can be employed only when the data set the reverse channel feature.

## B. Operating Procedure

5.03 Senders equipped with the circuit assurance and break feature will have a lamp in the SIGNAL position at the tape reader. Operation differs little from the procedure outlined in Part 3. Note that the high pitched tone heard when the receive station is placed in the DATA mode is accompanied by a low tone. The operator can ignore this low tone, pressing the DATA button in the normal mode when the high tone ceases. As mentioned in Paragraph 5.01 preceding, a stoppage of the reader is signaled by a lamp and by an auxiliary signal circuit (if employed). The Sender will not restart until the sending and receiving operators have put the data sets in the TALK mode and then into the DATA mode or have gone to the DATA mode as

on a new call. A stop of this nature normally involves some loss of data, requiring partial or complete retransmission.

## C. Principles of Operation (Figure 11)

5.04 Operation is much the same as for the standard unit. Note however that the strap across pins 31 and 32 of P753 (Figure 7) has been removed. The current operate path to the reader operate magnets is now dependent upon contact 1 of the RC (reverse channel) relay. This relay is energized in the normal manner through contact 12 of the AS relay (Part 4). It then latches up on a reverse channel holding ground, through contact 4 (Figure 11). This ground originates at the data set as a result of the reverse channel feature. Any interruption of the ground will break the operate magnet current path, stopping the reader. Contacts 3 and 2 of the RC relay close when the relay releases. These contacts complete the current path through contacts 11 and 12 of the energized PD relay (K752) to light the SIGNAL lamp, and to provide a closed circuit to an auxiliary alarm device connected to terminals 1 and 2 of the TB753. Restoring the data set to the TALK mode allows the PD relay to release, extinguishing the SIGNAL lamp and opening the auxiliary signal circuit. Returning the data set to the DATA mode causes the circuit to function as at the beginning of transmission, again operating the RC relay which will lock up if the RC lead has been grounded by the data set (ie, reverse channel restored).

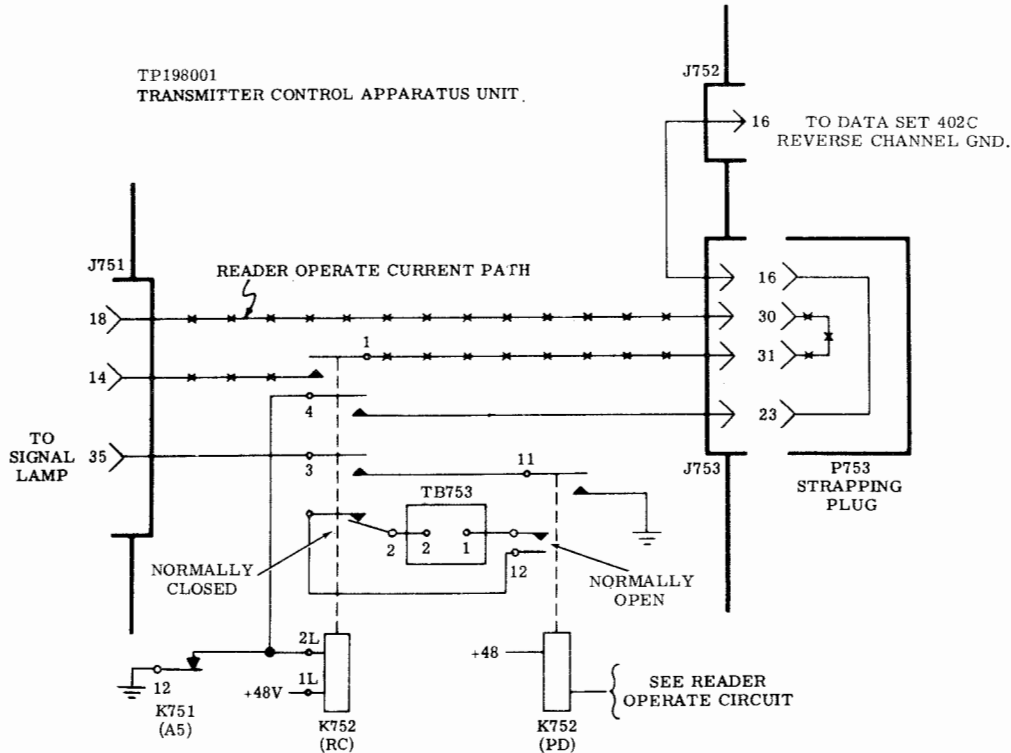


Figure 11 - Circuit Assurance and Break Option

#### D. Enabling Circuit Assurance and Break Option

5.05 The Sender is furnished from the factory with the option disabling jumper in place between pins 31 and 32 of the strapping plug. To enable the option, the strapping plug is removed from the equipment, its cover moved and pin 32 pulled from the connector and taped back as described in the installation procedure appearing in a related section. To disable the circuit assurance and break option, the pin should be replaced in position 32 of the strapping plug.

#### TP198002 RECOGNIZER APPARATUS UNIT OPTION

5.06 The TP198002 recognizer option enables the Tape Sender to respond to a call from a Receiver automatically, sending any taped data previously placed in the reader. The feature provides a recognizer circuit which will cause the Sender to transmit only in response to a coded signal. In this way, data will be transmitted only to authorized Receivers.

5.07 The recognizer feature is discussed fully in a related section.

#### TP199788 UNATTENDED SEND-RECEIVE APPARATUS UNIT OPTION

5.08 When a Sender and Receiver are connected as a send-receive station (Paragraph 2.02), the Receiver may be equipped with the TP199788 unattended send-receive option. When the Receiver is so equipped, and the Sender is equipped with a TP198002 recognizer apparatus unit, a calling station may direct the send-receive station to send or receive at will. Note that a calling Receiver must have a properly coded TP199784 station identifier (see appropriate section) to activate the send-receive station's Sender.

5.09 The unattended send-receive option is discussed more fully in a related section.

#### TP198021 AND TP199543 CABLE OPTIONS

5.10 Tape Sender 5A is normally equipped with a 10 foot power cable, and a 10 foot apparatus unit cable. Where it is necessary to place the tape reader farther away from the apparatus box assembly, a 25 foot TP198021 apparatus unit cable, and 25 foot TP199543 three-wire power cable are available as options.

TABLE 1

## SERVICE ARRANGEMENTS

The following table summarizes the apparatus required for various types of service arrangements. The use of suffixes in the coding scheme permits initial ordering of the arrangements needed. The addition of apparatus unit options to existing standard equipments can provide the same arrangements.		
SERVICE	SENDER APPARATUS STATION 1	RECEIVER APPARATUS STATION 2
Attended at both stations	5A or 5C Sender data set 402C or 402A	5B Receiver data set 402D and data auxiliary set 804A
Sender attended Receiver unattended	5A or 5C Sender data set 402C or 402A	5B Receiver - use auto answer feature in data set 402D and data auxiliary set 804A
Sender unattended Receiver attended	5A-1 or 5C-1 Sender - use auto answer feature in data set 402C	5B-1 Receiver data set 402D and data auxiliary set 804A
Unattended Send-Receive Stations	5A-1 or 5C-1 Sender - use auto answer feature in data set 402C	5B-2 Receiver - use auto answer and send-receive features in data set 402D
Unattended Send-Receive stations. Receiver in manual condition and capable of calling unattended Sender	5A-1 or 5C-1 Sender - use auto answer feature in data set 402C	5B-3 Receiver - use auto answer and send-receive features in data set 402D
<p>For the table-mounted Sender, the TP198002 recognizer option for discrete calling and unattended service mounts beside the other apparatus units in the wall-mounted apparatus box. For the floor-mounted Sender, this unattended service apparatus unit option is mounted in a space provided in the equipment cabinet.</p> <p>Unattended Send/Receive Station</p> <p>This station consists of a Sender arranged for unattended service and a Receiver containing an unattended send/receive apparatus unit option (TP199788). The send/receive station will automatically arrange itself to send or receive as appropriate to the type of calling station. A send/receive station used in placing a call can be manually switched to function as a Sender or as a Receiver; and a remote unattended send/receive station will follow these switching operations.</p>		

Note: Refer to text paragraphs covering options.