FIELD MAINTENANCE PRACTICE

SECTION 592-805-350
ISSUE 1, OCT. 1973

dataspeed®

TYPE 2A

TAPE SENDER TERMINAL

FMP

Bell System

"DATASPEED" TYPE 2 TAPE-TO-TAPE SYSTEM

TAPE SENDER 2A

CONTENTS

Prepared for American Telephone and Telegraph Company by Teletype Corporation

2.04 VISUAL INSPECTION — INTERNAL

CAUTION: REMOVE ELECTRICAL POWER FROM STATION BEFORE INSPECTION.

(a) Remove reader cover, open doors, and slide out tape transport.

(b) Check that all plugs are tightly connected to receptacles.

(1) Inspect ac power cord and connections.

(2) Check 37-pin connection on reader.

(3) Check 36-pin reader plug.

(4) Check 25-pin receptacle at data set.

(5) Check power cords at data set and at motor control.

(6) Check that all cards are firmly in position.

(7) Check that cables do not interfere with module or tape transport movement.

(8) Inspect all cables and wiring for broken or frayed wires.

(c) Check that all mechanisms appear trouble free.

(1) Check that reader and motor "float" freely in their rubber mountings. Check for loose mounting screws.

(2) Check that reader is free of binding by manually turning the flywheel.

(3) Check gears for barely perceptible backlash (6.04).

(4) Inspect for excessively worn parts. If permitted on customer premises, replace worn parts or assemblies that are likely to cause operational failure before next routine visit.

(5) Inspect for dry bearing or oxide deposits which indicate lubrication breakdown.

2.05 LUBRICATION

NOTE: Remove electrical power from station and thoroughly lubricate set as indicated below. Avoid overlubrication which might permit lubricant to drip or be thrown into adjacent areas.

(a) The following areas must be kept dry (free of all lubrication):

(1) All electrical components, terminals, connector, and contact surfaces

(2) Both magnet core faces in CX and any surfaces which contact them

(3) All parts normally touched by an attendant and exposed surfaces in paper handling areas

(4) All large flat areas.

(b) Use KS7470 oil in the following areas:

(1) All pivot surfaces

(2) All sliding contacting surfaces (unless otherwise noted)

(3) All spring hooks and comb guides

(4) All felt wicks and washers (saturate).

(c) Use KS7471 grease in the following areas:

(1) All gears and pinions

(2) Main shaft bearings (as needed).

(d) Use thin coat of "Lubriplate" grease (TKS102) on all cabinet slides.

2.06 SET CLEANING

NOTE: Do not allow solvent to come into contact with any plastic part.

(a) Wipe off any excessive lubricant.

(b) Remove paper dust, etc.

(c) Clean magnet core face and its armature by pulling a piece of bond paper between the armature and the pole pieces to remove any oil or foreign matter that may be present.

(d) Clean external surfaces with a soft cloth and mild soap or detergent solution. Thoroughly rinse and buff surface dry.

2.07 OPERATION TEST

(a) Connect all terminals and connectors previously removed.

(b) Connect station to electrical power source.

(c) Perform proper operating tests as directed in Part 3.

(d) Upon successful completion of operating tests, return station to service.

3. OPERATING TESTS

3.01 The operating tests and checks are divided into the following parts:

"OFF-LINE" OPERATING TESTS
Tape Sender Terminal
Sender Terminal Features

"ON-LINE" OPERATING TESTS
Tape Sender Terminal
Sender Terminal Features
Send-Receive Terminal
Sender Terminal with SA120 Feature

WIRING OPTIONS
Data Set Strapping Features
Rubout Delete Feature

3.02 Perform the required tests after installation, routine maintenance, or trouble call servicing.

3.03 The operating tests give the station a complete checkout. Individual test procedures are followed by subparagraphs which give the required response. If the unit does not respond as required, analyze per TROUBLE ANALYSIS TABLE (5.04) referred to in TROUBLE ANALYSIS column. If no reference is given, proceed as outlined in 5.02.

3.04 The operating tests provide a method for each of the individual components to verify proper operation, and in case of failure a check list of probable causes is given.

NOTE: The following tests and connections do not require operation of equipment on-line.

"OFF-LINE" OPERATING TESTS	TROUBLE ANALYSIS
3.05 Tape Sender Terminal	
• Connect power cord to 120 v ac receptacle.	
• AUTO-MANUAL switch to MANUAL.	
• WINDER switch OFF.	
• BREAK FEATURE (if present) OFF.	
• ON-OFF switch to ON at power supply module.	1,2
• POWER ON lamp on at power supply module.	5
• POWER lamp on at control panel.	5
• Check voltmeter on power supply module for each voltage.	3,4

METER SELECTION SWITCH	METER READING
+1.5	1.35 to 1.65
+6	5.4 to 6.6
-6	5.3 to 6.5
-6R	5.3 to 6.5
+12	10.8 to 13.2
-28	25.3 to 30.9

NOTE: +1.5 v, +6 v, and -12 v are adjustable. If any meter reading is outside limits, check adjustment in Section 592-805-402 before replacing power supply.

- Place TP146606 (8-level) or TP146861 (6-level advanced feed hole) test tape in reader.
- RUN-STOP-FREE lever to STOP.
- Depress READER button.
- Reader motor starts. 6
- RUN-STOP lever to RUN.
- Tape feeds through reader. 14,15,16,17
- RUN-STOP-FREE lever to STOP.
- Tape stops. 16
- Depress READER button.
- Reader motor stops.
- WINDER switch ON.
- Winder motor starts. 7
- Move tape tension arm toward chad depressor.
- Winder motor stops. 8
- Move tape tension arm away from chad depressor.
- Winder motor starts. 7
- WINDER switch to OFF.
- Winder motor stops.

3.06 Sender Terminal With TP146527 Line Break and Automatic Answer Assembly Feature

(a) Test for automatic answer.
- Check level indicator position.
- Check tape guide position.
- ON-OFF switch to ON (POWER lamps on). 1,2,5
- BREAK FEATURE switch (if present) to ON.
- Place tape in reader.
- AUTO-MANUAL switch to MANUAL.
- SEND-RECEIVE switch (if present) to SEND.
- RUN-STOP-FREE lever to RUN. 16
- Bell rings and LINE BREAK lamp on. 20,21,23
- Depress AUTO key at data set.
- AUTO-MANUAL switch to AUTO.
- LINE BREAK lamp off; bell stops ringing. 11
- OPR/TEST switch to OPR.

- Dial sender from nearby telephone.
- Data set at sender rings.
- TALK and DATA key lamps on. 11,13
- Reader and winder motors start. 6,7,9

NOTE: The RUN-STOP-FREE lever only controls reader transmission on sets using interim unattended answering option or a reverse channel data set.

- OPR/TEST switch to TEST.
- Reader runs. 14,15,17
- OPR/TEST switch to OPR.
- Reader stops. 22
- Hang up calling telephone, depress TALK button, lift handset and then hang up.

(b) Test for line break alarm.

- Place tape in reader.
- OPR/TEST switch to TEST.
- Reader and winder motors run. 6,7,9
- Tape feeds through reader. 14,15,17
- Open tape lid.
- Reader stops.
- Reader motor stays on. 6,9
- Bell rings. 21,23
- LINE BREAK lamp on. 20,23
- RUN-STOP-FREE lever to STOP. 16
- Alarms off.
- ON-OFF switch OFF.
- Reader motor stops.
- Close tape lid.

3.07 Sender Terminal With TP199610 Modification Kit "Y" Cable With or Without TP326713 Local Control Cable Adaptor — Tested With a Receiver Terminal as a Station

- LOCAL switch (if present) to LOCAL. 39
- SEND-RECEIVE switch to SEND. 24
- Place tape in reader.
- RUN-STOP-FREE lever to STOP.
- POWER switches ON at sender and receiver. 1,2

NOTE: All adjustments should be made before locally running station back-to-back.

- Depress READER key.
- Reader and winder motors run. 6,7,9
- WINDER switch on at receiver, winder motor runs.
- Depress PUNCH key, punch motor runs.

- Punch motor runs.
- RUN-STOP-FREE lever to RUN. 16
- Sender sends message. 14,15,17
- Receiver punches message. 25
- No errors in tape. 26 through 29

3.08 Sender Terminal With TP315900 Modification Kit to Provide Operate Time Delay of Line Break Relay

- Meet conditions of 3.06 (a) and (b).
- Tape in reader, RUN-STOP-FREE lever to RUN.
- Dial sender from a nearby telephone.
- Data set at sender rings.
- TALK and DATA key lamps light. 11,13
- Reader and winder motors start. 6,7,8
- Talk into handset (simulating line noise).
- Tape should not advance. 37
- Hang up calling telephone, depress TALK button, lift handset and then hang up.

"ON-LINE" OPERATING TESTS

3.09 Tape Sender Terminal

(a) Call Test Center and request type of test required.
- State type of station being tested (Type 2 DATASPEED sender).
- Station's optional features.
- Type of test (manual or auto, etc).
- Desired length of test (45 seconds or more).

NOTE: If SA120 is present on sender, its PARITY CHECK switch must be in OFF position except when testing SA120 Parity Failure Detector (3.16).

(b) Test Center operator will report:
- Any abnormal procedure.
- All errors in data transmission (final test must be free of errors).

NOTE: Should any error knowingly be transmitted by the calling station, recall Test Center and request repeat of test.

3.10 Sender Terminal Without Reverse Channel Feature

(a) Meet conditions of 3.09 (a) and (b).
- Place test tape in reader.
- ON-OFF switch ON (POWER lamps on). 1,2
- AUTO-MANUAL switch to MANUAL.
- OPR/TEST switch to TEST (simulates reverse channel).

- RUN-STOP-FREE lever to STOP. 16
- Depress READER button.
- Reader and winder motors start. 6,7,9
- Depress TALK key.

(b) Call Test Center and request test — of Type 2 Sender without reverse channel — of 45 seconds duration.
- Test Center goes to DATA mode.
- High-pitched tone heard in sender handset.
- Depress DATA key.
- DATA key lamp on. 12,13
- RUN-STOP-FREE lever to RUN. 16
- Within 10 seconds, tape transmission starts. 14,15,17
- Test message transmitted for 45 seconds.
- Depress TALK key.
- DATA key lamp off.
- RUN-STOP-FREE lever to STOP. 16
- Reader stops feeding tape.
- Depress READER button.
- Reader motor stops.

(c) Call Test Center for test report. 25 through 29
- Handset on-hook concludes test.

3.11 Sender Terminal With Reverse Channel Feature

(a) Meet conditions of 3.09 (a) and (b).
- Test tape in reader.
- ON-OFF switch ON (POWER lamps on). 1,2
- AUTO-MANUAL switch to MANUAL.
- OPR/TEST switch to OPR.
- RUN-STOP-FREE lever to STOP. 16
- Depress READER button.
- Reader and winder motors start. 6,7,10
- Depress TALK key.

(b) Call Test Center and request test — of Type 2 Sender with reverse channel — of 45 seconds duration.
- Test Center goes to DATA mode.
- High-pitched, then low-pitched tones heard in sender handset.
- Depress DATA key.
- DATA key lamp on. 12,13
- RUN-STOP-FREE lever to RUN. 16
- Within 10 seconds, tape transmission starts. 15,18
- 45 seconds of transmission (as prearranged with Test Center).
- Reader stops feeding tape. 22

(c) Depress TALK key and request test report from Test Center. 25 through 29
- Handset on-hook concludes test.

3.12 Sender Terminal With TP148161 Interim Unattended Answer Modification Kit (Without Reverse Channel Feature)

(a) Meet conditions of 3.09 (a) and (b).
- Test tape in reader.
- ON-OFF switch ON (POWER lamps on). 1,2
- RUN-STOP-FREE lever to RUN. 16
- READER button and WINDER switch unoperated.
- OPR/TEST switch to OPR.
- AUTO-MANUAL switch to AUTO. 11
- Depress TALK key.

(b) Call Test Center and request test — of Type 2 Sender without reverse channel equipped with TP148161 Interim Unattended Automatic Answer Modification Kit — of 45 seconds duration.
- Depress AUTO key.
- Replace handset on-hook.
- Data set rings.
- DATA and TALK key lamps on. 11,13
- Reader and winder motors on. 10
- Within 10 seconds reader transmits. 19
- After 45 seconds of transmission, release tape lid on reader.
- Reader stops feeding tape.
- Bell rings. 21,23
- LINE BREAK lamp on. 20,23
- Reader and winder motors stop.
- RUN-STOP-FREE lever to STOP. 16
- Alarms off.

(c) Depress TALK key and call Test Center to obtain test report. 25 through 29
- Handset on-hook concludes test.

3.13 Sender Terminal with TP146327 Line Break and Automatic Answer Assembly (With Reverse Channel Feature)

(a) Meet conditions of 3.09 (a) and (b).
- Test tape in reader.
- RUN-STOP-FREE lever to RUN. 16
- ON-OFF switch ON (POWER lamps on). 1,2
- AUTO-MANUAL switch to AUTO. 11
- OPR/TEST switch to OPR.
- READER button and WINDER switch unoperated.
- Depress TALK key.

(b) Call Test Center and request test — of Type 2 Sender equipped with TP146527 line break and automatic answer (with reverse channel) — of 45 seconds duration.

- Depress AUTO key.
- Replace handset on-hook.
- Data set rings.
- DATA and TALK key lamps on. 11,13
- Reader and winder motors on. 10
- Within 10 seconds reader transmits. 18
- After 45 seconds of transmission, Test Center goes into TALK mode (as prearranged).
- Reader stops feeding tape. 22

(c) Depress TALK key and obtain test report. Instruct Test Center to return to DATA mode. 25 through 29

- Depress DATA key.
- Within 10 seconds reader transmits. 18
- Create a tape-out condition by releasing tape lid.
- Reader stops feeding tape. 22
- Bell rings. 21,23
- LINE BREAK lamp on. 20,23
- RUN-STOP-FREE lever to STOP. 16
- Alarms off.
- Handset on-hook concludes test.

3.14 Sender Terminal With TP199551 Recognizer Unit Feature

(a) Meet conditions of 3.09 (a) and (b).

- Check that card Z601 is tightly seated in position.
- Test tape in reader (TP146606 for 8-level or TP146861 for 6-level special).
- ON/OFF switch ON (POWER lamps on). 1,2,5
- AUTO-MANUAL switch to AUTO. 11
- OPR/TEST switch to OPR.
- Level selection dial on reader is at proper tape level setting.
- RUN-STOP-FREE lever to RUN. 16
- READER button and WINDER switch unoperated.
- BREAK FEATURE switch OFF at stations without reverse channel feature; BREAK FEATURE switch ON at stations having reverse channel feature.
- Depress TALK key.

(b) Call Test Center and request test — with or without reverse channel feature, as required — of Type 2 Sender equipped with TP199551 recognizer unit — in AUTO mode — of 45 seconds duration. Compare coding of recognizer/identifier coded discs, codes must match at sender and Test Center or a substitute blank (uncoded) disc may be used for testing.

- Depress AUTO key.
- Replace handset on-hook.
- Data set rings.
- DATA and TALK key lamps light. 11,13
- Reader and winder motors on. 10

NOTE: A transmission of an invalid transmitter start code is now sent by Test Center.

- Recognizer disc rotates once. 31,32,33
- Reader does not start. 35

NOTE: Test Center now transmits valid start code.

- Disc rotates once again. 32
- Within 10 seconds message transmission starts. 34

(c) On sets without reverse channel feature, depress TALK key 45 seconds after reader starts, to conclude test.
- DATA key lamp off.
- TALK key lamp remains on. 13
- Reader stops feeding tape.
- Reader motor off.

(d) On sets having reverse channel feature, reader stops feeding tape 45 seconds after it starts (Test Center goes to TALK mode). 22
- Depress TALK key.
- DATA key lamp off.
- TALK key lamp remains on. 13
- Reader motor off.

(e) Check with Test Center for test report and request test of manual operation.
- AUTO-MANUAL switch to MANUAL.
- Depress READER button.
- Reader motor on. 6
- Test Center goes to data mode.
- High-pitched tone heard in sender handset.
- Depress DATA key.
- DATA key lamp lights. 13
- Within 10 seconds, tape transmission starts.
- Create a tape-out condition by releasing tape lid.
- Reader stops. 22
- Bell rings. 20,23
- LINE BREAK lamp lights. 21,23
- RUN-STOP-FREE lever to STOP. 16
- Alarms off.
- 30 seconds after reader stops, DATA key lamp off. 36
- Depress READER button.
- Reader motor off.

NOTE: Test Center need not be called back unless operation is abnormal. Likewise the Test Center will only call back if transmission is abnormal.

- Handset on-hook concludes test.

3.15 Send-Receive Terminal With TP199610 Send-Receive "Y" Cable, TP199551 Recognizer and (If Present) TP320296 Mode Control Modification Kit.

NOTE: To test SEND-RECEIVE mode completely it is necessary to call a Test Center equipped with a send-receive station. But, if customer will not use automatic switching from send to receive modes on a single call, any Test Center capable of testing DATASPEED Type 2 may be called.

(a) Meet conditions of 3.09 (a) and (b).

NOTE: If necessary to test sender alone (for trouble-shooting) disconnect ST connector and connect mating connector to data set.

(b) SEND-RECEIVE switch to SEND and perform on-line test in 3.14.

(c) SEND-RECEIVE switch to RECEIVE. 24
- Depress AUTO key.
- Data set rings.
- DATA and TALK key lamps on. 13
- Punch and winder motors on.

NOTE: Test Center sender goes to data mode.

- Reperforator punches tape for 30 seconds, as prearranged with Test Center.
- Reperforator stops punching.
- Depress TALK key and verify test results.

(d) SEND-RECEIVE switch to SEND/RECEIVE. 24
- Depress AUTO key.
- Data set rings.
- DATA and TALK key lamps light. 13
- Reader and winder motors on. 6,7
- Punch and winder motors on.

NOTE: Test Center receiver transmits discrete transmitter start code.

- Recognizer disc rotates once. 31,32,33
- Within 10 seconds tape transmission starts. 34,37
- Create a tape-out condition by releasing tape lid.
- Reader stops.
- Bell rings and LINE BREAK lamp lights. 20,21,23

NOTE: Test Center punch stops; in a few seconds Test Center starts sending.

- Receiver punch perforates tape.

NOTE: Test Center need not be called back unless operation is abnormal. Likewise the Test Center will only call back if transmission is abnormal.

- Handset on-hook concludes test (d).

NOTE: Testing of TEST position is OFF-LINE.

(e) SEND-RECEIVE switch to TEST. 24
- Punch and reader motors on. 9
- Sender OPR/TEST switch to TEST.
- Call sender from a nearby telephone.
- Data set rings.
- Lift handset and depress DATA key.
- DATA key lamp lights. 13
- RUN-STOP-FREE lever to RUN. 16
- Tape transmission starts. 15
- Punch perforates tape. 25
- RUN-STOP-FREE lever to STOP. 16
- Reader stops.
- Punch stops.
- Inspect tape perforated by punch. 25 through 29

NOTE: If TP320296 Mode Control Modification Kit is present, continue with (f); otherwise, handset on-hook concludes test (e).

(f) SEND-RECEIVE switch to SEND/RECEIVE. 24
- AUTO-MANUAL switch to AUTO. 11
- OPR/TEST switch to OPR.
- Test tape in reader.
- RUN-STOP-FREE lever to RUN. 16
- TEST-OPERATE switch to TRD module in receiver to OPERATE.
- Adequate tape supply at receiver.
- PUNCH and WINDER switches unoperated.
- Call a Test Center equipped with a send-receive station having reverse channel and request test of send-receive station equipped with TP320296 Mode Control feature.

NOTE: Action by the Test Center should be as follows; Test Center calls back, unattended send-receive station answers, Test Center goes to DATA mode in RECEIVE position, and transmits the transmitter start code. After receiving traffic for 30 seconds, Test Center goes to TALK mode (but does not speak) for 15 seconds. It then switches to DATA mode and SEND position and transmits a test message for 30 seconds. At the end of 30 seconds, a switch back to RECEIVE is made and the transmitter start code is again transmitted. After receiving transmission for a few seconds, Test Center returns to TALK mode and reports test results.

- Depress AUTO key.
- Data set rings.
- DATA and TALK key lamps light. 13
- Reader motor on. 10
- Punch and winder motors on.

NOTE: Test Center now generates valid transmitter start code.

- Recognizer disc rotates once. 31,32,33
- Within 10 seconds tape transmission occurs. 34,37
- After 30 seconds of transmission (as prearranged with Test Center) reader stops.
- As soon as reader stops, observe operation of relay KS15-1; It should de-energize in 4, 8 or 12 seconds (as determined by set strapping). 38
- Station switches to receive mode.
- After 3 to 11 seconds more (total 15 seconds after reader stops), station begins to receive traffic. 34,37
- After 30 seconds of tape reception, punch stops.
- When punch stops observe recognizer disc again.

NOTE: Test Center generates valid start code again.

- Recognizer disc rotates once. 31,32,33
- Within 10 seconds, tape transmission resumes. 34,37
- After a few seconds of transmission, depress TALK key and obtain test report from Test Center.
- Handset on-hook concludes test.

3.16 SA120 Parity Failure Detector Feature on Sender Terminal (If Present) — Even Parity Inserted in Tape

(a) Sender tested on-line per 3.10, 3.11, 3.12, 3.13, 3.14 or 3.15 with SA120 PARITY CHECK switch OFF.
- Turn PARITY CHECK switch ON.

(b) Call Test Center and request a repeat of 3.10 and 3.11. Explain to Test Center that received test pattern should have even parity.

(c) Test Center should report that all-marking and all-spacing characters are received unchanged, but all characters with one marking bit in tape are received with eighth-bit marking (except characters with eighth-bit marking only, which is received as an all-spacing character). 40 through 45
- Handset on-hook concludes test.

3.17 Data Set strapping features — required for DATASPEED Type 2 terminal are as follows:

FEATURE DESCRIPTION			WIRING OPTION	STRAP TERMINALS ON TB2
Auto Answer Feature	Key Controlled (Contact Interface)		ZC	49-50
	Permanent (Contact Interface)		ZD	50-51
Bit Rate			ZB	15-16
Amplitude Equalizer		IN	F*	18-19
		OUT	E	17-18
Delay Equalizer		IN	B*	61-62, 64-65
		OUT	A	62-63, 63-64
Interface		Contact	M	2-3, 5-6, 9-10, 12-13
Squelch		IN	S*	46-47
		OUT	ZM	47-55 (Remove R Wirng)
Demodulator Clamp		ON	V*	20-21
		OFF	U	21-22
2-Wire Operation			Z*	27-28, 31-32, 33-34, 35-36, 38-39, 41-42, 53-54, 56-57
Termination		600 ohm	X	44-45
Data Transmit Levels (Select Best)**		0 dbm	K	11-12
		-3 dbm	J	24-25
		-6 dbm	H*	22-23
		-9 dbm	G	33-34

			TERMINAL NUMBERS	TERMINAL BOARD
Reverse Channel (202C1, C5, C7, C9, C11—OUT, 202C2, C6, C8, C10, C12—IN)	IN	T	1-2, 6-7	TB3
	OUT	S	2-3, 7-8	TB3
Reverse Channel Transmit Level (Select Best)**	-3 dbm	ZE	White lead to 1	TB4
	-6 dbm	ZG*	White lead to 2	TB4
	-9 dbm	ZH	White lead to 3	TB4
801 Type Auto Calling Unit	Not Provided	—	17-20	TB1
6017 AP Key	Not Provided	ZV*	7-9	TB1
Carrier Soft Turn Off	IN	ZV*	1-2	ON CP AS39

*Factory-furnished option. **Potentiometer in new data set.

3.18 Wiring required for Rubout Delete feature in TTSC800 is as follows.

(a) At TP177560 check A, B and R. If not strapped, wire BJ pins A, B and R.

(b) Remove wire CR-P to A-C4; restrap CR-P to BJ-P.

(c) Add the following straps at:

BH-Z216, BJ-Z215, and BK-Z217

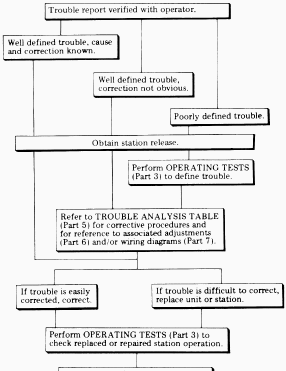
BH-C to BK-B	BJ-C to BR-B (omit for 5-level)
BH-E to A-C4	BJ-D to BR-D
BH-D to BJ-B	BJ-E to BQ-B
BH-R to BJ-S	BJ-F to BQ-D
BK-A to CK-N	BJ-H to BP-B
BK-K to BJ-N	BJ-K to BP-D
BK-P to BN-P	BJ-L to BN-B
BK-S to CK-C	BJ-M to BN-D

BH-H to BJ-J to BK-R to BM-S

NOTE: Replace cards in cases of trouble, as in 5.04 — Trouble 30.

4. TROUBLE CALL PROCEDURE

4.01 The chart below illustrates the procedure normally followed during a trouble call.



5. TROUBLE ANALYSIS

5.01 The following table (5.04) contains correction procedures for all troubles listed in the Operating Tests (Part 3). Corrective procedures are given directly, or refer to a specific adjustment in Part 6; electrical system callouts refer to Wiring Diagrams shown in Part 7.

5.02 If a trouble is not covered in this table, or cannot be corrected within a reasonable amount of time, consider the following:

(a) Use locally specified procedures (assistance, call supervisor, etc).

(b) Repair component using associated BSP or wiring diagrams (1.02).

(c) Replace (defective) components, only after checking that wiring and connections are not at fault. All components should be tested prior to replacement, if a test is available (available field tests are included in 5.04).

5.03 Replace cards or fuses only as directed in 5.04.

CAUTION: BEFORE REMOVING OR REPLACING CARDS, COVERS OR ANY OTHER COMPONENTS, REMOVE ELECTRICAL POWER. USE PREADJUSTED CARDS FOR ALL SUBSTITUTIONS.

5.04 TROUBLE ANALYSIS TABLE

No.	Trouble	Corrective Procedure
1	No power (power supply turned ON).	Examine 10 amp SL-BL fuse TP120165 in bottom front of cabinet. Replace if blown.
		Test customer ac outlet (115 v ac ±10% 60 Hz).
		Examine power cord TP165239. Replace if defective.
		Replace power supply TP177149.
2	POWER lamp at power supply does not light.	Replace bulb TP171642.
3	Power supply voltmeter does not show a reading when a voltage is checked.	If all voltages are missing, check both 1.6 amp ac fuses TP171642. Replace if blown.

No.	Trouble	Corrective Procedure
3 (cont)		Examine fuse for missing voltage. VOLTAGE AMPS PART NO. -6 V 1 TP120139 AC 1.6 TP171642 (2) +1.5 V 2 TP120166 -6R V 1 TP120139 12 V 3 TP171648 -28 V 6 TP171641 +6 V 1 TP120139 Replace if blown.
		Check output voltage at fuse holder (with VOM). If voltage is present, replace rotary switch TP171447. If voltage is missing, replace power supply TP177149.
4	Power supply voltmeter reading or readings outside limits.	Verify output voltage at fuse holder (with VOM). If voltage is within limits, replace meter or entire power supply.
		If +1.5 v, +6 v or -12 v voltage is outside limits, adjust power supply (if posable). If -6 v, -6R v or -28 v is outside limits, replace power supply TP177149.
5	POWER lamp at control panel fails to light (POWER ON lamp at power supply on).	Examine both at fuses TP171642 and -28 fuse TP171641 at power supply. Replace if blown.
		Check POWER lamp bulb TP171559.
		Examine POWER lamp socket TP142158. Replace if defective.
		Check terminal B4 on P902(R) with respect to terminal B2. it should be approximately -28 v; if not, check connectors and wiring for faults.
		Replace TP177149 power supply.
6	Reader motor does not run(winder motor runs, READER pushbutton ON).	If red reset button at left side of motor is out, push to reset.

No.	Trouble	Corrective Procedure
6 (cont)		Spin reader flywheel, by hand, to check for binding of motor. Check motor for overheating (obstructions at ventilating holes or binding of gears). Clear any obstructions or binding; replace TP161984 motor if burned out.
		Verify continuity of READER push-button switch TP145971 when operated (POWER OFF). Replace switch if defective.
7	Winder motor does not run (reader motor runs, WINDER switch on and winder arm unlatched).	Check Winder Switch Electrodes 6.06 and Winder Switch Mounting Clamp 6.07.
		Check mercury switch assembly TP146357 for continuity when visibly closed. Replace switch if defective.
		Check toggle switch TP199609 for continuity in WINDER position. Replace switch if defective.
		Examine winder motor for binding and inspect wiring. If no defects are found, replace TP145976 motor.
8	Improper tape winding.	If winder does not operate at all, refer to Trouble 7.
		Check Chad Depressor Bracket 6.05.
		Check Tape Unwinder Arm 6.08.
9	Reader and winder motors do not run (OPR./TEST switch in TEST and AUTO-MANUAL switch in AUTO).	Verify presence of -28 v at one side of motor start relay (K). If missing, examine -28 v fuse TP171641 and wiring for relay (7.06).
		Replace relay driver card TP146520 or TP177543 (unattended set) and retest.
		Verify that motor start relay (K) energizes when input is +8 v. Replace entire TP146527 line break and automatic answer assembly if relay is defective.

No.	Trouble	Corrective Procedure
10	Reader and winder motors do not run (OPR/TEST switch in OPR, AUTO-MANUAL switch in AUTO and DATA key lamp ON).	Place OPR/TEST switch in TEST. If motors do not run refer to Trouble 9 (return switch to OPR).
		Remove power from set and extend card in Z601 (EC520 or EC543) using a 15-pin card extender TP172450. Disconnect connector from data set and check continuity between pin 6 of that connector and pin M of card EC520 or EC543. If continuity is missing repair wiring or connectors; if continuity is present test/or replace 202C Data Set (1.02(c)).
11	Data set does not answer calls automatically when sender is in AUTO mode.	If reader and winder motors are not running, refer to Trouble 10.
		Check continuity of AUTO-MANUAL switch TP109609. If contacts do not make or if contact resistance is high, replace switch.
		Inspect connector J601 for proper contact.
		Replace card in Z601 (TP146520 or (TP177543) and retest.
		Verify that automatic relay (B) energizes in AUTO mode. If not, replace entire TP146527 line break and automatic answer assembly.
12	Data set drops call shortly after going into DATA mode (POWER on at sender).	If sender is connected to a Centrex exchange and reverse channel is not used, replace data set with a 202C9 or higher series Data Set.
		Examine connections between data set and sender for loose connectors or broken wires. Tighten or repair connector as required.
		Test/or replace 202C Data Set (1.02(c)).
13	Data set lamps do not light.	With handset off-hook and power ON, press key. If lamp does not light, test/or replace lamp or entire 202C Data Set (1.02(c)).

No.	Trouble	Corrective Procedure
14	Poor tape condition (feed holes tearing, etc).	Inspect tape routing.
		Check Tape Lid 6.09.
		Check Feed Wheel Detent 6.19.
15	Reader does not feed tape (reader operating magnets energized).	Check Tape-Out Pin 6.10.
		Check Tight-Tape Arm 6.13.
		Check Feed Wheel Detent 6.19.
		Check Feed Pawl 6.20.
		Check Inertia Stop Lever 6.21.
		Check Tape Lid 6.09.
		Check Magnet Assembly 6.17 and 6.18.
		Replace maladjusted or defective (CX802 or CX602) reader.
16	Reader does not go into RUN or STOP (RUN-STOP-FREE lever moved to RUN or STOP with motor running.)	Check Start-Stop Contact Assembly Bracket 6.11 and 6.12.
		Check Magnet Assembly 6.17 and 6.18.
		Replace (CX802 or CX602) reader.
17	Reader does not feed tape (motor running, RUN-STOP-FREE lever in RUN, and OPR/TEST switch in TEST).	If reader operating magnets energize but tape does not feed, refer to Troubles 15 and 16.
		If reader operating magnets do not energize, remove power from set and extend card in Z601 (EC520 or EC543) using a 15-pin card extender (TF172450). Reconnect power and measure voltages between pins D (gnd) and F of card EC520 or EC543. If this voltage is 0 v, check +6 v fuse; if fuse is good, check +6 v output at power supply with VOM. Replace power supply (TF177149) if +6 v output is missing.
		If +6 v is present at power supply output but not at pin F of card EC520 or EC543, check continuity for it and repair any defective wiring or connectors.

No.	Trouble	Corrective Procedure
17 (cont)		If +6 v is present at pin F of card EC520 or EC543, measure voltage between pins D and J. (When using EC543 card, wait 15 seconds after power is applied.) If this voltage is anything other than 0 v, replace card EC520 (TP146520) or EC543 (TP177543).
		If 0 v is present at pin J of card EC520 but line break relay (C) does not energize, disconnect connector (B) (behind reader) and check for continuity between pins 13 and 29 of this connector (with tape in reader and tape-out pin depressed). If continuity is missing, replace (CX802 or CX602) reader.
		If continuity is present between pins 13 and 29 of connector (B) but line break relay does not energize, replace entire TP146527 line break and automatic answer assembly.
		If line break relay energizes but reader operating magnets do not, check for continuity between pins 28 and 18 of connector (B) and no continuity between pins 28 and 12 with RUN-STOP-FREE switch in RUN. If either is bad, refer to Trouble 16; if both are good, check wiring for reader at pins 14 and 15 of connector J801 (A). If wiring is good, replace (CX802 or CX602) reader.
18	Reader does not feed tape, using EC520 card (motor running, RUN-STOP-FREE lever in RUN, and OPR/ TEST switch in OPR).	If station is equipped with a TP199551 recognizer unit, refer to Troubles 31 and 34. If not, place OPR/TEST switch in TEST. Reader should send, if not refer to Trouble 17 (return switch to OPR).
		If reader feeds tape in TEST, call customer receiver or Test Center and have operator go into DATA mode while you stay in TALK mode. Listen for a low-pitched (reverse channel) tone from receiver at end of short high-pitched tone. If line is silent, receiver is at fault.

No.	Trouble	Corrective Procedure
18 (cont)		If reverse channel tone is heard, remove power from set and extend card EC520 (2601) using 15-pin card extender (TP172450). Disconnect connector from data set and check continuity between pin 12 of that connector and pin F of card EC520. If continuity is missing, check wiring and connectors for faults.
		If continuity is present, check reverse channel strapping of data set at TB3 (3.16). If straps are good, replace 202C Data Set (1.02(c)).
19	Reader does not feed tape, using EC543 card (motor running, RUN-STOP-FREE lever in RUN, and OPR/TEST switch in OPR).	Place OPR/TEST switch in TEST. If reader does not send, refer to Trouble 17. Return switch to OPR.
		If reader feeds tape in TEST mode, remove power from set and extend card EC543 (position 2601) using 15-pin card extender (TP172450). Disconnect connector from data set and check continuity between pin 6 of that connector and pin M of card EC543. If continuity is missing, check wiring and connectors for faults.
		If continuity is present, reconnect data set and power and depress DATA key on data set so that DATA key lamp lights. Measure voltage between pins C (gnd) and M on card EC543 (card extended, OPR/TEST switch in OPR). If this voltage is +5 to +9 v, replace card EC543. If it is anything else (0 v or negative), test/or replace 202C Data Set (1.02(c)).
20	Line break bell rings, lamp does not light.	Replace lamp TP171559.
21	Line break lamp lights, bell does not ring.	Verify that alarm relay (L) TP146522 energizes when line break relay (c) de-energizes. If not, replace relay or entire TP146527 line break and automatic answer assembly.
		If alarm relay energizes, replace bell audible alarm TP159611.

No.	Trouble	Corrective Procedure
22	Loss of reverse channel does not stop sender (BREAK FEATURE switch — if present — ON, OPR/TEST switch in OPR).	Verify that receiving station is interrupting transmission (is in TALK mode) and that RUN-STOP-FREE lever is in RUN.
		Remove power from set and extend card EC520 using 15-pin card extender (TP172450). Reconnect power and measure voltage between pins D (grd) and F of card EC520 (Z6011) when reverse channel is interrupted. If this voltage does not go to approximately -6 v, replace 202C Data Set (1.02(e)).
		If -6 v is present at pin F of card EC520, measure voltage between pins D and J. If this voltage is 0 v, replace card EC520 (TP146520) and retest; if it is -6 v to -28 v, replace entire TP146527 line break and automatic answer assembly.
		If retest fails, determine whether line break relay (C) is de-energized. If not, check line break relay and associated wiring for short to ground. If no short is found or if line break relay is de-energized, replace entire TP146527 line break and automatic answer assembly.
23	Line break lamp does not light and bell does not ring when reverse channel is absent.	If sender does not stop when reverse channel is interrupted, refer to Trouble 22.
		If sender stops but alarms do not operate, replace entire TP146527 line break and automatic answer assembly.
24	Mode switch (SEND — RECEIVE — SEND/ RECEIVE — TEST) does not switch modes properly.	Inspect switch TP148322. Replace if defective.
		If TP320296 modification kit is present, replace card TP303294 and retest.
		Verify operation of relay K835U (TP320296 modification kit only). If inoperative, replace entire TP199551 recognizer unit.

No.	Trouble	Corrective Procedure
25	Tape moves through reader but nothing is sent (line always marking). NOTE: If an oscilloscope or test point signal monitor is available, it will save time to use it to analyze this trouble per BSP Section 592-805-501.	Check Universal Transfer Lever 6.15.
		Check Timing (Universal) Contact Actuator 6.16.
		Clean universal code contacts. If defective replace contact assembly or entire (CX802 or CX602) reader.
		Check Magnetic Pickup 6.22.
		Check for short between insulated lead of 2.7K ohm resistor (between pins 9 and 4 of P701 (N) connector) and frame ground.
		Replace cards in TTSC module as follows and recheck operation after each: Z209 (TP172431), Z211(TP172324), Z212 (TP172225), and Z202 (TP172361).
		Replace cards in TTD module as follows and recheck operation after each: Z108 (TP172394) see NOTE (below), Z109 (TP172429), Z121 (TP172490), Z101 (TP172365), Z102 (TP172347), Z103 (TP172321), Z104 (TP172359), Z105 (TP172473), Z106 (TP172375), and Z107 (TP172323). NOTE: If replacing card Z108 corrects trouble, look at position of dots on adjustable inductor on card replaced. If not lined up, adjust inductor to bring them next to each other. Restore card and retest.
		Replace (CX802 or CX602) reader.
		Test/or replace 202C Data Set (1.02 (c)).
26	Tape moves through reader but all spaces are sent. NOTE: If an oscilloscope or test point signal monitor is available, it will save time to use it to analyze this trouble per BSP Section 592-805-501.	Call Test Center and perform loop-back test of 202C Data Set. Replace if defective.
		Check for loose or open connection at J801 (A), P201 (T), P101 (S), and P701 (N).
		Check Sensing Bail 6.14.

No.	Trouble	Corrective Procedure
26 (cont)		Switch cards between positions Z111 and Z118. If operation changes, replace card now in Z118 (TP173359).
		Replace (CX802 or CX602) reader.
27	Tape moves through reader but all marks are sent. NOTE: If an oscilloscope or test point signal monitor is available, it will save time to use it to analyze this trouble per BSP Section 592-805-501.	Switch cards between positions Z111 and Z118. If operation changes, replace card now in Z118 (TP172359).
		Replace (CX802 or CX602) reader.
28	Garbled transmission — one or more levels frequently or constantly marking or spacing. NOTE: If an oscilloscope or test point signal monitor is available, it will save time to use it to analyze this trouble per BSP Section 592-805-501.	If level 0 is always spacing and/or levels 6 and 7 are always marking, check settings of level selector switches on reader and cabinet.
		Check for loose or broken card connectors.
		Determine which level is failing, replace cards in TTSC module as follows and recheck operation after each one. LEVEL — POSITION AND CARD 0 or 1 — Z201, TP172361 Z203, TP172375 Z207, TP172385 2 or 3 — Z201, TP172361 Z204, TP172375 Z207, TP172385 4 — Z201, TP172361 Z205, TP172375 Z208, TP172385 5 — Z202, TP172361 Z205, TP172375 Z208, TP172385 6 or 7 — Z202, TP172361 Z206, TP172375 Z208, TP172385

No.	Trouble	Corrective Procedure
28 (cont)		Adjust reader normally-closed contact for failing lever(s). Check Control Mechanism Spring Tension — Normally Closed Contact 6.23, Control Mechanism Backstop — Normally Closed Contact 6.24 or Control Mechanism Spring Tension — Normally Closed Contact Against Backstop 6.25, if failing by going marking.
		Replace (CX802 or CX602) reader.
29	Garbled transmission no obvious pattern. NOTE: If an oscilloscope or test point signal monitor is available, it will save time to use it to analyze this trouble per BSP Section 592-805-501.	Check for loose connections at J801 (A), P201 (T), P101 (S) and P701 (N); also check for loose card connectors.
		Check Universal Transfer Lever 6.15.
		Check Timing (Universal) Contact Actuator 6.16.
		Check Magnetic Pickup 6.22.
		Call Test Center and perform loop-back test of 202C Data Set. Replace if defective.
		Replace cards in TTD module as follows and recheck operation after each: Z108 (TP172394) see NOTE (below), Z109 (TP172420), Z121 (TP172490), Z101 (TP172365), Z102 (TP172347), Z103 (TP172321), Z104 (TP172339), Z105 (TP172473), Z106 (TP172375), Z107 (TP172323), Z119 (TP177363), and Z120 (TP172363). NOTE: If replacing card Z108 corrects trouble, look at position of dots on adjustable inductor on card replaced. If not lined up, adjust inductor to bring them next to each other. Restore card and retest.
		Replace cards in TTSC module as follows and recheck operation after each: Z213 (TP172363) and Z214 (TP172363).
		Replace (CX802 or CX602) reader.
		Replace TP177149 power supply.

No.	Trouble	Corrective Procedure
30	Terminal with rubout delete feature sends all marks.	Verify special wiring for this feature (3.171). Look for loose or missing connections.
		Replace cards in TTSC module as follows and recheck operation after each: BJ (Z215) TP177560, BH (Z216)-TP177505, BK (Z217) TP172401 and CR (Z202) TP172361.
31	Signal generator motor does not run (TP199551 recognizer unit, sender in AUTO mode, reader and winder motors run in DATA mode).	Observe operation of relay K817-U in unattended operation. If relay does not energize, check relay K835-L. This relay should energize when B relay of line break and automatic answer assembly energizes. If B relay does not energize with AUTO/MANUAL switch in AUTO, tape in reader, and RUN-STOP-FREE switch in RUN, refer to Trouble 11.
		If B relay energizes but K835-L does not, remove power from set, disconnect connectors from automatic answer assembly (AAA) and recognizer unit (A) and check continuity between connector AAA, pin 21, and connector A, pin B1, and between AAA, pin 19, and A, pin B5. If continuity is missing, check wiring and connectors for faults; if continuity is present, replace TP199551 recognizer unit.
		If relay K835-L energizes but relay K817-U does not, replace card in Z829 (TP303650) and retest. If relay K817-U still does not energize, replace card in Z830 (TP172497) and retest.
		If relay K817-U still does not energize, remove power from set, disconnect connectors from data set and recognizer unit (A), and check continuity between pin 6 of connector that mates with data set and pin C2 of connector A. If continuity is missing, check wiring and connectors for faults; if continuity is present, replace TP199551 recognizer unit.

No.	Trouble	Corrective Procedure
31 (cont)		If relay K817-U energizes but signal generator motor does not start, remove power from set, disconnect connector from recognizer unit (A), and measure 120 v ac between pins A9 and A10. If this voltage is missing, verify that ac power cord is plugged into electrical service panel; if it is, check wiring and connectors for faults.
		If 120 v ac is present at pins A9 and A10, clean contact 12M of relay K817-U and retest; if motor still fails to start, replace TP199570 signal generator assembly.
		Replace TP199551 recognizer unit.
32	Signal generator disc does not turn after transmitter start code is sent (motor runs).	Call customer receiver and have operator go into DATA mode and send a transmitter start code while you remain in TALK mode. Listen for a long high-pitched tone followed by short pulses corresponding to the transmitter start code. If proper tones are not heard, receiver is at fault.
		If proper tones are heard, measure voltage between pin 36 (grd) and pin 32 of card connector Z829 while receiver repeats transmitter start code with sender in DATA mode.
		If this voltage is a steady -6 v (approximately), test/or replace 202C Data Set (1.02(c)).
		If this voltage is a steady -11 v to -14 v, remove power from set, disconnect connector from data set, and check continuity between pin 3 of connector that mates with data set and pin 32 of card connector Z829. If continuity is missing, check wiring and connectors for faults; if continuity is present, replace 202C Data Set or test interface for presence of received data signal using a 914B Test Set. If this voltage varies between approximately +6 v (initially) and -6 v while code is received, observe operation of relay K817-L. If relay does not energize, replace card in Z829 (TP303650) and retest. If relay energizes but disc does not

No.	Trouble	Corrective Procedure
32 (cont)		turn, clean contact 1M on relay K817-L and retest; if disc still fails to turn, replace TP199570 signal generator assembly.
		Replace TP199551 recognizer unit.
33	Signal generator disc over-runs home position.	Replace TP199570 signal generator assembly.
34	Reader does not start after signal generator disc completes cycle.	If manual operation (without using recognizer) also fails, refer to Trouble 11.
		Verify that relay K814 is tightly seated in its socket.
		Call customer receiver or Test Center and have operator go into DATA mode and send a transmitter start code while you observe operation of relay K814. If relay does not energize, check operation of relay K835-U. If K835-U does not energize, replace TP199551 recognizer unit. If K835-U energizes, check continuity of TP155023 BREAK FEATURE switch in ON position — if reverse channel is used — or in OFF position — if reverse channel is not used. If continuity is missing, replace BREAK FEATURE switch; if continuity is present, replace TP199551 recognizer unit.
		If relay K814 energizes, verify coding of discs (coding TP199580 Disc 6.26) at sender and receiver. If coding matches, carefully wipe off sender disc and retest. If operation fails again, replace card in Z829 (TP303650) and retest; if operation still fails, replace TP199570 signal generator assembly.
		Replace TP199551 recognizer unit.
35	Reader starts after invalid transmitter start code received (during station testing).	Verify that relay K814 is tightly seated in its socket.
		Replace card in Z829 (TP303650) and retest.
		Replace relay K814 (TP199589).

No.	Trouble	Corrective Procedure
36	Recognizer unit does not hang up call approximately 30 seconds after loss of carrier.	Observe relay K813. If it opens its contact after receiver hangs up, check for a short circuit in set wiring between pins 19 and 20 of data set connector or pins A6 and A7 of connector J801. If a short is found, repair it and retest; if no short is found test/or replace 202C Data Set (1.06(c)).
		If relay K813 does not open its contact, replace card Z830 (TP172497) and retest.
		Replace relay K813 (TP199785).
37	Beginning of message from sender is missing and/or garbled reader starts and stops a few times before sending balance of tape without stopping.	Short duration random noise is probably present on telephone line, causing premature start-up. If so, installing TP315900 modification kit (see 3.08) will correct this problem.
		If TP315900 modification kit is already present, check wiring per 7.17. If good, replace capacitor C601 (TP171461) and retest; if trouble remains, replace resistor R3 (TP182770).
38	Improper discrete time-out period, using TP320296 mode control modification kit at send-receive station.	Inspect strapping on card TP303292: 4 seconds — strap across R3 and R4 8 seconds — strap across R3 12 seconds — no straps at R3 or R4.
39	LOCAL switch (on TP326713 local control cable — option) does not place set in LOCAL mode.	Examine switch TP323785 and resistor TP129852. Replace if defective.
		Inspect local control cable (TP326713) connectors — AL at data set and BL at DS connector of "Y" cable.
40	Remote receiver receives garbled data when PARITY CHECK switch of SA120 is ON (output normal when PARITY CHECK switch is OFF).	Check wiring for loose or wrong connections (7.16). Make certain cards are properly lined up.
		Check straps on card MC422 (should be 5 straps closed and 7 open as specified on card for parity insertion in level required).

No.	Trouble	Corrective Procedure
40 (cont)		Replace cards in SA120 as follows and recheck operation after each one: piggyback card MC206 (TP322206) on card MC001, piggyback card MC206 (TP322206) on card MC002, card MC001 (TP322001) or card MC002 (TP322002).
		If trouble remains after all cards have been replaced individually, replace in pairs to isolate defective cards.
41	Parity not inserted – data received identical to data sent (PARITY CHECK switch of SA120 ON).	Check wiring for loose or wrong connections (7.16). Make certain cards are properly lined up.
		Wiggle "sandwich" of cards in SA120 and compress it to be sure all connections are tight. Recheck operation.
		Check straps on card MC422 (should be 5 straps closed and 7 open as specified on card for parity insertion in level required).
		Replace entire "sandwich" of cards and retest. If trouble remains, replace entire SA120. If trouble disappears when all cards are replaced, replace cards in original "sandwich" one at a time as follows to isolate trouble to a single card (retest after each): MC001 (TP322001) (without piggyback card) MC422 (TP322422) or MC002 (TP322002) (without piggyback card).
		If trouble remains after all cards have been replaced individually, replace in pairs to isolate defective cards.
42	Parity inserted incorrectly by SA120 (data bits correct).	Check straps on card MC422 (should be 5 straps closed and 7 open as specified on card for parity insertion in level required).
		Check strapping of terminals W, X, Y, and Z on card MC001 (W and X, Y and Z should be strapped to provide even parity output, W and Y, X and Z should be strapped to provide odd parity output).

No.	Trouble	Corrective Procedure
42 (cont)		Replace entire "sandwich" of cards and retest. If trouble remains, replace entire SA120. If trouble disappears when all cards are replaced, replace cards in original "sandwich" one at a time as follows to isolate trouble to a single card (retest after each): MC001 (TP222001) (without piggyback card), MC422 (TP322422) or MC002 (TP322002) (without piggyback card).
		If trouble remains after all cards have been replaced individually, replace in pairs to isolate defective cards.
43	Remote receiver runs closed when PARITY CHECK switch of SA120 is ON.	Check wiring for loose or wrong connections (7.16). Make certain cards are properly lined up.
		Wiggle "sandwich" of circuit cards in SA120 and compress it to make sure all connections are tight. Recheck operation.
		Place continuous-loop test tape in reader and bend tape to Test Center. Measure voltage between terminals 1 and 3 on terminal board TB4 (end of SA120) while tape is being sent. If this voltage is a steady 0 v, check contacts and wiring on bypass switch assembly (7.16). If this voltage fluctuates near 0 v (positive or negative, but not a steady -5 v to -7 v measure voltage between terminals 2 and 3 on TB4 while tape is being sent. If voltage fluctuates near -7 v, check contacts and wiring at bypass switch assembly. If it is a steady -5 v to -10 v, replace entire "sandwich" of cards and retest.
		If trouble remains, replace entire SA120. If trouble disappears when all cards are replaced, replace cards in original "sandwich" one at a time as follows to isolate trouble to a single card (retest after each): piggyback card MC206 (TP322206) on card MC001, card MC001 (TP222001), piggyback card MC206 (TP322206) on card MC002, and card MC002 (TP322002).

No.	Trouble	Corrective Procedure
43 (cont)		If trouble remains after all cards have been replaced individually, replace in pairs to isolate defective cards.
44	Remote receiver runs open when PARITY CHECK switch of SA120 is ON.	Check wiring for loose or wrong connections (7.16). Make certain cards are properly lined up.
		Wiggle "sandwich" of circuit cards in SA120 and compress it to make sure all connections are tight. Recheck operation.
		Check 1-1/2 amp fuse F1 (TP143631) on SA120 chassis.
		Check 3/8 amp fuse **F2** (TP159269) on SA120 chassis. If blown, replace card TP322019 then replace F2.
		Replace card TP322019 and recheck operation.
		Place continuous-loop test tape in reader and send tape to Test Center. Measure voltage between terminals 1 and 3 on terminal board TB4 (end of SA120) while tape is being sent. If this voltage is a steady +6 v or less (but positive), check contacts and wiring on bypass switch assembly (7.16). If this voltage fluctuates near 0 v (positive or negative, but not a steady +5 to +7 v), measure voltage between terminals 2 and 3 on TB4 while tape is being sent. If this voltage fluctuates near +7 v, check contacts and wiring on bypass switch assembly. If it is a steady +5 to +7 v, replace entire "sandwich" of cards and retest. If trouble remains, replace entire SA120. If trouble disappears when all cards are replaced, replace cards in original "sandwich" one at a time as follows to isolate trouble to a single card (retest after each): piggyback card MC206 (TP322206) on card MC001, card MC001 (TP322001), piggyback card MC206 (TP322206) on card MC002, or card MC002 (TP322002).

No.	Trouble	Corrective Procedure
44 (cont)		If trouble remains after all cards have been replaced individually, replace in pairs to isolate defective cards.
45	PARITY CHECK switch (if present) inoperative.	Replace TP327640 bypass switch assembly.

6. ADJUSTMENTS

6.01 Following are the adjustment paragraphs referred to in Trouble Analysis Tables in Part 5.

6.02 After making each adjustment, tighten all screws and/or nuts loosened during adjustment procedures. Recheck requirements and if necessary, refine adjustment.

6.03 Illustration ". . . View" references consider "Front View" to be the view obtained by an attendant facing the control panel.

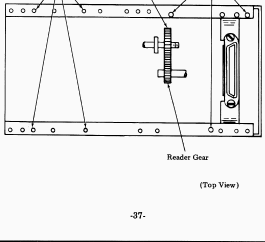
6.04 Gear Mesh

Requirement

Barely perceptible backlash between reader gear and motor gear measured at four points around motor gear.

To Adjust

Position reader with its mounting screws loosened. If requirement cannot be met, loosen motor mounting screws (not shown) and reposition motor.



(Top View)

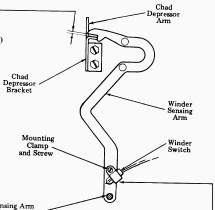
6.05 Chad Depressor Bracket

Requirement

Min some--Max 0.030 inch clearance between sensing arm and depressor bracket when sensing arm is held against depressor bracket. (Hold depressor arm clear (not shown) of winder arm.)

To Adjust

Loosen sensing arm pivot stud. Position stud up or down to meet requirement. Tighten stud.



6.06 Winder Switch Electrodes

Requirement

Winder switch electrodes should be on the same horizontal plane.

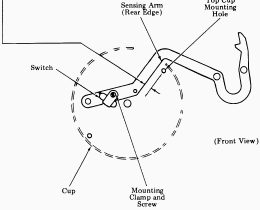
To Adjust

Loosen mounting clamp screw. Rotate switch within its clamp to meet requirement.

6.07 Winder Switch Mounting Clamp

Requirement
Winder motor should start when the rear edge of the sensing arm is Min 3/8 inch—Max 1/2 inch from the top cup mounting hole.

To Adjust
Loosen mounting clamp screw. Rotate clamp and switch to meet requirement.



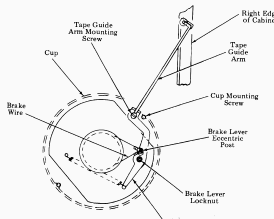
6.08 Tape Unwinder Arm

Requirement
(a) Tape guide arm should be stopped by the brake wire and not by cup mounting screw.

To Adjust
Loosen brake lever locknut. Move brake lever eccentric post to meet requirement. Tighten locknut.

Requirement
(b) Tape guide arm should be about even with right edge of cabinet.

To Adjust
Loosen tape guide arm mounting screw. Take up play between notch in brake lever and tape guide arm to left. Bend tape guide arm to meet requirement. Begin bend approximately 1/4 inch from cup.

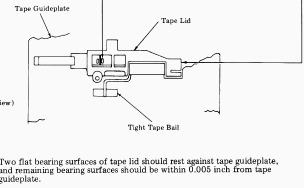


6.09 Tape Lid

Requirement

(a) Radius of tape guideplate should match contour of tape lid.

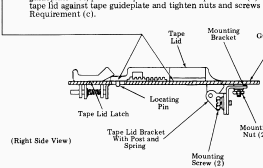
(b) Feed wheel groove in tape lid should line up with slot in tape guideplate, and tape lid vanes should be centrally located between slots in tape guideplate.



(c) Two flat bearing surfaces of tape lid should rest against tape guideplate, and remaining bearing surfaces should be within 0.005 inch from tape guideplate.

To Adjust

Loosen two mounting nuts and screws. With locating pin engaged in tape guideplate slot, position tape lid to meet Requirements (a) and (b). Press tape lid against tape guideplate and tighten nuts and screws to meet Requirement (c).



6.10 Tape-Out Pin

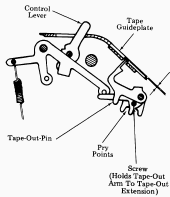
Requirement

(a) With control lever in FREE position:
Min some—Max 0.010 inch —— clearance between tape out pin and tape guideplate.

(b) With control lever in RUN position, tape-out pin should be stopped by tape guideplate.

To Adjust

Place control lever in FREE position. Loosen screw which secures tape-out arm to tape-out extension. Position tape-out pin by means of pry points.

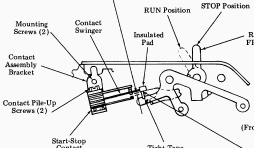


(Front View)

6.11 Start-Stop Contact Assembly Bracket

Requirement
(a) With RUN-STOP-FREE lever in STOP position:
Min 0.010 inch—Max 0.015 inch
gap between normally closed contacts.

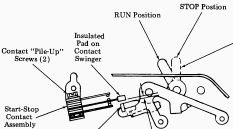
To Adjust
Position contact assembly bracket with its mounting screws loosened.



Requirement
(b) Tight-tape arm extension should fully engage insulated pad on swinger tip. Swinger should be approximately parallel to rear plate.

To Adjust
Loosen screws securing contact pile-up to assembly bracket. Position start-stop contact assembly (continued in 6.12).

6.12 Start-Stop Contact Assembly Bracket (continued)



(Front View)

Requirement

(c) With RUN-STOP-FREE lever in RUN position, there should be:

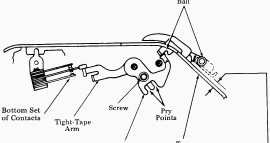
Min 0.003 inch

clearance between insulated pad on contact swinger and tight-tape arm extension.

To Adjust

Loosen contact "pile-up" screws and position assembly until requirement is met.

6.13 Tight-Tape Arm



Requirement

Bottom set of contacts should open when tight-tape bail is raised:
Min 0.045 inch—Max 0.075 inch from tape guideplate.

To Adjust

Place RUN-STOP-FREE lever (not shown) in RUN position. Loosen screw which secures arm with hub to tight-tape lever. By means of pry points, position tight-tape arm to satisfy the following:

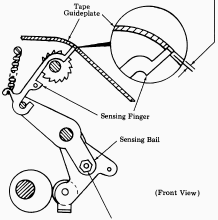
With a 0.040 inch gauge between tight-tape bail and tape guideplate, contacts should remain closed.

With a 0.060 inch gauge between tight-tape bail and tape guideplate, contacts should open. Check contacts visually.

6.14 Sensing Bail

Requirement
With sensing fingers in lowermost position:
Min 0.008 inch--Max 0.012 inch
between highest sensing pin and surface of tape guideplate.

To Adjust
With nut on sensing bail eccentric friction tight, adjust eccentric.



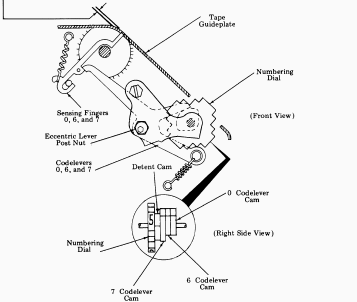
6.15 Universal Transfer Lever

To Check
Trip clutch and rotate cam until sensing fingers are in their uppermost position.

Requirement
With numbering dial detented in number 5 position, sensing fingers 0, 6, and 7 should be:
Min some--Max 0.012 inch
below (not flush with) tape guideplate.

To Adjust
Loosen eccentric lever post nut friction tight. Insert wrench into post socket and rotate post.

NOTE: Identifying slot on lever eccentric post should be in the seven to eleven o'clock position.



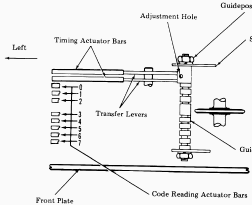
6.16 Timing (Universal) Contact Actuator

Requirement

With straight edge along left ends of actuator bars, timing actuator bars should be in line with code reading actuator bars. When main shaft (not shown) is rotated, timing actuator bars should start to move with code reading actuator bars.

To Adjust

Loosen nuts which secure guidepost to sensing bail. Rotate guidepost to meet requirement.



(Top View)

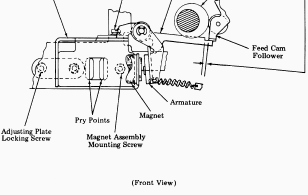
6.17 Magnet Assembly

Requirement
(a) With magnet energized, armature should contact and be flush with core faces.

To Adjust
Remove magnet assembly from unit. With armature bracket mounting screws loosened, press armature firmly against core face and tighten screws. Replace magnet assembly.

Requirement
(b) With magnet de-energized and followers on high point of cams there should be:
Min 0.003 inch--Max 0.006 inch
clearance between blocking surface of blocking lever and feed cam follower.

To Adjust
With magnet assembly mounting screws and adjusting plate locking screw friction tight, position magnet assembly mounting bracket by means of pry points. Tighten locking screw (proceed to 6.18).



(Front View)

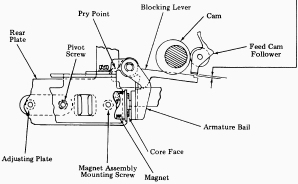
6.18 Magnet Assembly (continued)

Requirement

(c) With magnet energized and followers on low point of cams:
Min 0.008 inch--Max 0.010 inch clearance between top surface of blocking lever and feed cam follower at closest point.

To Adjust

With magnet assembly mounting screw and pivot screw friction tight, position magnet assembly by means of pry point.



(Front View)

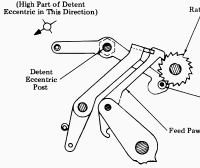
6.19 Feed Wheel Detent

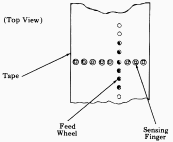
Requirement

With play in tape taken lightly toward right, feed wheel should center sensing fingers in code holes of new, conforming perforated tape.

To Adjust

With tape lid (not shown) unlatched, feed pawl held away from ratchet, and sensing fingers moved to lowermost position (not shown), loosen detent eccentric post to friction tight and adjust detent eccentric to meet requirement.





6.20 Feed Pawl

Requirement

With high part of feed-pawl eccentric to the left and sensing fingers in lowermost position (not shown), there should be:

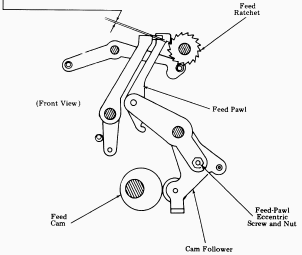
——— Min some--Max 0.003 inch

clearance between feed pawl and ratchet tooth just engaged.

To Adjust

Remove tape guideplate by loosening its mounting bracket screws. Loosen eccentric screw nut and rotate screw. Recheck at closest tooth through one revolution of feed ratchet.

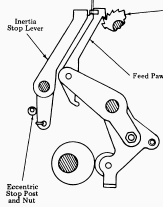
NOTE: Recheck Sensing Bail (6.14)



6.21 Inertia Stop Lever

Requirement
With feed pawl in lowermost position:
—— Min some—Max 0.012 inch
clearance between notch in inertia stop lever and feed pawl.

To Adjust
Remove top plate by loosening its mounting screws. With eccentric stop post nut friction tight, rotate stop post to meet requirement.



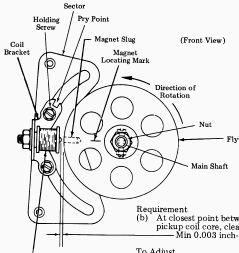
6.22 Magnetic Pickup

Requirement

(a) With sensing fingers (not shown) in uppermost position, magnet slug in flywheel should be adjacent to pickup coil core.

To Adjust

Loosen nut on end of main shaft. Remove screw and nut (at rear of flywheel) from shaft. Position flywheel to place magnet slug in same quadrant as pickup coil. Replace screw and tighten nuts. Loosen coil bracket holding screws and position coil adjacent to magnet slug.



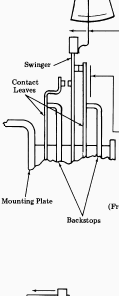
Requirement

(b) At closest point between magnet slug and pickup coil core, clearance should be:
Min 0.003 inch--Max 0.006 inch

To Adjust

Loosen screws holding coil bracket to sector and approximately center the pry point. Tighten upper screw friction tight. Position coil bracket to make rough adjustment. Tighten lower screw. Loosen upper screw and refine adjustment.

6.23 Control Mechanism Spring Tension — Normally Closed Contact



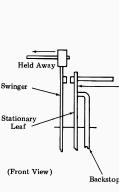
Requirement
Min 20 grams—Max 50 grams to open contact.

To Adjust
Bend swinger, using TP172060 contact bender.

6.24 Control Mechanism Backstop — Normally Closed Contact

Requirement
Normally closed contact leaves should be parallel to mounting plate and in line with each other.

To Adjust
Bend backstop, using TP172060 contact bender. Gauge by eye.



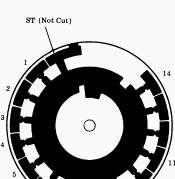
6.25 Control Mechanism Spring Tension — Normally Closed Contact Against Backstop

To Check
With swinger held away.

Requirement
Min 4 oz—Max 7 oz to move stationary leaf away from backstop.

To Adjust
Bend stationary leaf and, if necessary, bend backstop away from leaf (using TP172060 contact bender) and form leaf to increase tension. Reposition backstop to meet 6.24.

6.26 Coding TP199580 Disc



Unbroken etched spoke patterns, as illustrated, on the coding disc are marks, and broken patterns, not illustrated, are spaces. Segments are numbered as shown. Use the corner of a screwdriver or any other sharp instrument to break etched pattern at neck of pattern. Metal must be scraped completely through. Wipe disc using a clean soft cloth and remove all dirt or fingerprints. Replace coding disc, tighten wing nut, and replace cover on signal generator.

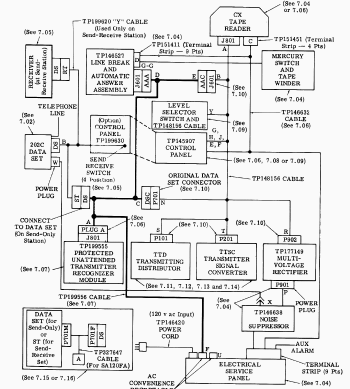
7. WIRING DIAGRAMS

7.01 Following are the diagrams mentioned in Trouble Analysis Table — Part 5.

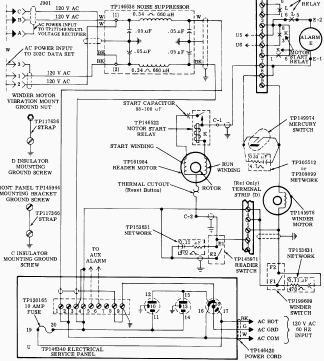
7.02 202C Data Set — Connector Lead Functions

PIN	DESCRIPTION	FUNCTION
1	Protective Ground	Frame and power cord ground.
2	Send Data	For transmission of data to receiving station.
3	Receive Data	On a send only station, used to receive discrete transmitter start code (when recognizer unit is present). On a send-receive station, used for all incoming data.
4	Request to Send	Conditions data set to transmit.
5	Clear to Send	Indicates data set is prepared to transmit data.
6	Data Set Ready (Interlock)	Indicates data set is in DATA mode.
7	Signal Ground	Establishes the common ground for all signaling.
8	Carrier Detect	Indicates data carrier tones (from a remote sender) are being received.
9	+17.5 v to +18 v	Provides voltage for permanent control functions.
11	Reverse Channel Send	Conditions data set to transmit reverse channel.
12	Reverse Channel Receive	Indicates reverse channel (from a remote sender) is being received.
19	Remote Release	Connected to pin 20 to accept or retain incoming calls; disconnected from 19 to terminate call. (This connection is permanent when recognizer unit is not used.)
20	Remote Control Common (Data Terminal Ready)	Connected to 19 and/or 21 as explained in Remote Release and Ready.
21	Ready	Connected to 20 for automatic answering of incoming calls.
22	Ring Indicator	Spare

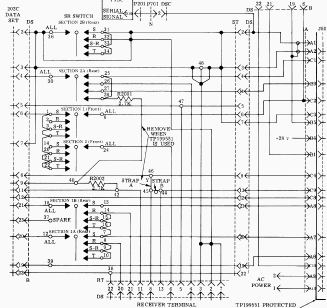
7.03 Interconnecting Diagram for Sender Terminal Cabling



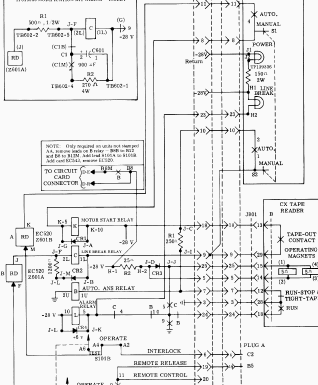
7.04 AC Wiring for Sender Terminal



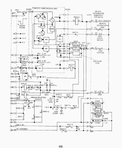
7.05 TP199610 Send-Receive "Y" Cable Feature



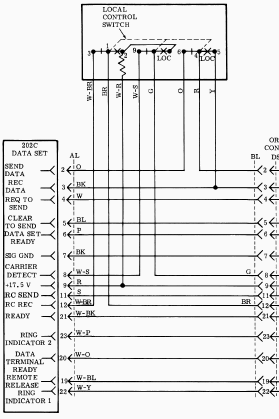
7.06 Interfaces Between Line Break and Automatic Answer (TP146527) to Control Panel and CX Tape Reader



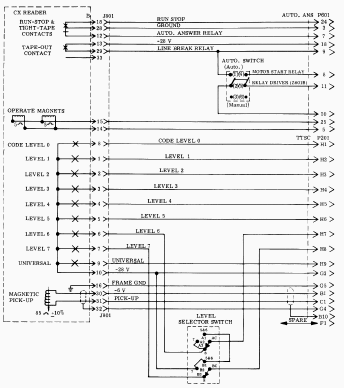
7.07 TP199551 Discrete Calling Recognizer Feature



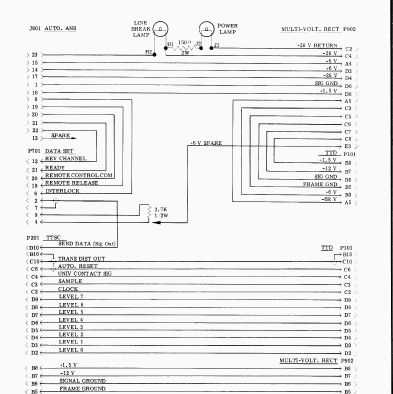
7.08 Interface Between Local Control Cable (Option) and Data Set



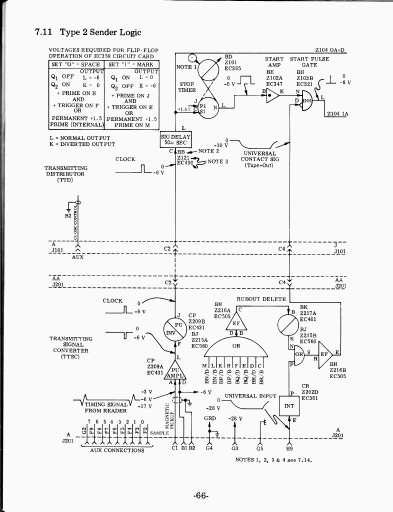
7.09 DC Wiring for Sender Terminal



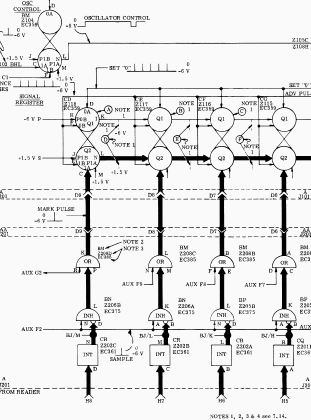
7.10 DC Wiring for Sender Terminal (continued)



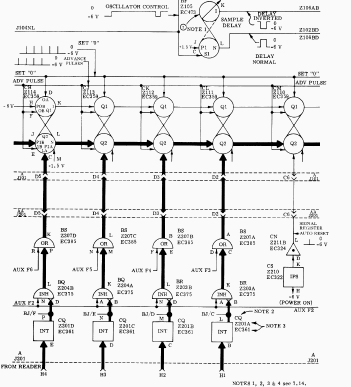
7.11 Type 2 Sender Logic



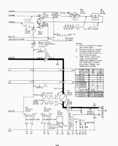
7.12 Type 2 Sender Logic (continued)



7.13 Type 2 Sender Logic (continued)

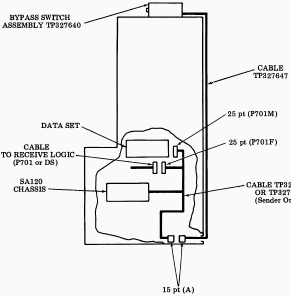


7.14 Type 2 Sender Logic (continued)

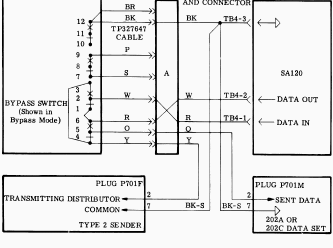


7.15 Connector Locations for SA120 Stuntronic Data Terminal

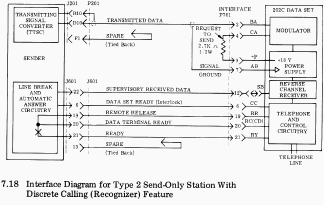
Receiver Connections at Send-Receive Terminal
RT to P701M
DS to P701F



7.16 Wiring for SA120FA



7.17 Interface Diagram for Type 2 Send-Only Station



7.18 Interface Diagram for Type 2 Send-Only Station With Discrete Calling (Recognizer) Feature