TELETYPEWRITER COMPATIBLE "DATASPEED*" 40/2

DESCRIPTION AND OPERATION

1. GENERAL

1.01 This practice covers the Teletypewriter Compatible DATASPEED 40 (DATASPEED 40/2) Station Arrangements, and provides the information necessary to identify DATASPEED 40/2 and associated equipment (supplemental information is referenced and necessary).

1.02 Whenever this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 Before installation, determine the station configuration.

1.04 When ordering or referring to components, unless otherwise specified, prefix each part number with the letters "TP" (ie, TP410055).

*Registered Trademark of AT&TCo.

2. SUPPLEMENTAL INFORMATION

BSP Sections

3. AC POWER AND ENVIRONMENTAL REQUIREMENTS

3.01 Currents and power shown are maximum values based on power company supplied voltages within the limits:

115 ±10% volts ac 60 Hz ±0.45 Hz

3.02 The starting current for the DATASPEED 40/2 is as follows (see Note 1):

KD Terminal   20 amp (see Note 2)
KDP Terminal   25 amp (see Note 2)

Note 1: A single circuit, fused at 10 amps, has been found capable of withstanding the starting load of a KD without data sets.

Note 2: Worst case conditions; for up to 3 cycles.

3.03 The following are the requirements for operating power and heat generation:

	Running Current	Watts	BTU
KD Terminal	2.7 amp	260	885
KDP Terminal — Printer Idle	2.9 amp	275	940
KDP Terminal — Printer Operating	4.5 amp	360	1230

3.04 Environmental conditions should be maintained within the following limits to avoid damage and provide proper operation.

ENVIRONMENTAL CONDITION	STORAGE OR TRANSPORTATION		OPERATION	
	MIN	MAX	MIN	MAX
Temperature	-40°F	+150°F	+40°F	+110°F
Humidity	2%	95%	2%	95%
Altitude	Sea Level	50,000 ft	Sea Level	10,000 ft

Note: As with any device that can be damaged by water, sudden temperature changes that can cause condensation should be avoided.

Example: A device stored in subzero temperatures will collect frost when unpacked in a warm humid room.

4. STATION IDENTIFICATION

4.01 The DATASPEED 40/2 consists of four basic station arrangements:

KD (Keyboard Display)
KDP (Keyboard Display With Printer)
KD-ROP (Keyboard Display With Receive-Only Printer) (See Note 2)
ROP (Receive-Only Printer) (See Note 1)

Note 1: The stand-alone ROP used in DATASPEED 40/2 applications is the Integrated ROP Station. Information on the Intergrated ROP Station is found in the following BSPs (until these BSPs are available, use FIMP Section 579-£05-350):

582-200-104 General Description
582-200-204 Installation
582-200-404 Wiring Diagrams
582-200-504 Testing and Troubleshooting

582-200-704 Component Access and Parts
582-200-754 Routine Maintenance
999-301-121 How To Operate Manual (DATASPEED 40 Printer)

Note 2: The ROP used in the KD-ROP Station arrangement may be either the Integrated ROP referred to in Note 1, or the ROP equipped with a 40C103/AD or 40C103/AE controller which can only be used at 1200 baud in a DATASPEED 40/2 KD-ROP Station. Information on this ROP can be found in the following BSPs:

579-505-350 FIMP (DATASPEED 40/1 Terminals)
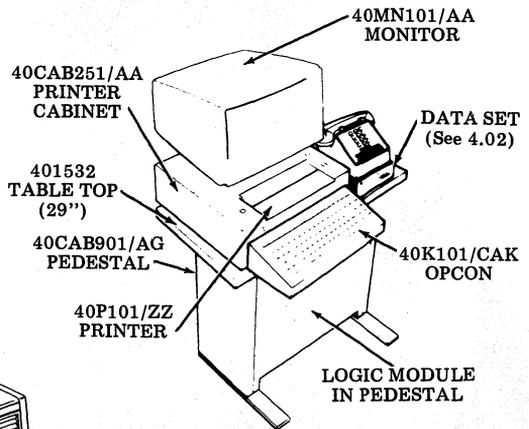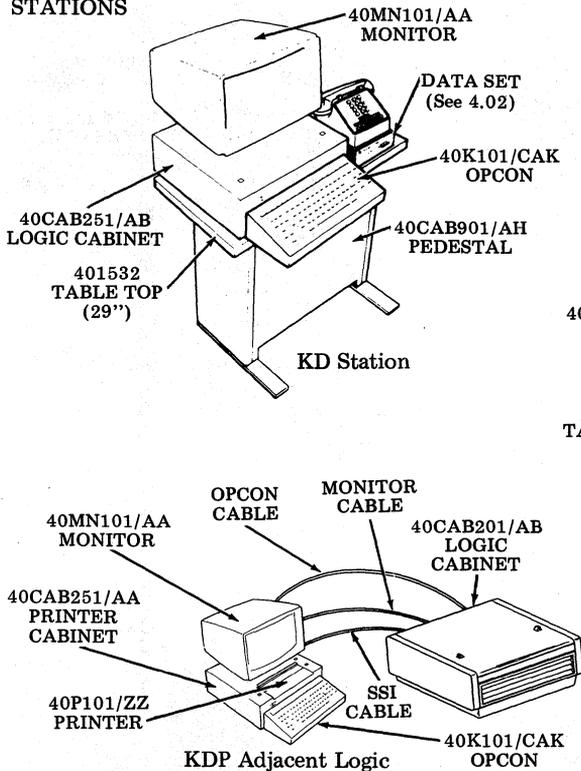582-200-100 General Description
582-200-200 Installation
582-200-400 Wiring Diagrams
582-200-500 Testing and Troubleshooting
582-200-700 Component Access and Parts
582-200-750 Routine Maintenance
999-301-121 How To Operate Manual (DATASPEED 40 Printer)

STATIONS

KD Station

KDP Adjacent Logic

KDP Station

STATIONS (Cont)

40MN101/AA MONITOR

DATA SET AND ATTENDANT SET (See 4.02)

40CAB351/AA PRINTER CABINET (See Note 1)

40P151/ZZ PRINTER (See Note 1)

401532 TABLE TOP (29")

401914 TABLE TOP (24-1/2" Slotted)

40CAB251/AB CABINET
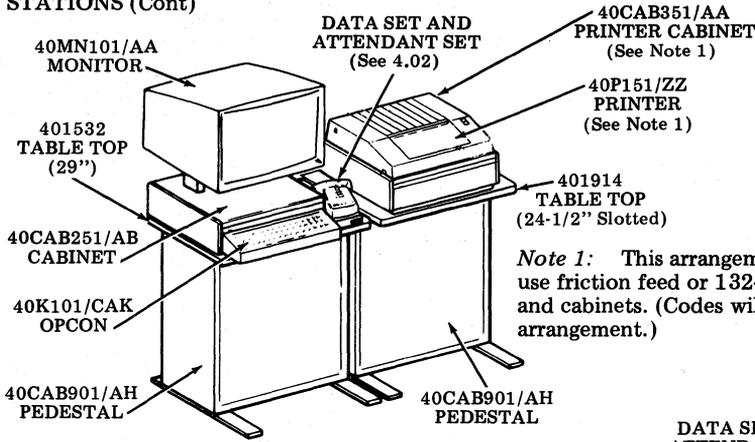
Note 1: This arrangement may also use friction feed or 132-column printer and cabinets. (Codes will vary for each arrangement.)

40K101/CAK OPCON

40CAB901/AH PEDESTAL

40CAB901/AH PEDESTAL

KDP Station W/Tractor Printer on Pedestals

40CAB351/ZZ PRINTER CABINET (See Note)

DATA SET AND ATTENDANT SET (See 4.02)

40P151/ZZ PRINTER (See Note 1)

40MN101/AA MONITOR

401914 TABLE TOP (24-1/2" Slotted)

401532 TABLE TOP (29")

40CAB251/AB CABINET

40K001/AAA OPCON

40CAB901/AH PEDESTAL

40CAB901/** PEDESTAL

40K101/CAK OPCON

(See Note 2)

PRINTER CABINET (See Note 1)

ROP

KD
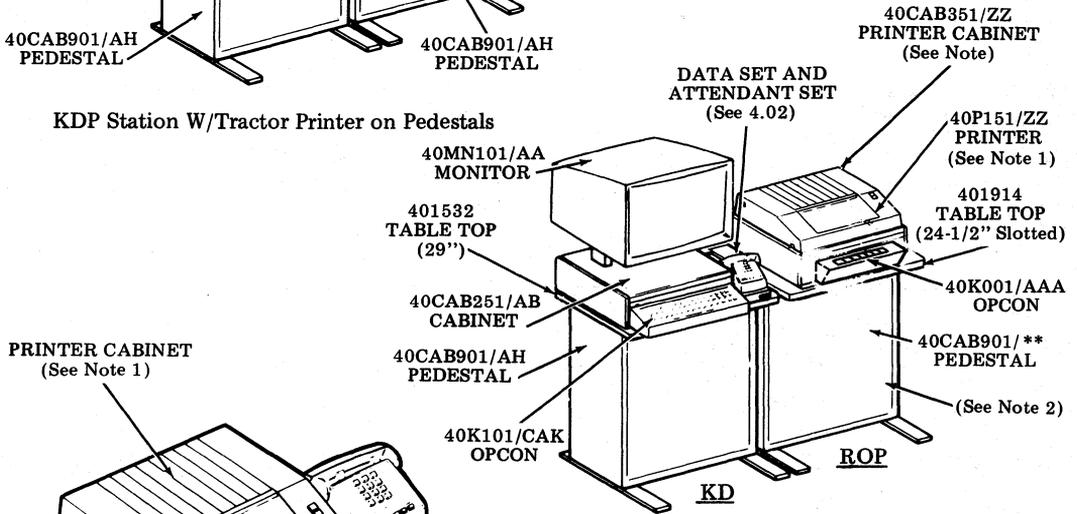
KD-ROP Station

Note 2: The controller of an ROP may be a 40C103/AD, 40C103/AE, or integrated controller (see Note 2 after 4.01).

DATA SET AND ATTENDANT SET (See 4.02)

40K001/AAA OPCON

40CAB901/**

(See Note 2)

ROP Station
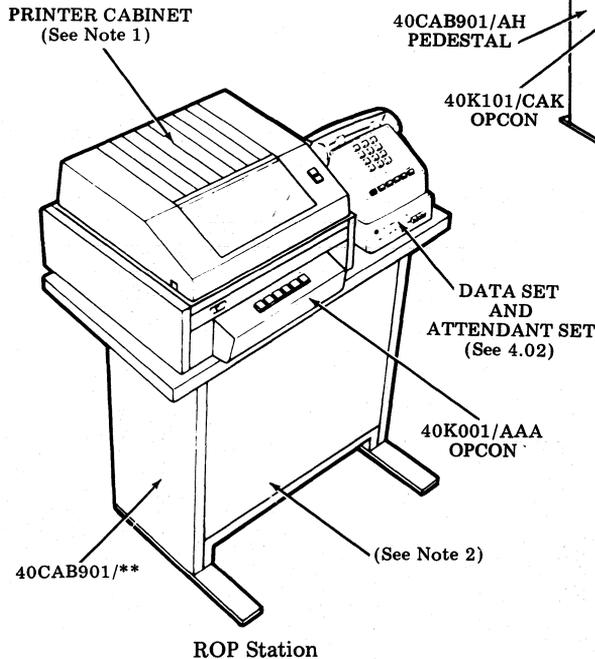
CIRCUIT CARD ARRANGEMENTS

A. Controller Logic

Position Number	KD/KDP Controller Arrangements 40C204/BA	Circuit Card Description
01	410770**	Printer Access
02	410679	Full Duplex Interface
03	410676	Send Variations
04	410675	Message Control
05	410674	Data Bus and Decode
Frame Number	402176*	

Full Editing — Teletypewriter Compatible — EIA (Electronic Industries Association)

410672 OPCON INTERFACE

402176

05 04 03 01 02

*This wired frame together with the proper circuit cards, can be used to make up the controller arrangement for replacement purposes.

**Not present on sets without printer or conversational (S/R) mode. 410770 card is not part of 40C204/BA, but is part of USOC ordering codes for DATASPEED 40/2.

B. Display Logic
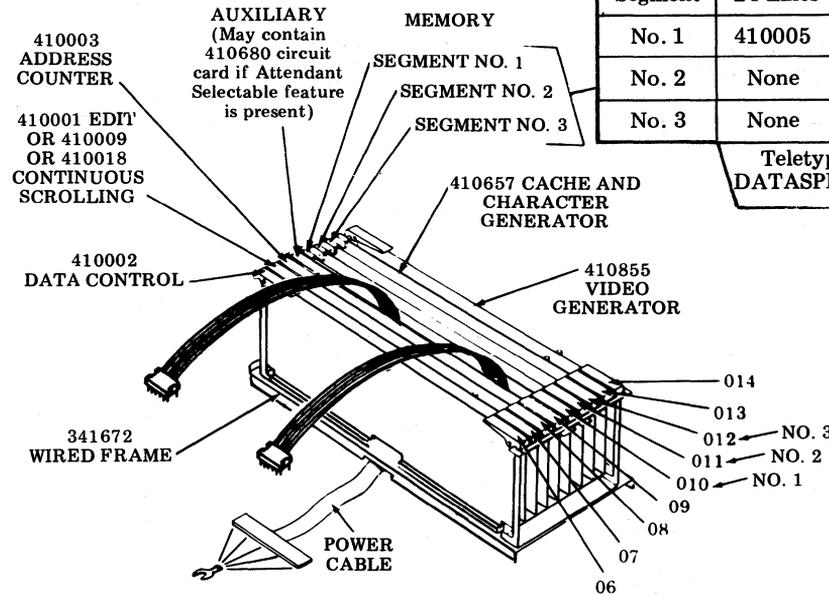
DISPLAY LOGIC ARRANGEMENTS (40DL291/ZZ)			
Memory Segment	Full Edit 24 Lines	Full Edit 48 Lines	Full Edit 72 Lines
No. 1	410005	410005	410005
No. 2	None	410005	410005
No. 3	None	None	410005

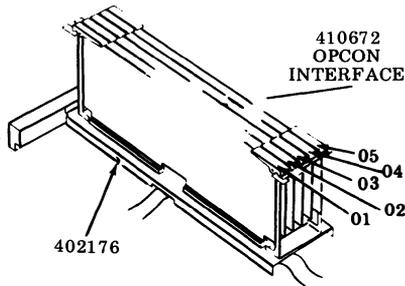Teletypewriter Compatible DATASPEED 40/2 (40C204/BA)

410003 ADDRESS COUNTER
410001 EDIT OR 410009 OR 410018 CONTINUOUS SCROLLING
410002 DATA CONTROL
341672 WIRED FRAME
POWER CABLE

AUXILIARY (May contain 410680 circuit card if Attendant Selectable feature is present)
MEMORY
SEGMENT NO. 1
SEGMENT NO. 2
SEGMENT NO. 3
410657 CACHE AND CHARACTER GENERATOR
410855 VIDEO GENERATOR

014 013 012 — NO. 3 011 — NO. 2 010 — NO. 1 09 08 07 06

DATA SETS

4.02   The following data sets are used in DATASPEED 40/2 applications.

DATA SET	MAXIMUM BAUD RATE	HOW TO OPERATE MANUAL
103G	300	999-311-121
103J	300	999-312-121
103A3	300	999-313-121
113A	300	999-314-121
202C	1200	999-316-121
202R	1200	999-318-121
202S	1200	999-319-121
202T	1200	999-320-121
201C (See Note)	2400	999-315-121
208A (See Note)	4800	999-317-121

Note: Use of Data Sets 201C and 208A require use of the 402320 modification kit.

5.   DEVICES AND ACCESSORIES

400552
SPINDLE
(Part of 40P101/ZZ)

FULL ROLL
KS-8621 PAPER
(White)

USOC: 4TNOO
405544
OPTIONAL PAPER
ACCUMULATING RACK
FOR 80-COLUMN
PRINTER
(Mounts on floor)

402444 RIBBON
W/2 SPOOLS
(5 Mil, 33 Yards)

USOC: 4T800
401200
COPYHOLDER

USOC: 4T700
40PWU101
PAPER WINDER

ON/OFF SWITCH
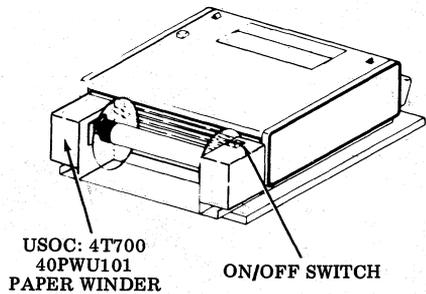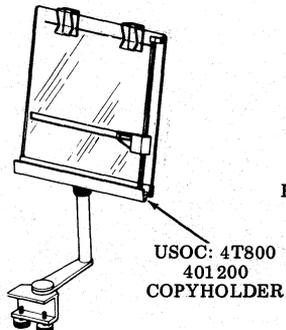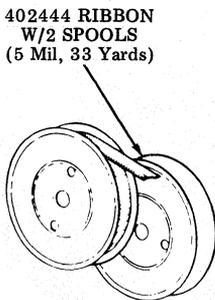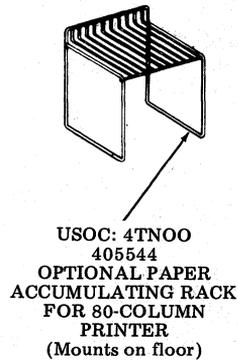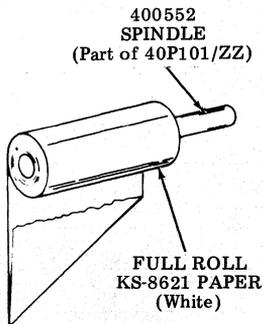
5.01   Modification kits and accessories that may be used with the DATASPEED 40/2 are listed in Table A, along with references to BSPs and 50,000 specifications. The 50,000 specifications are supplied with the modification kit or may be ordered from Teletype Corporation.

TABLE A

MODIFICATION KITS AND ACCESSORIES

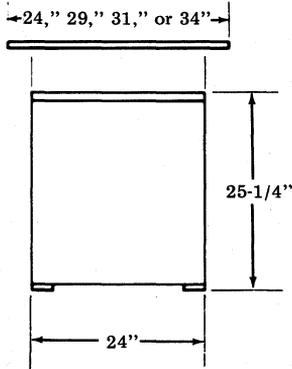| DESCRIPTION	REFERENCE
345630 EIA Switch Assembly	582-001-100
402178 Modification Kit — Data Set 113A or 113D Interfacing	50822S
402180 Modification Kit — 20/60 mA Interface	50835S
402231 Modification Kit — 115 V Output — 100 V Input	50837S
402307 Modification Kit — Video Blanking of Control Characters	50855S
402310 Modification Kit — Preparatory Send Mode and Even Parity Generation/Detection	50845S
402315 Modification Kit — 410018 Circuit Card Operation With 410001	50851S
402316 Modification Kit — 410018 Circuit Card Operation With 410009	50851S
402320 Modification Kit — Isochronous Operation With Synchronous Data Sets	50848S
402325 Modification Kit — Alteration of Line Disconnect, Reverse Channel, and Printer Motor Control Features	50849S
402850 Modification Kit — Multiple Form Printing Without Ink Ribbon	50847S
403378 Modification Kit — Connector Adapter for Current Loop Interface	582-200-402
403380 Modification Kit — Multicopy or Fanfold Paper (Friction Feed)	50815S
403399 Modification Kit — Attendant Selectable Features (Pedestal Mount)	50847S
403400 Modification Kit — Attendant Selectable Options	50825S
403570 Modification Kit — Lagging Power Factor Correction	9555WD
407414 Modification Kit — DC1, DC3, and EOT Features (410674 Card)	50843S
408045 Modification Kit — Cable Mounting and Storage in Cabinet	50802S
408050 Modification Kit — Beltless Ventilation Assembly	50820S
40AB101/AA — Answer-Back Unit	582-001-101

6. COMPONENT SPACE REQUIREMENTS AND WEIGHTS

MONITOR
38 LBS

CABINET
(With Terminal Logic — 65 Lbs)
(With Printer — 70 Lbs)

16"
15"
19"
17"
17-1/2"

COPYHOLDER
2-3/4 LBS

18"

RACK
6-1/2 LBS

12"

13"

12"

←24," 29," 31," or 34"→
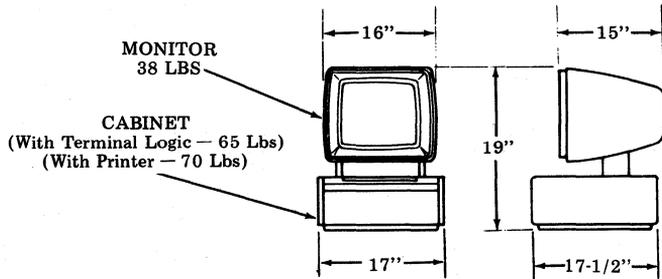
PEDESTAL (No Controller)

WITH 24" TOP — 53 LBS
WITH 29" TOP — 54 LBS
WITH 31" TOP — 54 LBS
WITH 34" TOP — 55 LBS

PEDESTAL
(With Terminal Logic —
Add 50 Lbs)

25-1/4"

24"

13-1/4"

20"
or 27-1/2"

17-3/8"

22"
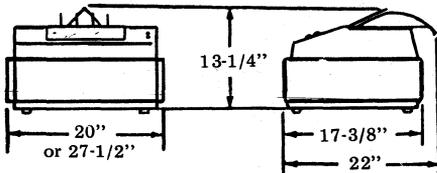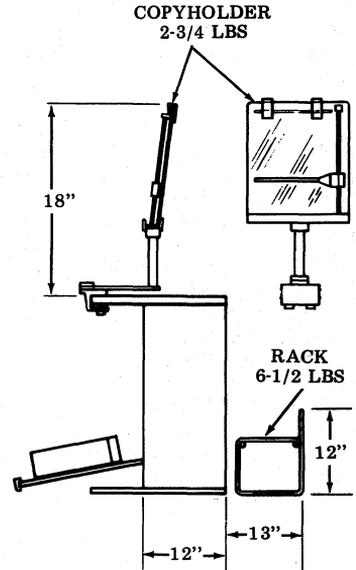
PRINTER IN CABINET
(80- or 132-Column Tractor Feed)
85 LBS OR 108 LBS

PAPER
WINDER
9-1/2 LBS

6-3/4"

17"

17-3/8"

27"
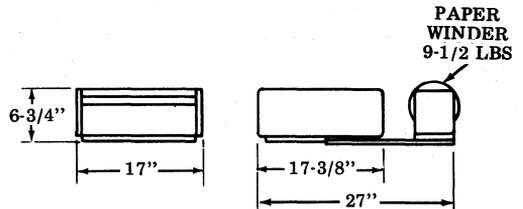
PRINTER IN CABINET
(Friction Feed)
55 LBS

3-1/4"

15"

6"

OPCON
7-1/2 LBS

17"

6-1/2"

17-3/8"
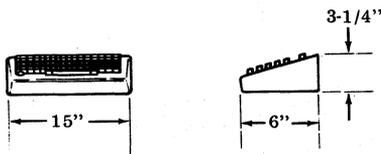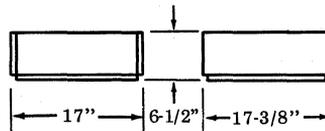
LOGIC (Table Top) — 65 LBS

7. THEORY OF OPERATION

7.01 The DATASPEED 40/2 contains several functional components which combine to form a KD or KDP. The 40C204 controller is the central unit which interfaces with the opcon, display logic, printer and the input/output port (data set or current loop).

CONTROLLER INTERFACES

7.02 The basic function of the controller is to provide the proper interface between the various devices that comprise the terminal and between the terminal and a data set or current loop. Therefore, the following interfaces are supplied by the controller.

A. Data Set Interface

7.03 Two data set interface options are available in the controller. The 202-type data set option interfaces medium and high speed data sets, and is shown in Table B for 202-type data sets and Table C for 201C and 208A Data Sets. The 103-type data set option interfaces with low speed data sets and is shown in Table D for 103-type data sets and Table E for 113-type data sets. Operating speed, however, is independent of the type of data set interface selected, ie, separate options must be selected to establish operating speed and data set signaling protocol.

7.04 The controller interface to a data set is made at connector JC3 on the rear apron of the controller. Interface signaling is compatible with EIA Standard RS-232-C. All output signals in this interface will be +5 V dc to +12 V dc to represent and "on" condition for control signals and a "space" condition for data signals. An "off" condition or a "mark" will be represented by a voltage level of -5 V dc to -12 V dc with respect to signal ground.

7.05 The pin assignment in the data set connector deviates from the RS-232-C standard in that both pin 11 and 19 are tied together within the controller to accommodate data sets equipped with the STD signal on either pin. On pin 23, an additional lead has been added to the interface to provide a control signal to be used when a Teletype Model 4210 Magnetic Tape Terminal is being used with the DATASPEED 40/2.

B. Current Loop Interface

7.06 An interface is provided in the controller to allow the terminal to communicate on a 20 or 60 milliampere current loop circuit (see 5.13). The controller can be optioned to allow the current loop to be the sole interface or to use it in conjunction with the Data Set 103 interface if provision is made to prevent simultaneous transmissions to the terminal. As with the data set interfaces, the current loop interface is independent of operating speed provided the transmission line will not greatly degrade the signal.

7.07 The interface between the controller and a current loop is available at the JC4 connector located at the rear apron of the controller's module.

7.08 Since the keyer circuitry is referenced to the controller's frame ground, <u>it is necessary that both the dc current source and all other devices attached to the loop be isolated from earth ground.</u>

7.09 The current loop interface circuits can be used in loops with potentials up to 125 V dc and currents of up to a maximum of 100 milliamperes.

7.10 If the current loop is not used simultaneously with a data set interface, a 403378 connector adapter plug must be inserted into the JC3 data set connector. (See 5-17.)

TABLE B	TABLE C
202-TYPE DATA SET INTERFACE	**201C AND 208A DATA SET INTERFACE** (See Note)

Pin No.	Lead Designations	Pin No.	Lead Designations
1	Protective Ground (AA)	1	Protective Ground (AA)
2	Transmitted Data (BA)	2	Transmitted Data (BA)
3	Receive Data (BB)	3	Receive Data (BB)
4	Request to Send (CA)	4	Request to Send (CA)
5	Clear to Send (CB)	5	Clear to Send (CB)
6	Data Set Ready (CC)	6	Data Set Ready (CC)
7	Signal Ground (AB)	7	Signal Ground (AB)
8	Data Carrier Detector (CF)	8	Data Carrier Detector (CF)
9	Spare	9	Spare
10	Spare	10	Spare
11	Supervisory Transmitted Data (SA)*	11†	Equalizer Mode (QM)
12	Supervisory Received Data (SB)	12	Spare
13	Spare	13	Spare
14	Spare	14	New Synch (SBA)
15	Spare	15	Transmit Timing (DB)
16	Spare	16	Divided Transmit Timing (DCT)
17	Spare	17	Receive Timing (DD)
18	Spare	18	Divided Receive Timing (SBB)
19	Spare	19‡	Remote Release (RR)
20	Data Terminal Ready (CD)	20‡	Data Terminal Ready (CD)
21	Spare	21	Signal Quality Detector (CQ)
22	Ring Indicator (CE)	22	Ring Indicator (CE)
23	Spare	23	Spare
24	Spare	24	Trans. Timing, External Source (DA)
25	Spare	25	Spare

*RS-232-C uses pin 19 as STD. Controller internally connects pin 11 and pin 19.

† Not on 201-type data set.
‡ Not on 208-type data set.

Note: Requires 402320 modification kit for isochronous operation.

Data and Control Circuits in Accordance With EIA RS-232-C

Data and Control Circuits in Accordance With EIA RS-232-C

Voltage	Control	Line Signal	Binary State
-5 V to -25 V	Off	Mark	1
+5 V to +25 V	On	Space	0

Voltage	Control	Line Signal	Binary State
-5 V to -25 V	Off	Mark	1
+5 V to +25 V	On	Space	0

TABLE D

103-TYPE DATA SET INTERFACE

Pin No.	Lead Designations
1	Protective Ground (AA)
2	Transmitted Data (BA)
3	Receive Data (BB)
4	Request to Send (CA)
5	Clear to Send (CB)
6	Data Set Ready (CC)
7	Signal Ground (AB)
8	Data Carrier Detector (CF)
9	Reserved for Testing
10	Reserved for Testing
11	Spare
12	Spare
13	Spare
14	Spare
15	Spare
16	Spare
17	Spare
18	Spare
19	Spare
20	Data Terminal Ready (CD)
21	Spare
22	Ring Indicator (CE)
23	Spare
24	Spare
25	Spare

Data and Control Circuits in Accordance With EIA RS-232-C.

Voltage	Control	Line Signal	Binary State
–5 V to –25 V	Off	Mark	1
+5 V to +25 V	On	Space	0

TABLE E

113-TYPE DATA SET INTERFACE

Pin No.	Lead Designations
1	Protective Ground (AA)
2	Transmitted Data (BA)
3	Receive Data (BB)
4	Request to Send (CA) } See Note
5	Clear to Send (CB)
6	Data Set Ready (CC)
7	Signal Ground (AB)
8	Data Carrier Detector (CF) (Data Set 113A Only)
9	Not to be Used
10	Not to be Used
11	Spare
12	Spare
13	Spare
14	Spare
15	Spare
16	Spare
17	Spare
18	Spare
19	Spare
20	Data Terminal Ready (CD)
21	Spare
22	Ring Indicator (CE)
23	Spare
24	Spare
25	Spare

Note: Pins 4 and 5 may be strapped together in data set.

Data and Control Circuits in Accordance With EIA RS-232-C.

Voltage	Control	Line Signal	Binary State
–5 V to –25 V	Off	Mark	1
+5 V to +25 V	On	Space	0

The 402178 modification kit must be used with the 113-type data set.

C.   Opcon Interface

7.11   The controller interface with the opcon allows the terminal operator to either enter data locally into the display logic or to type data directly onto the output interface in the S/R mode.

7.12   The interface between the opcon and the controller is in the form of Teletype's Standard Serial Interface (SSI). With this system, all information is transmitted on two pairs of signal leads. The receive pair is designated as INFORMATION TO CONTROLLER, ITC, and its complementary signal INFORMATION TO CONTROLLER, $\overline{ITC}$. Similarly, the send pair is INFORMATION TO DEVICE, ITD, and INFORMATION TO DEVICE, $\overline{ITD}$. All information is transmitted in the form of 18 bit words. Each word consists of a start bit, steering bit, 7 ASCII information bits, a flag bit and a parity bit. The remaining 7 bits that form the word are sent as MARKS.

7.13   The send pair, ITD and $\overline{ITD}$, is constantly transmitting either lamp or status (alarm) information from the CL to the opcon. Again, the information is in the form of an 18 bit word composed of a start bit, steering bit, 6 bits for the lamp address and two bits for the lamp condition (lamp on or off). The remaining bits are transmitted as MARKS.

7.14   As stated above, the serial data information is present on a pair of leads, a true and a complement. Together these leads form a 1 volt P-P signal level between the signal pair. These signals are transformer isolated at each end of the cable. Transmission is at a rate of 56 kilobits/second, resulting in a bit time of 17.9 microseconds and a word time of 321 microseconds. To indicate a SPACE, or ON condition for control bits, the data leads change state during the midpoint of a bit time. The absence of a transition during this time would be interpreted as a MARK for data or an OFF condition for control bits.

D.   Display Logic Interface

7.15   The input/output port and the opcon are interfaced to the Display Logic (DL) through the controller. The display logic functions as a receiver for data from the opcon in the local mode and as a sender or receiver for data in the on-line operating modes.

7.16   The interface between the controller and DL consists of 20 leads. All signals are DTL (Diode Transistor Logic) levels. Data and character control signals are bidirectional while

mode control signals are inputs to the display logic. Signals are transported by a 341740 cable between the 410674 circuit card in the controller and the 410002 circuit card in the display logic.

E.   Printer Interface

7.17   A DATASPEED 40/2 printer may be interfaced to the controller when the optional 410770 independent printer access circuit card is used. Interfacing can be either EIA in a KD-ROP combination or SSI in a KDP arrangement. Use of the EIA interface (KD-ROP) restricts the terminal operating speed to that of the RO printer, whereas the SSI interface allows the full range of operating speeds provided incoming data to the terminal is properly formatted with regard to the printer's line feed rate.

7.18   The controller can interface with a printer using either an SSI interface or an EIA type interface. Either interface is available at the JC4 connector on the rear apron of the controller.

7.19   The SSI interface operates in a manner similar to that described for the opcon interface. Character transfer is on a demand-response basis.

7.20   When the EIA printer interface is used, the controller simulates a data set interface to the printer. The controller would supply the printer with the Data Set Ready, Data Carrier Detect and Receive Data signals while the printer would present the Data Terminal Ready and Supervisory Transmitted Data signals to the controller. Character transfer can be controlled by the printer through the use of the Reverse Channel (STD) lead provided the data input source to the controller is capable of responding to a reverse channel signal. Transmission speed is at the rate selected as the controller's input/output transfer rate. In the print local mode, transfer is at a rate of 1200 baud (see 7.32).

DESCRIPTION OF STATION OPERATING MODES

A.   Local Mode

7.21   In the local mode (Fig. 1), the controller interfaces the opcon to the display logic. This "off-line" mode allows the terminal operator to prepare or edit information to be stored in the display logic and displayed on the monitor prior to transmission to the the line or a local printer. The terminal is in the local mode when the lamp is lighted in the LOCAL switch keytop on the opcon. Printer access in the local mode is discussed in 7.32.
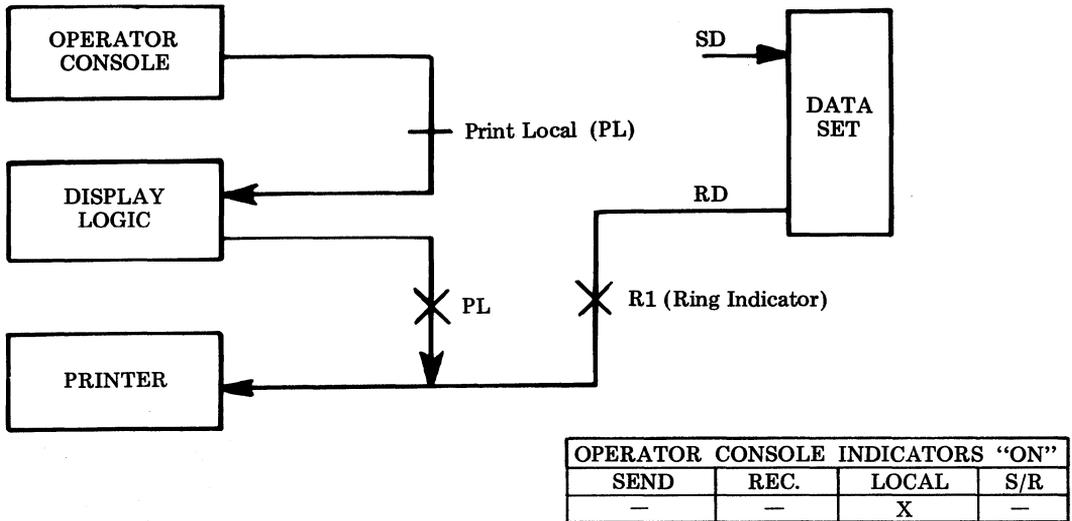
OPERATOR CONSOLE INDICATORS "ON"			
SEND	REC.	LOCAL	S/R
—	—	X	—

Fig. 1—Local Mode

B.   Receive Mode

7.22   In the receive mode (Fig. 2), the controller interfaces the input data line to the display logic. In this mode, the opcon is blinded except for the mode select keys. All data received from the line will appear on the monitor, unless one of the "Reject" options is being used. See Section 582-200-202 for descriptions of available options.

Note: S/R Operation, as described in 7.25, may allow the opcon to be active even though the receive mode lamp is on.

C.   Send Mode

7.23   The send mode (Fig. 3), allows the information stored in the display logic to be transmitted to the output interface. The controller regulates the transfer of characters out of the DL to match the transmission rate. Further, data may be modified enroute to the output interface to provide optional transmission features, or send variations, such as special treatment of protected or highlighted data fields, horizontal tabbing operation and line ending sequences. (Refer to Section 582-200-202 for descriptions of controller options.)

D.   Form Send Mode

7.24   This mode is similar in operation to the send mode described above with the exception that the send variation options are defeated and all information from the DL is transmitted as displayed including the field delimiters. This mode is indicated by the lamp in the FORM SEND keytop on the opcon. Operation of the FORM SEND and SEND keyswitches are required to initiate the form send mode. After the message has been transmitted, the form send mode will automatically be terminated when the terminal is placed into the local mode.

E.   S/R Mode (Conversational Mode)

7.25   The S/R mode (Fig. 4) is a send-receive or conversational mode in that the terminal operator may communicate, on-line, on a character-at-a-time basis rather than in the send mode as previously described where communication is on a "batch" basis for mass transmission of previously prepared data. This mode provides Full Duplex (simultaneous two way communications) or Half-Duplex (alternate two-way communication) operation thereby making the terminal compatible with most existing teletypewriter systems. Full or Half-Duplex operation is selectable as a terminal operation. The S/R mode is selected either by the terminal operator or by transmission on-line in the batch send mode of the ASCII Control Character DC3.

Fig. 2—Receive Mode
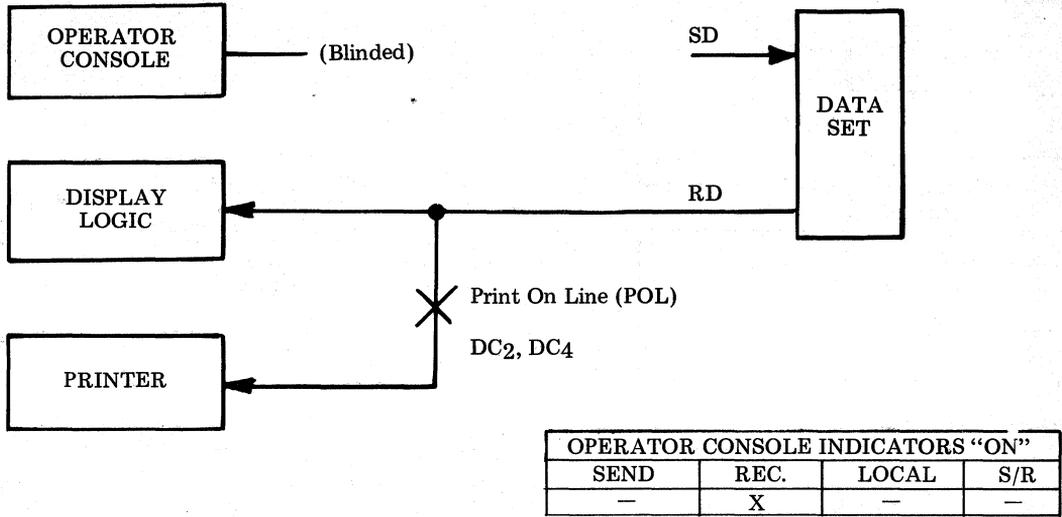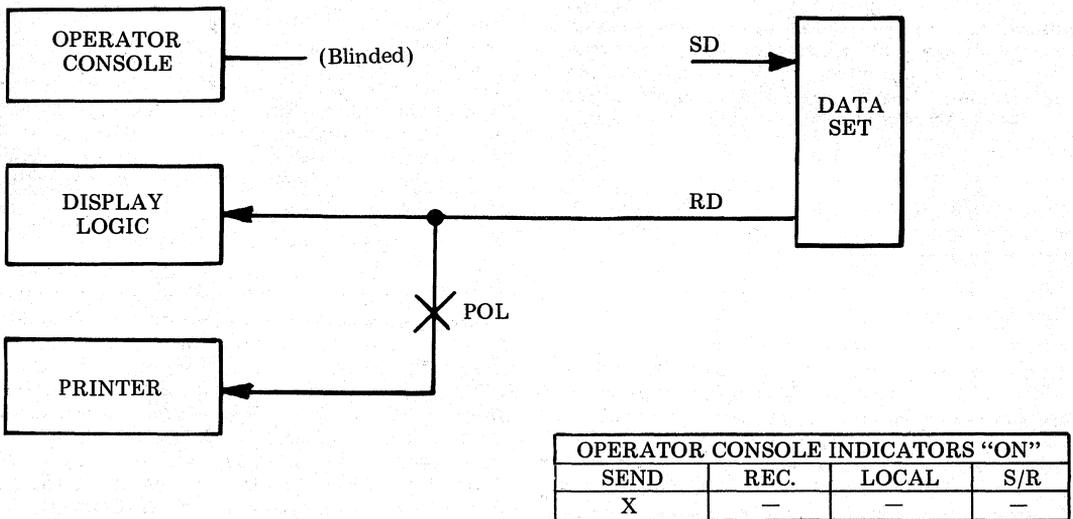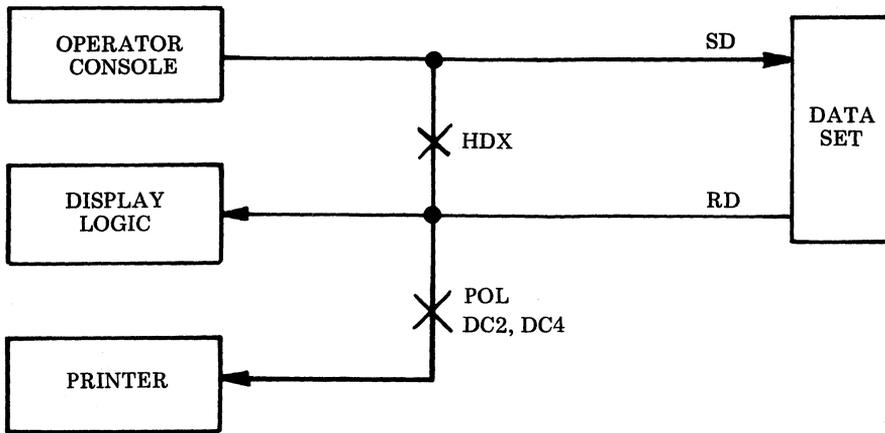
OPERATOR CONSOLE INDICATORS "ON"			
SEND	REC.	LOCAL	S/R
—	X	—	—

Fig. 3—Send Mode

OPERATOR CONSOLE INDICATORS "ON"			
SEND	REC.	LOCAL	S/R
X	—	—	—

	OPERATOR CONSOLE INDICATORS "ON"			
MODE	SEND	REC.	LOCAL	S/R
HDX — 202-TYPE DATA SET	SEND OR REC.		—	X
HDX — 103-TYPE DATA SET	X	X	—	X
FDX — 103-TYPE DATA SET	X	X	—	X

Fig. 4—S/R (Conversational) Mode

7.26   When the terminal is operated in the S/R mode with the Full Duplex option, the controller is used to interface the received data input line to the display logic while at the same time interfacing the opcon to the send data output line. In this arrangement, the receive portion of the controller performs identically as if the terminal were in the conventional (non S/R) receive mode. All receive data options remain active (ie, reject characters, etc).

7.27   The S/R mode with the Full Duplex option (ie, operation with a Data Set 103 interface) is indicated by the S/R, SEND and RECEIVE keyswitches all being lighted.

7.28   The opcon operation is similar to the operation in the local mode. However, the terminal operator will not see the typed character appear on the monitor, since data is sent only to the output data line. An exception is the case of "Echo" operation which is a Full Duplex System in which the outgoing character is echoed back by the distant end back to the originating terminal. All opcon keyswitches associated with local editing or mode control will not produce a char-

acter on-line as they are suppressed by the controller. The mode control switches will, however, remain active to allow operator control.

7.29   When the terminal is operated in the S/R mode with the Half-Duplex option, the received data input line is interfaced with the display logic during the receive portion of this mode (ie, S/R and receive). This operation is the same as the conventional (non S/R) receive mode. The opcon is blinded and the set will only respond to the mode control keyswitches. The S/R mode with the Half-Duplex option (ie, operation with a Data Set 202 interface) is indicated by the S/R and either the SEND or RECEIVE key-switches being lighted. (The SEND and RECEIVE indicators are also dependent on the data set interface signal Request To Send.)

7.30   In the send portion of the S/R mode with Half-Duplex, the opcon is interfaced by the controller to the send data output line. In addition, the controller internally wraps the send data output signals back into the received data circuitry resulting in the transmitted character

being entered into the the display logic and presented on the monitor. The local editing keyswitches are blinded, however, it is possible to do editing through the use of escape sequences (eg, if the operator types the sequence ESCAPE H, and the 410674 is optioned to respond to escape sequence, then the cursor will be positioned to the HOME position on the display monitor).

7.31   Mode control   keyswitches remain active to allow operator control of the terminal. Beyond this, the mode is controlled by use of the EOT character (ASCII End Of Transmission).

F.   Print Local Mode

7.32   The print local mode is intended to be an off-line operation wherein an operator may obtain a hard copy record of the information present on the display monitor. In this mode, the controller provides an interface between a printer and the display logic. The printer interface is optionally selected as either an SSI or EIA signaling format. Transmission speed is fixed at a transfer rate of 1200 wpm for selected on-line speeds up to 1200 baud (except that the SSI printer interface may reduce the transfer rate in cases where the message format would cause the line rate of the printer to be exceeded). Print local will be at the on-line transmission rate if that rate is in excess of 1200 baud.

G.   Print On Line Mode

7.33   The Print On Line (POL) mode may exist either as a unique on-line mode or in conjunction with one of the other on-line modes. When the opcon and display logic are in the local mode, the POL mode may be used to provide an accessible receiver for input data on the receive line. With the data set disconnected and the terminal in local, a Ring Indicator from the data set would cause a POL and enable the data set interface. In this manner, the terminal operator may prepare and edit information off-line on the display without interruption or being required to take the terminal out of service. The POL mode, when used in conjunction with on-line modes, provides a hard copy record of outgoing and/or incoming data at that terminal. The POL mode and the data set connection can be maintained when switching to local from an on-line mode as follows:

(a)   From send (batch) to local by operating the LOCAL keyswitch.

(b)   From S/R to local by depressing the S/R keyswitch.

(c)   From S/R to local by depressing LOCAL provided carrier is being received.

(d)   From REC to local by depressing LOCAL provided carrier is being received.

All information transmitted to the printer will be at the line transmission rate.

7.34   The POL mode may be selected either by the terminal operator or controlled from the distant end sender by use of the DC2 (POL mode ON) and DC4 (POL mode OFF) ASCII control characters. The PRINT ON LINE keytop is lighted to indicate that the mode has been selected.

CONTROLLER OPTIONS

7.35   A large number of selectable options are available in the 40C204 controller to accommodate the variety of applications in which a terminal of this type may be used. These options are implemented through the selection of the appropriate switches located on the circuit cards located within the controller module. (Refer to Section 582-200-202 for descriptions of options and optioning information.)

THEORY OF STATION OPERATION

7.36   Operating mode diagrams of the DATA-SPEED 40/2 stations are shown in Table F for 103-type data set interface and Table G for 202-type data set interface. The mode diagrams cover operation in the conversational mode (S/R on) and batch mode (S/R off). The following paragraphs provide a further description of the operation shown in Tables F and G.

A.   Initializing

7.37   When power is applied to the 40C204 controller, the LOCAL lamp lights on the opcon. When the display monitor is turned on by rotating the switch on the lower left-hand portion of the monitor, a raster and cursor appear on the monitor, permitting mode selection, and character transfer from the opcon to the controller logic. Character transfer is also allowed between the display logic and the controller logic.

7.38   Turning off the display monitor switch allows all previously lit lamps on the opcon to remain on, but character transfer to the display is suppressed. All previously stored data is retained, however, as the power to the controller logic, display logic, and opcon is maintained.

TABLE F

OPERATING MODES (103-TYPE DATA SET)

DEPRESS	SEND	RECEIVE
D1 SEND key	S1 DLE EOT	R1 DLE EOT
D2 REC key	S2 EOT	R2 EOT
D3 LOCAL key	S3 ETX or GS or FF	R3 ETX or GS or FF
D4 S/R key (on)		R4 DLE ETX, FF, GS
D5 S/R key (off)	S5 DC3	R5 ESCf (1)
D6 INTRPT key (on)	S6 DLE ETX, FF, GS	R6 DC1 (2)
or PRINT ON LINE	(HDX, or Echoplex Only)	
key (off) (DC4)		

(1) — Applies to Issue 4B and later 410674 Circuit Card.
* — HDX Only
RI — Detection of ring indicator from the data set with PRINT LOCAL off, INTRPT off and KD in LOCAL.
CD — No carrier detected for 45 seconds.
✦ — Change in mode.
+ — Then make connection or auto-answer.
△ — If PRINT ON LINE is on.
□ — If PRINT ON LINE is off.
CF — Loss of Carrier Detect
(2) — Requires 407414 modification kit.

Mode of 40 Terminal
PRINT ON LINE key on or off
Mode of Data Set

TABLE G

OPERATING MODES (202-TYPE DATA SET)
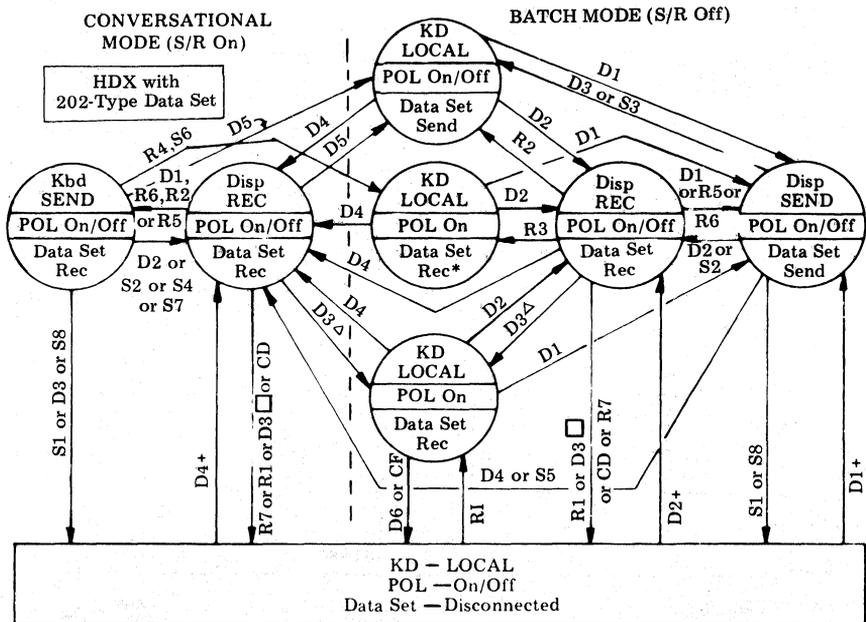
CONVERSATIONAL MODE (S/R On)

BATCH MODE (S/R Off)

HDX with 202-Type Data Set

KD LOCAL / POL On/Off / Data Set Send

Kbd SEND / POL On/Off / Data Set Rec

Disp REC / POL On/Off / Data Set Rec

KD LOCAL / POL On / Data Set Rec*

Disp REC / POL On/Off / Data Set Rec

Disp SEND / POL On/Off / Data Set Send

KD LOCAL / POL On / Data Set Rec

KD — LOCAL
POL —On/Off
Data Set —Disconnected

DEPRESS		SEND		RECEIVE	
D1	SEND key	S1	DLE EOT	R1	DLE EOT
D2	REC key	S2	EOT	R2	EOT
D3	LOCAL key	S3	ETX or GS or FF	R3	ETX or GS or FF
D4	S/R key (on)	S4	DC3 (2)	R4	DLE ETX, FF, GS
D5	S/R key (off)	S5	DC3	R5	ESCf (1)
D6	INTRPT key (on) or PRINT ON LINE key (off) (DC4)	S6	DLE ETX, GS, FF	R6	DC1 (2)
		S7	RETURN (←) (1)	R7	EOT (2)
		S8	EOT (2)		

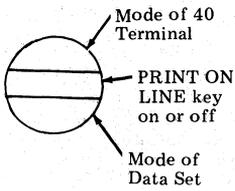Mode of 40 Terminal

PRINT ON LINE key on or off

Mode of Data Set

(1) — Applies to Issue 4B and later 410674 circuit card.
* — STD off.
RI — Detection of ring indicator from the data set with PRINT LOCAL off, INTRPT off and KD in LOCAL.
CD — No carrier detected for 45 seconds.
↗ — Change in mode.
+ — Then make connection or auto-answer.
△ — If PRINT ON LINE is on.
□ — If PRINT ON LINE is off.
CF — Loss of Carrier Detect
(2) — Requires 407414 modification kit.

B. Local Mode

7.39   When the DATASPEED 40/2 is in the local mode (LOCAL lamp lit), the set control is transferred to the opcon. The operator may enter data on the monitor, select display functions, or change modes from the opcon.

7.40   The local mode can be established by any of the following methods:

(a)   The initializing procedure.

(b)   From Send, Receive, or S/R by means of an end character.

(c)   From the operation of the S/R switch while in the S/R mode, or the LOCAL switch on the opcon.

(d)   From the time-out and disconnect sequence.

C.   Data in the Local Mode

7.41   When in the local mode, depressing a keytop on the opcon allows that character to be displayed on the monitor. If the keytop is not for a character to be displayed, but instead indicates a mode change such as Send, Receive, Print Local, Local, Interrupt, Send/Receive, Print On Line, or Form Send, the information from that keytop to perform the appropriate action is passed to the controller logic, allowing the controller logic to enter the appropriate mode. The form enter and highlight modes are similarly turned on and off by keytops on the opcon.

7.42   If the keytop on the opcon is not a character for which an action is taken by the controller logic, that character will simply be passed on to the display logic to be displayed on the monitor.

D.   Decoded Characters in the Local Mode

7.43   As previously noted, in 7.40, depressing some keytops causes an action to be taken by the controller logic. Depression of these keytops causes an internal character to be generated which is decoded by the controller logic. Of these decoded characters, only Form Enter, Highlight, and Form Send are blinded from operator access when the DATASPEED 40/2 is in the send or receive mode.

7.44   When the FORM ENTER switch on the opcon is operated with the station in the local mode, the FORM ENTER lamp turns on. During the time the FORM ENTER lamp is lit, all characters entered into the display logic will be "protected". A protected character is one which may not be altered, moved, or in any way changed except when in the form enter mode. While in local, the form enter mode may be terminated by again depressing the FORM ENTER switch on the opcon.

7.45   When the HIGHLIGHT switch on the opcon is operated with the station in the local mode, the HIGHLIGHT lamp turns on. During the time the HIGHLIGHT lamp is lit, all characters entered into the display logic will appear highlighted on the display monitor. Highlighted characters appear to blink by changing between half and full intensity at a rate of approximately one cycle per second. Highlighting may be terminated in the local mode by operating the HIGHLIGHT switch again to extinguish the lamp.

7.46   The local mode may be terminated by depressing either the SEND, RECEIVE, SEND/RECEIVE (S/R), or PRINT LOCAL keys on the opcon.

E.   Receive Mode

7.47   The receive mode and S/R-receive mode allows data from an external EIA or current loop sending device to be entered into the set and be displayed on the monitor. Optional features in this mode include the ability to reject characters and perform on-line editing.

7.48   Several methods are available for placing the set into the receive mode:

(a)   Operation of the RECEIVE keyswitch on the opcon (7.49).

(b)   From the send mode to the receive mode on EOT or other ending characters (7.50).

(c)   Receive mode as part of the S/R operation (7.51).

7.49   The operator may place the DATASPEED 40/2 into the receive mode by operating the RECEIVE switch on the opcon. The RECEIVE key lights when the set is in the receive mode.

7.50 An option on the 410675 circuit card allows the terminal to switch from the batch send mode to the receive mode each time an end character is sent. Any or all of the end characters EOT, ETX, FF, and GS may be selected with option switches on the 410674 circuit card.

7.51 The transmitted EOT characters will cause the terminal to go to the receive mode from send, even if the 410675 card is optioned to go to the local mode after send. This will occur only if the EOT character is selected as an ending character on the 410674 circuit card.

7.52 The S/R mode may be established either by operating the S/R keyswitch on the opcon or by sending a DC3 character in the batch send mode. The S/R and RECEIVE lamps both light when the terminal enters the S/R-receive mode. If the terminal is optioned for 103-type modem interface, the SEND key is also lit.

7.53 Once the receive mode has been established, incoming data signals are routed from the data set through the controller logic to the display logic, for display on the monitor.

7.54 As received characters pass through the controller logic, they are decoded. The following characters that are decoded may result in an action performed by the controller:

(a) End Characters (see 7.55)

(b) Reject Characters (see 7.56)

(c) Bell (see 7.57)

(d) Escape Sequences (see 7.58)

(e) DC2 or DC4 (see 7.59)

7.55 The characters EOT, ETX, FF, or GS will cause the mode to switch from receive to local, if it is optioned to do so. The DLE EOT sequence acts as a disconnect sequence, in addition to changing modes from receive to local.

7.56 The characters Carriage Return, Null, Delete, DC1 and DC3 are rejected by the controller logic if optioned to do so. These characters will not be presented to the display logic if they are rejected by the controller logic.

7.57 In the receive mode, the ASCII character Bell is decoded and causes an audible signal to be generated at the opcon. If there are more than one Bell characters, and they are relatively close together, the audible signal at the opcon will sound like a steady alarm.

7.58 The option for "Escape not displayed, function performed" is similar to the reject characters option mentioned previously. In this case, the ASCII character Escape is decoded and the character Escape and the following character are rejected from data being presented to the display logic. In addition, the function of the two-character Escape sequence is performed. For example, the Escape 3 sequence will cause the HIGHLIGHT lamp to turn on, and all succeeding characters will be highlighted by the display monitor.

7.59 The received characters DC2 and DC4 will cause the PRINT ON LINE function in the KDP to turn on and off, respectively. The PRINT ON LINE lamp on the opcon also turns on with a received DC2 and off with a received DC4.

7.60 A parity detection circuit in the controller logic detects even vertical parity on incoming data, and replaces errored characters with the ASCII character Substitute (displayed on the monitor as S_B). An option disables this feature and allows data to enter the display logic as received. In DATASPEED 40/2 operation, this parity detection circuitry is normally disabled.

7.61 The receive mode may be terminated by operation of the LOCAL, S/R, or SEND keyswitches on the opcon, or by detection of an ending character. Operation of the LOCAL keyswitch, or operation of the S/R keyswitch while in the S/R mode causes the receive mode to end and the terminal to go to local.

7.62 The end character option for changing from receive to local is selectable as an option by optioning switches on the 410674 circuit card. One or more of the end characters must be selected by closing switches on the circuit card. After the end character has been accepted by the display logic, the terminal switches from receive to local.

7.63 If the Data Set 202 interface option is used, a received EOT causes a Request to Send signal to be turned on to the data set interface, so the data set interface is not dropped. A received ETX, FF, or GS character will not cause Request to Send to be turned on, therefore, the distant end may time-out and disconnect due to loss of data set carrier.

7.64   If the Data Set 103 interface option is used, a received EOT turns off Data Terminal Ready, which causes a disconnect, in addition to the terminal switching from receive to local. A received ETX, FF, or GS character causes the terminal to go local.

7.65   In the S/R mode, when the Data Set 202 interface option is used, a received EOT causes the terminal to go from S/R-receive to S/R-send. If the Data Set 103 interface option is used, a received EOT causes the terminal to go local and disconnect. Received ETX, FF, or GS characters in the S/R mode have no effect on the mode in either 103-type or 202-type data set operation. However, the sequence DLE ETX, DLE FF, or DLE GS will cause the terminal to go to the local mode if the Data Set 103 option is being used. Reception of a DLE EOT sequence causes the terminal to go local and disconnect if the Data Set 202 option is being used.

F.   Send Mode

7.66   Data may be transmitted from the DATASPEED 40/2 to external receiving equipment in either the batch send mode or the SR-send mode. The S/R-send mode operation consists of transmitting data, on-line one character at-a-time from the opcon. The S/R-send mode operation is described starting with 7.88.

7.67   The batch send mode is used to transmit any data on the monitor, which may have been prepared by the operator while in the local mode, or which may have been received from an external source while in the receive mode.

7.68   The batch send mode is selected by either operating the SEND keyswitch on the opcon or by reception of the sequence "Escape f" (only on Issue 4B and higher of the 410674 circuit card). The SEND lamp on the opcon is lighted whenever the terminal is in the batch send mode. If an "Escape F" sequence is received, an internal signal in the controller logic places the terminal in the send mode and illuminates the SEND keyswitch on the opcon the same as if it had been manually operated.

7.69   Once the send mode has been established, the terminal turns on the Data Terminal Ready signal on the data set interface. The data set responds with a Data Set Ready signal when the data channel is established. The Data Set Ready being on, along with the send mode, causes the terminal to generate the Request to Send signal to the data set. The data set responds to the Request to Send signal by turning on Clear to Send, allowing the terminal to send the message on-line.

7.70   Transmission speed is derived from an internal crystal oscillator located on the 410679 circuit card. The oscillator drives a counter circuit which is preset by the speed select option switches.

7.71   Three options exist for processing the ASCII character Line Feed when sending from the DATASPEED 40/2 to a receiver. The Line Feed may be sent as displayed; it may be preceded by an internally generated Carriage Return, or it may be preceded by two generated Carriage Return characters. If a Line Feed character was not present in the line on the display monitor, the display logic will automatically generate and send a Line Feed at the end of a line.

7.72   The send variations options allow the terminal user to select the format of transmitted messages in the batch send mode that provide the most efficient system operation. All of the options are chosen via option switches on circuit cards within the controller logic module.

7.73   The send variations options consist of the following:

(a)   Disable Sending Highlight Delimiters (see 7.74)

(b)   Send Unprotected Data Only (see 7.75)

(c)   Send Protected Data as Space, Send Protected Data as Delete (see 7.76)

(d)   Send All Data Without Delimiters Except for Highlight (see 7.77)

(e)   Convert H_T to Space (see 7.78)

(f) H_T and Skip (see 7.79)

7.74   This option to disable sending highlight delimiters is implemented by closing switch 5 on switch pack C12 located on the 410674 circuit card. This option prevents the highlight delimiters from being sent when there is highlighted data on the display monitor.

7.75 In the option to send unprotected data only, all protected characters are removed from the transmitted text. Switches 1 and 3 must be open on switch pack A4 located on the 410676 circuit card. If highlighted characters are within the protected field of characters, they will be transmitted, unless "Disable Sending Highlight Delimiters" (7.74) is utilized.

7.76 Protected Data may be sent as either Space characters or Delete characters. These options are similar to "Send Unprotected Data Only" (7.75), but instead of stripping the protected characters from the text, either Space or Delete characters are transmitted instead. Switches 1, 3, 4, and 6 must be open, and 2 and 7 closed on switch pack A4 on the 410676 circuit card. In addition, the "Delete" option requires that 5 be open, while the "Space" option requires 5 be closed.

7.77 All data can be sent without delimiters except for highlight. All switches must be closed except switch 2 on switch pack A4 on the 410676 circuit card. All data will be sent as displayed on the display monitor, but without delimiters for highlighted and protected data. Horizontal tabs are sent as a space character.

7.78 The "Horizontal Tab to Space" option is obtained by closing switches 7 and 8 on switch pack A4 on the 410676 circuit card. Horizontal tabs that are displayed are transmitted as space characters.

7.79 The "Horizontal Tab and Skip" option is selected by closing switches 2, 4, 5, and 8 on switch pack A4 on the 410676 circuit card. Remaining switches on the pack are open. With this option, protected data is not transmitted, but an H_T character is internally generated and transmitted in its place. When an unprotected H_T appears in the text, it is transmitted, and skip operation begins. Data following an unprotected H_T character is skipped, until a tab mark or unprotected line feed character is encountered. If the skip passes through a protected field, the H_T character is not generated again, and the skip proceeds to the first character after the protected field, where transmission resumes.

7.80 The form send feature overrides any of these send variations that may have been selected. Form send is selected by depressing the FORM SEND keyswitch on the opcon before entering the send mode. When form send is used, all data contained in the display logic memory

is transmitted to the external receiver. All delimiters for highlighting, tabs, and protected data are converted to the corresponding two-character escape sequence and transmitted with the message.

7.81 The form send mode is terminated when the terminal switches from send to local. The FORM SEND lamp on the opcon turns off upon entering the local mode.

7.82 The send mode can be terminated in any of the following ways:

(a) Sending an ending character (7.83)

(b) Sending a DC3 character (7.84)

(c) Sending a disconnect sequence (7.85)

(d) Disconnect generation (7.86)

(e) Mode switching from the opcon (7.87).

7.83 If the controller logic is optioned to recognize ETX, FF, or GS as an ending character, the mode switches from send to local. If the controller recognizes EOT as an ending character, the mode switches from send to receive.

7.84 When a DC3 character is sent to the line, the terminal switches from the send mode to the S/R mode. The S/R keyswitch on the opcon lights, along with the RECEIVE keyswitch for Data Set 202 operation, and the SEND and RECEIVE keyswitches for Data Set 103 operation.

7.85 A disconnect to data set interface is generated by the controller logic when a DLE EOT sequence is transmitted with Data Set 202 operation. With Data Set 103 operation, a transmitted EOT character causes a disconnect.

7.86 The send mode may be terminated by generation of a disconnect signal from the 410770 circuit card. This results in a disconnect at the data set interface and the set goes to local. This disconnect is the result of a loss of SSI interface if the Print On Line operation is selected, and the 410770 circuit card is optioned to go local on loss of SSI.

7.87 Operation of the RECEIVE, LOCAL, or S/R keyswitches on the opcon while in the send mode will cause that mode to be terminated and switch the controller to the selected mode.

G.   S/R Send Mode

7.88   The S/R mode is established by either operating the S/R keyswitch on the opcon (while not in the S/R mode) or by sending a DC3 character in the batch send mode.

7.89   In Data Set 103 operation, entering the S/R mode also lights the SEND and RECEIVE lamps on the opcon. In Data Set 202 operation, the SEND keyswitch must be depressed after entering the S/R mode.

7.90   The send portion of the S/R mode blinds the send circuitry used in the batch send mode and instead interfaces the opcon to the 410679 circuit card for on-line character-at-a-time transmission from the opcon. If the Reverse Channel option is selected, it is necessary for the Supervisory Received Data signal to be turned on before data may be transmitted.

7.91   Characters are transmitted one-at-a-time, on-line, from the opcon. When the Half-Duplex option is selected, the transmitted data is tied internally to the receiving distributor. The data is then processed by the controller as if that data had been received on-line.

7.92   The send portion of the S/R mode may be terminated in the following ways:

(a)   Sending a "turnaround" character (7.93)

(b)   Operation of LOCAL keyswitch (7.94)

(c)   Operation of S/R keyswitch (7.95)

(d)   Sending a Disconnect character or sequence (7.96).

7.93   The controller can be changed from the send to the receive portion of the S/R mode when operating with the Data Set 202 option only, by sending an EOT character or a Carriage Return (Issue 4B or later of 410674 circuit card). The S/R keyswitch remains lighted, SEND turns off, and RECEIVE lights.

7.94   S/R send can be terminated by operating the LOCAL keyswitch. This causes the mode to change to local, and also causes a disconnect if the PRINT ON LINE keyswitch is not lighted.

7.95   Operation of the S/R keyswitch while in the S/R mode causes the mode to change from S/R to local. No disconnect is caused.

7.96   Sending a disconnect character or sequence will cause the terminal to change from S/R-send mode to local, and disconnect. In Data Set 103 operation, EOT causes local and disconnect. In Data Set 202 operation, DLE EOT causes local and disconnect.

H.   Printer Operation

7.97   The controller logic in the DATASPEED 40/2 can provide an optional interface to either an SSI or EIA printer by the addition of a 410770 circuit card in module position Z101. This card provides functions for:

(a)   Selection of either SSI or EIA interface to a printer.

(b)   A disconnect timer.

(c)   Options for Print On Line operation.

(d)   Inhibiting the character following Escape when generating with an SSI printer.

(e)   Circuitry to provide an Interrupt signal.

(f)   Circuitry for the Print Local operation.

7.98   When the PRINT LOCAL keyswitch on the opcon is operated, data appearing on the monitor and stored in the display logic is transmitted to the printer without allowing that data to be transmitted to either the data set or current loop interfaces. While transmitting data to the printer in the print local mode, the PRINT LOCAL and SEND keyswitches are lighted on the opcon. When the operation is completed, these lamps turn off and the LOCAL lamp lights.

Note: The Print Local operation should only be implemented while the set is in the local mode to avoid unwanted data set turnaround, data set blinding, and in some instances invalid modes.

7.99   The Print On Line operation allows incoming data, outgoing data, or both, to be sent to an associated printer. The print on line mode is established by either operating the PRINT ON LINE keyswitch on the opcon, by reception of a DC2 character from the line, or by "Automatic Answer" of an incoming call.

7.100 The Automatic Answer operation allows an incoming data call to be completed while the terminal is in the local mode provided a printer is available to accept data. The associated data set responds to an incoming call by applying a pulse to the Ring Indicator EIA interface lead, which turns on the print on line mode, allowing the call to be answered.

Note: Some data sets may have an option by which the ring indicator signal remains on constantly during a data connection. This option must not be used or improper controller operation will result.

I. Interrupt

7.101 The INTERRUPT keyswitch on the opcon is used to provide a method of signaling back to a distant sender or to inhibit the controller from automatically answering a data call. The use of Interrupt operation to signal a distant sender requires the use of Reverse Channel operation.