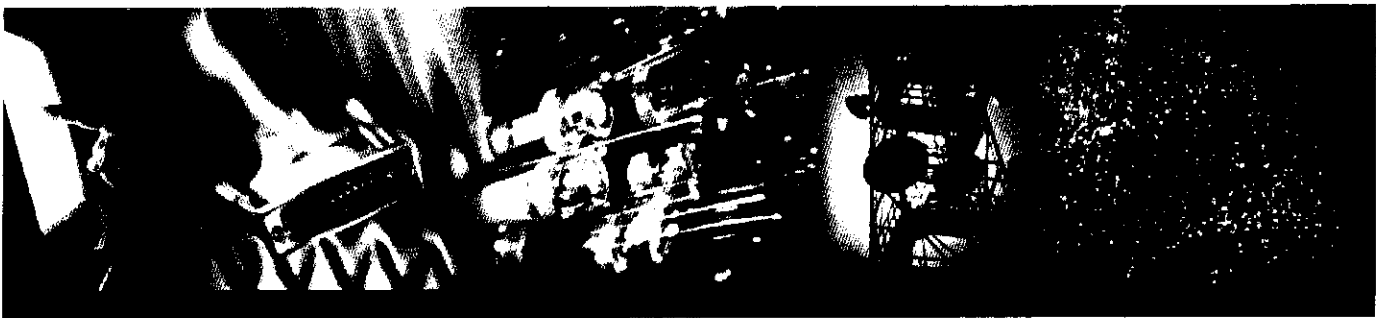


# Operating Manual

V.35/306 DTE/DCE  
DATA INTERFACE  
OPERATING MANUAL  
(MODEL 40202)



**TTC**<sup>™</sup>

OPTIMIZING NETWORK PERFORMANCE

ML11031  
Rev. -

**V.35/306 DTE/DCE  
DATA INTERFACE  
OPERATING MANUAL  
(MODEL 40202)**

**SEPTEMBER 1989**

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**TELECOMMUNICATIONS TECHNIQUES CORPORATION**  
20400 Observation Drive, Germantown, MD 20876  
(800) 638-2049 • (301) 353-1550 • FAX: (301) 353-9216  
WWW Address: <http://www.ttc.com>

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## GENERAL INFORMATION

### 1.1 INTRODUCTION

This manual contains descriptions, set-up and operating instructions, specifications, maintenance, and service information for the Telecommunications Techniques Corporation (TTC) Model 40202 V.35/306 DTE/DCE Data Interface. The V.35/306 DTE/DCE Data Interface allows all FIREBERD mainframes to be connected to V.35/306-type compatible circuits and act as the data terminal equipment (DTE) or data communications equipment (DCE).

### 1.2 INTERFACE FEATURES

The V.35/306 DTE/DCE Data Interface has the following features.

- Enables a FIREBERD mainframe to act as the DTE or DCE with an appropriate adaptor cable.
- Interface panel switches allow clock polarity and timing mode control.
- Allows testing of V.35/306-type circuits using serial binary formatted data at rates up to 15 MHz.

### 1.3 INTERFACE COMPATIBILITY

The V.35/306 DTE/DCE Data Interface is designed in accordance with the following specifications.

- CCITT Recommendation V.35, Data Transmission at 48 Kilobits Per Second Using 60-108 kHz Group Band Circuits for Wideband Modems.
- Bell System Technical Reference Publication PUB41304 for 306-Type Wideband Data Sets.
- Bell System Technical Reference Publication PUB41450 for Digital Data System (DDS) Data Service Units (DSU).

### 1.4 OPTIONS AND ACCESSORIES

The following cables are available from TTC for the V.35/306 interface. Cable diagrams are provided in Appendix A.

- Model 10214, 6' cable with 34-position male connectors.
- Model 10419, 10' cable with 34-position male connectors.
- Model 10204, 9" DCE-to-DTE crossover cable with 34-position male and female connectors (supplied with interface).



**INTERFACE DESCRIPTION**

**2.1 PHYSICAL DESCRIPTION**

The V.35/306 DTE/DCE Data Interface has three two-position toggle switches, one V.35/306 compatible connector, and one LED as shown in Figure 2-1. The three switches control transmit and receive clock polarities and timing mode configuration.

**2.1.1 Interface Switches and Indicators**

**DTE — TX CLK/DCE — RCV CLK Switch** - When configured as the DTE, setting the TX CLK switch to the INVERT position causes SD to be valid on the rising edge of the chosen clock source instead of the falling edge (normal). When configured as the DCE, setting the RCV CLK switch to the INVERT position causes the FIREBERD to synchronize valid RD on the rising edge of SCR instead of the falling edge (normal).

**DTE — RCV CLK/DCE — TX CLK Switch** - When configured as the DTE, setting the RCV CLK switch to the INVERT position causes the FIREBERD to synchronize valid RD on the rising edge of SCR instead of the falling edge (normal).

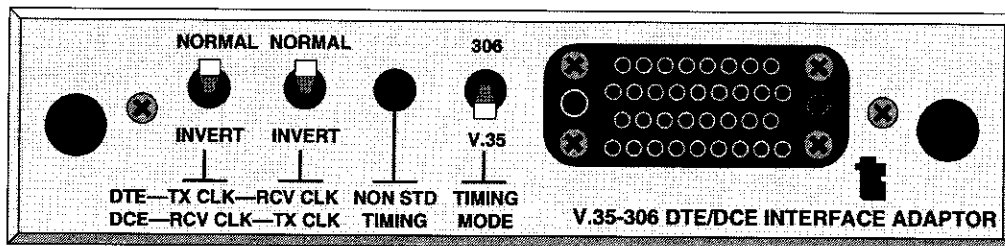
When configured as the DCE, setting the TX CLK switch to the INVERT position causes SD to be valid on the rising edge of the chosen clock source instead of the falling edge (normal).

**TIMING MODE Switch** - This switch controls the timing requirements for Bell standard 306-type and CCITT V.35 specified circuits.

**NON-STD TIMING LED** - This LED illuminates when either interface clock switch is set to the INVERT position. On the FIREBERD 6000, ignore the LED when the Auxiliary Function 05 (INTF CONTROL) is set to F-BERD.

**2.1.2 Interface Connector**

The interface connector is a female, 34-position connector which allow connections to V.35/306-compatible equipment. Pin assignments are defined by the CCITT V.35 and Bell 306-type interface standards as previously mentioned and listed in Table 2-1. Only the pin assignments listed in Table 2-1 are provided at the interface connector. Table 2-2 provides a MIL-SPEC C-22857-C to commercial connector pin assignment cross reference.



**Figure 2-1**  
**The V.35/306 DTE/DCE Data Interface**



**Table 2-1  
V.35/306 Interface Connector Pin Assignments**

Pin #	EIA	CCITT	Command	Signal Source		Description
				DTE	DCE	
A	AA	—	PGND	—	—	Protective Ground
B	AB	102	SGND	—	—	Signal Ground
C	CA	105	RS (RTS)	X		Request to Send
D	CB	106	CS (CTS)		X	Clear to Send
E	CC	107	DSR		X	Data Set Ready
F	CF	109	RLSD		X	Received Line Signal Detector
H	CD	—	DTR	X		Data Terminal Ready
P	—	103	SD (A)	X		Send Data (A lead)
R	—	104	RD (A)		X	Received Data (A lead)
S	—	103	SD (B)	X		Send Data (B lead)
T	—	104	RD (B)		X	Received Data (B lead)
U	—	—	SCTE (A)	X		Serial Clock Transmit External (A lead)
V	—	115	SCR (A)		X	Serial Clock Receive (A lead)
W	—	—	SCTE (B)	X		Serial Clock Transmit External (B lead)
X	—	115	SCR (B)		X	Serial Clock Receive (B lead)
Y	—	114	SCT (A)		X	Serial Clock Transmit (A lead)
*Z	—	—	SCT (A)		X	Serial Clock Transmit (A lead)
a	—	114	SCT (B)		X	Serial Clock Transmit (B lead)
*b	—	—	SCT (B)		X	Serial Clock Transmit (B lead)
*c	—	—	DTE/DCE			DTE/DCE Control
*f	—	—	SGND			Signal Ground

\*Leads only used when configuring FIREBERD as the DCE. Requires adaptor cable, Model 10204.

**Table 2-2  
Connector Pin Assignment  
Cross-Reference**

MIL-SPEC C-22857-C Connector	Commercial Connector
A	A
B	B
C	C
D	D
E	E
F	F
H	H
J	J
K	K
L	L
M	M
N	N
P	P
R	R
S	S
T	T
U	U
V	V
W	W
X	X
Y	Y
Z	Z
AA	a
BB	b
CC	c
DD	d
EE	f
FF	g
HH	h
JJ	i
KK	j
LL	k
MM	m
NN	n

type circuits. All signaling drivers and receivers are single-ended RS-232/CCITT V.28 type circuits. This interface enables a FIREBERD to act as the DTE when testing the DCE. With the use of the DCE/DTE adaptor cable (supplied with interface), the FIREBERD can be configured as the DCE when testing the DTE. Data is exchanged in serial binary format. Synchronous data analysis can be performed up to 15 Mb/s. Asynchronous data analysis can be performed up to 20 kb/s. Recovered timing provides a clock derived from the received data transitions up to 520 kb/s. Refer to the mainframe operating manuals for specific operating capabilities.

### 2.2.1 Operating as the DTE

When testing 306-type circuits, the DCE supplies timing to the FIREBERD (acting as the DTE) on the SCT leads. With the FIREBERD generator clock set for interface control, the FIREBERD generates SD and SCTE coincident with SCT. With the FIREBERD generator clock or synthesizer set to any of the available internal rates, the FIREBERD ignores SCT and generates SD and SCTE coincident with the selected internal rate.

When testing V.35 or Data Service Unit (DSU) type circuits, timing is supplied to the FIREBERD on the SCT leads in the same manner as the 306-type circuits. With the interface set for V.35 operation, SCTE is disabled and the interface generator clock should be used. When the clock source is the mainframe internal clock or synthesizer, only data appears at the interface connector. In both the V.35 and 306 modes, data and clock are received for analysis on the RD and SCR leads, respectively.

The two clock switches on the V.35/306 interface provide clock and data synchronization control. As the DTE, setting the TX CLK switch to the INVERT position causes SD to be valid on the rising edge of the chosen clock source instead of the falling edge (normal). Setting the RCV CLK switch to the INVERT position causes the FIREBERD to expect valid RD on the rising edge of SCR instead of the falling edge (normal). If either clock switch is set to the INVERT position, the NON-STD TIMING LED illuminates.

RS and DTR are controlled by the mainframe signaling switches. The status of DSR, RLSD, and CS are received and displayed on the mainframe signaling panel.

## 2.2 FUNCTIONAL DESCRIPTION

The V.35/306 DTE/DCE Data Interface converts the signal characteristics specified by the appropriate interface specifications to the TTL signals used by the FIREBERD to analyze and test circuit operation (see Figure 2-2). All clock and data drivers and receivers are high-speed, balanced V.35-

### 2.2.2 Operating as the DCE

The V.35/306 DTE/DCE Interface can be configured to look like the DCE to test DTEs by using the DCE adaptor cable (Model 10204) supplied with the interface. When connected

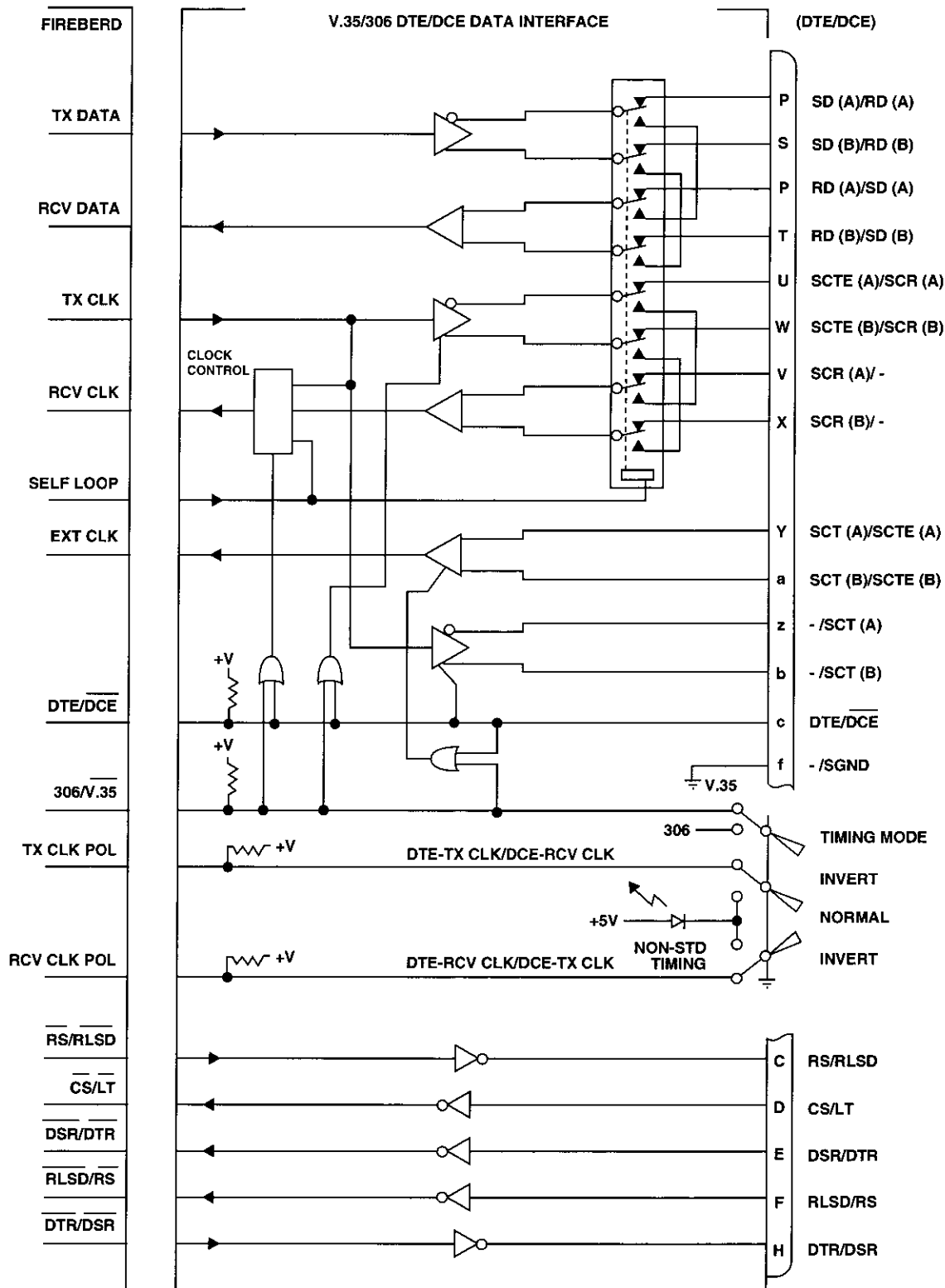


Figure 2-2  
V.35/306 DTE/DCE Interface Block Diagram

to the interface, the adaptor cable configures the interface connector as the DCE. The cable grounds a control lead (pin c) and redirects data, clock, and signaling leads to configure the interface connector for DCE operation (see Figures 2-2 and A-2).

When testing 306-type circuits, the FIREBERD (acting as the DCE) supplies SCT to the DTE. The DTE returns SD and SCTE to the FIREBERD, which may or may not be coincident with SCT (depends on configuration of DTE). The SD and SCTE signals are then translated to TTL and sent to the FIREBERD receiver section for analysis.

When testing V.35 or Data Service Unit (DSU) type circuits, SCT is generated by the FIREBERD as in 306-type circuit testing. However, the DTE does not return SCTE. The DTE only returns SD to the FIREBERD coincident with the FIREBERD-generated SCT. In the DCE V.35 mode, SCTE is disabled. In both V.35 and 306 modes, the FIREBERD generates SCR and RD and sends them to the DTE.

The two V.35/306 interface clock switches provide clock and data synchronization control. When configured as the DCE, setting the RCV CLK switch to the INVERT position causes the FIREBERD to generate a valid RD signal on the rising edge of SCR. Setting the TX CLK switch to the INVERT position causes the FIREBERD to expect a valid SD signal on the rising edge of SCTE for 306 mode or SCT for V.35 mode operation. The NON-STD TIMING LED illuminates when either switch is placed in the INVERT position.

Two mainframe switches control RLSD and DSR. DTR, RS, and LT are received and displayed on the FIREBERD signaling panel. The DTE-generated RS and CS are tied together through the DCE/DTE adaptor cable.

### **2.2.3 Self-Loop Testing**

The interface can be tested using the mainframe self-loop test switch. When activated, the interface transmit clock (SCTE) and data (SD) outputs are looped back to the receive clock (SCR) and data (RD) inputs (see Figure 2-2). The loop test tests the drivers and receivers used during normal operation. External timing for the loop test can be provided through the SCT (DCE source) leads in the DCE mode, SCTE (306 mode only), or through the mainframe rear-panel clock input connector. User connections do not have to be removed during the loop test.



## INSTALLING AND SETTING UP THE INTERFACE

### 3.1 INTRODUCTION

This section describes how to install and set up the V.35/306 DTE/DCE Data Interface with each of the FIREBERD mainframes.

**NOTE:** Configure the FIREBERD and V.35/306 interface before connecting it to the circuit being tested. This will avoid unnecessary troubleshooting and circuit downtime.

**NOTE:** Connecting the FIREBERD and V.35/306 DTE/DCE Data Interface to a live circuit will interrupt customer operations. Verify circuit activity before connecting the FIREBERD.

NORMAL - Valid data is expected on the falling edge of the clock pulse.

INVERTED - Valid data is expected on the rising edge of the clock pulse.

- (2) Set the timing mode switch to 306 or V.35. Selection depends on the timing of the circuit being tested.
- (3) Refer to Section 4 to set up the FIREBERD 6000 and Section 5 to set up the FIREBERD 4000.

### 3.2 INSTALLING THE INTERFACE

**CAUTION:** Turn the AC power OFF to the FIREBERD mainframe before installing the interface module.

- (1) Turn the AC power off to the FIREBERD.
- (2) Facing the FIREBERD rear panel, insert the interface into the opening with its plastic cover facing down and PCB board facing up.
- (3) Press the module into the FIREBERD until the interface panel is flush with the rear panel.
- (4) Secure the interface with the fasteners on interface panel.
- (5) Turn the AC power on and perform self-loop test on the interface.

### 3.3 INTERFACE SETUP

- (1) Set the clock switches to the appropriate position as indicated.



## SETTING UP THE FIREBERD 6000

### 4.1 INTRODUCTION

This section describes how to set up the FIREBERD 6000 with the V.35/306 DTE/DCE Data Interface. Refer to the FIREBERD 6000 Operating Manual for mainframe operating procedures.

**NOTE:** Configure the FIREBERD before connecting it to the circuit being tested. This will avoid unnecessary troubleshooting and circuit downtime.

**NOTE:** Connecting the FIREBERD and V.35/306 DTE/DCE Data Interface to a live circuit will interrupt customer operations. Verify circuit activity before connecting the FIREBERD.

### 4.2 FIREBERD 6000 MAINFRAME SETUP

- (1) Turn the AC power ON, if necessary.
- (2) Set the DATA switch to the appropriate test pattern. Refer to the FIREBERD 6000 Operating Manual for valid test patterns.
- (3) Set the GEN CLK switch to the appropriate generator clock source:

**SYNTH** - If the synthesizer is being used, use the MENU switch to select the SYNTH FREQ (synthesizer frequency) menu. Select the desired frequency from the soft keys or enter it through the keypad.

**INTF** - Provides the generator clock through the interface received clock in synchronous mode and recovered clock in recovered clock mode.

**BNC** - (GEN CLK IN connector on rear panel) Allows an input from an external clock source.

- (4) Set the TIMING MODE switch to the appropriate timing mode as required:

**SYNC** - Selects the synchronous timing mode (up to 15 Mb/s).

**ASYNCR** - Selects the asynchronous timing mode (up to 20 kb/s).

**RECOVD** - Selects the recovered timing mode (up to 520 kb/s). The recovered clock option 6004 must be installed.

- (5) Use the MENU switch to select the INTF SETUP (interface setup) function. The soft keys are labeled INT232 and V.35.
- (6) Press the V.35 soft key to select the V.35/306 DTE/DCE Interface. The mainframe cannot control the interface switches.
- (7) Select the applicable categories and results displays from the ANALYSIS RESULTS panel. Refer to the FIREBERD 6000 Operating Manual for applicable results displays.
- (8) Select the desired ANALYSIS MODE (right of ANALYSIS RESULTS panel), CONTINUOUS or SINGLE.
- (9) Connect the interface cable between the mainframe and circuit being tested.
  - (a) Use the standard cable (Model 10214, 10419, or equivalent) to test the DCE.
  - (b) Use the DCE/DTE adaptor cable (Model 10204 or equivalent) to test the DTE.
  - (c) Refer to Appendix A for cable diagrams.
- (10) Perform circuit testing and analysis as required.

### 4.3 MAINFRAME AUXILIARY FUNCTIONS

The FIREBERD can control the interface clock polarity switches through Auxiliary Functions 05, 01, and 02. When Auxiliary Function 05 (INTF CONTROL) is set to F-BERD (default), interface clock polarities are controlled through Auxiliary Functions 01 (GEN CLK POL) and 02 (RCVR CLK POL). In this case the interface clock switches are disabled, and the NON-STD TIMING LED should be ignored. When Auxiliary Function 05 is set to INTF, the interface clock switches are enabled.



#### **4.4 MAINFRAME PRINTER OPERATION**

Refer to the FIREBERD 6000 Operating Manual for printer set-up and operating instructions.

## SETTING UP THE FIREBERD 4000

### 5.1 INTRODUCTION

This section describes how to set up the FIREBERD 4000 with the V.35/306 DTE/DCE Data Interface. Refer to the FIREBERD 4000 Operating Manual for mainframe operating procedures.

**NOTE:** Configure the FIREBERD before connecting it to the circuit being tested avoiding unnecessary troubleshooting and downtime.

**NOTE:** Connecting the FIREBERD and V.35/306 DTE/DCE Data Interface to a live circuit will interrupt customer operations. Verify circuit activity before connecting the FIREBERD.

- (5) Select the applicable categories and results displays from the ANALYSIS RESULTS panel. Refer to the FIREBERD 4000 Operating Manual for applicable results displays.
- (6) Connect the interface cable between the mainframe and circuit being tested.
  - (a) Use the standard cable (Model 10214, 10419, or equivalent) to test the DCE.
  - (b) Use the DCE/DTE adaptor cable (Model 10204 or equivalent) to test the DTE.
  - (c) Refer to Appendix A for cable diagrams.
- (7) Perform circuit testing and analysis as required.

### 5.2 FIREBERD 4000 MAINFRAME SETUP

- (1) Turn the AC power ON, if necessary.
- (2) Use the SETUP CATEGORY switch to select the INTERFACE setup menu. Press the V.35 soft key to select the V.35/306 interface. The mainframe cannot control the interface switches.
- (3) Use the SETUP CATEGORY switch to select the GENERATOR CLOCK setup menu. Press the appropriate soft key to select the desired generator clock source:

NTRNL - Select fixed speed from list or enter desired speed if synthesizer option is installed.

INTF - Provides the generator clock through the interface received clock.

BNC - (GEN CLK IN connector on rear panel) Allows an input from an external clock source.

- (4) Use the SETUP CATEGORY switch to select the PATTERN setup menu. Press the appropriate soft key to select the desired test pattern. Refer to the FIREBERD 4000 Operating Manual for valid test patterns.

### 5.3 MAINFRAME PRINTER OPERATION

Refer to the FIREBERD 4000 Operating Manual for printer set-up and operating instructions.



**INTERFACE SPECIFICATIONS**

**6.1 INTRODUCTION**

Table 6-1 lists the specifications for the V.35/306 DTE/DCE Data Interface.

**Table 6-1  
V.35/306 DTE/DCE Data Interface Specifications**

Item	Specification
<b>Maximum data rates</b> 306 mode V.35 mode	15 Mb/s Cable length dependent
<b>Clock and data tolerances</b> Delay, SCT to SD Skew, SCTE to SD	approximately 70 ns typical approximately 20 ns typical
<b>Balanced Drivers</b> Signal swing (bipolar) Short circuit current Rise Time Generator Impedance	$\pm 0.55V \pm 0.1V$ into 100 ohms less than 100 mA less than 20 ns 100 ohms
<b>Balanced Receivers</b> Load resistance	100 ohms
<b>Unbalanced Drivers (EIA RS-232-C)</b> Rise time Generator Impedance Short circuit current Output level	greater than 20 microseconds less than 100 ohms less than 100 mA $\pm 10$ volts typical (7k ohm Load)
<b>Unbalanced Receivers</b> Load Impedance Maximum input voltage	3k to 7k ohms $\pm 25$ Vdc
<b>Polarity</b> Data Polarity	Mark (binary 1): "A" lead negative with respect to "B" lead. Space (binary 0): "A" lead positive with respect to "B" lead
Signaling Polarity	On: greater than +3 Vdc Off: open or less than -3 Vdc



## **MAINTENANCE AND SERVICE**

### **7.1 INTRODUCTION**

This section contains information on maintenance and service for the V.35/306 DTE/DCE Data Interface.

### **7.2 MAINTENANCE**

#### **7.2.1 In Case of Difficulty**

If the unit fails to operate and no front or rear panel indicators illuminate, check the following:

- AC power cord and AC supply
- AC fuse and fuse size

If some indicators illuminate but the unit fails to operate, verify that the interface in use is the correct type and properly inserted (turn off power before inserting or removing interface). Check the interface cable and connections to the FIREBERD. Try substituting another interface if one is available.

Follow the self-loop procedures in the FIREBERD Operating Manual as an aid in localizing the problem. If the unit continues to be inoperative, refer to the following sections for service information or call the TTC Customer Service Department for applications assistance.

### **7.3 SERVICE**

#### **7.3.1 Warranty Policy**

All equipment manufactured by Telecommunications Techniques Corporation (TTC) is warranted against defects in material and workmanship. This warranty applies only to the original purchaser and is non-transferable unless express written authorization of the warranty transfer is granted by TTC.

Data interfaces, accessories, cables, breakout boxes, and all equipment other than FIREBERD mainframes will be repaired or replaced (at our option) at no charge for a period of one (1) year after shipment to the customer.

Liability under this warranty extends only to the replacement value of the equipment. The warranty is void if:

- (1) Equipment has been altered or repaired without specific authorization from TTC.
- (2) Equipment is installed or operated other than in accordance with instructions contained in TTC literature and operating manuals.

No other warranty is expressed or implied. TTC is not liable for consequential damages.

#### **7.3.2 In-Warranty Service**

Equipment in warranty must be returned to the factory with shipping prepaid. The equipment should be packed and shipped in accordance with the instructions in Section 7.3.4 of this manual. Before returning any equipment, the customer must obtain a Return Authorization (RA) number by contacting the TTC Repair Department. The RA number should then appear on all paperwork and be clearly marked on the outside of the shipping container.

After the equipment is repaired by TTC, it will be tested to applicable specifications, burned-in for at least 24 hours, retested, and returned to the customer with shipping prepaid. A brief description of the work performed and the materials used will be provided on the Equipment Repair Report furnished with the returned equipment.

#### **7.3.3 Out-of-Warranty Service**

The procedure for repairing out-of-warranty equipment is the same as that used for equipment still in warranty. However, there is a minimum charge applied to each request for out-of-warranty service. The minimum charge guarantees the customer an estimate of the repair costs and is used as credit against actual materials and labor costs should the equipment be repaired. Contact the TTC Repair Department for specific information on the minimum out-of-warranty repair charge.

The customer will be billed for parts plus standard labor rates in effect at the time of repair. The customer will also be

required to furnish a purchase order number before repair work can be started, and a hard copy of the purchase order must be received by TTC before the repaired equipment may be shipped to the customer. A description of the labor and materials used will be provided in the Equipment Repair Report.

Once an out-of-warranty repair is made, the repaired part or component is warranted for 90 days. This warranty applies only to the part or component that was repaired; other parts or components are not covered under the 90-day repair warranty.

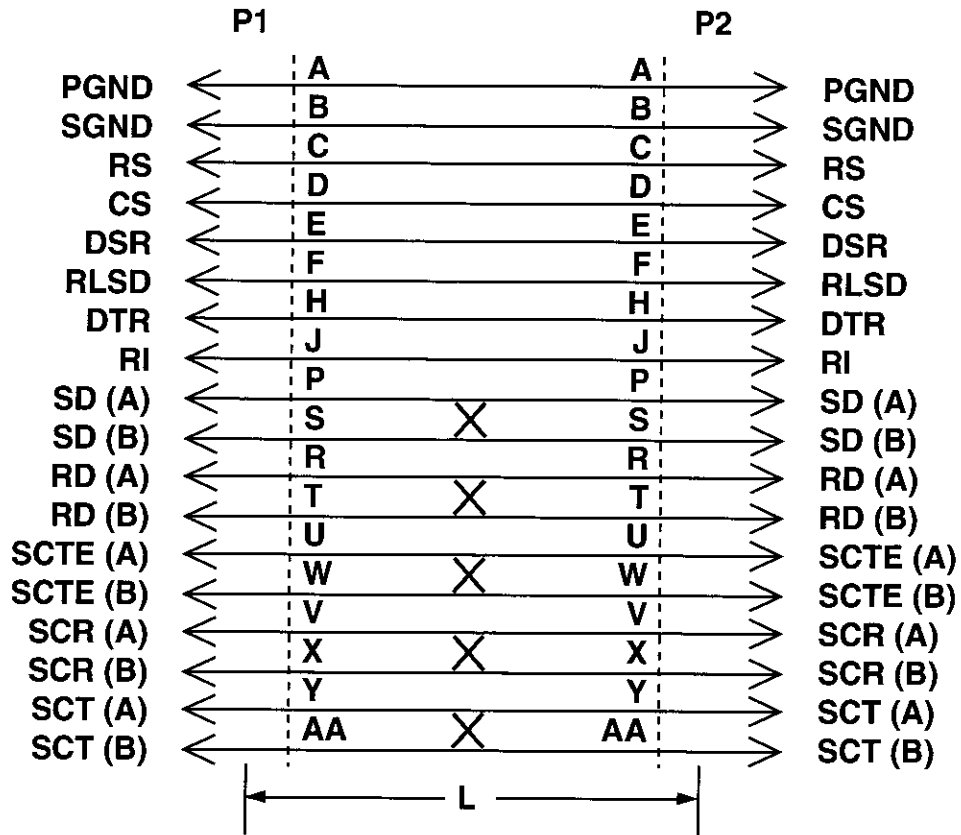
### **7.3.4 Equipment Return Instructions**

The customer should attach to all equipment returned for repair a tag that includes the following information:

- (1) Owner name and address.
- (2) A list of equipment being returned and the applicable serial number(s).
- (3) A detailed description of the problem or service requested.
- (4) The name and telephone number of the person to contact regarding questions about the repair.
- (5) The Return Authorization (RA) number.

If possible, the customer should return the equipment using the original shipping container and material. If the original container is not available, the unit should be carefully packed so that it will not be damaged in transit. TTC is not liable for any damage that may occur during shipping. The customer should clearly mark the TTC-issued RA number on the outside of the package and ship it prepaid and insured to TTC.

**CABLE DIAGRAMS**



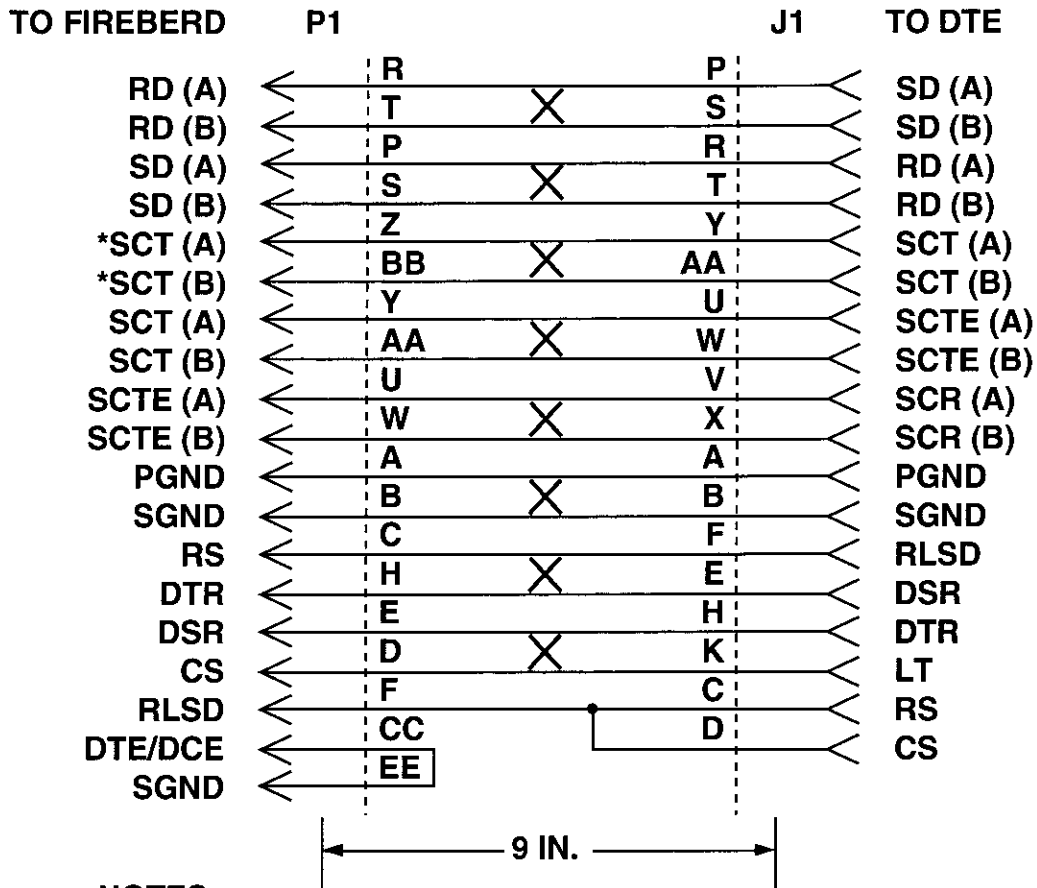
**NOTES:**

- P1/P2 - V.35/306 34-POSITION MALE CONNECTORS
- L - MODEL 10419, 10 FT.; MODEL 10214, 6 FT.
- X - TWISTED PAIR
- SHIELD CONNECTED TO PIN A ON BOTH SIDES

**FIGURE A-1**  
**FIREBERD-to-DCE Adaptor Cable, Model 10214/10419**



## CABLE DIAGRAMS



**NOTES:**

- P1 - V.35/306 34-POSITION MALE CONNECTORS**
- J1 - V.35/306 34-POSITION FEMALE CONNECTORS**
- \* - ONLY FOR DCE OPERATION**
- X - TWISTED PAIR**
- SHIELD CONNECTED TO PIN A ON BOTH SIDES**

**FIGURE A-2**  
**FIREBERDDTE/DCE Adaptor Cable, Model 10204**