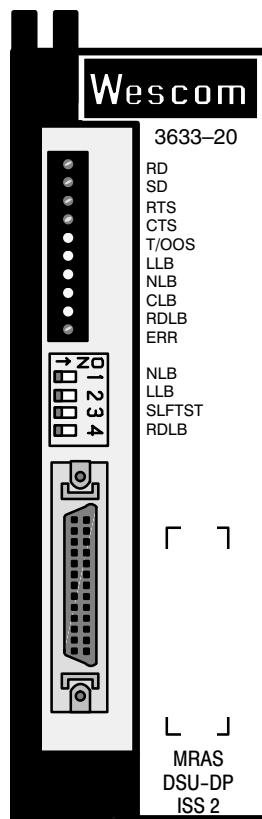


## 3633-20 Multi-Rate Async/Sync DSU-DP Channel Unit

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**Figure 1. 3633-20 Front Panel**

## 1. GENERAL

### 1.1 Document Purpose

This document provides general, circuit, installation and testing information for the Charles Industries 3633–20 Multi-Rate Async/Sync Data Service Unit–Data Port (DSU–DP) Channel Unit, which is part of the Charles Industries 360 channel bank system. The 3633–20 is shown in Figure 1.

### 1.2 Document Status

This document is reprinted to clarify the relationship of the CMI option to the PRTS option.

### 1.3 Equipment Function

The 3633–20 is a plug-in channel unit for the Charles 360 channel bank system. The unit provides one channel of service at data rates from 1.2 to 64 Kb/s and provides either RS232, RS449/422, RS530 or V.35 interfaces to Data Terminal Equipment (DTE). Synchronous channel operation is provided at data rates from 1.2 to 64 Kb/s. Asynchronous channel operation is provided from 1.2 to 19.2 Kb/s. In addition, the unit provides various test features to verify plug-in operation and end-to-end channel integrity over the T1 facility.

### 1.4 Equipment Location/Mounting

The 3633–20 is usable in any channel unit position in any Charles Industries 360/363 channel bank assembly.

### 1.5 Equipment Features

The 3633–20 provides the following features:

- Selectable data rates of 1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 56, and 64 Kb/s
- DTE interfaces of RS232, RS449/422, RS530 and V.35
- Synchronous operation at rates of 1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 56 and 64 Kb/s
- Asynchronous operation at rates of 1.2, 2.4, 4.8, 9.6, and 19.2 Kb/s
- Async to sync conversion using V.14 protocol
- Facility error correction at rates from 1.2 to 19.2 Kb/s
- Compatible with “DDS” network control codes, error correction and multiplexing as defined in Bellcore TR–TSY–000077, TR–TSY–000083, and ANSI T1.107B 1991
- Optional latching loopback
- Optional V.54 loopback
- Integral local and network test features

The 3633–20 provides a front panel 26-pin D-microminiature connector to the DTE. Order specific DTE interfaces by the kit part number, which includes the 3633–20 and an appropriate adapter cable assembly:

DTE Interface	Kit Part #	Includes...
RS232	3633–21K	The 3633–20 plug-in unit and an adapter cable assembly (p/n 03–211980–0) with a female 25-pin RS232 connector to the DTE.
RS449/422	3633–22K	The 3633–20 plug-in unit and an adapter cable (p/n 03–211983–0) with a female 37-pin RS449 connector (RS422 electrical) to the DTE.
RS530	3633–23K	The 3633–20 plug-in unit and an adapter cable (p/n 03–211982–0) with a female 25-pin RS530 connector to the DTE.
V.35	3633–24K	The 3633–20 plug-in unit and an adapter cable (p/n 03–211981–0) with a 34-pin female V.35 connector to the DTE.

## 2. INSPECTION

### 2.1 Inspect for Damages

Inspect the equipment thoroughly upon delivery. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company.

### 2.2 Equipment Identification

Charles Industries' equipment is identified by a model and issue number imprinted on the front panel or located elsewhere on the equipment. Each time a major engineering design change is made on the equipment, the issue number is advanced by 1 and imprinted on subsequent units manufactured. Therefore, be sure to include both the model number and its issue number when making inquiries about the equipment.

### 2.3 Static Concerns

Each unit is shipped in static-protective packaging to prevent electrostatic charges from damaging static-sensitive devices. Use approved static-preventive measures, such as static-conductive wrist straps and a static-dissipative mat, when handling units outside of their protective packaging. A unit intended for future use should be tested as soon as possible and returned to its original protective packaging for storage.



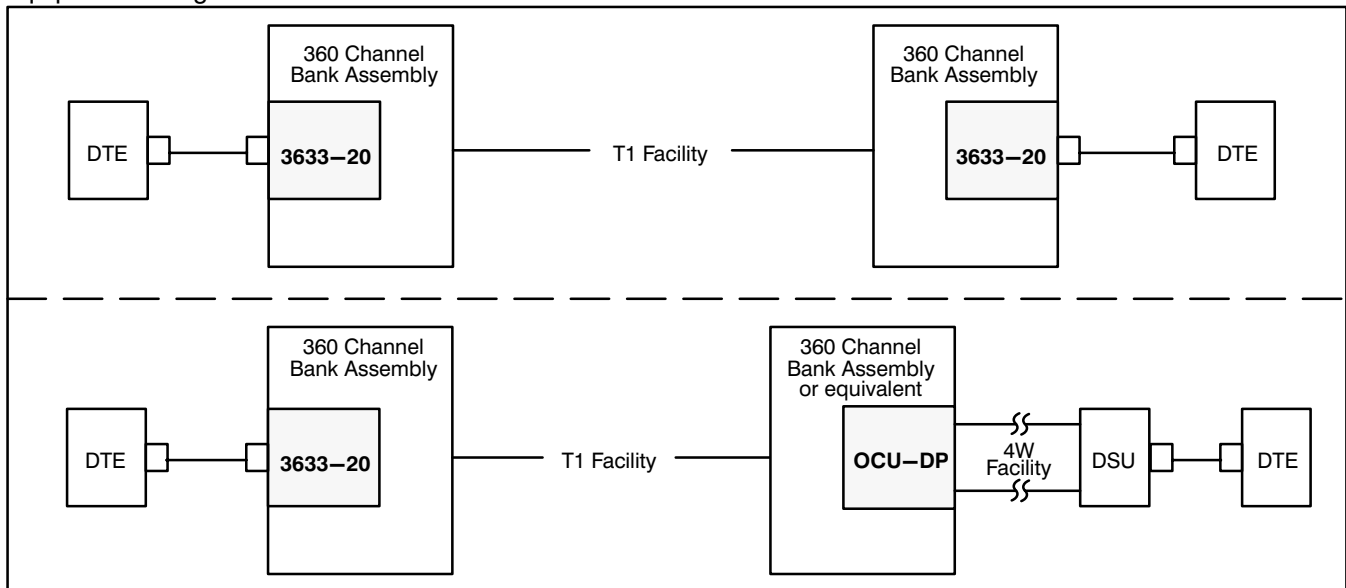
**STATIC-SENSITIVE**

**This equipment contains static-sensitive electronic devices. To prevent electrostatic charges from damaging static-sensitive units:**

- Use approved static preventive measures (such as a static-conductive wrist strap and a static-dissipative mat) at all times whenever touching units outside of their original, shipped static-protective packaging.
- Do not ship or store units near strong electrostatic, electromagnetic, or magnetic fields.
- Use static-protective packaging for shipping or storage.

## 3. APPLICATION GUIDELINES

The 3633–20 can be used in point-to-point or multipoint applications. The 3633–20 is usable in any channel unit position in any Charles Industries 360/363 channel bank assembly. Figure 2 shows two possible end-to-end equipment configurations.



**Figure 2. 3633–20 Applications**

## 4. CIRCUIT DESCRIPTION

Refer to Figure 3, the 3633–20 Block Diagram, when reading the following description.

### 4.1 DTE–DCE Interface

This part of the circuit consists of a front panel (J1) connector to the DTE, Loopback 1, and the interface drivers and receivers. This circuit is reconfigured by the unit depending on the electrical Data Channel Equipment (DCE) interface selected via S1 and PCB-mounted jumper assembly (RS232, RS422, RS530, or V.35). Detailed wiring for this interface and its appropriate adapter cable assembly for each type of interface is shown in Figure 17 through Figure 20.

### 4.2 Control Lead Logic

*Note: In the balance of this practice, when reference is made to DTE–DCE lead names, the RS232 conventions are used. Figure 17 through Figure 20 show the standard names for each interface.*

When the DTE wants to send data over the channel, it checks the data set ready (DSR) control lead, which will be on if the channel is ready for service. Assuming DSR is on, the DTE then turns on the RTS (request to send) lead, which causes the 3633–20 to stop transmitting idle code to the far end. The 3633–20 now turns on CTS (clear to send) to the DTE, which in turn sends its data over the SD (send data) lead toward the 3633–20 and the network.

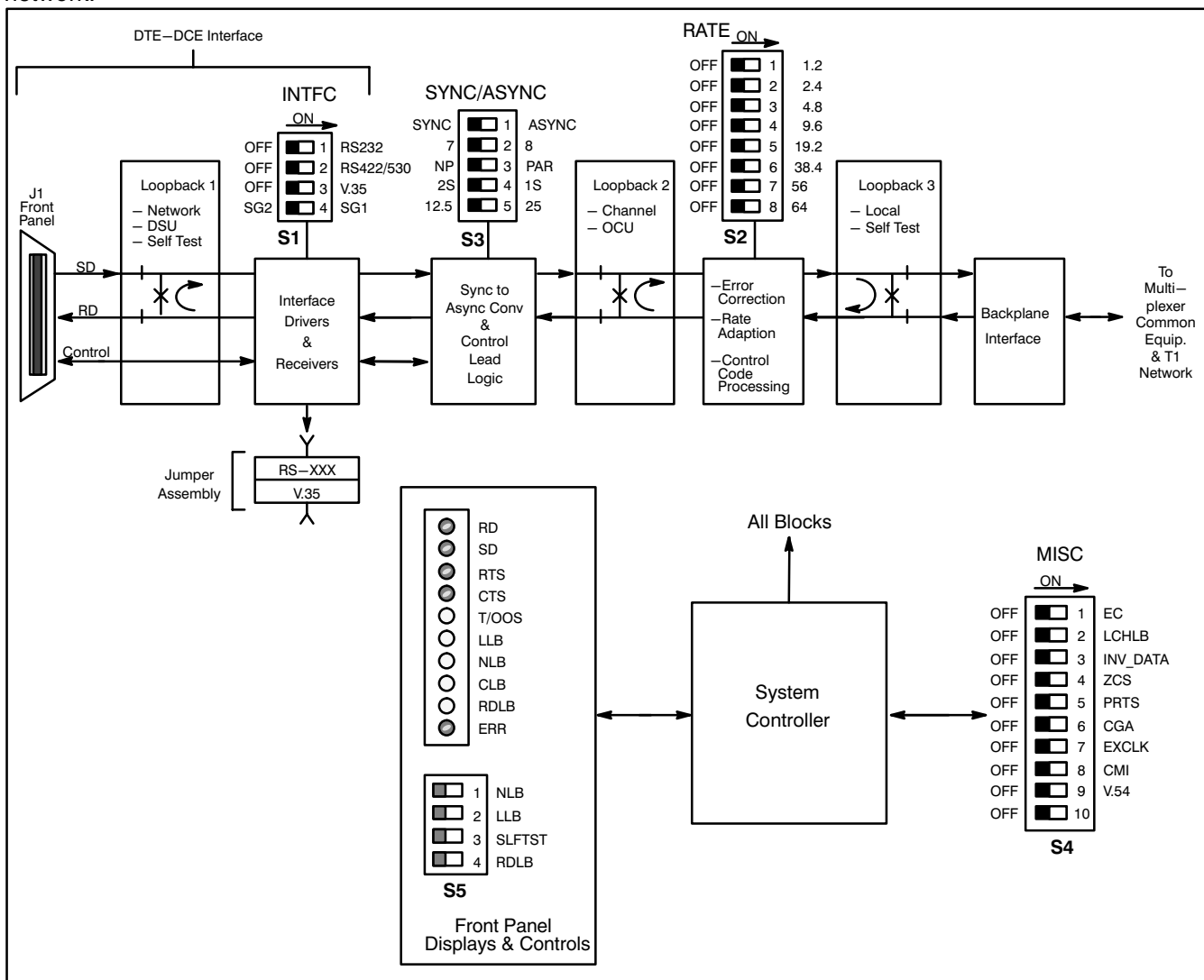


Figure 3. 3633–20 Block Diagram

When the 3633–20 has data from the network to send to the DTE, it turns on the RLSD (Receive Line Signal Detect) lead to the DTE and sends the data on the RD (Receive Data) lead.

### 4.3 Sync to Async Conversion

When the ASYNC option (S3–1) is selected, the unit allows asynchronous data from the DTE to be passed over the synchronous T1 communications channel. This is accomplished by manipulating the async data's stop bits.

When the frequency of the async data from the local DTE is slower than the sync channel, the unit will add stop bits to match the sync channel rate. When the frequency of the async data from the DTE is faster than the sync channel rate, up to one in every four stop bits can be deleted to match the rate.

In the receive direction, data from the sync channel to the DTE, the 3633–20 recognizes start and stop bits. If a missing stop bit is detected, then the stop bits are shortened during each character by a percentage of either 12.5% or 25%, as selected by S3–5.

### 4.4 Rate Adaptation and Error Correction – 1.2, 2.4, 4.8, and 9.6 Kb Rates

Data transmitted from the DTE is broken into 6-bit bytes. To these bytes an LSB (stuff bit) and MSB (control bit) of logic 1 are added to make the byte 8 bits. To increase the sub-rate to the channel rate of 64 Kb/s, each byte is repeated 40 times at 1.2 Kb, 20 times at 2.4 Kb, 10 times at 4.8 Kb, and 5 times at 9.6 Kb. The resultant 64 Kb stream is sent to the multiplexer common equipment and the T1 network. This process is the same regardless of whether error correction is enabled or disabled via S4–1.

The synchronous data received from the network for 1.2, 2.4, 4.8, and 9.6 Kb data rates is received as 8-bit bytes. If error correction is enabled, the circuit performs a majority vote (MJV) on each group of 5 bytes. The corrected data is stripped of its LSB and MSB, and the resultant 6-bit bytes are sent toward the DTE. If error correction is disabled, the majority vote algorithm is not performed on the receive data.

### 4.5 Rate Adaptation and Error Correction – 19.2 Kb Rates

Data transmitted from the DTE at 19.2 Kb is broken into 6-bit bytes and has an LSB and MSB of logic 1 added to create an 8-bit byte. If error correction is enabled (S4–1 on), a parity byte is calculated using a BCH algebraic coding algorithm. The two data bytes and their parity bytes are combined with a framing byte which is the complement of the second parity byte. The resultant 5-byte group (DATA 1, DATA 2, PARITY 1, PARITY 2, and FRAMING) is sent to the common equipment and T1 network.

Data received from the network for the 19.2 Kb rate is received as 8-bit bytes. When error correction is enabled, the BCH error correction algorithm uses the parity bytes in each 5-byte group to correct any data errors. This error correction scheme will correct all 1- and 2-bit errors and some 3-bit errors.

When error correction is disabled at the 19.2 Kb rate (S4–1 off), the unit does not create parity bytes for the DTE data sent to the network. The 5-byte sequence is DATA 1, DATA 2, DATA 2, DATA 2, DATA 2, with the MSB set to zero for the last three bytes of DATA 2. In the receive direction from the network, the unit discards the bytes with MSB set to zero and passes the data to the DTE.

### 4.6 Rate Adaptation at 38.4, 56, and 64 Kb

The 3633–20 does not perform error correction at these rates. At 38.4 and 56 additional data bytes are added to increase the data rate to the channel rate.

### 4.7 Control Code Processing

The 3633–20 can receive data, idle pattern, or one of several control codes from the network. These codes, their meaning and functions, are shown in Table 1. The 3633–20 will transmit an idle pattern to the network when not in a test mode or sending data. One of two types of idle pattern may be selected via S4–8. Additional details on the loopback related codes are provided in Part 7 of this document.

Table 1. Network Control Codes

Mode	Received Control Codes	Definition	DTE Control Leads			
			CTS	DSR	RLSD	TM
Normal	XXXX XXX1	Data	ON/OFF	ON	ON	OFF
	X111 1110	Idle	OFF	ON	OFF	OFF
Out of Service	X001 1000	Unassigned MUX channel	OFF	OFF	OFF	ON
	X001 1010	MUX out of sync				
	X001 1100	Test code				
	X001 1110	Abnormal remote station				
Test Loopback	X010 1100	DSU loopback	OFF	OFF	OFF	ON
	X010 1000	CSU (channel) loopback				
	X010 1010	OCU loopback				
Test Latching Loopback Sequence	X011 1010	Transition in progress	OFF	OFF	OFF	ON
	X101 0101 or X011 0001	OCU select CSU channel select				
	X101 0110	Loopback enable				
	X010 1010	Far-end voice				
Unknown	X010 1010	Other	OFF	OFF	OFF	ON

Note: X = don't care.

#### 4.8 Front Panel Controls and Indicators

The 3633–20 provides LEDs to show various status conditions of the unit. In addition, a 4-position DIP switch is provided to invoke various test routines.

##### 4.8.1 LED Display

The 10 front-panel LEDs indicate the various status conditions of the 3633–20, as described in Table 2.

Table 2. LED States

LED	Color	State	Indicates...
RD	Green	ON	Valid receive data (RD) to DTE.
SD	Green	ON	Valid send data (SD) from DTE.
RTS	Green	ON	Request to send (RTS) control lead is on (from DTE).
CTS	Green	ON	Clear to send (CTS) control lead is on (to DTE)
T/OOS	Yellow	OFF	The unit is in service.
		ON	The unit is in a test or out-of-service (T/OOS) mode for any of the following conditions: <ul style="list-style-type: none"> <li>• Loopback 1, 2, or 3 activated</li> <li>• Out-of-service network codes being received (see Table 1)</li> <li>• Self-test routines in process</li> <li>• Carrier Group Alarm (CGA)</li> </ul>
		Flashing	An invalid PCB option switch combination has been selected.
LLB	Yellow	ON	A local loopback (LLB) has been activated via the front panel LLB switch or by the DTE via a control lead

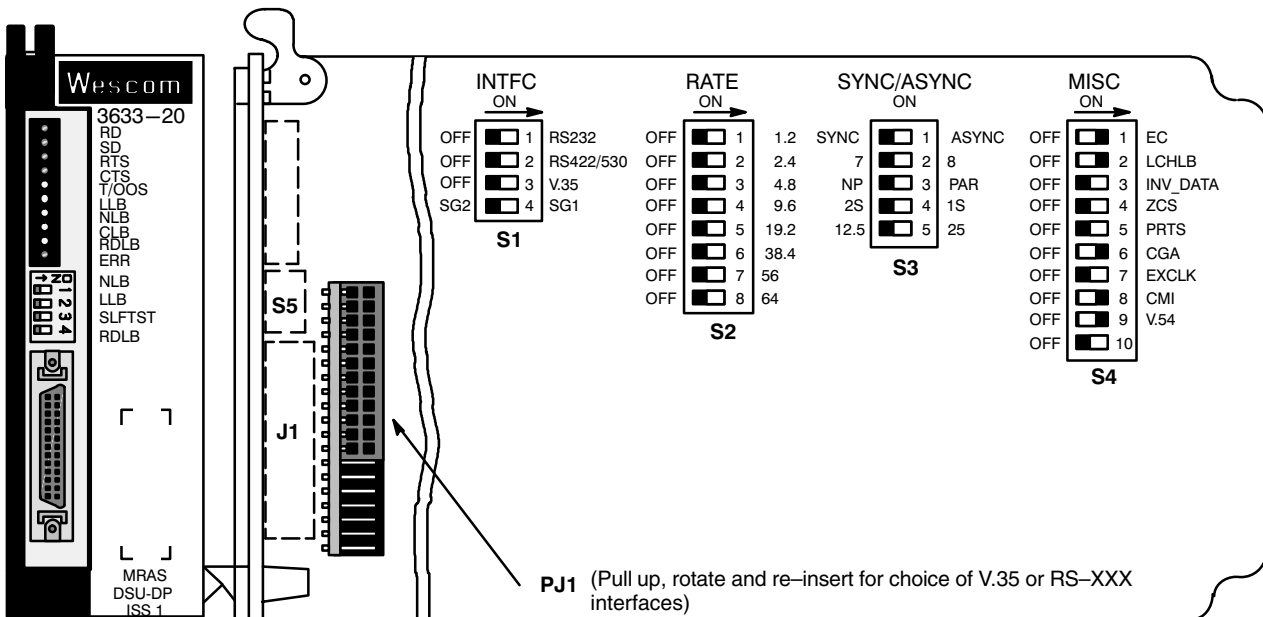
LED	Color	State	Indicates...
NLB	Yellow	ON	A network loopback (NLB) has been activated via the front panel NLB switch or by the network via a control code sequence.
		Flashing	Loopback has been activated by a network latching loopback sequence.
CLB	Yellow	ON	The channel (CSU) or OCU loopback (CLB) has been activated from the network via a control code sequence.
		Flashing	Loopback has been activated by a network latching loopback control code sequence.
RDLB	Yellow	ON or flashing	The status of a remote DSU loopback (RDLB) test as invoked by the front panel RDLB switch or by the DTE via its remote loopback control lead. When an RDLB test is invoked, the RDLB LED will FLASH until the remote DSU completes its loopback; then RDLB will then go ON steady.
ERR	Red	ON	A detected bit error (ERR) during local or remote self-test routines. In addition, when operating at the 1.2 to 19.2 Kb rate, this LED will indicate MJV or BCH error corrections.

**4.8.2. Test Switches**

The front panel also contains a 4-position DIP switch to invoke various test routines. Each position is described below. For further details on the test routines invoked by these switches, see Part 7 of this document.

**Table 3. Switch States**

Switch	State	Purpose
NLB	ON	Activates loopback 1, which loops the network data back to the network.
LLB	ON	Invokes local loopback 3. This loops DTE data back to the DTE.
SLF TST	ON	Activates loopbacks 1 and 3 and a unit self-test.
RDLB	ON	Causes the unit to send a loopback code to the far-end and loop up the remote DSU.
SLF TST + RDLB	ON	Operating both these switches will cause the unit to perform a self-test on both the local and remote units plus the intervening T1 channel.



**Figure 4. Side Panel Switch Option Locations**

Table 4. Side Panel Switch Option Summary

Switch	Position (check one)		Function
PJ1	<input type="checkbox"/> RS–XXX	<input type="checkbox"/> V.35	Selects V.35 or RS–XXX interface
S1–1	<input type="checkbox"/> OFF	<input type="checkbox"/> RS232	Selects electrical DTE–DCE interface. Select one only.
S1–2	<input type="checkbox"/> OFF	<input type="checkbox"/> RS422	
S1–3	<input type="checkbox"/> OFF	<input type="checkbox"/> V.35	
S1–4	<input type="checkbox"/> SG2	<input type="checkbox"/> SG1	Selects signal ground source. SG1=from 3633–20, SG2=from DTE.
S2–1	<input type="checkbox"/> OFF	<input type="checkbox"/> 1.2	Select data rate; one only, all other positions OFF.
S2–2	<input type="checkbox"/> OFF	<input type="checkbox"/> 2.4	
S2–3	<input type="checkbox"/> OFF	<input type="checkbox"/> 4.8	
S2–4	<input type="checkbox"/> OFF	<input type="checkbox"/> 9.6	
S2–5	<input type="checkbox"/> OFF	<input type="checkbox"/> 19.2	
S2–6	<input type="checkbox"/> OFF	<input type="checkbox"/> 38.4	
S2–7	<input type="checkbox"/> OFF	<input type="checkbox"/> 56	
S2–8	<input type="checkbox"/> OFF	<input type="checkbox"/> 64	
S3–1	<input type="checkbox"/> SYNC	<input type="checkbox"/> ASYNC	Selects sync or async operation.
S3–2	<input type="checkbox"/> 7	<input type="checkbox"/> 8	Selects 7 or 8 data bits for async mode only.
S3–3	<input type="checkbox"/> NP	<input type="checkbox"/> PAR	Selects no parity or parity for async mode only.
S3–4	<input type="checkbox"/> 2S	<input type="checkbox"/> 1S	Selects 1 or 2 stop bits for async mode only.
S3–5	<input type="checkbox"/> 12.5	<input type="checkbox"/> 25	Selects percentage that the stop bits can be shortened; for async mode only.
S4–1	<input type="checkbox"/> OFF	<input type="checkbox"/> EC	Enables T1 facility error correction at 1.2 to 19.2 Kb rates.
S4–2	<input type="checkbox"/> OFF	<input type="checkbox"/> LCHLB	Enables latching loopback.
S4–3	<input type="checkbox"/> OFF	<input type="checkbox"/> INV_DATA	Inverts data.
S4–4	<input type="checkbox"/> OFF	<input type="checkbox"/> ZCS	Enables zero code suppression for 64 Kb rate only.
S4–5	<input type="checkbox"/> OFF	<input type="checkbox"/> PRTS	Enables permanent request to send.
S4–6	<input type="checkbox"/> OFF	<input type="checkbox"/> CGA	Enables the 3633–20 to react to CGA from multiplexer.
S4–7	<input type="checkbox"/> OFF	<input type="checkbox"/> EXCLK	Enables unit to accept clock from DTE.
S4–8	<input type="checkbox"/> OFF	<input type="checkbox"/> CMI	Selects type of idle pattern.
S4–9	<input type="checkbox"/> OFF	<input type="checkbox"/> V.54	Enables V.54 loopback
S4–10	<input type="checkbox"/> OFF	<input type="checkbox"/>	Not used

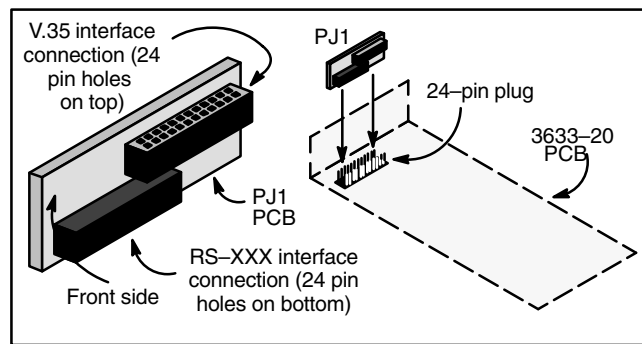
## 5. OPTIONS

The 3633–20 contains various DIP-type switches and one plug-on jumper assembly located on the circuit board which must be optioned before the unit is placed in service. See Figure 4 for the location of these switch options.

### 5.1 (PJ1) Plug-on Jumper

The Plug-on Jumper (PJ1) is a small PCB that is inserted into a 24-pin plug on the 3633–20 PCB. This plug-on jumper is located directly behind the front panel DTE–DCE interface connector (J1) (see Figure 4). Orient the plug-on jumper one way for a V.35 interface, or remove it and rotate it 180° (flip it) and re-insert it for all other interfaces. The back side of the plug-on jumper PCB is labelled “V.35” and “RS–XXX”. For any “RS” interface, insert the RS–XXX labelled-side into the pins on the main 3633–20 PCB. For V.35 interface, insert the V.35 labelled-side into the pins on the main 3633–20 PCB. See Figure 5.





**Figure 5. PJ1 Plug-on Jumper**

## 5.2 Switch S1 – INTFC

This switch is used to select the electrical characteristics of the interface to the DTE. Place S1–1, S1–2, or S1–3 in the ON position to select either an RS232, RS422/530, or V.35 interface, respectively. Do not select more than one type. Switch S1–4 determines the source of the signal ground on the DTE interface connector. Select SG1 to source this ground from the 3633–20 circuit pack. Select SG2 to disconnect signal ground from the 3633–20 (thereby sourcing it from the DTE).

## 5.3 Switch S2 – RATE

This switch selects the data rate for the DTE and can be set to any standard rate between 1.2 Kb and 19.2 Kb/s for asynchronous operation, and between 1.2 and 64 Kb/s for synchronous operation. Select one rate only on S2.

## 5.4 Switch S3 – SYNC/ASYNC

This switch configures the sync/async conversion feature of the module. Place S3–1 in either the sync or async position, depending on the DTE. Note that async cannot be used on data rates of 38.4, 56 and 64 Kb/s. Switch sections S3–2, S3–3, S3–4, and S3–5 are used only if S3–1 ASYNC is selected. S3–2 is set for either 7 or 8-bit character size. S3–3 is set for Parity (PAR) or No Parity (NP). S3–4 is set for 1 Stop bit (1S) or 2 Stop bits (2S). S3–5 determines the percentage which the stop bit will be shortened on receive data. Select 12.5 (12.5%) to allow the difference between async and sync of –2.5 to +1.0%. Select 25 (25%) to allow the frequency difference between async and sync of –2.5 to +2.3%. Use **12.5** for normal applications.

## 5.5 Switch S4 – MISC

Switch S4 controls ten miscellaneous options for the unit.

### 5.5.1. Switch S4–1 EC (Error Correction)

This switch enables/disables the standard “DDS” T1 facility error correction at rates of 19.2 Kb and lower. Error correction at 1.2, 2.4, 4.8 and 9.6 is by majority vote. Error correction at 19.2 Kb is via a modified BCH parity byte algorithm. No error correction is available at 38.4, 56 and 64 Kb/s rates. Normally this option is *ON*.

### 5.5.2. Switch S4–2 LCHLB (Latching Loopback)

When this switch is ON, the unit will recognize and respond to latching loopback codes from the network as shown in Figure 15 and Figure 16. In addition, when ON, the unit performs a remote DSU loopback (see paragraph 3.9.2) by sending latching loopback codes to the far end as shown in Figure 12 and Figure 13. When this switch is OFF, the unit ignores latching loopback codes from the network. In addition, when OFF, the unit performs a remote DSU loopback by sending nonlatching code to the far end as shown in Figure 10 and Figure 11. Normally the LCHLB option is *ON*.

### 5.5.3. Switch S4–3 INV\_DATA (Invert Data)

This switch, when ON, causes the unit to invert the DTE data. This is useful with some DTE data equipment that sends long strings of zeros during idle intervals. Note that the far end must be capable of data inversion to return the data to its original form. Normally this switch is OFF.

#### 5.5.4. *Switch S4–4 ZCS (Zero Code Suppression)*

This switch has an effect only when the 64Kb rate is selected with S2–8. To allow unrestricted clear channel operation at 64Kb, S4–4 (ZCS) should be OFF, and the associated multiplexer common equipment AND T1 facility should be configured for B8ZS operation.

If the multiplexer common equipment and T1 facility cannot be arranged for B8ZS, S4–4 should be ON. This will cause the 3633–20 to replace any data octet of 8 zeros from the DTE with a 100110000 pattern, assuming adequate ones density on the T1 facility. Normally, when operating at 64Kb, S4–4 (ZCS) is OFF and the circuit is arranged for B8ZS.

#### 5.5.5. *Switch S4–5 PRTS (Permanent Request To Send)*

When this switch option is ON, the RTS line to the DTE is permanently enabled. This causes the 3633–20 to enable the CTS line to the DTE, allowing it to continuously output data. In general, if the interface from the DTE does not provide an RTS lead, the PRTS option should be ON. If the DTE provides an RTS lead, PRTS should be OFF. This option is overridden during network loopback (NLB), remote DSU loopback (RDLB) and self-test modes. Normally, PRTS is OFF.

#### 5.5.6. *Switch S4–6 CGA (Carrier Group Alarm)*

When this switch option is ON, the unit responds to a CGA by disabling the CTS, DSR, and RLSD control leads, sending MUX out of sync (10011010) toward the network, and lighting the T/OOS LED. When CGA is OFF, the 3633–20 takes no action upon CGA. Normally this option is ON.

#### 5.5.7. *Switch S4–7 EXCLK (External Clock)*

When this switch option is ON, the 3633–20 receives external clock from the DTE. Note that the DTE external clock must be timed from the DCE (3633–20) receive clock. Normally this option is OFF.

#### 5.5.8. *Switch S4–8 CMI (Control Mode Idle)*

When this switch option is ON, the unit sends the idle code pattern of 11111110 to the network during idle. When CMI is OFF, the unit transmits all ones during idle. Normally CMI is ON. If the PRTS option is on/enabled, the CMI option switch state is ignored.

#### 5.5.9. *Switch S4–9*

When this switch is ON, the unit will respond to V.54 loopback sequences from the network.

#### 5.5.10. *Switch S4–10*

Switch S4–10 is not used.

### 5.6 **Switch S5 (Front Panel)**

See paragraph 4.8.2. and Figure 6 through Figure 16 for information about this switch.

### 5.7 **RLSD (DCD) Operation on the Data Interface**

Set the PRTS option (S4–5) to OFF and the CMI option (S4–8) to ON to allow the RLSD (DCD) lead on the data interface at the far end to follow the RTS lead on the data interface at the local end.

## 6. **INSTALLER CONNECTIONS**

### **CAUTION**

<p><b>Installation and removal of modules should be done with care. Do not force a module into place. If excessive resistance is encountered while installing a module, remove the module and check the card guides and connector to verify proper alignment and the absence of foreign material.</b></p>
---

### 6.1 **Module Installation**

Set the options located on the PCB of the 3633–20 before inserting it in the channel unit slot.

When the 3633–20 is installed in channel bank common equipment, it makes electrical connection to associated equipment through a card-edge connector provided as part of the mounting assembly.

### 6.2 DTE Interface Cable

The DTE interface cable connects to the front panel of the 3633–20 and provides the RS232, RS530, RS449/422, or V.35 interface to the DTE. The installation of this cable differs slightly between various 360 bank assemblies. Consult the installation documentation for the particular bank being used.

## 7. TESTING

If trouble is encountered with the operation of the unit, verify that all the installer connections have been properly made and that all options have been conditioned as required. Make certain that the unit is making good connection with the mounting assembly card connector; remove and reinsert the module.

See Figure 6 through Figure 16 for testing procedures.

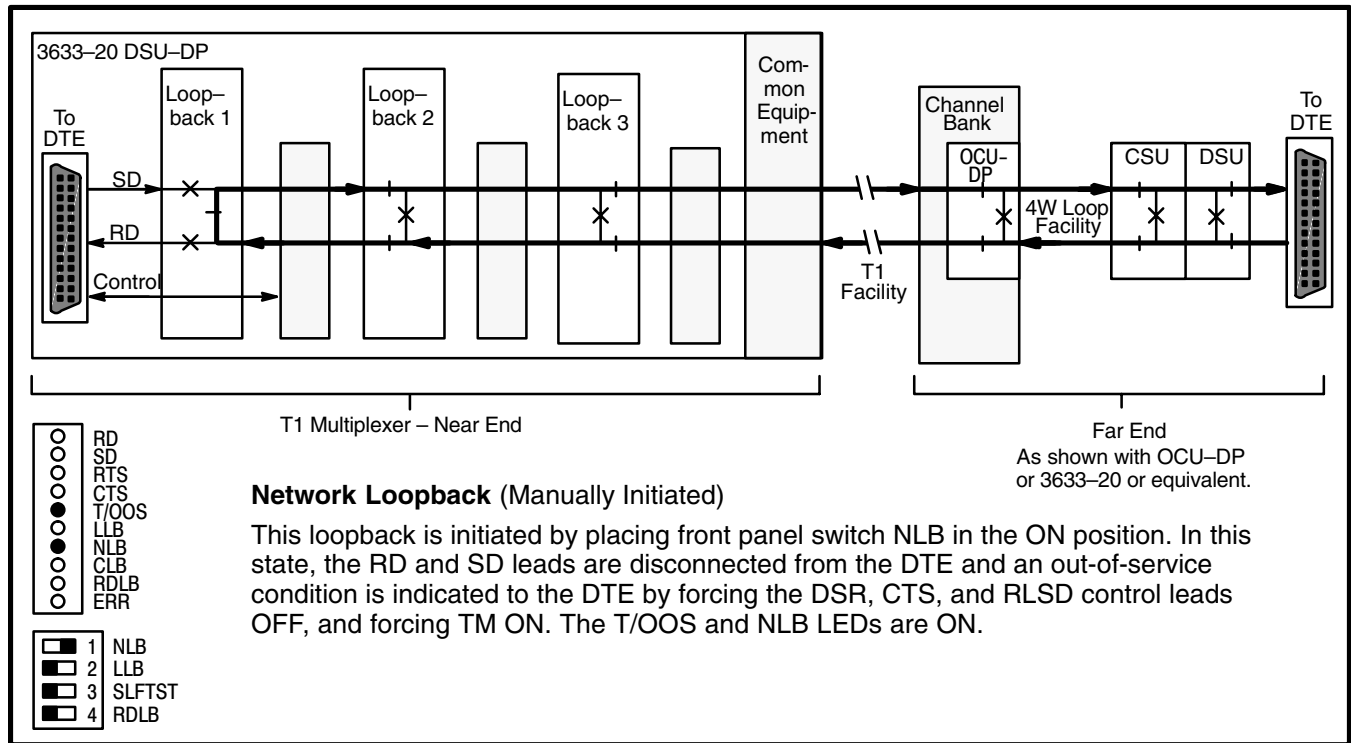


Figure 6. 3633–20 Manually Initiated Network Loopback

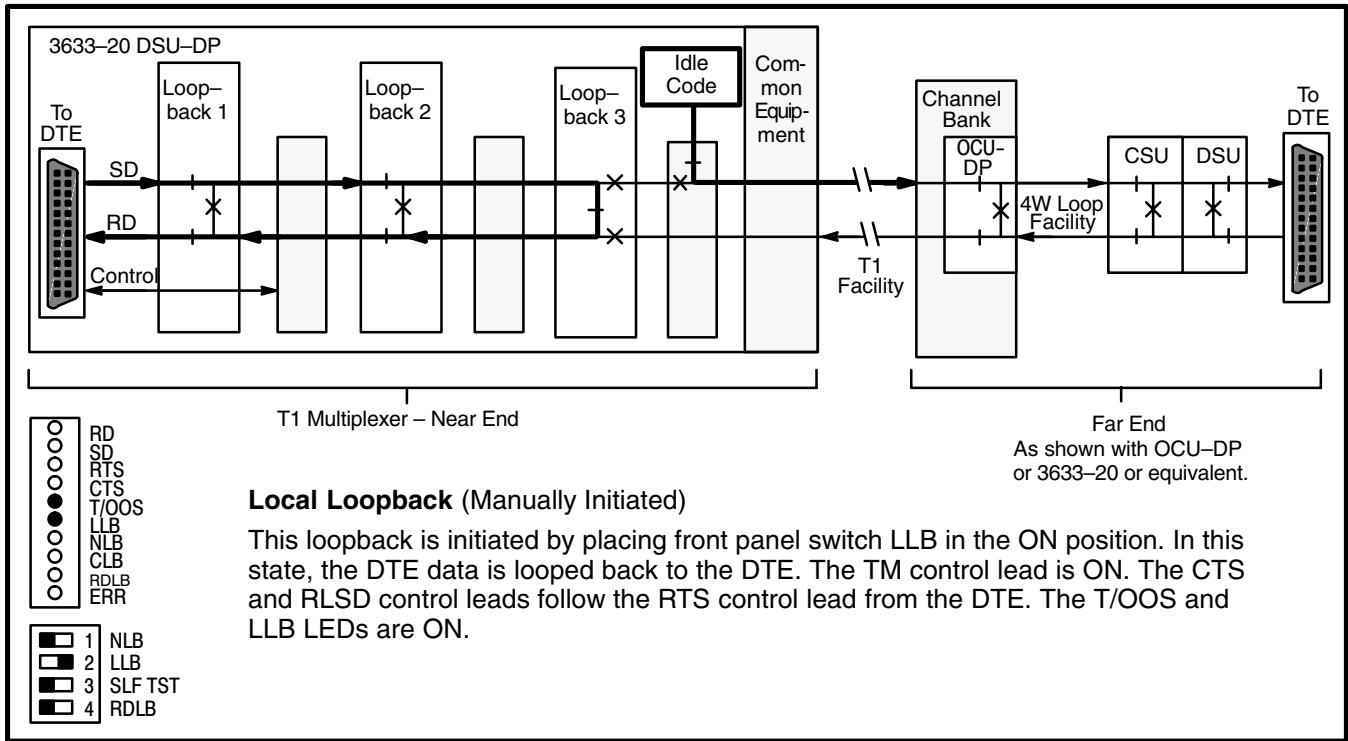


Figure 7. 3633-20 Manually Initiated Local Loopback

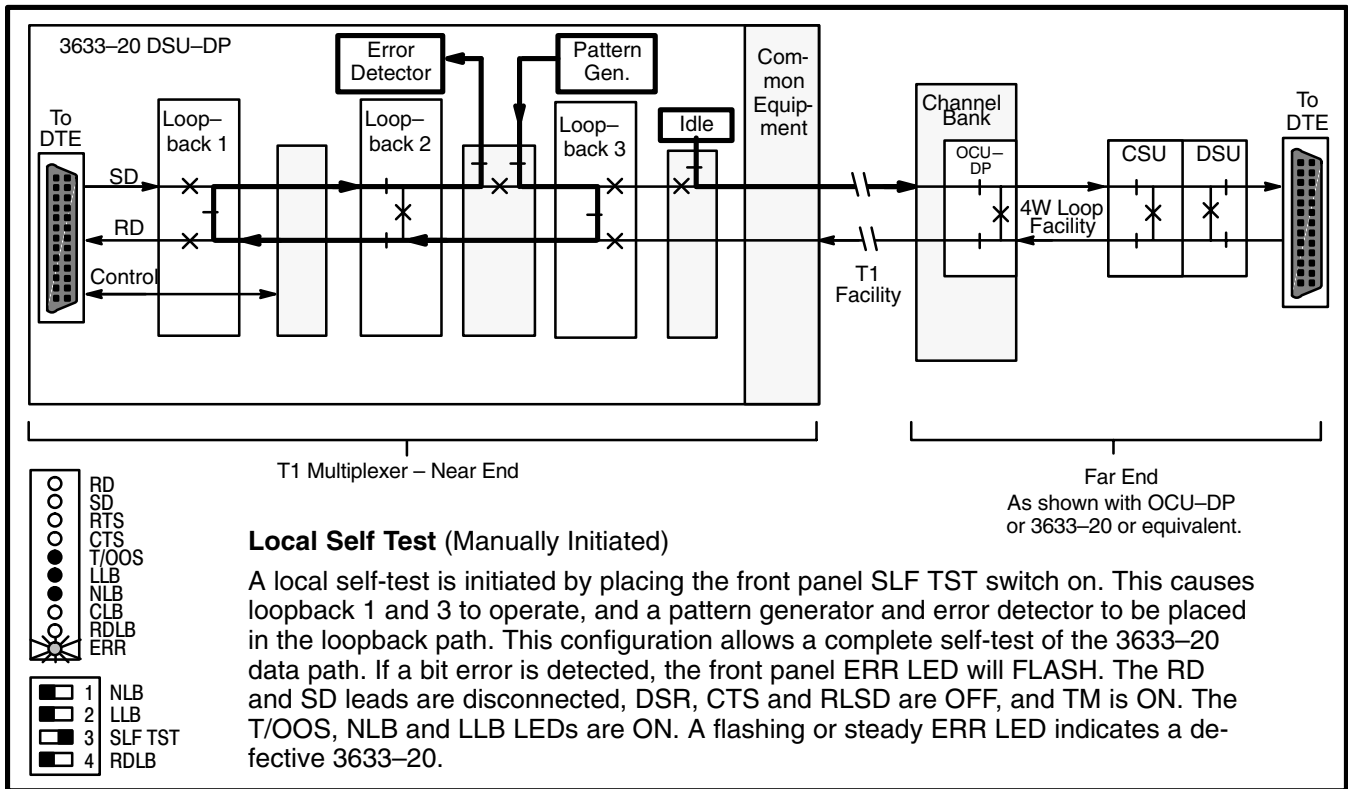


Figure 8. 3633-20 Manually Initiated Local Self-Test

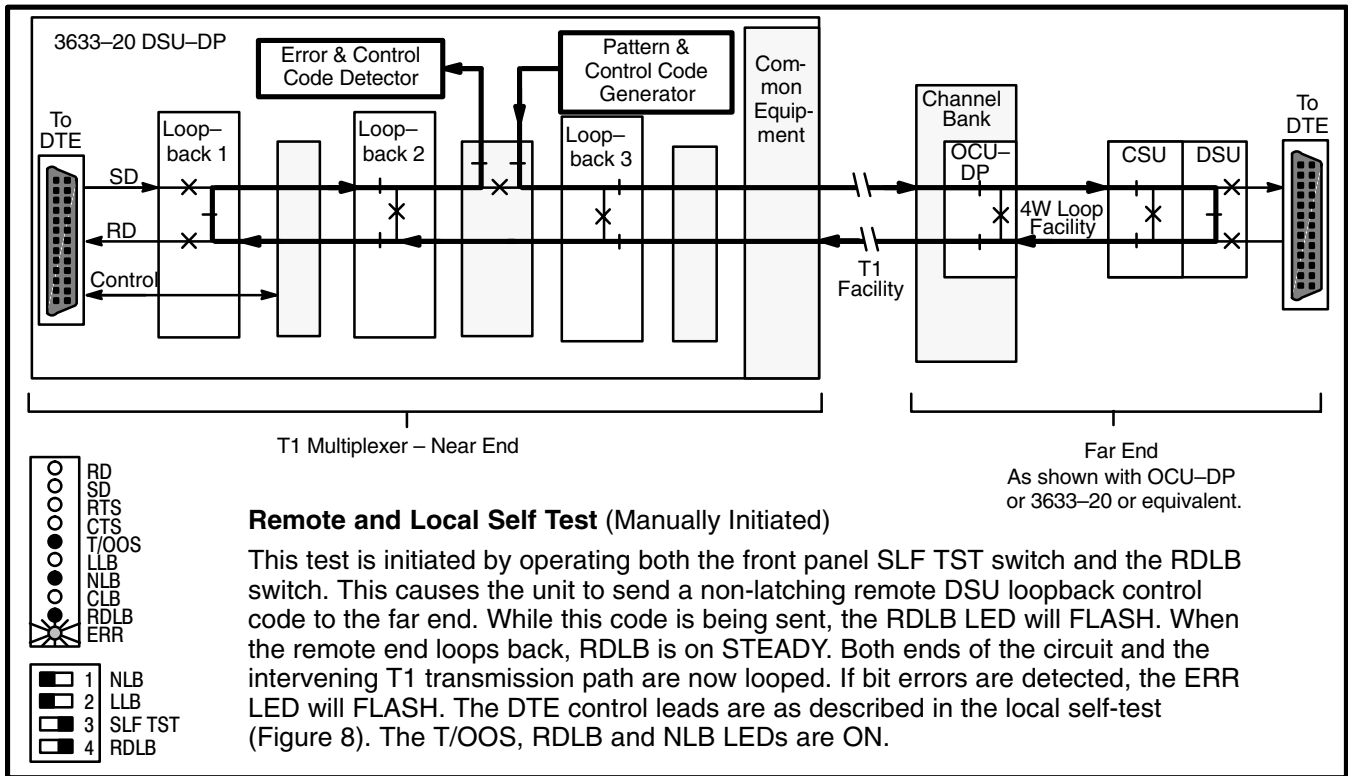


Figure 9. 3633-20 Manually Initiated Local, Remote, and Channel Self-Test

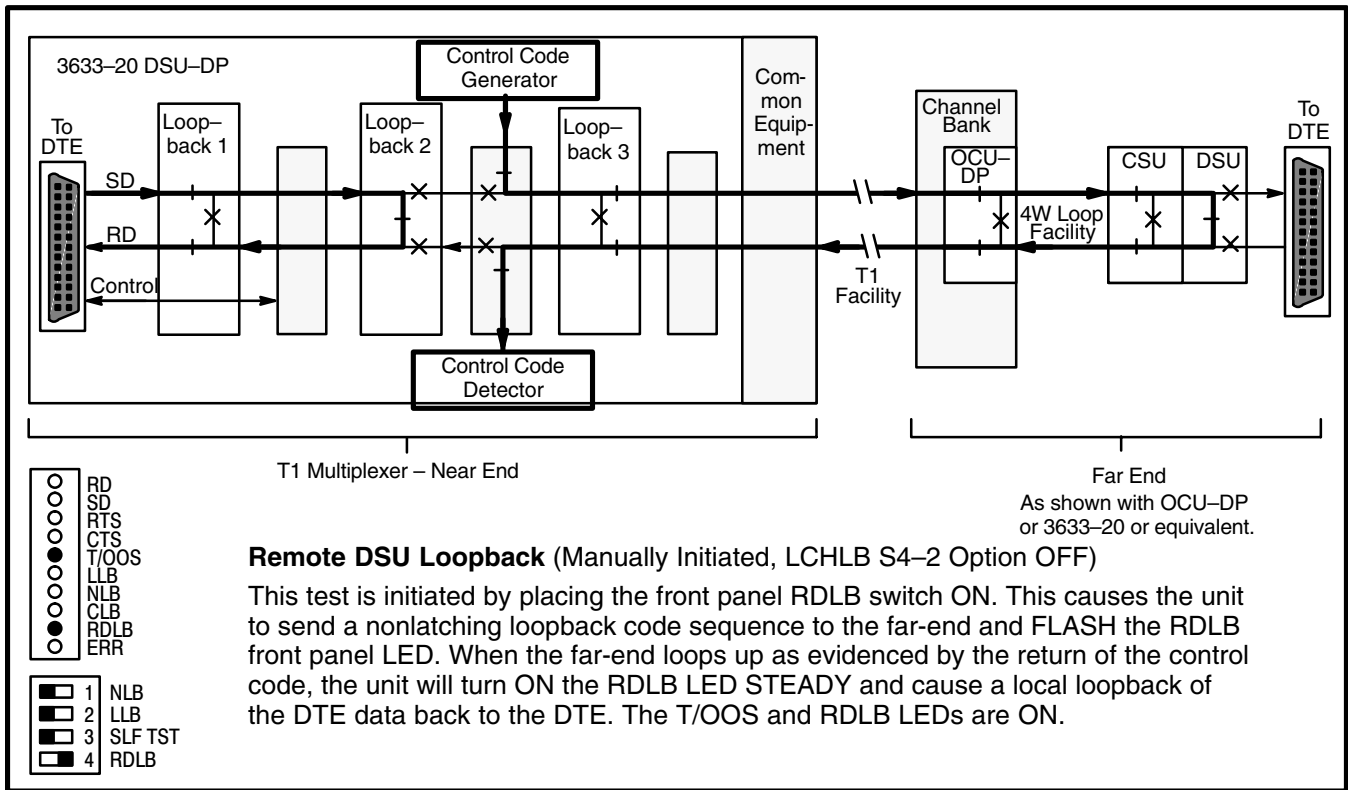


Figure 10. 3633-20 Manually Initiated Remote DSU Nonlatching Loopback

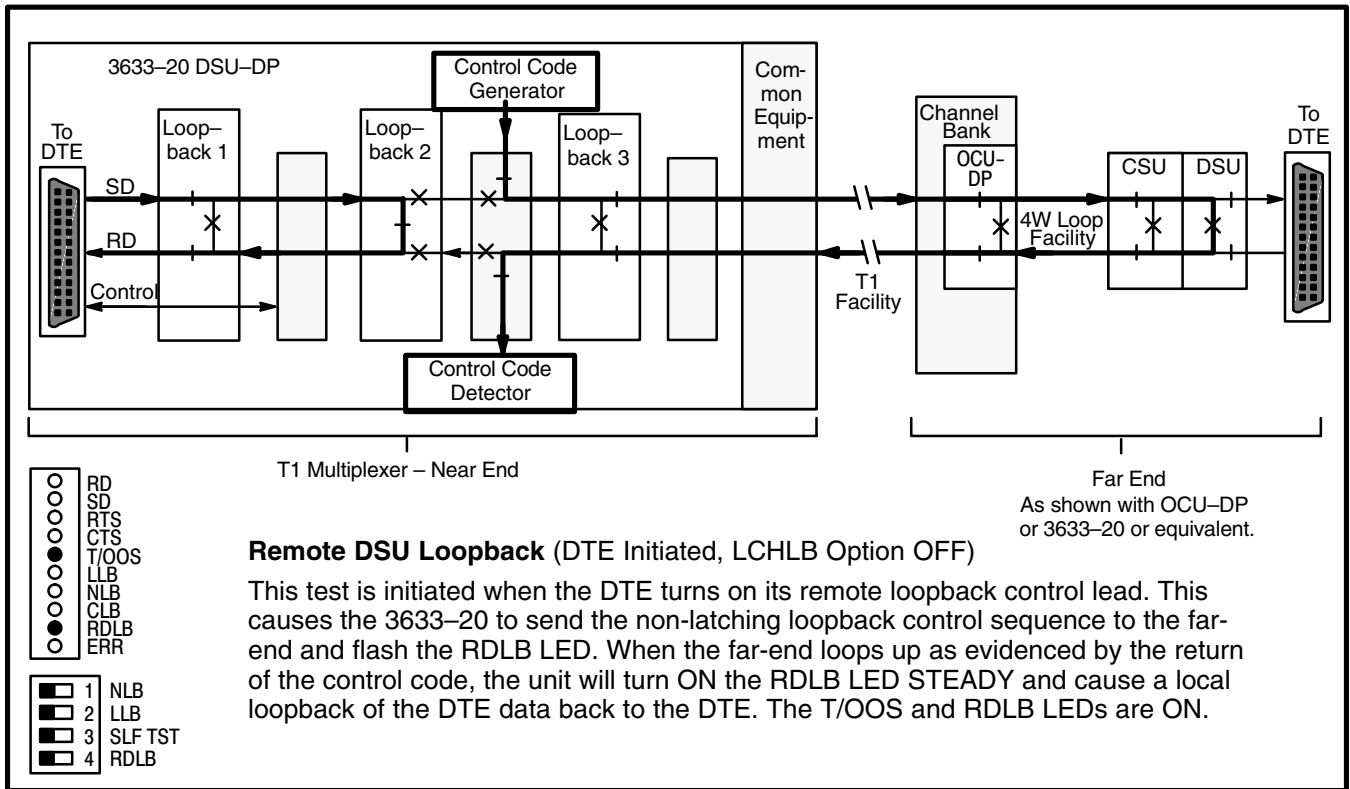


Figure 11. 3633-20 DTE Initiated Remote DSU Nonlatching Loopback

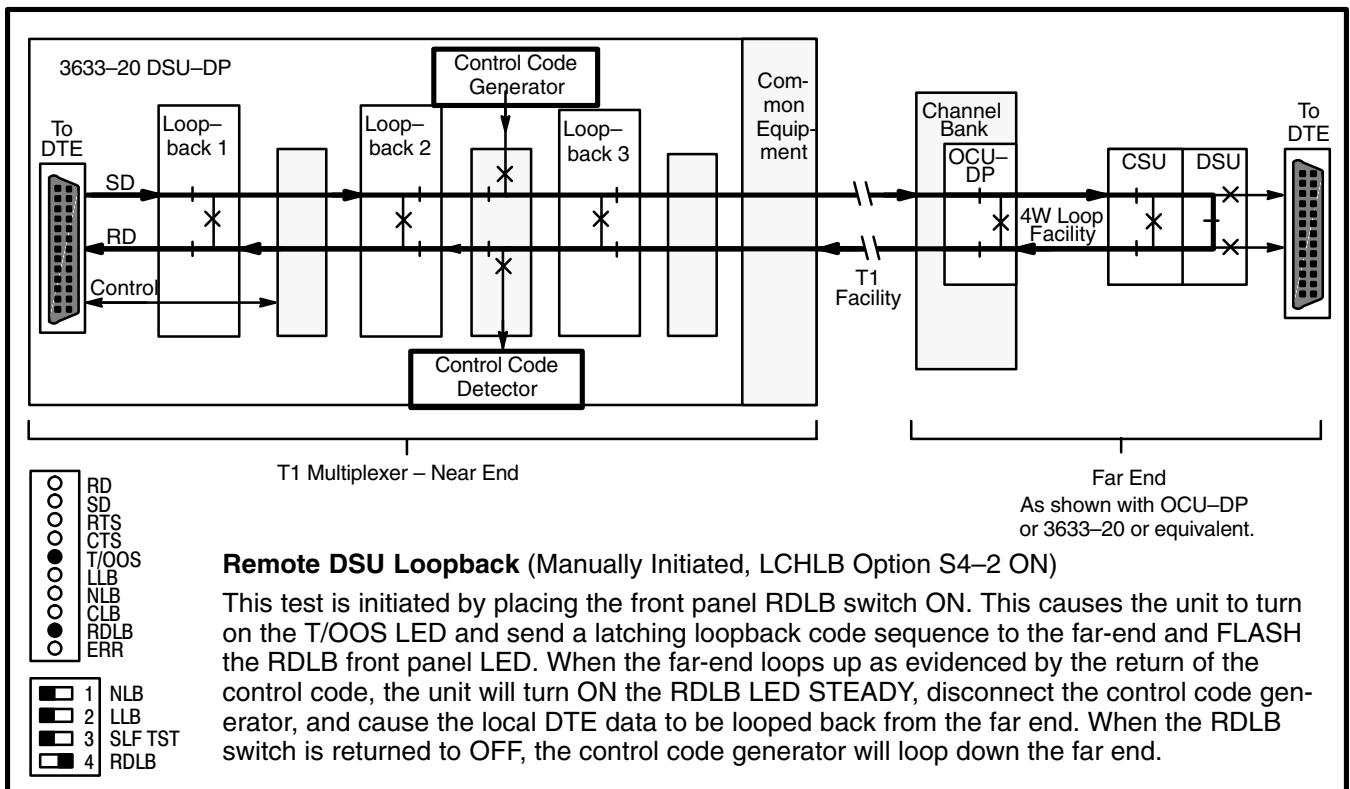


Figure 12. 3633-20 Manually Initiated Remote DSU Latching Loopback

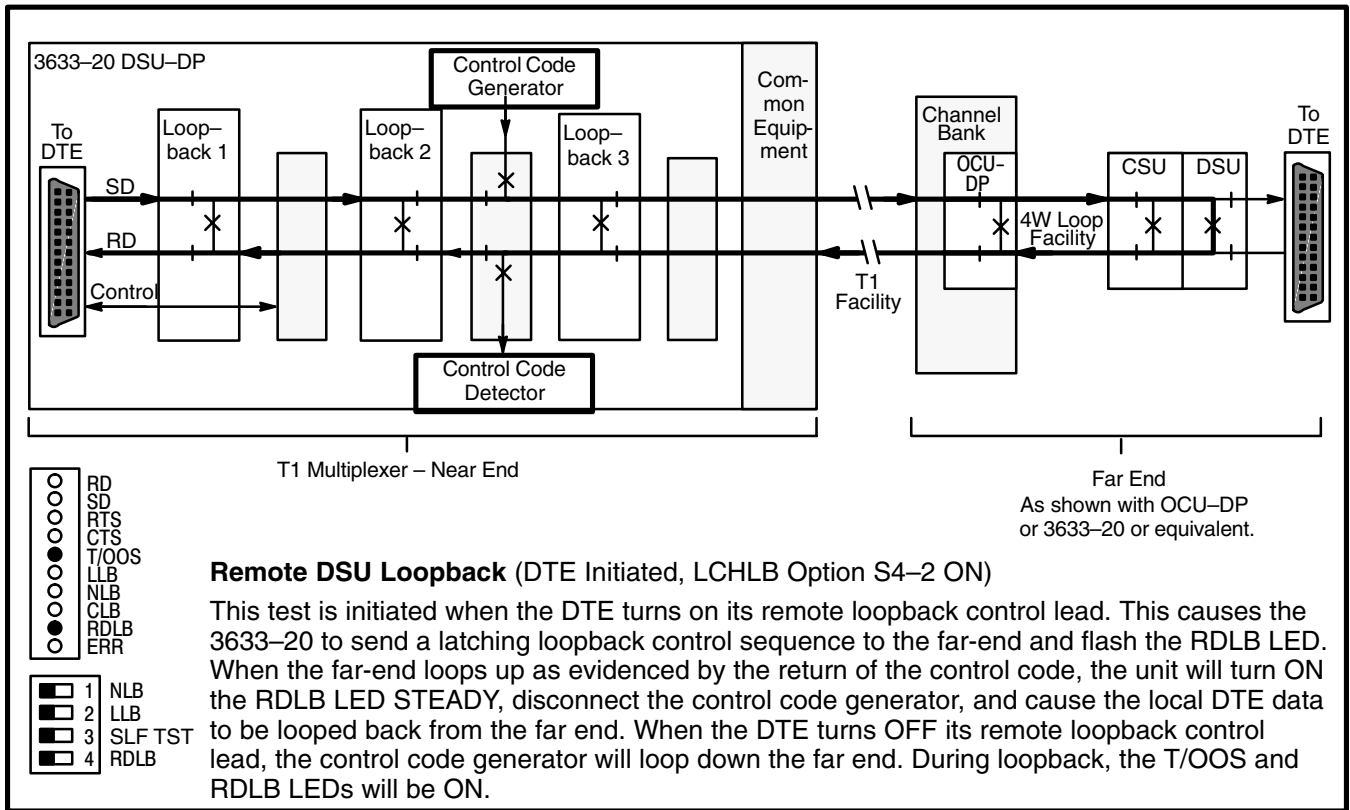


Figure 13. 3633-20 DTE Initiated Remote DSU Latching Loopback

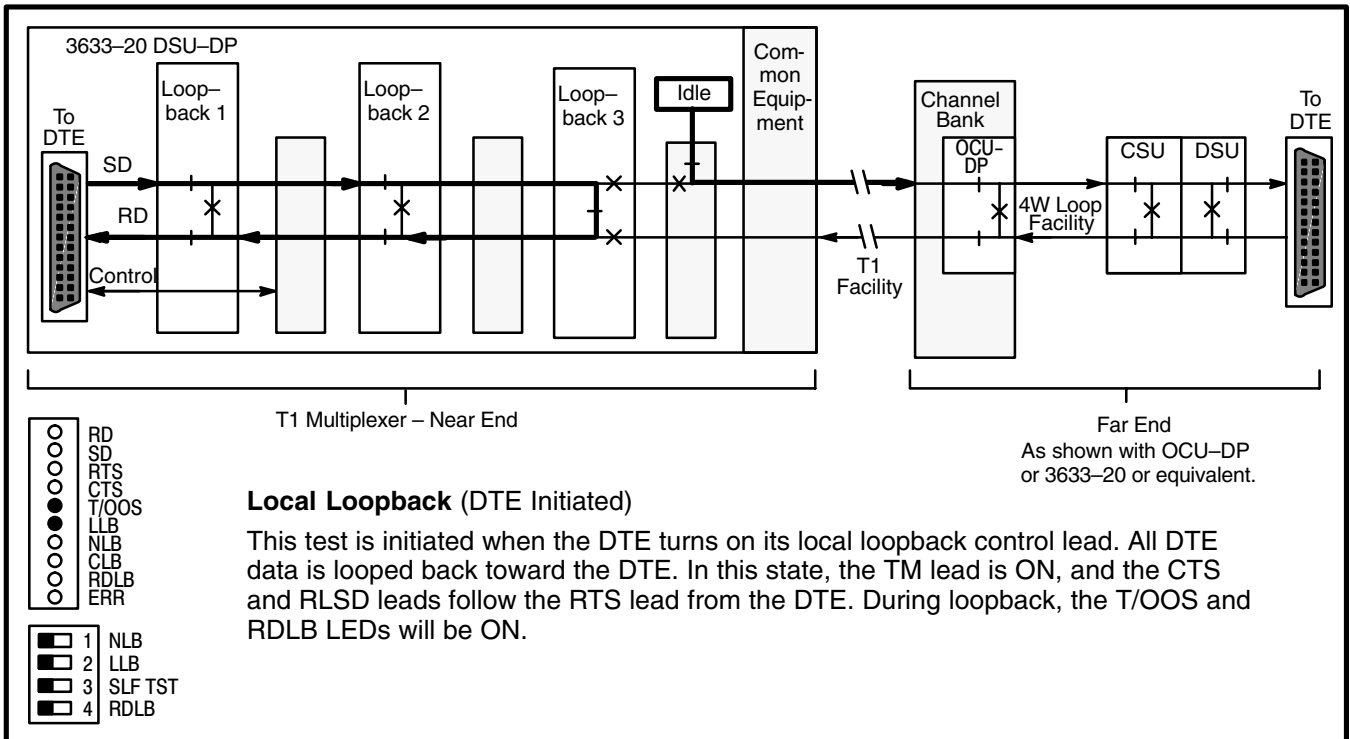


Figure 14. 3633-20 DTE Initiated Local Loopback

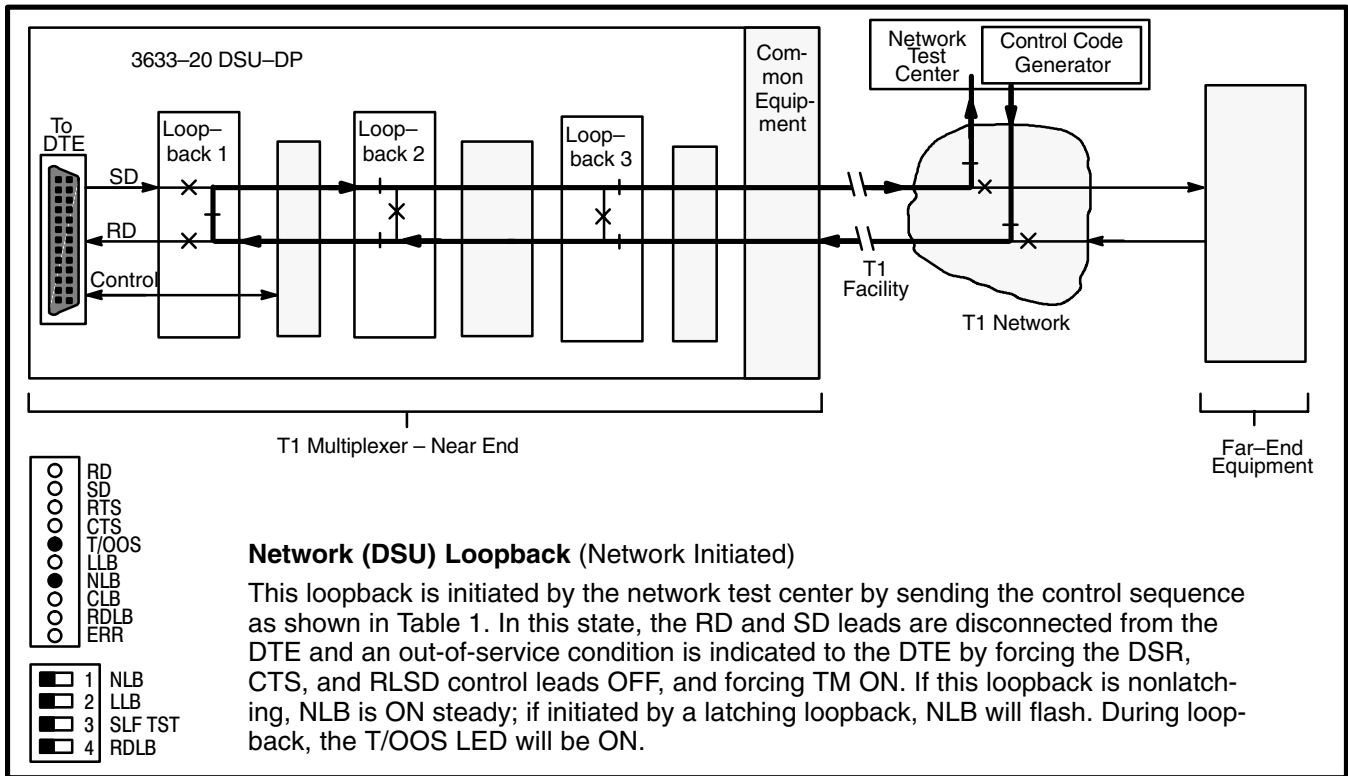


Figure 15. 3633-20 Network Initiated DSU Loopback

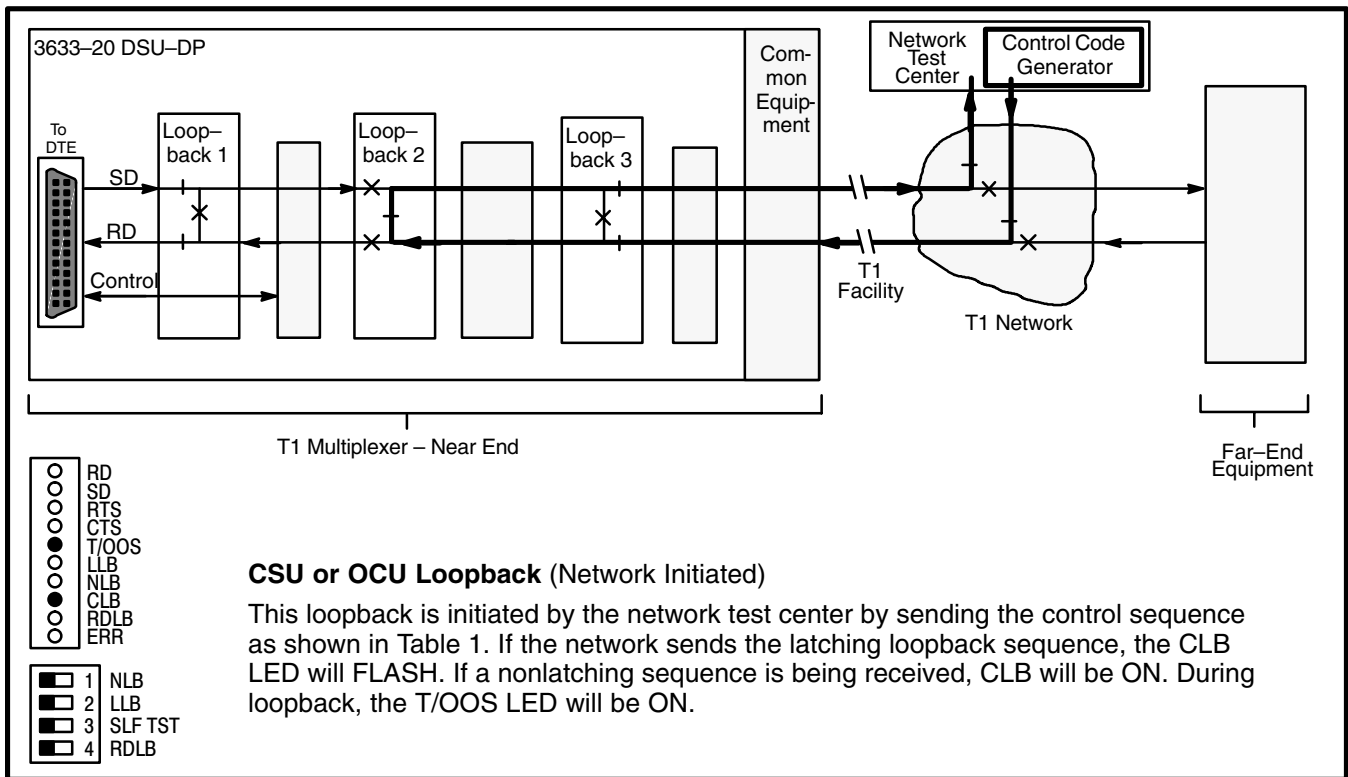
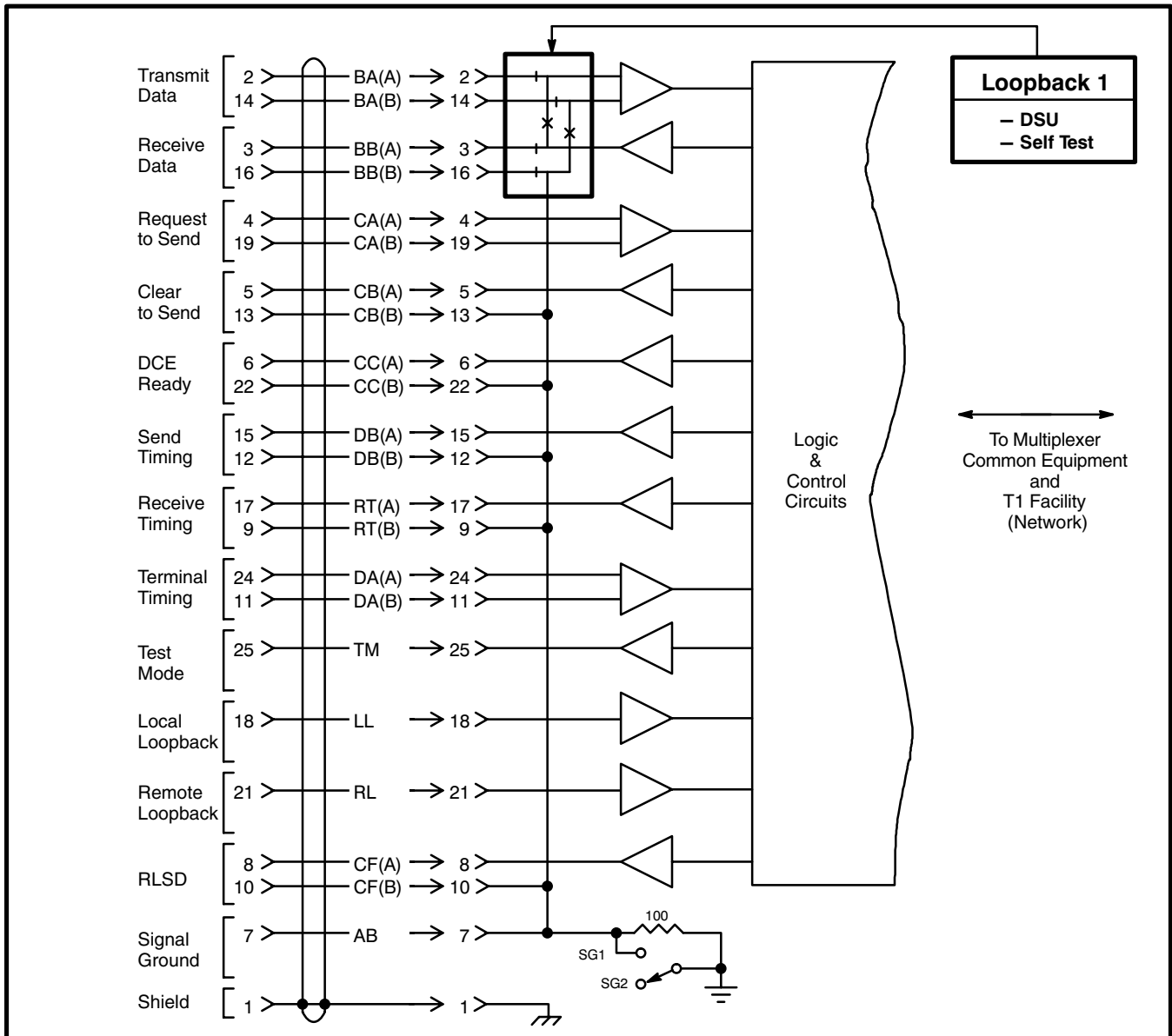


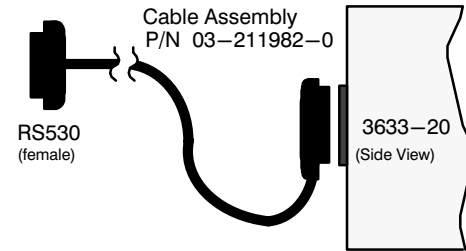
Figure 16. 3633-20 Network Initiated CSU or OCU Loopback





**RS530 Interface**

Signal Designation	Pin #	Signal Designation
Transmitted data (B)	14 -	Shield (A)
Transmitter signal element DCE (A)	15 -	Transmitted Data (A)
Received data (B)	16 -	Received Data (A)
Receiver signal element timing DCE (A)	17 -	Request to Send (A)
Local loopback	18 -	Clear to Send (A)
Request to send (B)	19 -	DCE Ready (A)
	20 -	Signal Ground
Remote loopback	21 -	Received Line Signal Detector (A)
DCE ready (B)	22 -	Receiver Signal Element Timing - DCE (B)
	23 -	Received Line Signal Detector (B)
Transmitter signal element timing DTE (A)	24 -	Transmitter Signal Element Timing - DTE (B)
Test Mode	25 -	Transmitter Signal Element Timing - DCE (B)
		Clear to Send (B)



**Figure 17. RS530 DTE/DCE Interface**

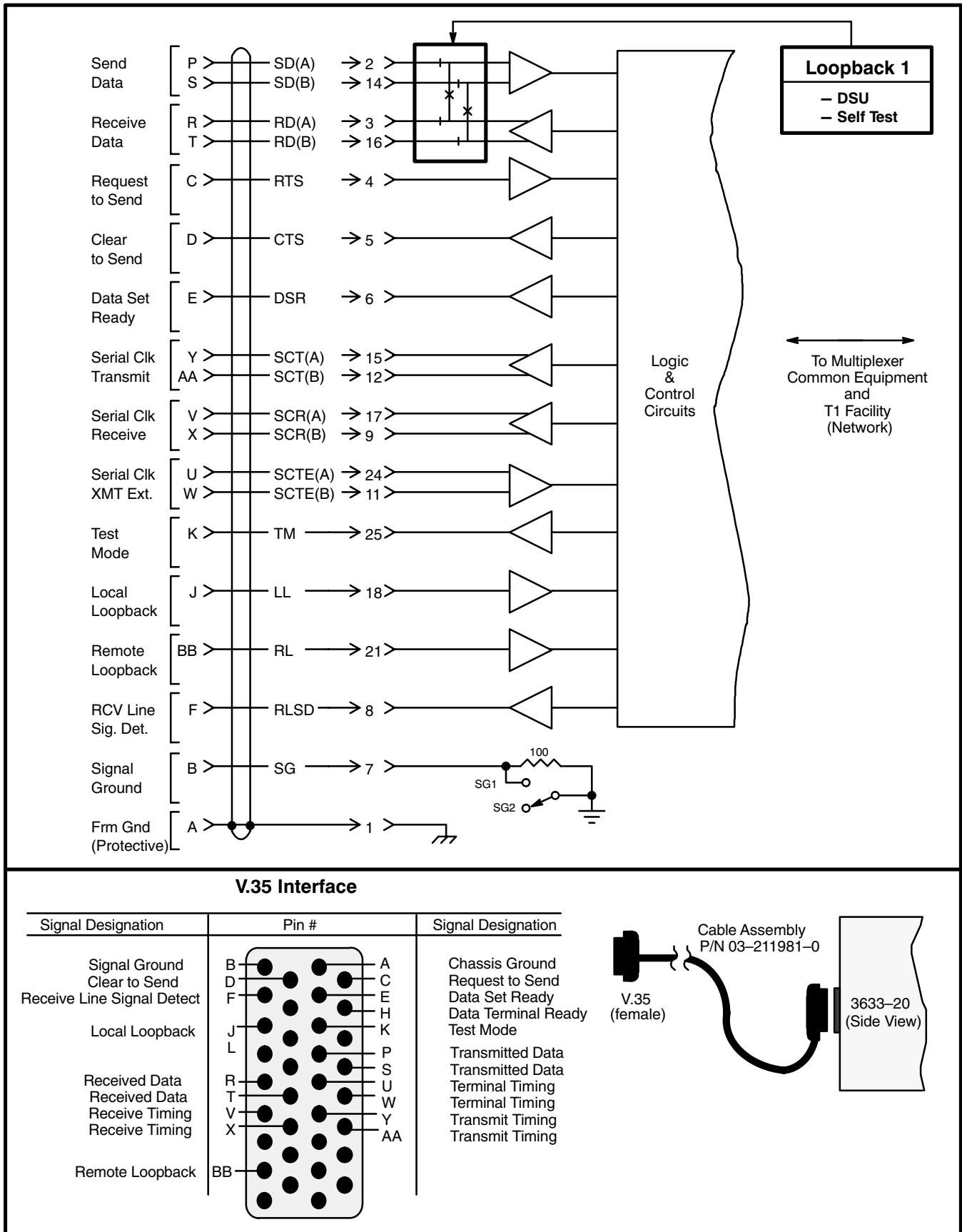
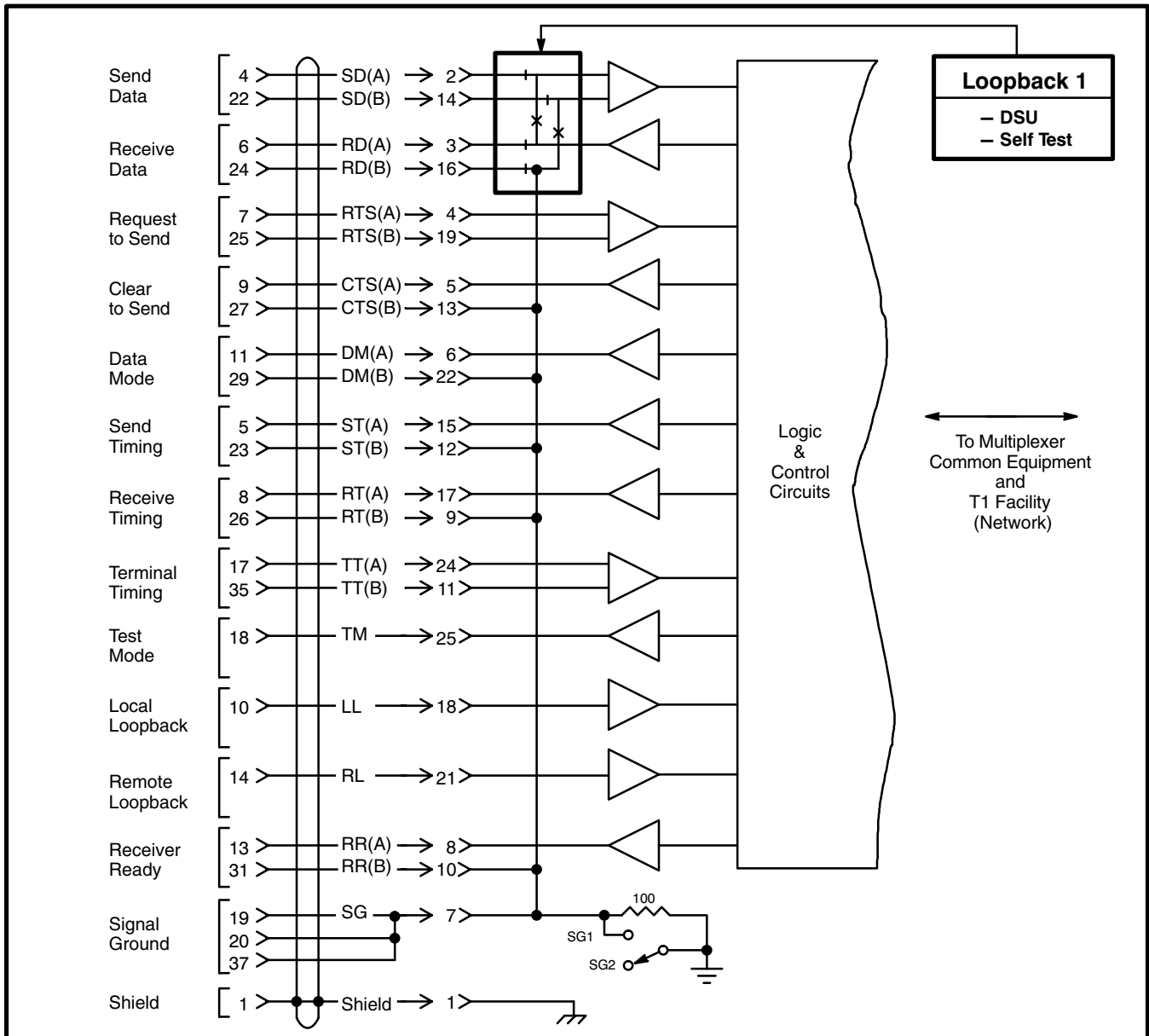


Figure 18. V.35 DTE/DCE Interface



Signal Designation	Pin #	Signal Designation
Receive Common	20-21	Shield (A)
Send Data	22	Send Data
Send Timing	23	Send Timing
Receive Data	24	Receive Data
Request to Send	25	Request to Send
Receive Timing	26	Receive Timing
Clear to Send	27	Clear to Send
Data Mode	29	Local Loopback
Terminal Ready	30	Data Mode
Receiver Ready	31	Terminal Ready
	32	Receiver Ready
	33	Remote Loopback
	34	Remote Loopback
Terminal Timing	35	Terminal Timing
	36	Test Mode
Send Common	37	Signal Ground

**RS449 Physical Interface (RS422 Electrical)**

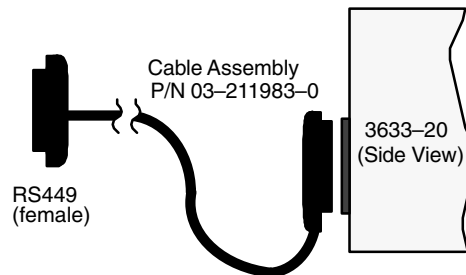
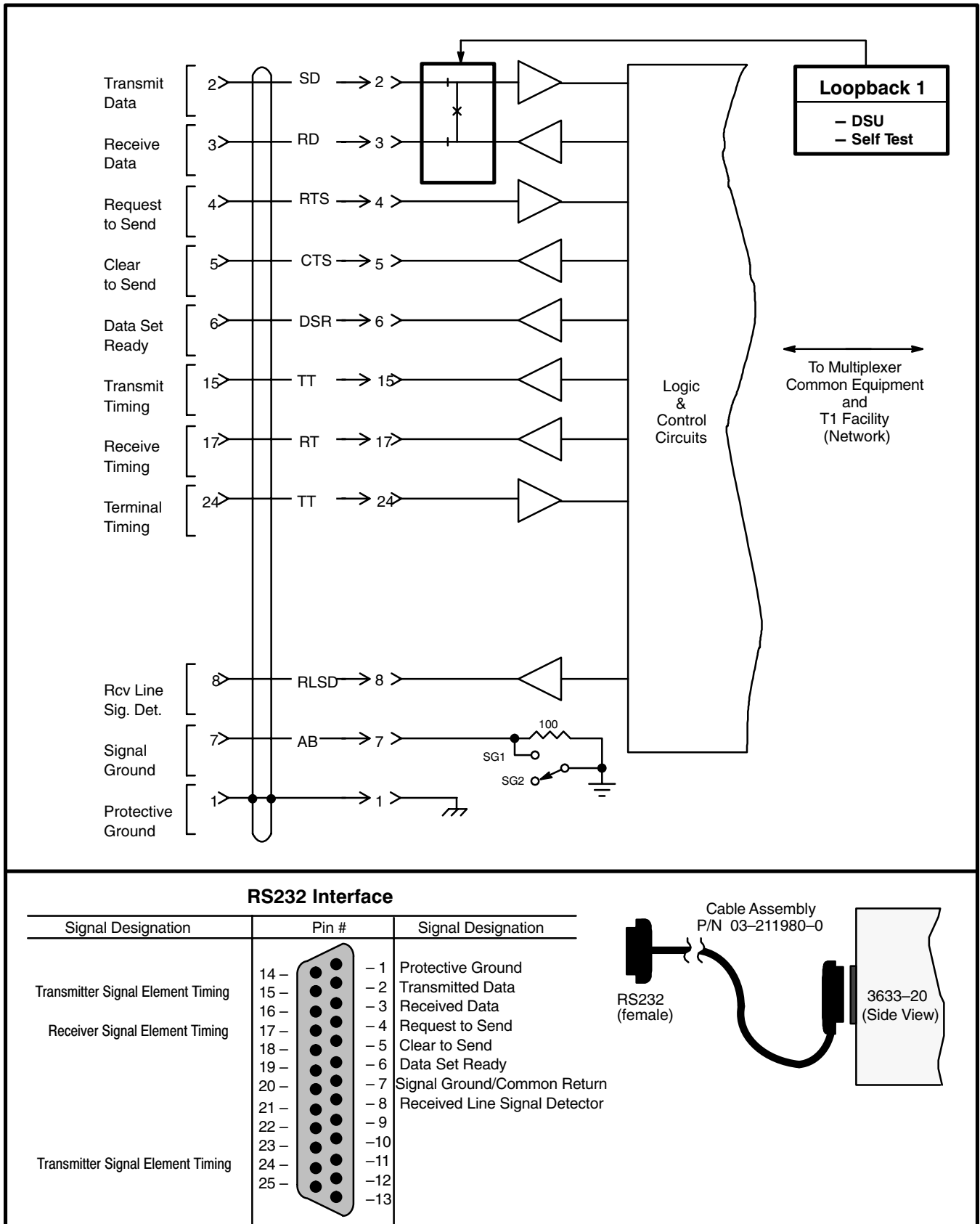


Figure 19. RS449/422 DTE/DCE Interface



**RS232 Interface**

Signal Designation	Pin #	Signal Designation
	14 -	- 1 Protective Ground
Transmitter Signal Element Timing	15 -	- 2 Transmitted Data
	16 -	- 3 Received Data
Receiver Signal Element Timing	17 -	- 4 Request to Send
	18 -	- 5 Clear to Send
	19 -	- 6 Data Set Ready
	20 -	- 7 Signal Ground/Common Return
	21 -	- 8 Received Line Signal Detector
	22 -	- 9
	23 -	- 10
Transmitter Signal Element Timing	24 -	- 11
	25 -	- 12
		- 13

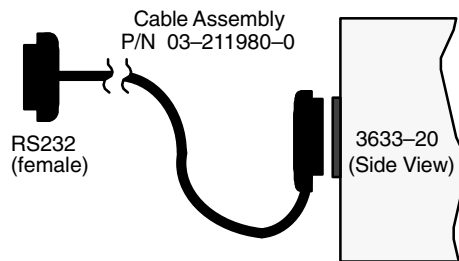


Figure 20. RS232 DTE/DCE Interface

## 8. TECHNICAL ASSISTANCE

If technical assistance is required, contact Charles Industries' Technical Services Center at:

847–806–8500  
 847–806–8556 (FAX)  
 800–607–8500  
 techserv@charlesindustries.com (e-mail)

## 9. WARRANTY & CUSTOMER SERVICE

### 9.1 Warranty

Charles Industries, Ltd. offers an industry-leading, 5-year warranty on products manufactured by Charles Industries. Contact your local Sales Representative at the address or telephone numbers below for warranty details. The warranty provisions are subject to change without notice. The terms and conditions applicable to any specific sale of product shall be defined in the resulting sales contract.

Charles Industries, Ltd.  
 5600 Apollo Drive  
 Rolling Meadows, Illinois 60008–4049  
 847–806–6300 (Main Office)  
 847–806–6231 (FAX)

### 9.2 Field Repairs (In-Warranty Units)

Field repairs involving the replacement of components within a unit are not recommended and may void the warranty and compatibility with any applicable regulatory or agency requirements. If a unit needs repair, contact Charles Industries, Ltd. for replacement or repair instructions, or follow the *Repair Service Procedure* below.

### 9.3 Advanced Replacement Service (In-Warranty Units)

Charles Industries, Ltd. offers an “advanced replacement” service if a replacement unit is required as soon as possible. With this service, the unit will be shipped in the fastest manner consistent with the urgency of the situation. In most cases, there are no charges for in-warranty repairs, except for the transportation charges of the unit and for a testing and handling charge for units returned with no trouble found. Upon receipt of the advanced replacement unit, return the out-of-service unit in the carton in which the replacement was shipped, using the pre-addressed shipping label provided. Call your customer service representative at the telephone number above for more details.

### 9.4 Standard Repair and Replacement Service (Both In-Warranty and Out-Of-Warranty Units)

Charles Industries, Ltd. offers a standard repair or exchange service for units either in- or out-of-warranty. With this service, units may be shipped to Charles Industries for either repair and quality testing or exchanged for a replacement unit, as determined by Charles Industries. Follow the *Repair Service Procedure* below to return units and to secure a repair or replacement. A handling charge applies for equipment returned with no trouble found. To obtain more details of this service and a schedule of prices, contact the CI Service Center at 217–932–5288 (FAX 217–932–2943).

#### *Repair Service Procedure*

1. Prepare, complete, and enclose a purchase order in the box with the equipment to be returned.
2. Include the following information:
  - Company name and address
  - Contact name and phone number
  - Inventory of equipment being shipped
  - Particulars as to the nature of the failure
  - Return shipping address

3. Ship the equipment, purchase order, and above-listed information, transportation prepaid, to the service center address shown below.  
  
 CI Service Center  
 Route 40 East  
 Casey, IL 62420–2054
4. Most repaired or replaced units will be returned within 30 or 45 days, depending on the product type and availability of repair parts. Repaired units are warranted for either 90 days from the date of repair or for the remaining unexpired portion of the original warranty, whichever is longer.

**10. SPECIFICATIONS**

**10.1 Electrical**

The electrical characteristics of the 3633–20 are as follows:

- (a) SUPPORTED DATA RATES: 1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 56, and 64 Kb/s.
- (b) TRANSMISSION TYPE: Synchronous at 1.2 to 64 Kb/s rates; asynchronous at 1.2, 2.4, 4.8, 9.6, and 19.2 Kb/s.
- (c) T1 TRANSPORT FORMAT: “DDS” Network compliant.
- (d) ASYNCHRONOUS PROTOCOLS SUPPORTED: 7 or 8 data bits, 1 or 2 stop bits, parity or no parity bit.
- (e) ERROR CORRECTION: Majority vote at 2.4, 4.8, and 9.6 Kb, BCH parity byte at 19.2 Kb.
- (f) ELECTRICAL DTE TYPES SUPPORTED: RS232, RS449/422, RS530, RS530A, and V.35.

**10.2 Physical**

The physical characteristics of the 3633–20 are as follows:

**Table 5. Physical Specifications**

<b>Feature</b>	<b>U.S.</b>	<b>Metric</b>
Height	4.3 inches	10.9 centimeters
Width	1.36 inches	3.5 centimeters
Depth	10.4 inches	26.4 centimeters
Weight	8 ounces	226.8 grams
Temperature	32 to 120° F	0 to 49° C
Humidity	To 95% (no condensation)	

