

Bell System Data Communications

TECHNICAL REFERENCE

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Wideband Data Stations

303 Type

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Supplement 1

March 1969

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**ENGINEERING DIRECTOR DATA COMMUNICATIONS
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MEMORANDUM:

General

This supplements the Bell System Data Communications Technical Reference entitled "Wideband Data Stations - 303-Type, August 1966" to cover new station equipment being made available and to correct errors contained in the Technical Reference. It includes information on:

1. Station Arrangements for Switched Wideband Data Services.
2. New Station Equipment Designed for Use Over Digital Transmission Facilities.
3. Improved Scrambler For 303-Type Data Sets.
4. Non-Synchronous Use of the Data Set 303-Type.
5. High Speed Connector Used on The Data Station 303

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1. STATION ARRANGEMENTS FOR SWITCHED WIDEBAND DATA SERVICES

1.1 Voice-band Data Set

Switched wideband services are normally provided by a six-wire switching arrangement. This six-wire arrangement provides a two-wire voice-band channel and a four-wire wideband channel. The DATA-PHONE[®] 50 common user network and most private switched systems are of this configuration. The Data Set 404B1, which is designed for four-wire operation, cannot be used on these networks. Where a voice-band data set is required, as in the case of certain non-synchronous facsimile systems, the Data Set 103F2 will be used. The Data Set 103F2 transmits low speed serial data on a full duplex basis over the two-wire voice-band channel. This data set will not be provided in normal synchronous applications.

When the Data Set 103F2 is required, it is mounted in the same cabinet as the 303-Type Data Set. The low-speed cable from the business machine is plugged directly into the connector on the rear of the Data Set 103F2. This connector is equivalent to a Cinch or Cannon DB-19604-433 Connector. The business machine should be equipped with a cable not longer than 50 feet and a Cinch or Cannon DB-19604-432 Plug mounted in a DB-51226-1 Hood Assembly. Detailed information on the Data Set 103F2 is available in the "Data Set 103F Interface Specification, May 1964."

In applications not requiring a voice-band data set, the station may be arranged to permit simultaneous talk and wideband data. This should be helpful in coordinating data transmissions.

1.2 Data Terminal Ready - Interface Lead

The Technical Reference "Wideband Data Stations - 303-Type, August 1966" states that the Data Terminal Ready (DTR) lead must be controlled by the business machine in applications where automatic answering of calls is required. It also states that this lead will be wired in the "ON" condition by the Telephone Company when automatic answering is not used. This second provision does not apply in switched network applications of Data Station 303. In all cases where the data station is to work on a switched service basis, the DTR lead must be controlled by the business machine.

On switched systems, the control of the DTR interface lead is the same whether or not the simultaneous talk and wideband data feature is provided. (Only stations not requiring a voice-band data set on the voice coordination channel may be provided with the simultaneous talk and wideband data feature.

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On manually answered calls the business machine must present an "ON" signal to the DTR lead before the data station can be placed in the "data" mode. On automatically answered calls the business machine must present an "ON" signal to the DTR lead in order to answer the incoming call. Both manually and automatically answered calls may be dropped manually by depressing the TALK button on the 804-Type Data Auxiliary Set and then hanging up the handset. If the DATA button is depressed, the handset can be replaced without dropping the call. In this case, the call can be dropped only by the business machine turning DTR OFF momentarily (for 100 milliseconds or more).

2. NEW STATION EQUIPMENT DESIGNED FOR USE OVER DIGITAL TRANSMISSION FACILITIES

2.1 Limited Distance Service Using Digital Subscriber Lines

A new series of 303-Type Data Sets have been introduced to provide higher data transmission rates over digital transmission facilities. These new sets, designated 303J-Type, provide 460.8 KB/S synchronous service or non-synchronous facsimile type data service with a minimum signal element width of 2 microseconds. The data sets are designed to transmit over T1 digital line facilities only and the maximum transmission distance is limited to the 50-mile maximum of the T1 system.

The Data Set 303J-Type is used in conjunction with a T1WM-4 Wideband Modem and T1 Line Terminating Unit. The T1WM-4 Wideband Modem and T1 Line Terminating Unit are usually placed in the data station cabinet.

2.1.1 Data Set 303J-Type

The Data Set 303J-Type is a new version of 303-Type Data Set. The roll-off filter, automatic gain control, restored polar receiver, and restored polar transmitter and line interface circuit packs are not used. The DC-coupled balanced line interface circuit pack is used in the transmitter and line interface location. The data set transmits and receives a DC-coupled balanced 1 volt P-P line signal.

No changes have been made in other portions of the data set and signals to and from the customer's business machine are the same as for other 303-Type Data Sets.

2.1.2 Wideband Data Station Using 303J and T1WM-4

The wideband data station equipment can be housed in a 30" high cabinet (Per KS20018 L4). The T1WM-4 and Line Terminating Unit are placed at the bottom. The remaining equipment is placed in the same relative positions as shown by the Photographs in the Technical Reference. A block diagram of a Typical 460.8 KB/S synchronous data station is shown in Figure 1.

2.2 Other Services Using Digital Subscriber Lines

A new series of 303-Type Data Sets has been introduced to provide data transmission at all previously available 303 synchronous and non-

synchronous rates using T1 line customer loops. These data sets and data stations are the same as the limited distance 460.8 KB/S data sets except for the transmit clock and sync recovery frequencies.

3. IMPROVED SCRAMBLER FOR 303-TYPE DATA SETS

303-Type Data Sets, now being shipped from the factory, are equipped with the 16A1 Data Unit, an improved scrambler. The new scrambler removes the restriction, "Synchronous business machines should not present more than 500 successive spaces to 303-Type Data Sets" that was underlined on Page 4 of the August 1966 Technical Reference. The new scrambler effectively removes all constraints from the business machine data format. The 16A1 Data Unit is a plug-in circuit pack which is a direct physical replacement for the old scrambler, circuit pack AR134. Telephone Companies will generally substitute the new scramblers in synchronous data sets in the field as they become available. Because the new scrambler is not compatible with the old one, it is imperative that all scramblers working together on a switched network or two-point private line be changed simultaneously.

When synchronous 303-Type Data Sets are connected to a line, they are normally arranged to stay in bit synchronism even when the Request To Send lead is OFF. This is possible because the sending data set normally transmits scrambled 1's during this time. The receiving data set descrambles these signals and delivers all 1's or "Mark Hold" to the business machine. The receiving data set maintains bit synchronism from the idling scrambler line signals. If the transmission line is opened so that no signals reach the receiver, two things occur: (1) AGC Lock goes OFF as noted on Page 13 of the Technical Reference; and (2) the new scrambler will cause the receiver to deliver to the business machine a repeating pattern of one mark, then 31 spaces or one space, then 31 marks, depending upon the state of the receiver when the line is opened. The old scrambler would have delivered either all marks or all spaces under the same open line condition.

No start-up sequence is involved with the scrambler, and the first data bit presented to the scrambler will be properly encoded. In the descrambler, proper decoding takes place once the registers are filled; this takes at most 20 bits. This means that the first data bit will be properly decoded if at least 20 bits of scrambler idle code precede it. Note that at least 3000 bits of idle code should have been transmitted to get the sync recovery circuit into phase lock in the initial start-up of the system.

4. NON-SYNCHRONOUS USE OF THE DATA SET 303

This is intended to emphasize once again the restrictions associated with the non-synchronous use of the Data Set 303-type as mentioned on Page 4 of the Technical Reference.

Non-synchronous wideband data service was originally offered to meet the needs of facsimile customers. The assumption was made that the transmitted copy would be sufficiently random in nature to result in a nearly random line signal. As long as non-synchronous data service is used for facsimile, this assumption is sufficiently valid to assume that any interference will be within tolerable limits.

Periodically, there is an inquiry for non-synchronous service where the customer intends to use the service for a synchronous data signal at some rate other than one of the standard clock rates. This is not permitted because "non-synchronous service" has no provision for scrambling the data signal to eliminate repetitive patterns. These repetitive patterns create strong single frequency tones on the transmission line which may seriously disrupt other services on adjacent channels.

In addition to the interference problem, there may be problems associated with attempts to operate non-standard rate synchronous data signals over facilities using wideband regenerative repeaters. These regenerative repeaters have the capability to detect synchronous data signals and to retune these signals to standard data rates. If a signal at a non-standard rate were detected by this regenerator it would be garbled by the regenerative action.

5. HIGH SPEED CONNECTOR USED ON DATA STATION 303

The Technical Reference "Wideband Data Stations - 303-Type, August 1966" incorrectly states that the business machine cable should have a Burndy MD 12 MXP-17R plug. The correct plug is a Burndy MD 12 MXP-17TC. (The Burndy Corporation was informed of this error immediately and has been shipping the proper plug on orders showing the erroneous number.)

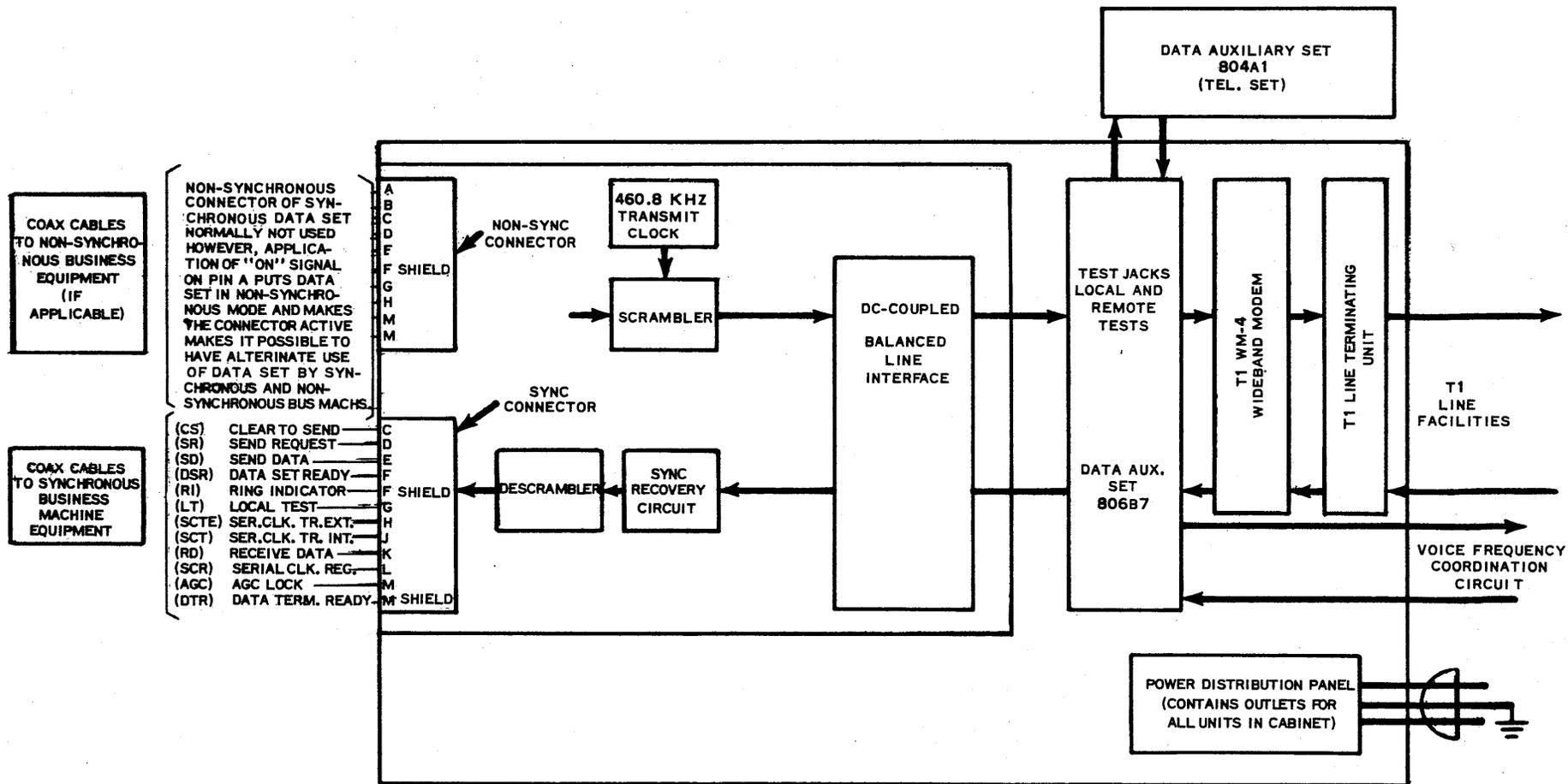


FIGURE 1
TYPICAL SYNCHRONOUS DATA STATION
460 KB/S