

9131 TELETYPEWRITER SELECTIVE CALLING SERVICE
SYSTEM DESCRIPTION

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- Originate calls to a series of stations
- Originate calls to a group of stations
- Perform a roll call function
- Return appropriate responses when called.

In addition, the controllers can operate the teletypewriters on-line or off-line in a local mode, place them out of service, or place the data sets in the test mode. The controllers use the ASCII format characters listed in Table A in controlling the transmission functions of the stations.

1. GENERAL

1.01 This section covers the physical and functional characteristics of a teletypewriter selective calling service that employs the model 9131 station controller. This system will be referred to as a 9131 Teletypewriter Selective Calling Service (9131 TSCS).

1.02 A typical 9131 TSCS (Fig. 1) will consist of several stations arranged in a multipoint private line configuration. The system uses eight-level, even parity ASCII code and is capable of half-duplex operation at 100 words per minute in multipoint private line applications. The 9131 station controller does not require a line control station to provide the central polling function. Any station can call any other station on a contention basis. A selective calling format is used whereby any station (when selected) may send to any other station by waiting its turn. Each station has switch programmable electronic response character generators to produce answer-back signals and switch programmable character detectors to detect group and station addresses.

1.03 The 9131 station controllers give the station(s) the capability to:

- Originate calls to any other station

1.04 An optional roll call feature is available whereby the station transmits its station address code after ETX and before EOT to verify receipt of the message.

2. DESCRIPTION

A. Physical

2.01 The major components in a typical 9131 TSCS station are:

- A teletypewriter (model 33 or 35)
- A 9131 station controller
- A data auxiliary set (DAS) 820D-L1A
- A data set 108- or 109-type.

The data set is housed in the DAS which is mounted in the pedestal of the teletypewriter. The 9131 station controller is also mounted in the pedestal but is controlled by a six-button switch located to the right of the keyboard. Refer to the documents listed in Part 3 of this section for a more detailed description of the individual components.

B. Functional

2.02 Each station is assigned its own two-character sequence station address. When the 9131

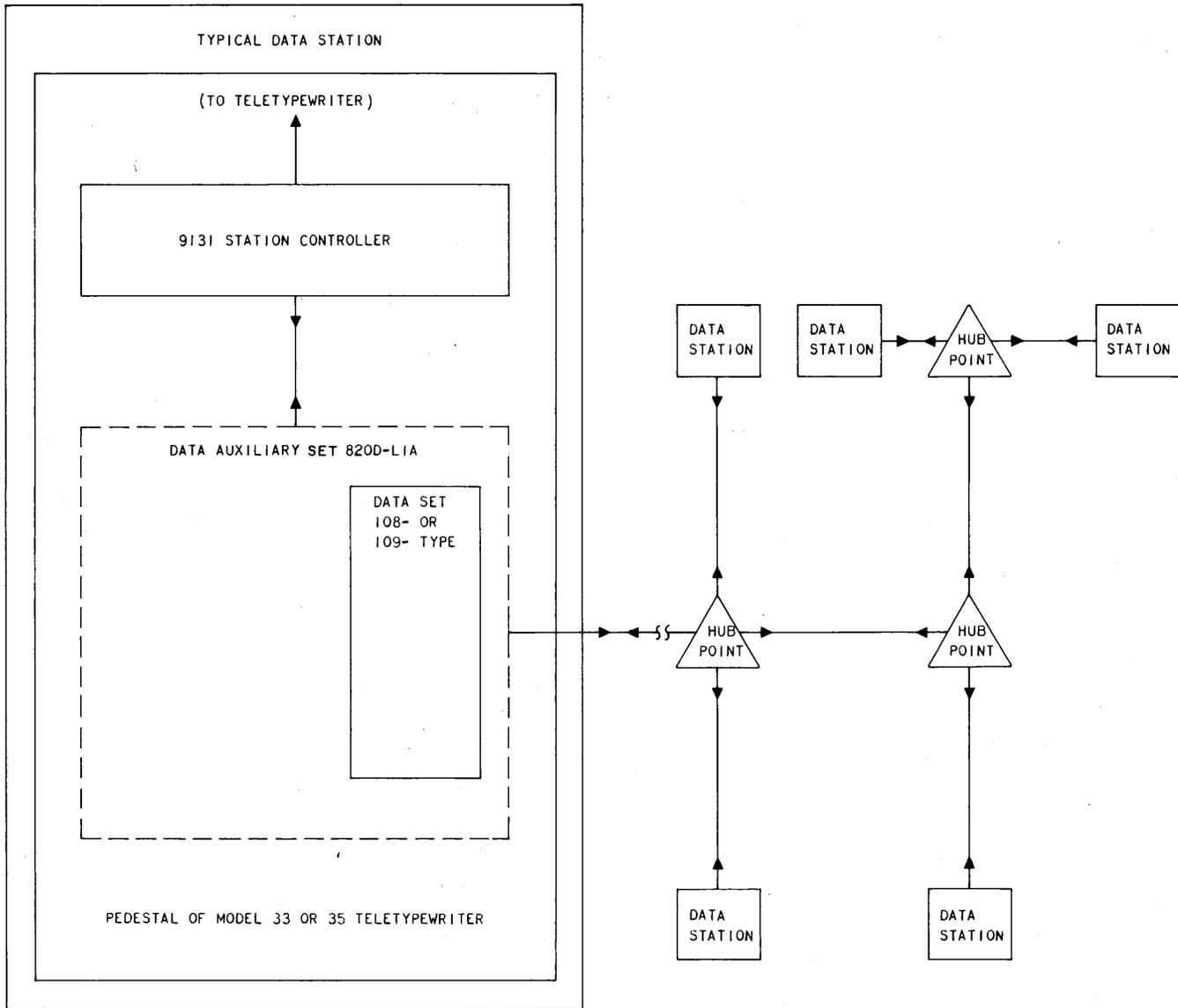


Fig. 1—Typical 9131 Teletypewriter Selective Calling System

station controller detects its station address, the teletypewriter motor(s) is turned on and generates a PRC. The teletypewriter remains in mark-hold until STX is detected. If an alarm condition exists when station address is detected, the motor(s) is not turned on and an NRC is generated.

2.03 Each station is also assigned a single-character group address. If the controller detects its group address, the teletypewriter motor is turned on but does *not* generate a PRC. The PRC is not generated because the message is being transmitted to a group of stations simultaneously. If an alarm

condition exists when group address is detected, the teletypewriter is not turned on but, for obvious reasons, *no* NRC is generated. An example of a typical on-line message format is shown in Fig. 2.

9131 Station Controller

2.04 The 9131 station controller may be in one of six different modes when it is on-line.

2.05 Off: The station will be in the off mode after being normalized and before receiving a NULL or going into the originate mode. EOT,

TABLE A

FUNCTION	CHARACTER
Bid for Line	NULL
Station Address or Call Directing Code	Two characters (programmable); The last character is ENQ or other control character
Group address or broadcast code	A single character (programmable)
Start of text	STX
End of text	ETX
End of transmission	EOT
Positive response character (PRC)	A single alphanumeric character (programmable)
Negative response character (NRC)	A single alphanumeric character (programmable)

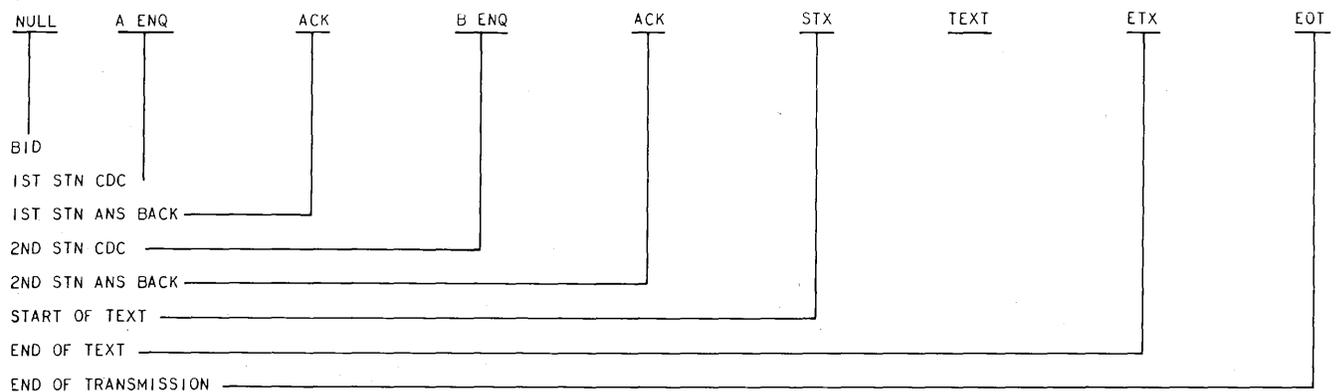


Fig. 2—Typical Message Format

an idle line time out, loss of data set ready signal, or operation of the OFF, LOCAL or OUT OF SERVICE keys will normalize the station.

2.06 Originate: Depressing the LINE key with the teletypewriter off will cause it to enter the originate mode. In this mode, the teletypewriter is enabled to permit transmission of station or group addresses. The station is taken out of the originate mode when STX or EOT is transmitted.

2.07 Busy: Transmission of a NULL causes the busy lamp to flash at all the other stations and the originate function at the called station to be disabled.

2.08 Select: A teletypewriter is switched from the busy mode to the select mode when the station address or group address code is detected and an alarm is not present. The teletypewriter motor(s) will turn on when the unit goes into the select mode. Receiving STX terminates the select mode. Once a teletypewriter has been selected and switched out of the select mode, the teletypewriter will switch back into the select mode by detecting ETX. Only a normalizing signal will deselect a unit once selected.

2.09 Message-Print: A selected station is switched from the select mode to the message-print mode upon receipt of STX and terminates with

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ETX or EOT. A station which switches from the originate to the message-print mode will have the format error detector disabled. A station which switches from the select to the message-print mode removes the mark-hold to the typing unit. ETX switches the station from the message-print mode to the mode the station was in prior to going into this mode.

2.10 Message-Nonprint: An unselected station is switched from the busy to the message-nonprint mode upon receipt of STX and will remain in that mode until receipt of ETX or a normalizing signal. ETX will place the unselected station back into the busy mode for possible selection or to accommodate the roll call of selected stations.

820D-Type Data Auxiliary Set

2.11 The DAS 820D-type houses the data sets and provides an interface to the teletypewriter. It also interfaces the telephone lines with the station equipment.

2.12 The signal voltages toward the data set conform to Electronics Industries Association (EIA) Standard RS-232-B for transmit, receive, and carrier detector leads. The carrier squelch lead does not use EIA voltages.

2.13 The interface toward the teletypewriter should also conform to EIA Standard RS-232-B; however, it should be noted that the voltage interface is an installer option in the DAS. (The current interface is not used with the 9131 TSCS.)

2.14 The telephone line and supervisory interface provides access to tip and ring of the data set via a terminal strip.

2.15 Operation of the test relay in the DAS causes the station to enter the test mode, in which case the data set is isolated from the teletypewriter and the data set transmit and receive leads are connected.

Data Set 108-Type

2.16 Data set 108-type is a low-speed (300 baud) full-duplex, serial data set that uses frequency-shift-keyed modulation. It converts the EIA signals on the transmitted data lead into voice-frequency tones for transmission over the line facilities. The voice-frequency tones transmitted

from a distant station are received by data set 108-type and converted into EIA voltage signals.

Data Set 109-Type

2.17 Data set 109-type is a low-speed (150 baud), full-duplex, serial data set that utilizes a tricurrent level baseband transmission scheme. Transmission is accomplished by converting EIA signals into mark or space voltages which cause a corresponding current to flow in the loop. The direction and magnitude of current flow in the loop are recognized and converted into EIA signals by the receiving data set.

Model 33 Teletypewriter

2.18 The model 33 teletypewriter is a 4-row, 100 word-per-minute machine which uses eight-level ASCII code. It may be an automatic send and receive (ASR), a receive only (RO), or a keyboard send and receive (KSR). The ASR machine consists of a page printer, tape punch, tape reader, and keyboard. During the transmit sequence, it converts the characters from the punched tape into voltage signals which are then presented to the station controller. During the receive sequence, the controller regenerates the signal voltages received from the data set and transmits them to the teletypewriter where they are converted into the appropriate character or action.

Model 35 Teletypewriter

2.19 The model 35 teletypewriter is a 4-row, 100 word-per-minute machine which uses eight-level ASCII code. It may be an automatic send and receive (ASR), a receive only (RO), or a keyboard send and receive (KSR). The ASR machine consists of a page printer, tape punch, keyboard, and transmitter distributor. The transmitter distributor performs the same function as the tape reader in the model 33 machine.

Note: The model 33 and 35 KSR machines consist of a keyboard and printer while the RO consists of a printer only.

C. Operating Procedures

2.20 The operating procedures for the 9131 TSCS are as follows:

(a) ***Originating a Call to Another Station:***

To originate a call, the operator depresses the line control key. This action generates a NULL character which is transmitted to all stations on the network indicating that a station is bidding for control of the line. The NULL will activate the busy circuit in all stations causing the busy lamp to flash at all the other stations and prevents them from bidding for the line. This represents the busy mode. Approximately one-half second after operating the line control key, the station's motor(s) turns on but requires approximately two seconds to reach operating speed. After this pause, the station address code of the station to be called may be sent from the originating station. The called station detects its address code and generates a positive response character (PRC) if it is able to communicate or a negative response character (NRC) if it cannot communicate because of paper alarm or local or out-of-service conditions. If NRC is received, an EOT should be transmitted to turn off the originating station and restore the line to the idle state. If a PRC is received, the station has changed from the busy to the select mode and STX should be sent after a two-second pause to allow the called station's motor to reach operating speed. The STX is detected by all stations on the line. The station that was selected will change from the select mode to the message-print mode and the unselected stations will change from the busy to the message-nonprint mode. The busy lamp at the selected station changes from flashing to steady ON upon receipt of STX and the station is able to send and receive traffic. The communication is terminated by transmission of EOT which returns all stations to the off mode. The busy lamp at the unselected stations will continue to flash until receipt of EOT.

(b) ***Originating a Call to a Series of Stations:***

The procedure for multiple station addressing is similar to the above selection process except a series of station address codes are sent with pauses for the answer-back response. After all desired stations have been selected, STX is sent as noted above after a two-second pause to allow the last station to reach operating speed.

(c) ***Originating a Call to a Group of Stations:***

The procedure for selecting all stations on the line is to send a broadcast code, pause for two seconds and send STX. Generally, no answer-back would be received from a broadcast code. As an alternative, one station may be coded to answer back to the broadcast code. Since the controller logic requires a two-character sequence to activate the answer-back code, two characters would be sent for this application; the first character as the broadcast code and the second to initiate the answer-back. The station designated to answer back for the line would be assigned a station address code compatible with the broadcast code (differing by one information element) such that either the station address or broadcast code would initiate the response. The stations on the line may also be divided into groups by community of interest and assigned group codes. The selection process would be similar to that for broadcast.

(d) ***Performing a Roll Call:*** An alternate disconnect procedure is to transmit ETX at the end of the message and evoke a roll call. By transmitting the address code of the selected station, the originating station will receive the response character which signifies that the station is still active. A positive response at both the beginning and end of the message is an indication that the station received the entire message. The originating station should now transmit EOT to turn off all stations or send STX if an additional message is going to be transmitted to the selected station.

(e) ***Special Transmitter Control Feature:*** The basic controller logic does not provide for starting the station transmitters. It is possible, however, to equip the teletypewriter with transmitter control contacts and use ASCII characters DC1 and DC3 to control the transmitter. The station would be selected and placed in the message-print mode in the normal manner. Control character DC1 would then be sent to start the transmitter and DC3 or EOT transmitted from the tape would stop the transmitter.

(f) ***Idle Line Timer:*** The controller includes an idle line timer which will normalize the station if the line is busy and no activity is

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encountered on the line for 4 \pm 2 minutes. Such would be the case if:

- EOT was not transmitted following a message.
- A hit on the line activated the station busy circuit.
- Contention on line by two or more stations prevents one station from assuming the originate mode.

D. Special Applications

2.21 *Obtaining a Response When Selecting a Group of Stations on a Network:*

Normally a group address requires a single character. To have a group address generate a response requires a two-character sequence. A single station is designated to provide the response and has its station address coded to match the special two-character group address. The remaining stations in this group have their group address detectors set to detect one of the two characters in the special group address sequence. Thus, the station generating the response will be activated by the two-character sequence and all of the remaining stations in the group will be activated by one of the individual characters in the special group address.

2.22 *Message Monitor:* One station on a network can be assigned the task of copying all messages on a network. Coding the group address for NULL will activate the station whenever a call is originated. STX will remove the terminal from mark-hold permitting the message to be printed. Only the message is printed, no station identification, PRC, or NRC.

2.23 *Fast Addressing With Station Verification*

Later: An emergency network could be set up where all the stations are activated by their group address. STX places the network in the message mode. The message is transmitted. The select mode is reinstated by transmitting ETX. Each station on the network is individually selected using its station address. The originating station now receives the PRC or NRC indicating which stations received the message.

2.24 *Intermixing Group and Station Addresses:*

Stations can be called into use via their group address. This may leave one or two stations which are to receive the message, but are not

selected. The station address of the individual stations is transmitted to add these stations to those already selected. The method of selecting the stations, either by group or station addresses, can be intermixed. Standard operating procedures are followed.

2.25 *Pyramiding of Selected Stations:* It is possible to pyramid or increase the number of selected stations during a call. At the conclusion of the original message, ETX is transmitted. The new stations which are to receive the new message are now selected. STX is transmitted removing the mark-hold from all of the selected stations. The message will be received by the originally selected stations and the newly added stations.

2.26 The call should be terminated by transmitting EOT unless more stations are to be added to receive additional messages. Then ETX is transmitted and more stations are added as per 2.25.

3. REFERENCES

SECTION	TITLE
574-010-100	33 and 35 Teletypewriter Sets For EIA and Direct Neutral Interface—Description
581-123-105	Teletypewriter Station with 9131 Station Controller Using Limited Feature Selective Calling (Station to Station) Operation
581-123-106	Limited Feature Selective Calling Systems (Station to Station Operation) Using 9131 Station Controller
581-123-205	Teletypewriter Station with 9131 Station Controller Using Limited Feature Selective Calling (Station to Station) Operation
581-123-305	Teletypewriter Station with 9131 Station Controller Using Limited Feature Selective Calling (Station to Station) Operation
591-028-100	Data Sets 108D- and 108E-Types Used In Station Applications—Description

SECTION	TITLE	SECTION	TITLE
591-028-101	Data Sets 108D- and 108E-Types Single Private Line Station Arrangement Using Data Auxiliary Set 820D—Description and Operation	591-036-102	Data Set 109E-Type Single Private Line Station Using Data Auxiliary Set 820D-Type—Description
591-036-100	Data Set 109E-Type—Identification		