

**DATA SET 108-TYPE  
PRIVATE LINE SYSTEM STATION APPLICATION  
DESCRIPTION**

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**1.05** Data Sets 108A- and 108C-type are designed to work in conjunction with data auxiliary sets (DASs) in the 820 series for private line service.

**1.06** Data Sets 108A- and 108C-type have fixed transmit and receive frequencies. Data Set 108A transmits 2225 Hz for a mark frequency, 2025 Hz for a space frequency, and receives 1270 Hz for a mark frequency and 1070 Hz for a space frequency. Data Set 108B- and 108C-type both transmit 1270 Hz for a mark frequency and 1070 Hz for a space frequency, and receive 2225 Hz for a mark frequency and 2025 Hz for a space frequency. Therefore, two data sets of the same type cannot communicate with each other. Table A summarizes the line frequencies for the data sets.

**1. GENERAL**

**1.01** This section covers the physical and functional description of Data Set 108-type, designed to provide data communication over 2-wire private line voiceband facilities.



*Data Sets 108A- and 108C-type are not designed to handle supervisory line current.*

**1.07** Data Set 108A-type is intended to work with either a central office Data Set 108B-type for loop operation to the first telegraph office hub point or Data Set 108C-type for station-to-station operation. Data Set 108C-type is intended to work with Data Set 108A-type for station-to-station operation only.

**1.02** This section is reissued to provide a system concept of Data Set 108-type. Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

**1.03** This section contains information on Data Sets 108A- and 108C-type only. For information on Data Set 108B-type used in the central office hub, refer to the section entitled Data Set 108B, Description (312-800-100).

**1.04** Data Sets 108A- and 108C-type are low-speed, full-duplex, serial data sets that employ frequency-shift-keyed modulation and are intended for station applications.

**2. DESCRIPTION**

**SYSTEM DESCRIPTION**

**2.01** Data Set 108-type provides for the transmission of data at speeds up to 150 bauds on telegraph circuits and up to 300 bauds on point to point private line voice grade circuits. Station equipment includes the data set, data auxiliary set (station controller), teletypewriter (TTY) or customer-provided terminal (CPT). In addition, certain 108-type station applications will require key sets to place selected data sets into the test mode.

TABLE A

DATA SET	FREQ BAND	MARK FREQ	CENTER FREQ	SPACE FREQ
108A	TRMT F2	2225 Hz	2125 Hz	2025 Hz
	RCV F1	1270 Hz	1170 Hz	1070 Hz
108B or 108C	TRMT F1	1270 Hz	1170 Hz	1070 Hz
	RCV F2	2225 Hz	2125 Hz	2025 Hz

**2.02** The private line circuits may be divided into the following types:

- (a) Station-to-hub circuits
- (b) Station-to-station circuits.

Examples of typical private line station circuit arrangements are shown in Fig. 1.

#### PHYSICAL DESCRIPTION

**2.03** Data Sets 108A-type (Fig. 2) and 108C-type are printed circuit boards and are similar in appearance. The only differences are the filters and tuned circuits due to the assigned frequencies used by each type of data set.

**2.04** Each data set requires approximately 5 watts of filtered +24 and -24V dc power which is normally supplied by the DAS.

**2.05** The data sets operate in an ambient temperature range of 40 to 120°F and a relative humidity range of 20 to 95 percent.

#### FUNCTIONAL DESCRIPTION

**2.06** Data Set 108-type accepts from, and delivers to, the DAS voltage signals that conform to Electronic Industries Association (EIA) Standard RS-232-B. The EIA leads are as follows:

- BA—Transmitted Data
- BB—Received Data

- CF—Data Carrier Detector.

One additional non-EIA lead to the DAS is provided for control of the transmitted carrier.

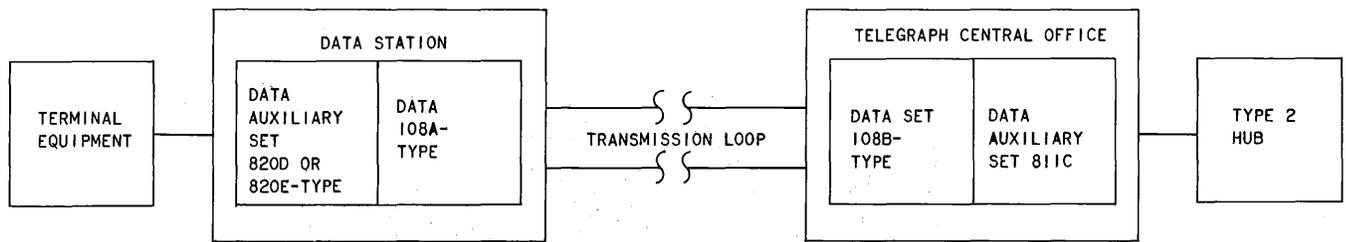
**2.07** The data set transmitting level is continuously adjustable from 0 dBm to -14 dBm to compensate for differences in local loop losses. This adjustment is made by R11 which is accessible from the front of the data sets.

**2.08** The data sets will operate satisfactorily over private line voiceband facilities which allow the received carrier frequencies to arrive at a signal strength greater than -40 dBm.

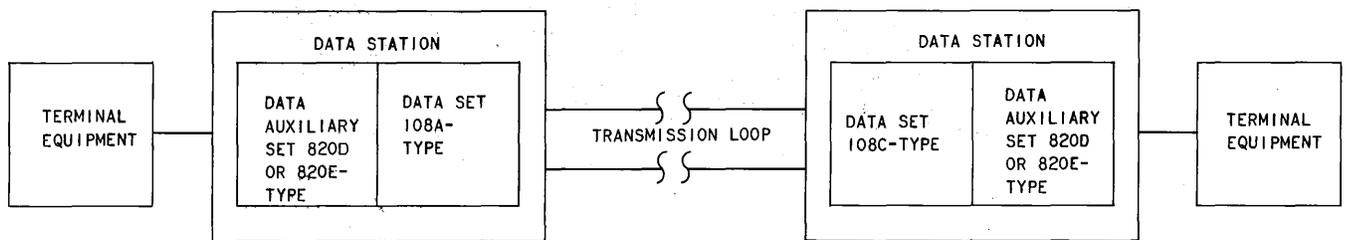
**2.09** The data sets incorporate loss-of-carrier detection which permits prompt recognition of transmission interruptions due to signal fading, line opens, etc. Upon detecting loss of received carrier, the data set responds as follows:

- (1) Provides loss of carrier indication to the associated DAS on the CF lead
- (2) Clamps the BB lead marking to the associated DAS
- (3) Assumes a preconnect mode and monitors for incoming marking carrier.

**2.10** When steady marking carrier is received for at least one-half second, the data sets are restored to their normal mode of operation.



A. STATION-TO-HUB OPERATION



B. STATION-TO-STATION OPERATION

Fig. 1—Data Set 108-Type Typical Station Circuit Arrangements

2.11 The data signals pass through the DAS. If current signals are involved, they are converted to EIA signals by the DAS and fed to Data Set 108-type. If EIA signals are used, the DAS passes these signals directly to the data set. Either interface is selected on an option basis on a printed circuit board supplied with the DAS.

2.12 Data Set 108-type converts the EIA signals on the transmitted data (BA) lead into voice-frequency tones for transmission over the private line facilities. The voice-frequency tones transmitted from the distant station are received by Data Set 108-type and converted into EIA voltage signals.

2.13 When the terminal equipment requires current signals, the interface card in the DAS converts the EIA signals from the data set into

current signals. When EIA signals are required, the interface card passes the data set EIA signals directly to the terminal equipment.

2.14 The following description of Data Sets 108A- and 108C-type assumes that EIA signals are required and refers to Fig. 3.

2.15 In the idle or marking condition, a negative voltage is applied on the transmitted data (BA) lead. This negative voltage conditions the *keyer* to cause the *oscillator* to generate a tone representing a mark signal. Data Set 108A-type will generate 2225 Hz while Data Set 108C-type will generate 1270 Hz. This frequency passes through the *send filter* to the *send buffer amplifier*.

2.16 The *send buffer amplifier*, in addition to isolating the *send filter* impedance from

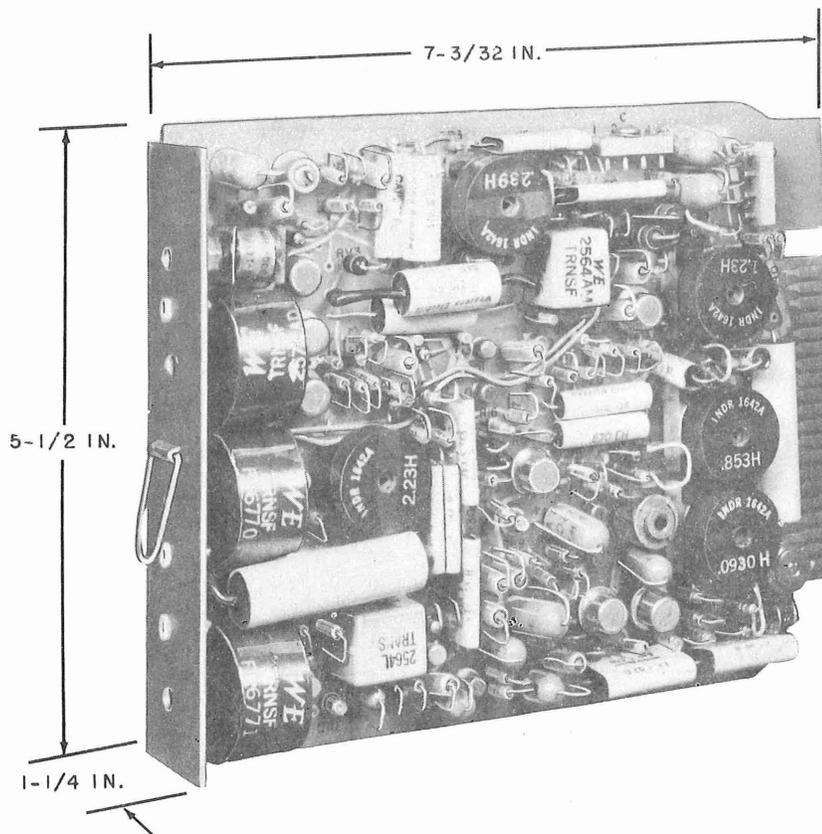


Fig. 2—Data Set 108A-Type

the *hybrid*, is an adjustable gain amplifier with an output level range from 0 dBm to -14 dBm. The output of the *send buffer amplifier* passes through the *hybrid* and then over the private line facilities to the distant data station.

**Note:** Assuming that a Data Set 108C-type is installed at the near end, a Data Set 108A-type must be installed at the distant end.

**2.17** A marking signal received from the distant data station passes through the *hybrid* to the *receive buffer amplifier*. The *receiver buffer amplifier*, in addition to isolating the telephone line from the *bandpass filter*, is an adjustable gain amplifier. The gain of the amplifier is adjusted in two 4-dB steps by means of a screw switch.

**2.18** The output of the *receive buffer amplifier* passes through the *bandpass filter* to the *limiter*. The two outputs of the *limiter* are to the *discriminator* and the *carrier detector*.

**2.19** The *limiter* amplifies the incoming frequency and limits the output to provide a constant amplitude signal to the *discriminator*. The *discriminator* detects, rectifies, and produces a voltage signal that is proportional to frequency. The output of the *discriminator* passes through the *low-pass filter*.

**Note:** Both Data Set 108A-type and Data Set 108C-type have the same type *low-pass filter*. The *low-pass filter* removes carrier ripple in the rectified signal from the *discriminator*.

**2.20** The dc voltage output from the *low-pass filter* passes through the *dc amplifiers* and out to the terminal equipment on interface lead BB in the form of EIA signals.

**2.21** The second output from the limiter is to the *carrier detector*. The *carrier detector* monitors the *output* of the limiter for the presence of an acceptable level of carrier. In the event

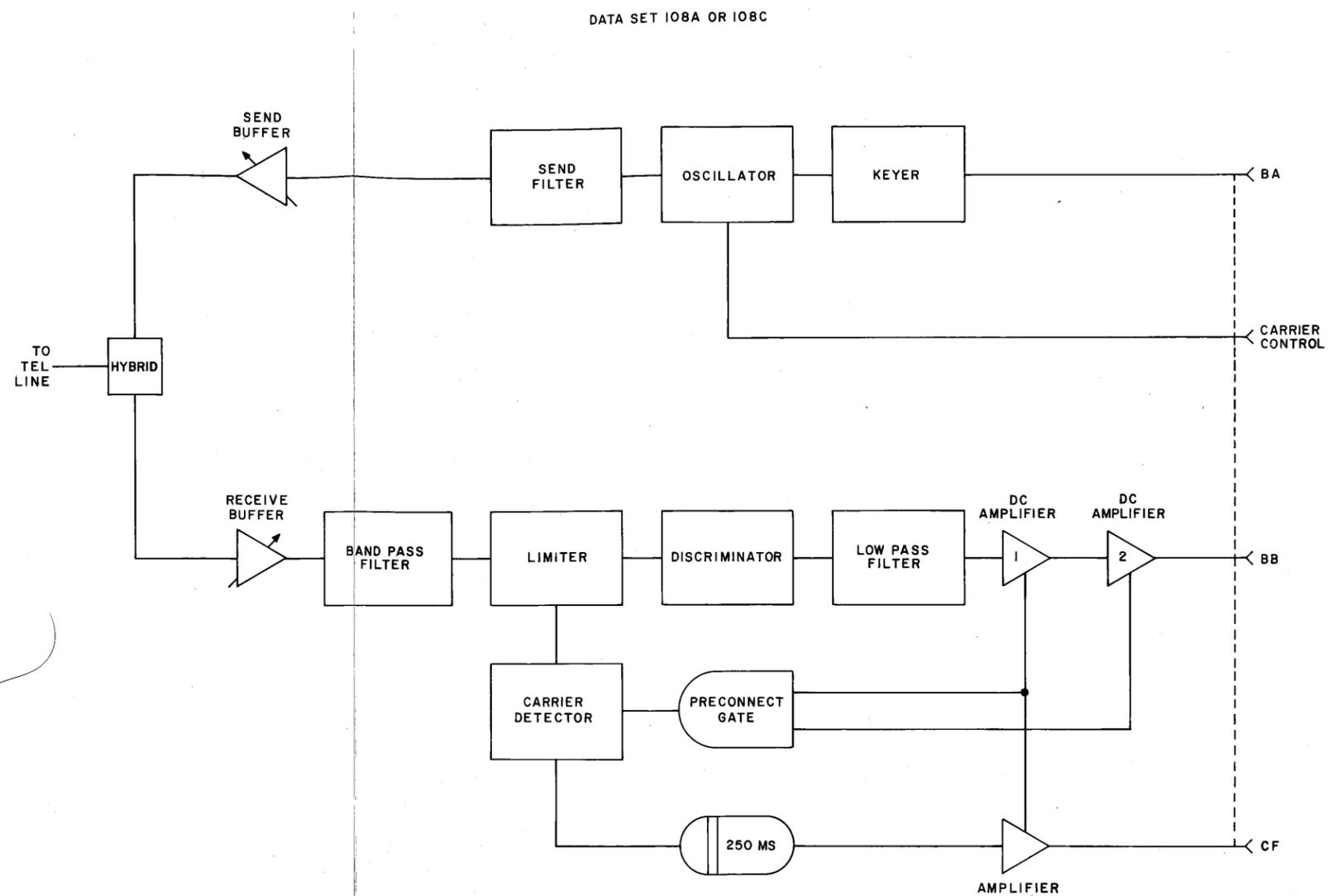


Fig. 3—Data Set 108-Type Functional Block Diagram

that the carrier power level falls below  $-47$  dBm for 110 to 250 milliseconds, the **carrier detector** operates and passes a signal to the **amplifier**. The **amplifier** conditions the **data carrier detector** to turn off interface lead CF. This notifies the terminal equipment that a failure exists. The **amplifier** also clamps interface lead BB in a marking condition (ie, mark hold condition). The data set assumes a preconnect mode in which it monitors for incoming marking carrier via the preconnect gate.



*In order to restore the data station to normal mode of operation after a carrier failure, two conditions must be met which are (1) a received carrier power level greater than  $-40$  dBm, and (2) the received carrier frequency is the mark frequency.*

**2.22** When the two conditions have been met for 200 to 500 milliseconds, the carrier detector circuit removes the signal to the **amplifier**. The **amplifier** removes the clamp on interface lead BB and turns on the data carrier detector lead to notify the terminal equipment that carrier has been restored.

**2.23** Some service applications using Data Set 108A- and 108C-type will use carrier squelch on data carrier failure option. When this option is provided, the DAS connects a ground to the **oscillator** whenever the carrier detector lead turns off, thereby turning off transmitted carrier to the distant data station.

**2.24** Data Sets 108A- and 108C-type are capable of operating in a test mode, which enables them to be tested from telegraph serviceboards (No. 2, 9B, etc). The test mode enables signals transmitted by the test center to be demodulated at the station and looped back to the modulator at the station for transmission to the test center. Detailed maintenance and test procedures are covered in the sections entitled Data Set 108-Type—Private Line System Station Application—Maintenance (591-023-300), Data Set 108-Type—Single Private Line Station Using Data Auxiliary Set 820D-Type—Test Procedures (591-023-501), Data Set 108-Type—Multiple Private Line Station Using Data Auxiliary Set 820E-Type—Test Procedures (591-023-502), and Data Set 108B—Maintenance (312-800-300) and Test Procedures (312-800-500).

**2.25** Test mode of operation is established by operating the test key on the associated DAS or keyset. The operated key will operate the **test** relay on the associated interface card and allow the data set to be tested. The **test** relay operates as follows:

- (a) Connects the receive lead (of the data set) to the transmit lead of the data set
- (b) Blocks signals from the data terminal equipment
- (c) Connects the carrier squelch on data carrier detector whether option is installed or not (this enables data set sensitivity tests to be made by the test center)
- (d) Connects ground to lead 1 to operate a lamp, if provided, to indicate the data set is in the test mode
- (e) Turns off the data set ready interface lead (CC) to the terminal equipment
- (f) Blocks the operate path of the local relay in the DAS.

**2.26** To restore the data set to normal mode, the **test** relay is released by operation of the appropriate key on the DAS or associated key equipment.

### 3. REFERENCES

**3.01** The following sections pertain to Data Set 108-type:

SECTION	TITLE
591-023-ZZ0	Data Set 108-Type—Private Line System Station Application
591-023-ZZ1	Data Set 108-Type—Single Private Line Station—Using Data Auxiliary Set 820D-Type
591-023-ZZ2	Data Set 108-Type—Multiple Private Line Station—Using Data Auxiliary Set 820E-Type
312-800-ZZ0	Data Set 108B

