# DATA SET 108-TYPE
# USED WITH VOICE GRADE CIRCUITS
# REFERENCE GUIDE

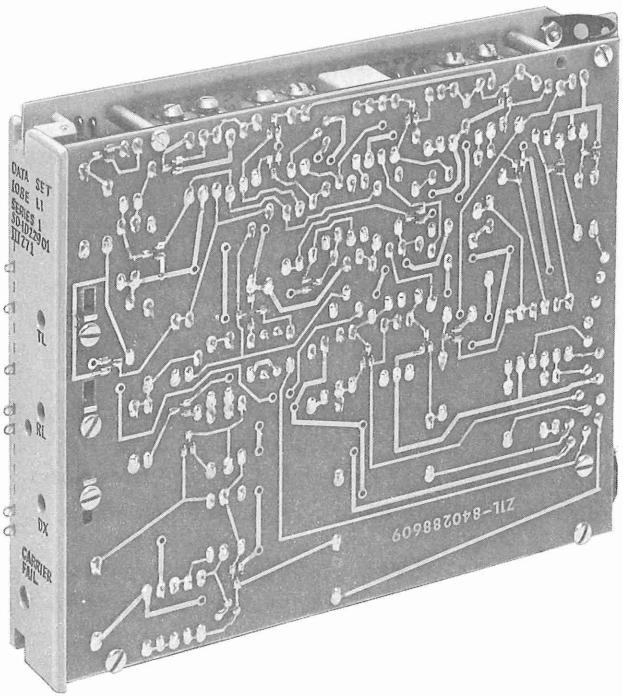


**Fig. 1—Data Set 108-Type—Typical**

## 1. GENERAL

**1.01** This section gives a brief summary of the pertinent functions and features of data sets 108A-, C-, D-, and E-type when used in either a single or multiple private line station with a customer-provided terminal. Data sets 108-type are full-duplex, frequency shift-keyed, serial binary transmission data sets that operate at low speeds (up to 300 baud) over either 2-wire or 4-wire point-to-point private line voiceband facilities. Data set 108A or E communicates with either a data set 108C or D.


***This section does not cover the data set 108-type for telegraph use with a WES ordering code. Only the applications of the data set 108-type covered by the USOC are presented in this section.***

**1.02** The data sets use Electronics Industries Association (EIA) voltage interface signals which are converted to voice-frequency tones for transmission. Circuit pack AR17 mounted in a DAS 820D or E provides current interface signals with optional contact closure on certain control leads when used with data set 108-type. Data sets 108A- and C-types are rated Manufacture Discontinued (MD) and are replaced by data sets 108E- and D-types, respectively.

## 2. PHYSICAL AND ELECTRICAL CHARACTERISTICS

**2.01** Data sets 108A and C consist of a single printed circuit card measuring 5-1/2 inches high, 1-3/8 inches wide, and 7-3/32 inches deep. Data sets 108D and E consist of two printed circuit cards (piggyback) measuring 5-1/2 inches high, 1-1/8 inches wide, and 7-3/32 inches deep. Data sets 108A and C weigh 1-1/2 pounds while 108D and E weigh 2 pounds.

**2.02** Data set 108-type is not supplied with a housing. It must be incorporated with other equipment into a housing to be functionally complete. The housing and associated data apparatus are ordered separately. An external power supply must be provided with the housing or ordered separately. The data set 108-type requires power sources of $+24 \pm 3$ and $-24 \pm 3$ volts dc and consumes approximately 5 watts of total power.

## 3. OPERATION

**3.01** The data set converts ac signals received from the line into dc signals and delivers them to the terminal equipment. Conversely, the data set converts dc signals received from the terminal equipment into voice frequency ac signals and transmits them onto the line. Since the ac signals are transmitted in opposite directions and occupy different frequency bands, the line functions as if it were two separate one-way channels. Thus, it is the terminal that dictates either half-duplex or full-duplex operation.

**3.02** In a private line arrangement, the data set is always connected to the line for normal operation. Transmission to the line can optionally be squelched upon a carrier fail condition via an appropriate data auxiliary set or mounting. A carrier fail condition causes the data set to enter the preconnect mode. In the preconnect mode, the data set must receive the proper unmodulated carrier frequency for a sufficient period of time (0.2 to 0.6 second) to remove the carrier squelch and restore the data set to normal operating condition.

**3.03** A functional comparison of data sets 108-type is provided in Table A.

## 4. SERVICE ORDER INFORMATION

**4.01** Data service orders should describe the desired service by USOC and should not specify particular data set codes. The ***encoding procedure*** to determine the appropriate USOC suffix is described in Section 590-000-100. Customer option decisions which must be made to determine the USOC suffix are listed in 4.03. An explanation of features and options common to most data sets is given in Section 590-000-101. A rapid cross-reference between USOC, data sets, and reference guides is presented in Section 590-000-102. Intercity Service Manual (ISM), Section 87, gives customer billing nomenclature, shows tariff listings for data services, and provides general reference information.


***Service orders should not specify data set codes. Engineering or Plant Department personnel responsible for selecting data sets are not compelled to use any particular data set codes specified or suggested on the service order. To achieve maximum reuse of data station apparatus, the first choice in selecting apparatus should be the oldest available model that will satisfy the service requirements as identified by USOC. When the desired data set model is not available from telephone company stocks (field or class C), the use of an available substitute is preferred over the purchase of a new current model. USOC decoding procedures are described in Section 590-000-100.***

**4.02** Service offerings and usable data sets are given in Table B. Table C shows the associated apparatus required with the data set 108-types.

### CUSTOMER OPTIONS

**4.03** The following paragraphs provide detailed information on customer options for ***USOC suffix determination.*** Customer options and option designations are given in Table D.

(a) ***DECISION A—Carrier Squelch Upon Carrier Fail or No Carrier Squelch Upon Carrier Fail:***

(1) ***1. Carrier Squelch:*** If the incoming carrier signal level drops below a certain value (−47 dBm for 2-wire or −50 dBm for 4-wire) for 0.11 to 0.30 second (carrier fail condition), the transmitted carrier will be squelched and the data set will enter the preconnect mode. This is an option on the associated data apparatus.

(2) ***2. No Carrier Squelch:*** If the incoming carrier fails, the transmitted carrier will not be affected.


***The Carrier Squelch on Carrier Fail option must not be installed at both ends of a point-to-point private line arrangement. Unless the option is desired for a specific reason, it is not recommended in a private line arrangement due to difficulties encountered in troubleshooting procedures.***

**TABLE A**

**FUNCTIONAL COMPARISON**

| FEATURES | | DATA SET | | | |
|---|---|---|---|---|---|
| | | 108A | 108C | 108D | 108E |
| Loop Termination | | 900 ohm 2-wire | 900 ohm 2-wire | 900 ohm 2-wire or 600 ohm 4-wire | 900 ohm 2-wire or 600 ohm 4-wire |
| Transmit Frequency | mark | 2225 Hz | 1270 Hz | 1270 Hz | 2225 Hz |
| | space | 2025 Hz | 1070 Hz | 1070 Hz | 2025 Hz |
| Receive Frequency | mark | 1270 Hz | 2225 Hz | 2225 Hz | 1270 Hz |
| | space | 1070 Hz | 2025 Hz | 2025 Hz | 1070 Hz |
| Restore Signal Required* | | Marking | Marking | Marking | Marking or Spacing |
| Transmit Level (dBm) | | Continuous 0 to −14 | Continuous 0 to −14 | Continuous −6 to −26 | Continuous 0 to −26 |
| Max Operating Speed (baud) | | 150 | 150 | 300 | 300 |
| Interface Signals† | | EIA | EIA | EIA | EIA |
| CF Lamp | | No | No | Yes | Yes |

*Signal which will restore data set transmission capability after data set has entered preconnect mode.

†EIA refers to Electronics Industries Association voltage interface signals. A current interface with data set 108-type is an option furnished with associated data apparatus.

(b) ***DECISION B—Optional Mark or Space Transmitted to Terminal Upon Carrier Fail:***

(1) ***3. Mark Hold:*** This option causes a marking signal to be continuously transmitted to the terminal device during a carrier fail condition.

(2) ***4. Space Hold:*** This option causes a spacing signal to be continuously transmitted to the terminal device during a carrier fail condition.


***These options are available with data set 108D and E and AR17 circuit pack.***

(c) ***DECISION C—Optional Copy or No Copy in Test Mode:***


***This decision is only applicable to station arrangements using DAS 820D or E with AR17 circuit pack.***

(1) ***5. Copy:*** This option is furnished by AR17 circuit pack at a station arrangement and is selected when a copy of outgoing traffic is desired while the station is in the test mode.

(2) ***6. No Copy:*** This option is selected when ***no*** copy of outgoing traffic is desired while the station is in the test mode.

**TABLE B**

**SERVICE OFFERINGS**

| USOC | FEATURE | USABLE SETS | REMARKS |
|---|---|---|---|
| DVS++ | Private line data only — 2-wire — 2-point only | 108A | 2 |
| | | 108E | Latest Model, 3,4 |
| | | 108C | 2 |
| | | 108D | Latest Model, 4 |
| | | 103F1 | 5 |
| | | 103F2 | 5 |

*Note 1:* Data-set 108A or E communicates with either a data set 108C or D. See Table C for associated apparatus required for this service.

*Note 2:* Not for multiple installations over 6 data sets, 2-wire only, no CF lamp.

*Note 3:* Steady space also reenables carrier indication.

*Note 4:* 2-wire or 4-wire, single or multiple installations, CF lamp.

*Note 5:* Not for multiple installations, 2-wire only, no CF lamp. Permanent mode option is required. Wiring modification required to turn request-to-send lead on. (Strap P4-4 to P4-9 on customer interface connector.)

(d) ***DECISION D—Optional Local Copy or No Local Copy of Outgoing Traffic:***


***This decision is only applicable to station arrangements using DAS 820D or E with AR17 circuit pack.***

(1) ***7. Local Copy:*** This option is furnished by AR17 circuit pack at a station arrangement and is selected when local copy of all outgoing traffic is desired.

(2) ***8. No Local Copy:*** This option is selected when ***no*** local copy of outgoing traffic is desired.

**4.04** Telephone company engineering options and option designations are given in Table E.

## 5. DISPOSITION AND CONVERSION INFORMATION

**5.01** Table F provides disposition and conversion information for data set 108-type. Update information is given as part of Table G, Series Information.

## 6. MAINTENANCE SPARE GUIDELINES

**6.01** To reduce the types of data sets in field stock, a universal spare may be used for a group of in-service data sets containing various features. For a recommendation of the substitute data sets which should be stocked for maintenance spares, refer to Table H.

## 7. REFERENCES

**7.01** The following Bell System Practices provide additional information on data sets 108-type and associated equipment.

**Data Set 108A- and 108C-Type**

| SECTION | TITLE |
|---|---|
| 591-023-100 | Private Line System Station Application—Description |

## TABLE C

## ASSOCIATED APPARATUS

| DATA SET | APPLICATION | REQUIRED ASSOCIATED DATA APPARATUS | PURPOSE OF DATA APPARATUS |
|---|---|---|---|
| 108-Type | Single Station | DAS 820D<br>And<br>AR17 Circuit Pack | Houses data set and AR17 CP and provides test mode capability<br>Provides interface connections within station and options |
| | Multiple Station Using 108D or E only | 28A1 Data Mounting<br>And<br>27B1 Data Unit<br>And<br>KS-20575 Rectifier | Houses data sets, data unit, and power supply<br>Provides interface connections within station, Carrier squelch on carrier fail option, and test mode capability<br>Supplies power (+24V and −24V) |
| | Multiple Station | DAS 820E<br>And<br>AR17 Circuit Pack | Houses 6 or less data sets and AR17 CP and provides test mode capability<br>Provides interface connections within station and options |

| | | | |
|---|---|---|---|
| 591-023-300 | Private Line System Station Application—Maintenance | 591-023-501 | Single Private Line Station Using Data Auxiliary Set 820D-Type—Test Procedures |
| 591-023-101 | Single Private Line Station Using Data Auxiliary Set 820D-Type—Description and Operation | 591-023-102 | Data Sets 108A and C Multiple Private Line Station Using Data Auxiliary Set 820E-Type—Description |
| 591-023-201 | Single Private Line Station Using Data Auxiliary Set 820D-Type—Installation and Connections | 591-023-202 | Data Sets 108A and C Multiple Private Line Station Using Data Auxiliary Set 820E-Type—Installation and Connections |
| 591-023-301 | Single Private Line Station Using Data Auxiliary Set 820D-Type—Maintenance | 591-023-302 | Data Sets 108A and C Multiple Private Line Station Using Data |

**TABLE D**

**CUSTOMER OPTIONS**

| DECISION | CUSTOMER OPTION | OPTION DESIGNATION | | |
|---|---|---|---|---|
| | | AR17 | 27B1 | DATA SET 108D & E |
| A (Note 1) | 1. Carrier squelch upon carrier fail | K | R | — |
| | 2. No carrier squelch upon carrier fail | J | Q | — |
| B (Notes 1 and 2) | 3. Mark transmitted to terminal upon carrier fail | N | — | U |
| | 4. Space transmitted to terminal upon carrier fail | M | — | V |
| C (Note 3) | 5. Copy in test mode | T | * | — |
| | 6. No copy in test mode | S | — | — |
| D (Note 3) | 7. Local copy of outgoing traffic | R | — | — |
| | 8. No local copy of outgoing traffic | Q | * | — |

***Note 1:*** This decision is necessary for both single station and multiple station arrangements.

***Note 2:*** For data set 108A or C, this option is provided on AR17 circuit pack. When using data set 108D or E with the AR17 circuit pack, the option is available with both the data set and circuit pack; however, the circuit pack option setting has control over the option. In this case, the data set option setting has no effect upon operation.

***Note 3:*** This decision is necessary only for station arrangements using DAS 820D or E. When using 27B1 data unit, the features (*) obtained are always "Copy in test mode" and "No local copy of outgoing traffic."

| | | | |
|---|---|---|---|
| | Auxiliary Set 820E-Type—Maintenance | | 820D-L1A in the 10-Type Data Line Concentrator System (DLCS) |
| 591-023-502 | Data Sets 108A and C Multiple Private Line Station Using Data Auxiliary Set 820E-Type—Test Procedures | 591-023-210 | Single Private Line Station Using Data Auxiliary Set 820D-L1 or 820D-L1A in the 10-Type Data Line Concentrator System (DLCS) — Installation and Connections |
| 591-023-110 | Single Private Line Station Using Data Auxiliary Set 820D-L1 or | 591-023-310 | Single Private Line Station Using Data Auxiliary Set 820D-L1 or |

## TABLE E

## TELCO ENGINEERING OPTIONS

| FEATURE | DESIGNATION (NOTE 1) | UNIT (NOTE 2) |
|---|---|---|
| 900 ohm 2-wire (Note 3)<br>600 ohm 4-wire | Y<br>Z | Data Set 108D and E |
| Transmit signal level | —<br>(Note 4) | Data Set 108-Type |
| Six-dB pad in<br>Six-dB pad out | K<br>J | Data Set 108D and E |
| Eight-dB pad in<br>Four-dB pad in<br>Zero-dB pad in | —<br>—<br>— | Data Set 108A and C |
| EIA voltage interface<br>Current interface | W (Note 5)<br>V | AR17 Circuit Pack |
| Full-duplex | X (Note 6) | Data Set 108D and E |

*Notes:*

1. Option designations must be examined in conjunction with unit to which they apply.
2. This column specifies the unit with which the option is available.
3. Data set 108A and C have only the 900 ohm 2-wire feature available.
4. The transmit signal level is continuously adjustable in the data set 108-type over the required range (see Table A).
5. Multiple station arrangements use only the EIA voltage interface. Current interface is for use at single station arrangements with terminal devices requiring a current interface.
6. Full-duplex must be installed at all station arrangements. If the terminal device is half-duplex, the data set automatically operates in that manner.

**TABLE F**

**DISPOSITION AND CONVERSION INFORMATION**

| DATA SET | LATEST SERIES | MANUFACTURE STATUS | REPLACED BY | DISPOSITION RECOMMENDATION |
|---|---|---|---|---|
| 108A | 5 | MD | 108E | Update series 2,3,4 and Repair |
| 108C | 5 | MD | 108D | Update series 2,3,4 and Repair |
| 108D | 6 | Standard | — | Update series 3 and Repair |
| 108E | 4 | Standard | — | Repair |

820D-L1A in the 10-Type Data Line Concentrator System (DLCS)—Maintenance

591-023-510 Single Private Line Station Using Data Auxiliary Set 820D-L1 or 820D-L1A in the 10-Type Data Line Concentrator System (DLCS)—Test Procedures

**Data Set 108D- and 108E-Type**

591-028-100 Used in Station Applications—Description

591-028-101 Single Private Line Station Arrangement Using Data Auxiliary Set 820D—Description and Operation

591-028-201 Single Private Line Station Arrangement Using Data Auxiliary Set 820D—Installation

591-028-301 Single Private Line Station Arrangement Using Data Auxiliary Set 820D—Maintenance

591-028-501 Single Private Line Station Arrangement Using Data Auxiliary Set 820D—Test Procedures

591-028-102 Multiple Private Line Station Arrangement Using 28A1 Data Mounting and 27B1 Data Unit—Description

591-028-202 Multiple Private Line Station Arrangement Using 28A1 Data Mounting and 27B1 Data Unit—Installation and Connections

591-028-302 Multiple Private Line Station Arrangement Using 28A1 Data Mounting and 27B1 Data Unit—Maintenance

591-028-502 Multiple Private Line Station Arrangement Using 28A1 Data Mounting and 27B1 Data Unit—Test Procedures

**Miscellaneous**

590-000-100 Implementation of Data Services, Interdepartmental Coordination

590-000-101 Reference Guide—Description of Data Set Features and Options

590-000-102 Data Service—Reference Guides, Cross-Reference Information.

## TABLE G

## SERIES INFORMATION

| DATA SET | SERIES | MODIFICATION | UPDATE |
|---|---|---|---|
| 108A | 2 | Voltage stabilization | Yes |
| | 3 | Improve temperature performance of data carrier detector | Yes |
| | 4 | Improve temperature performance of FM discriminator | Yes |
| | 5 | Mechanical redesign | No |
| 108C | 2 | Voltage stabilization | Yes |
| | 3 | Improve temperature performance of data carrier detector | Yes |
| | 4 | Improve temperature performance of FM discriminator | Yes |
| | 5 | Mechanical redesign of option switcher | No |
| 108D | 2 | Lamp type change | No |
| | 3 | Proper operation of directional control circuit — double spacing condition | Yes |
| | 4 | New option switch | No |
| | 5 | First shielded transformer | No |
| | 6 | Second shielded transformer | No |
| 108E | 2 | New option switch | No |
| | 3 | First shielded transformer | No |
| | 4 | Second shielded transformer | No |

**6.02** The following schematic drawings (SDs) and circuit descriptions (CDs) provide additional information on data set 108-type and associated equipment.

**NUMBER** **TITLE**

SD- & CD-3D024-01 Data Set 108A-Type

SD- & CD-3D032-01 Data Set 108C-Type

SD- & CD-73060-01 Data Set 108D-Type

SD- & CD-1D229-01 Data Set 108E-Type

SD- & CD-3D031-01 Data Auxiliary Sets 820D- and 820E-Type

SD- & CD-1D176-01 Data Systems Station 28-Type Data Mounting

SD- & CD-1D183-01 Data Systems 27-Type Data Unit.

## TABLE H

## MAINTENANCE SPACE GUIDELINES

| SETS IN SERVICE | COMMON MAINTENANCE SPACE | REMARKS |
|---|---|---|
| 108A | 108A | |
| 108A<br>108E | 108E | 1 |
| 108C | 108C | |
| 108C<br>108D | 108D | 1 |

*Note 1:* When more than one spare is required, a combination of both in-service sets could be used.