E2 STATUS REPORTING AND CONTROL SYSTEM
ALARM REPORTING REMOTE
DESCRIPTION

CONTENTS PAGE

1. GENERAL

1.01 This section describes the equipment and operating features associated with the J92617J, -K, and -L, -AJ, -AK, and -AL alarm reporting remote bays and the J92617EJ, -EK, and -EL expansion bays.

1.02 Whenever this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 The E2 system is a solid-state general-purpose telemetry system. A typical E2 system consists of a central station and a number of remote stations that are used for gathering information from remote locations. Section 201-644-100 contains a description of the overall E2 system. The manual alarm central station is described in Section 201-644-112.

1.04 Communication between central and the remotes is performed using frequency shift keying (FSK) over 4-wire voice-frequency data networks. The information is contained in binary words, each 30.5 bit intervals in length. (See Fig. 1.)

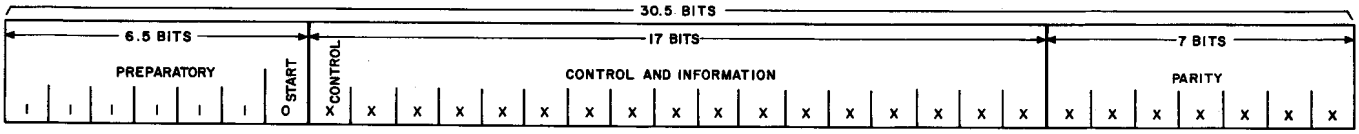
1.05 The basic equipment at each remote station is modular or prepackaged in nature. Each shelf in the remote bays is dedicated to a particular feature or aspect (eg, alarm status panels, regenerators, etc.). In general, the number of shelves of equipment and, therefore, the number of bays depend on the features incorporated and the number of alarms or status points to be monitored.

1.06 The alarm reporting remote is equipped for alarm reporting, status display reporting, and remote switching. Each of these features is discussed in detail in Part 3 of this section.

2. PHYSICAL DESCRIPTION

A. J92617J, -K, and -L Remote Station Bays

2.01 The J92617J, -K, and -L (11-foot 6-inch, 9-foot, and 7-foot bays, respectively) are the older versions of the alarm reporting remote. They are 23-inch wide unequal flange duct-type



NOTE:
X INDICATES EITHER A LOGIC 0 OR 1.

Fig. 1—E2 Word Format

bays which require access to both front and rear. Although these bays are functionally identical to the J92617AJ, -AK, and -AL remote bays, the physical layout of the bays is different. A typical layout of a J92617J, -K, or -L remote bay is shown in Fig. 2. Note these bays are now rated Manufacture Discontinued (MD) except for selected growth lists which are rated Additions and Maintenance Only (A & M Only).

B. J92617AJ, -AK, and -AL Alarm Reporting Remote Bays

2.02 The J92617AJ, -AK, and -AL (11-foot 6-inch, 9-foot, and 7-foot, respectively) alarm reporting remote bays are 23-inch wide unequal flange duct-type bays which require access to both the front and rear. The basic difference between these bays and the J92617J, -K, and -L remote bays is that the -AJ, -AK, and -AL bays are prepackaged and have list numbers for each mode and feature and a new alarm and status input panel. A typical alarm reporting remote bay, along with the identification of each panel, is shown in Fig. 3.

C. J92617EJ, -EK, and -EL Alarm Reporting Expansion Bays

2.03 The J92617EJ, -EK, and -EL (11-foot 6-inch, 9-foot, and 7-foot, respectively) alarm reporting expansion bays are 23-inch wide unequal flange duct-type bays which require access to both front and rear. These bays are used to incorporate additional remote switch and alarm and status input panels when the main remote bay has been filled to capacity. A typical expansion bay is shown in Fig. 4. Note that these bays can be used to expand the older type remote bays (J92617J, -K, and -L) as well as the newer alarm reporting remote bays (J92617AJ, -AK, and -AL).

3. FUNCTIONAL DESCRIPTION

A. General

3.01 Figure 5 is a block diagram of an alarm reporting remote. This figure shows the interconnection among all the various circuits which make up the features available with the remote. Information, as stated previously, is transferred between the remotes and central over 4-wire voice-frequency data networks. The interface between the data network and the E2 equipment is provided by the data transmission circuit (data set). The receiver in the data transmission circuit converts the incoming FSK tones into binary bits (1s and 0s). This information is then sent to the data transmission control (DTC) circuit for processing. The transmitter section of the data transmission circuit reverses the above operation.

3.02 The DTC circuit contains a 17-bit shift register, memory for the register, an address recognizer (not shown in Fig. 5), and transmission, timing, and error control circuits. The basic E2 word sent to the central from the the remote (and vice versa) is shown in Fig. 1. The first 5.5 bits of every word (preparatory bits) are used to turn on the data sets at the remotes. The next bit, a logic 0 start bit, synchronizes the clocks in the receiver at each remote. The following 17 bits (information bits) which contain the remote address, type of operation, etc., are received by the control circuits and then sent to the shift register. At the same time that the bits are sent to the shift register, they are sent to the error control circuit where they are used to generate the parity bits. When the word-length counter indicates that all the information bits are in the shift register, the input to the shift register is disabled. The last 7 bits (parity bits) are then sent to the error control circuit where they are compared with the parity bits generated from the 17 information bits. If both sets of parity bits are the same, the information

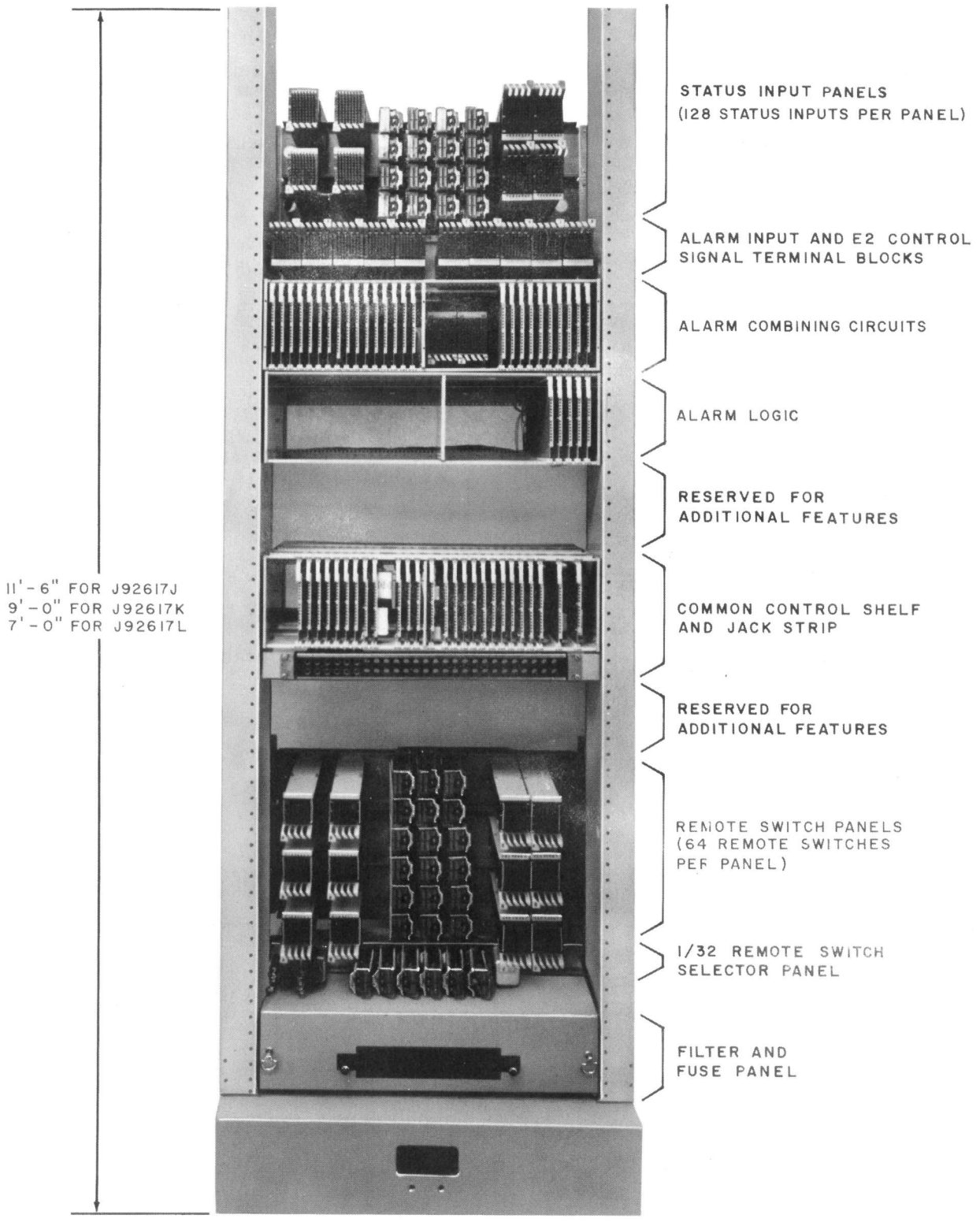


Fig. 2—J92617J, -K, and -L Remote Station Bay

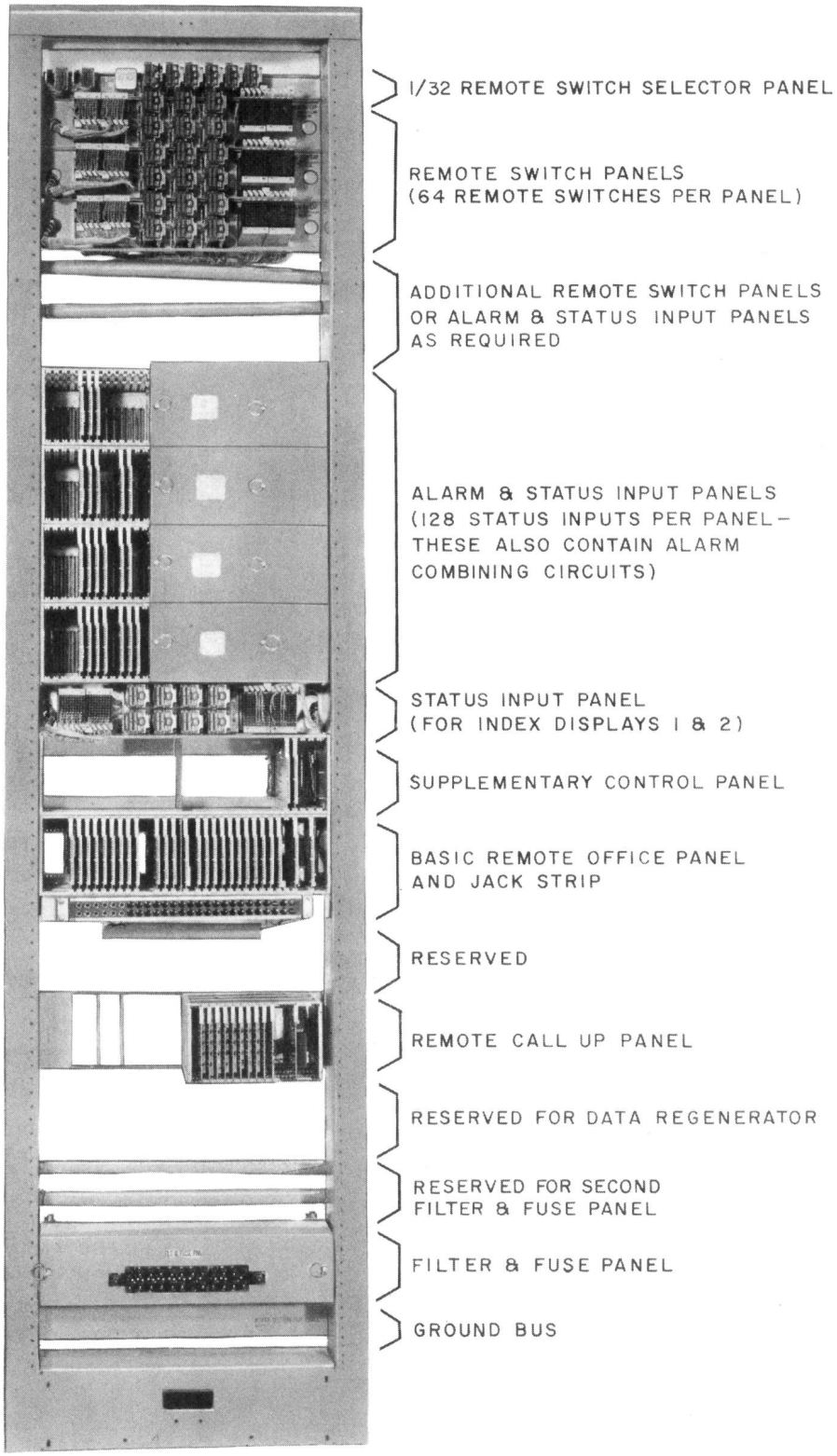


Fig. 3—J92617AJ, -AK, and -AL Alarm Reporting Remote Bay

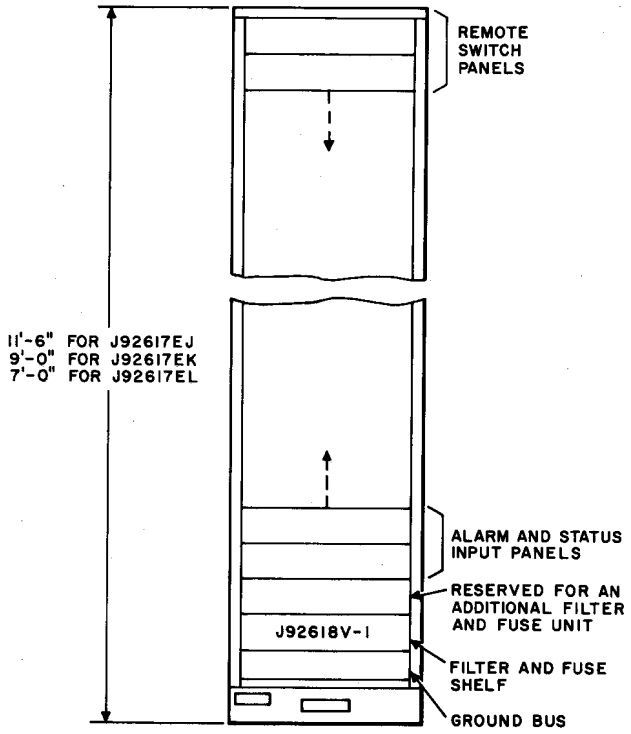


Fig. 4—J92617EJ, -EK, or -EL Expansion Bay

is assumed to be without error. If they are not the same, an error is indicated and the word is ignored. Once the entire word is determined to be without error, the remote address portion is compared by each remote with its own address. If the two addresses match, the word is sent to the appropriate circuits. If the addresses do not match, the word is ignored.

B. Alarm Reporting

3.03 Figure 6 is a functional block diagram showing the circuitry and the word format for the alarm reporting feature. Alarm reporting is the automatic reply to an alarm polling request sent by the central station. As each remote is polled, it replies with a one-word answer which indicates the overall alarm condition at that remote. To provide the one-word answer, the remote combines all of its alarm conditions into a maximum of six bits, as shown in Fig. 6B. Each alarm status to be combined generates an AC and a DC alarm indication. The AC lead is used for reporting NEW alarms and the DC lead is used for reporting uncleared ANY alarms. Similiarly, the NEW and ANY alarms are combined to form three or five of the six bits in the reply word, depending on which station assignment concept (large or small) is used.

3.04 For alarm reporting, a one-word command is sent from the central station. This word contains the remote address and a logic 0 in bit positions 2 and 3 to indicate to the remote that it is an alarm report request. As soon as the address in the received word has been checked for correspondence with the remote's address, the alarm transmitting circuit sends the summarized alarm information to the DTC along with a start-transmit-mode signal.

3.05 The transmission from the remote begins with 5.5 logic 1 preparatory bits followed by a logic 0 start bit. As the start bit is transmitted, the shift register is loaded with the summarized alarm information from the alarm transmitting circuit. The shift register then shifts the information, one bit at a time, to the transmission control circuit and also to the error control circuit to form the parity bits. When the last information bit is sent to the DTC, the output of the error control circuit is enabled and the parity bits are sent to the DTC. Once all bits have been transmitted back to the central, via the data transmission circuit, the alarm report is complete.

C. Status Display Reporting

3.06 A block diagram and word format for the status display reporting feature is shown in Fig. 7. A status display report consists of the transmission of one-fourth of a group, or four subgroups (words). The request for a status display report requires two words from the central station. The first word contains the remote address and the group number from which the report is desired. It also indicates, by logic 1s in bit positions two and three, that a second word will follow. The second word received by the remote causes the counter in the group transmitting circuit to preset to state 1, 5, 9, or 13. The counter is then allowed to update through the four subgroups (for example, 1 through 4, 5 through 8, etc.). After the proper subgroup has been selected by the matrix selector circuit and the subgroup selector circuit, the condition of the statuses are loaded into the load gates of the group transmitting circuit. From there, the status information is shifted to the DTC circuit for transmission to the central station.

D. Status Group Reporting

3.07 E2 alarm reporting remotes can status display report and status group report to certain types of central stations, as shown in Table A. Figure 7 is a functional block diagram of the group reporting circuitry and associated word format. To request a status group report, the central sends a one-word command to the remote (see Fig. 7C). The word contains the remote address of the desired station and the number of the group to be reported, along with a logic 1 in bit position 3, all of which identifies it as a status group report command. When the request from the central is received, by the remote, it is first checked for errors (parity). If the word is without error, the portion of the word containing the remote address is sent to the address recognizer and compared to the address of that remote station. If both addresses match, the remaining portion of the word is processed. This includes both the group number going to the matrix selector circuit via the 4-bit memory in the DTC and the bits indicating that the word is a group report request going to the group transmitting circuit.

TABLE A

STATUS REPORTING BY E2 REMOTES

TYPE OF STATUS REPORTING BY E2 REMOTES	TYPE OF TELEMETRY CENTRAL		
	E1 MANUAL	E2 MANUAL	SCOTS
Status Display RPT	No	Yes	Yes
Status Group Reporting	Yes	No	Yes

3.08 The group number acting through the matrix selector circuit enables one of the columns in the 16-by-16 array of relays, while the subgroup number from the group transmitting circuit enables one of the rows in the array. The combined action of the group and subgroup number activates one relay. Each relay has 16 contacts, one for each status in the subgroup. A group report is accomplished by the matrix selector enabling the column of relays corresponding to the group being reported. Simultaneously, the group transmitting circuit counts from 1 to 16 enabling one subgroup relay in that group to count. The counting is done slowly (about 10 counts per second) so that enough time is allowed for the 16 bits to be loaded into the load gates for transmission back to the central. This process continues until the entire group (256 bits) is transmitted back to the central.

E. Remote Switching

3.09 Figure 8 is a block diagram of the remote switching feature and the associated word format. To initiate a remote switch operation, the central must send a two-word command. The first word contains the station address, the group number, and a logic 1 in bit positions two and three, which indicates that a second word is coming. The second word contains the subgroup number, the switch number, and the remote switch command. The remote switch command sets the duration of contact closure which is 300 milliseconds.

3.10 After the words have been checked by the remote for errors, they are sent to the other circuits. The group number and part of the subgroup number are sent to the matrix selector circuit. The switch number and one bit of the subgroup number are sent to the remote switch control circuit. The remote switch control circuit then combines the switch number from the control circuit and the group number from the matrix selector circuit to produce a momentary relay contact which corresponds to the switch number in the central command word. Once the relay has operated, the remote switch control circuit sends a start-transmit-mode (STM1) signal to the DTC circuit. The shift register then transfers a response word (Fig. 8B) to the transmission control circuit for transmission back to the central as verification that the remote has received the remote switch command without error.

4. REMOTE CALL-UP DATA TRANSFER

4.01 Remote call-up (RCU) data transfer is a special feature incorporated in some remotes which will permit non-E2 input/output (I/O) devices to use the data network of the E2 system for data transfer between remote stations on the same data network. An example of the use of this feature is in the Transmission Surveillance System for transmission maintenance on the L5 Carrier System.

A. Request Procedure

4.02 Before data transfer between I/O devices can be accomplished, permission must be attained from the controlling RCU central. In order to do this, the I/O device first indicates the

request for data transfer to the E2 remote via a command request signal. This signal inserts a logic 1 in position 17 of the alarm poll reply word. This indicates to the central that the remote wishes to perform a data transfer process. Immediately after the central receives the request from the remote, it stops polling and sends a transmit data command to the remote. The remote then loads, from the input device, the address of the remote and the I/O device to which the information is to be sent. This first word also contains two bits which indicate, if desired, a continue (CN) request and/or an immediate reply (IR) request. These bits inform the central whether or not the I/O device wishes to continue the data transfer process and whether an immediate reply is required from the receiving remote. The remaining 15 words contain the data to be transferred to the desired I/O device. These words require no special format as far as the E2 system is concerned and can be in any form which satisfies the I/O device using the E2 data network. Once all data has been transferred, the central is returned to the alarm polling function. Note that if either of the remotes should fail during this process, a time-out circuit at the central will return the system to the alarm polling function. The maximum time that RCU can inhibit alarm reporting is 30 seconds. At the end of this interval, the central will automatically return to alarm polling.

B. Transmitting and Receiving

4.03 Figure 9A is a functional block diagram showing the remote call-up circuitry at a remote station. The diagram shows two types of data flow: information, shown by the heavy lines; and control, shown by the lighter lines.

4.04 When the remote receives the TD command, the word containing the station address, I/O address, and control bits (CN & IR) is loaded into a register in the transmitting circuit (Fig. 9A). During transmission of the first word, *load buffer* pulse is given to the I/O device directing it to load the next word into its buffer. When this word has been loaded into the I/O buffer, the I/O device will give the RCU equipment a *buffer ready* (BR) pulse. On completion of transmission of the first word, the group transmission circuit initiates transmission of the second word. This word is then loaded into the transmission circuit buffer and then transmitted. This process continues until all words in the sequence have been transmitted.

4.05 If a transmission is less than 16 words long, a *group end* pulse is supplied to the system along with BR pulse to indicate that the word is the last word in the transmission. Note that this does not necessarily terminate the entire transmission sequence, but only the transmission of that group. It is possible to send several data transmissions of five or six words, each in sequential order, linked by a continue bit in the first word of each transmission.

C. Reply Transmissions

4.06 If the transmitting I/O device requires verification from the E2 system that the data was transferred to a particular I/O device (at the receiving station) without a transmission error, and that the receiving device was not busy, it will request an IR. This two-word reply indicates the receiving I/O address and a no-error verification, a data ignored (indicating the I/O device was busy), or a transmission error (indicating there was an error in the transmission or that the receiving I/O device was insane).

4.07 If a CN and IR (Fig. 9B) are requested, the transmitting I/O device places a logic 1 in bit positions 12 and 13 of the first word (4th word in 9B). When this word is transmitted, the RCU panel at the central stores the CN and IR bits along with the remote address. After the last word in the block of data is transmitted, the central transmits a TD command to the receiving station and an IR will be returned. When the IR is returned, the address of the remote to which it is directed is stored by the RCU central panel and the IR flip-flop in the central is cleared. Since the continue flip-flop is still set at the RCU central panel, a TD command will be sent to the remote receiving the IR. Thus, the transmitting remote is able to transmit the second block of data.

4.08 If the transmitting station does not request an IR but requests a continue, then a quick reply (Fig. 9C) will be given instead of an IR. A quick reply is an error verification similar to the IR, except it is only one word and does not indicate a specific I/O device or E2 remote address. Since the transmitting station requested to continue, and after the quick reply has been given, the central transmits a TD command to the transmitting station using the address stored in the central; the second block of data will be transmitted. If the address word for this block of data does not contain an IR

or CN, a quick reply will be returned and the central will return to the poll mode.

4.09 If the transmitting I/O device requires data to be returned from the receiving I/O device, two commands must be transmitted. The first word (see fourth word in Fig. 9D) contains the address of the remote to which the data is to be transmitted and a logic 1 in bit position 13. The second word is contained in one of the remaining 15 data words in the transmitted block of data. When the first word of the transmitted block is sent, the RCU panel at the central will store the receiving remotes address and the logic 1 in bit position 13 indicating that an immediate reply is requested.

4.10 At the receiving remote, bit 13 of the first word (fourth word in 9D) sets the immediate reply flip-flop. Once the completion data block has been received, the central transmits a TD command to the remote. If the receiving I/O device has initiated a BR pulse, the remote will then return a response reply (Fig. 9D). If the I/O device has not initiated a BR pulse, an IR will be returned and the E2 system will go back to the polling mode. The next time the central polls that remote, if a BR pulse has been initiated by the I/O device, the data will then be returned to the transmitting remote as a deferred response (Fig. 9E).

5. MAINTENANCE CONSIDERATIONS

5.01 If trouble occurs at a remote station, the problem can be isolated to a circuit pack (CP) or group of CPs through the use of the E-telemetry station test set (KS-20937) and the RCU test set (Model RCU-100). The defective CPs are then replaced with the spares provided, and the defective CPs are repaired.

6. REFERENCES

6.01 The following is a list of circuit descriptions (CDs), schematic drawings (SDs), and Bell System Practices (BSPs) associated with the E2 remotes.

DRAWING	TITLE
1C301-01	Data Transmission Circuit
1C302-01	Data Transmission Control Circuit
1C306-01	Remote Switch Control Circuit
1C307-02	Alarm Transmitting Circuit
1C308-01	Group Transmitting Circuit
1C309-01	Status Input Circuit
1C310-01	Matrix Selector Circuit
1C311-01	Remote Switch Circuit
1C314-01	Filter, Fuse, and Grounding Circuit
1C320-01	System Block Diagram
1C322-01	Remote Call-up Data Transfer Circuit

SECTION	TITLE
103-117-101	E-Telemetry Station Test Set—Description, Operation and Maintenance
201-644-100	Overall System—Description
201-644-110	Multidirectional Data Regenerator—Description
201-644-112	Manual Alarm Central—Description
201-644-142	Remote Call-up Test Set—Description, Operation and Maintenance

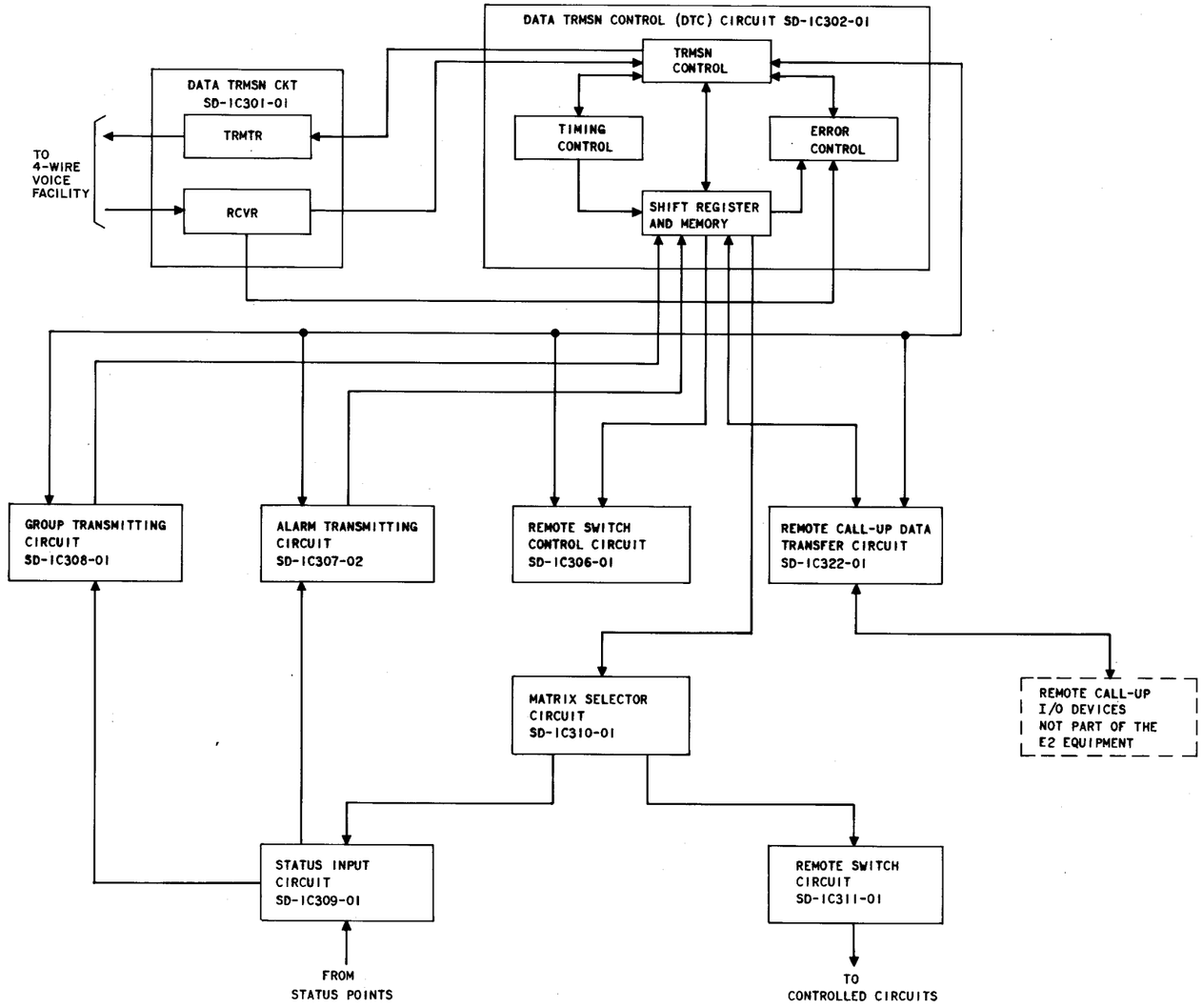
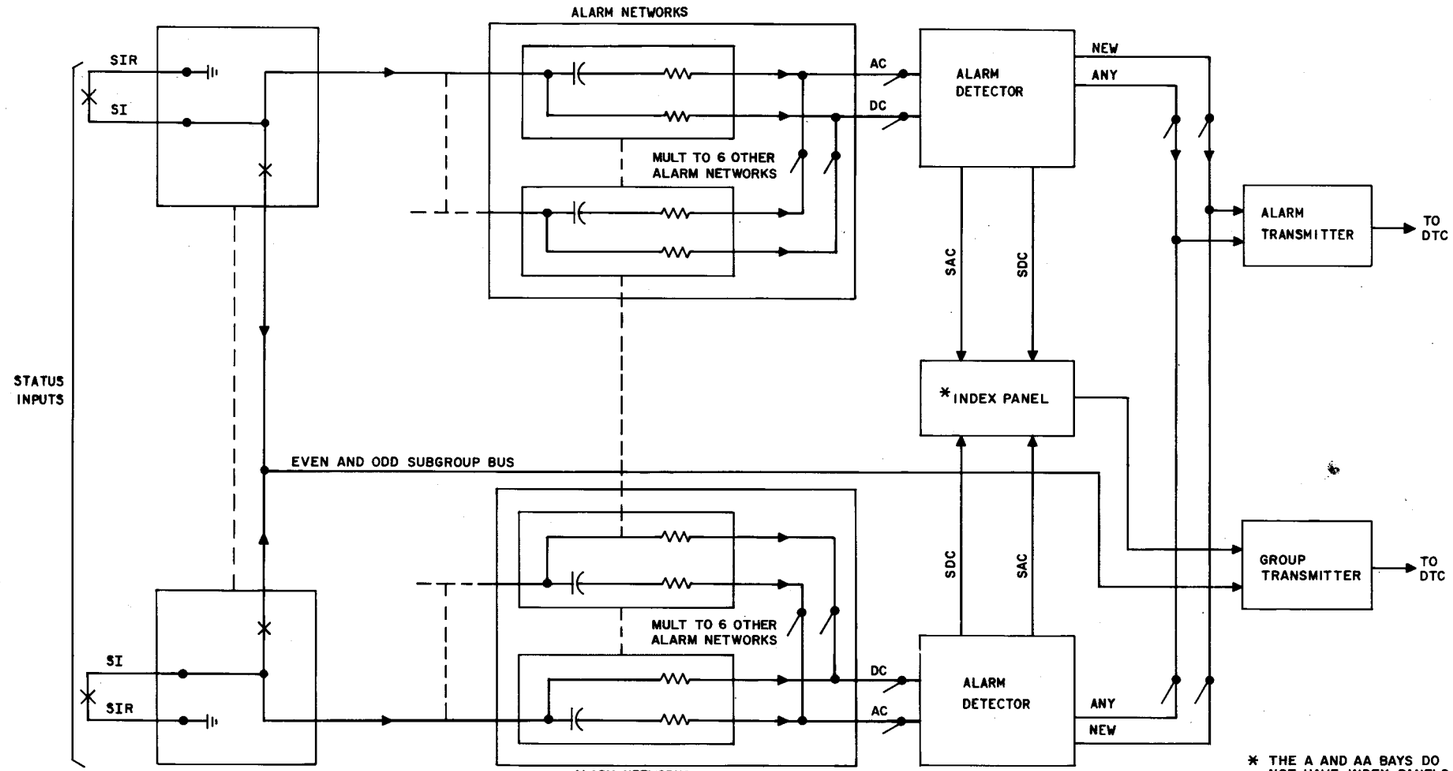


Fig. 5—Alarm Reporting Remote Block Diagram



A - STATUS GROUPING AND ALARM REPORTING

BIT 1 ... BIT 17

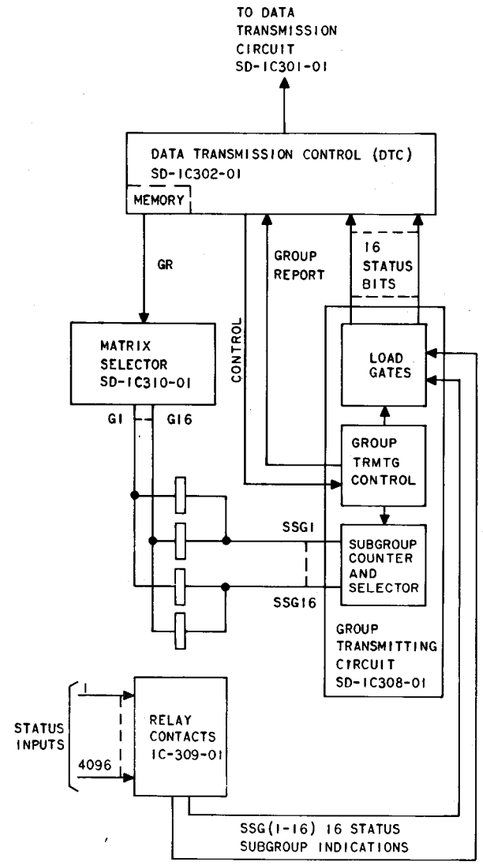
CENT SEND	ALARM POLL	REMOTE STATION ADDRESS	NOT USED	
0	0 0	X X X X X X X X	0 0 0 0 0 0	TO REMOTE

REM SEND	ALARM INDICATIONS	NOT USED	
1	X X X X X X	0 0 0 0 0 0 0 0 0 0	TO CENTRAL

B - WORD FROM REMOTE IN RESPONSE TO AN ALARM POLL REQUEST

NOTE:
X INDICATES EITHER A LOGIC 0 OR 1.

Fig. 6—Alarm Reporting Block Diagram and Word Format



A. STATUS DISPLAY AND STATUS GROUP REPORT BLOCK DIAGRAM

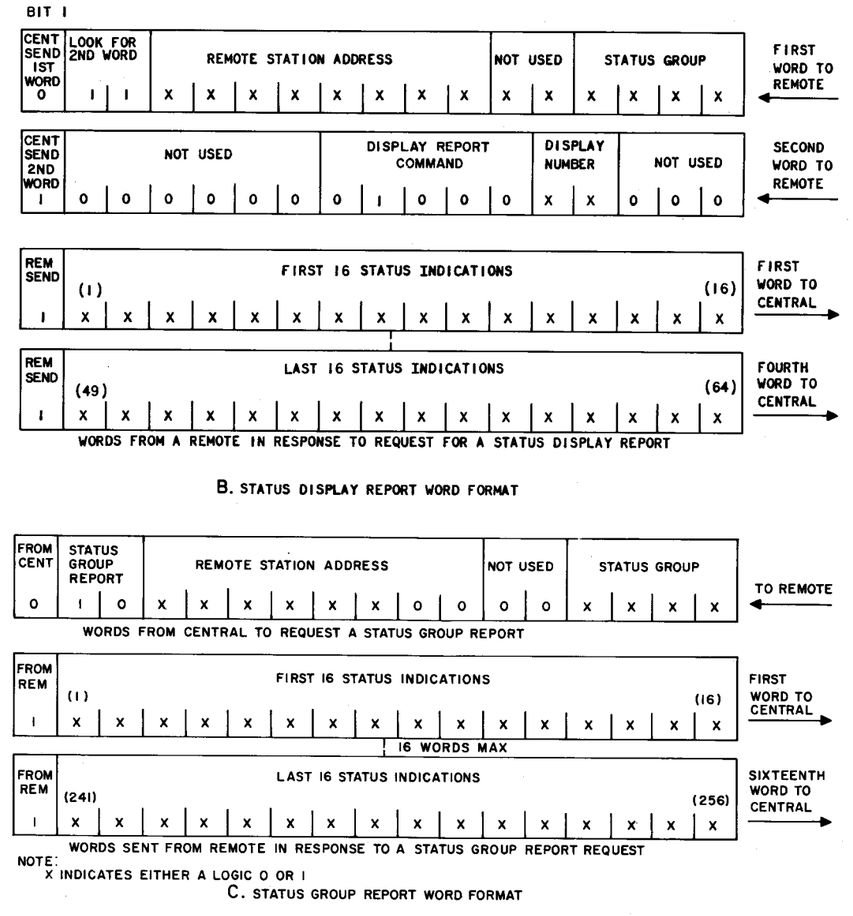
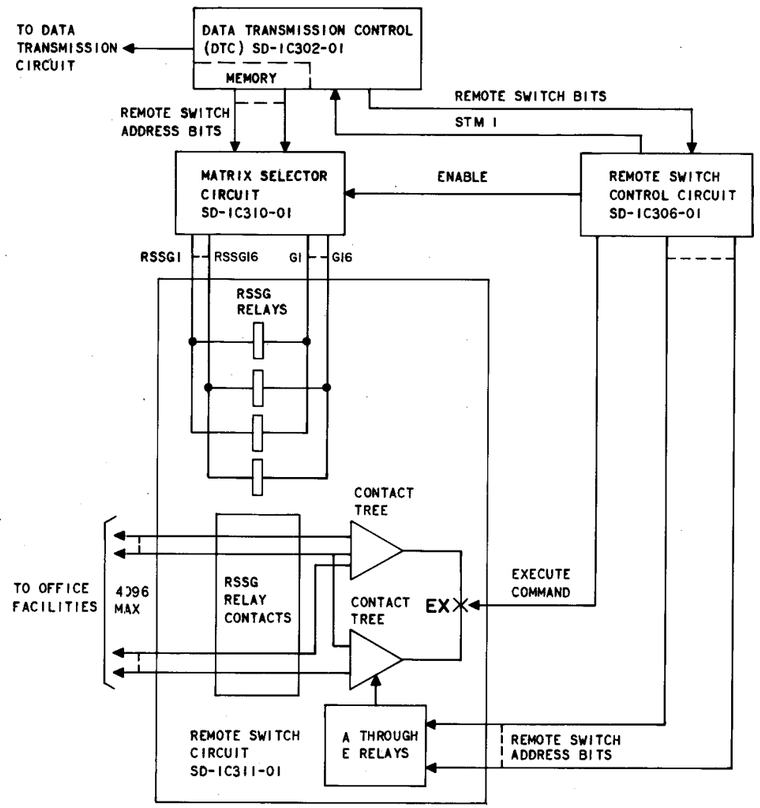


Fig. 7—Status Display and Status Group Reporting Block Diagram and Word Formats



A. REMOTE SWITCHING BLOCK DIAGRAM

BIT 1 ... BIT 17

CENT SEND IST WORD 0	LOOK FOR 2ND WORD		REMOTE STATION ADDRESS								NOT USED		REMOTE SWITCH GROUP				TO REMOTE
	1	1	X	X	X	X	X	X	X	X	0	0	X	X	X	X	
CENT SEND 2ND WORD 1	REMOTE SWITCH NUMBER				REMOTE SWITCH SUBGRP		REMOTE SWITCH COMMAND				REMOTE SWITCH SUBGRP		NOT USED				TO REMOTE
	X	X	X	X	X	X	0	0	0	X	1	X	X	0	0	0	

WORD FROM CENTRAL TO REQUEST A CONTACT CLOSURE AT A REMOTE

REM 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

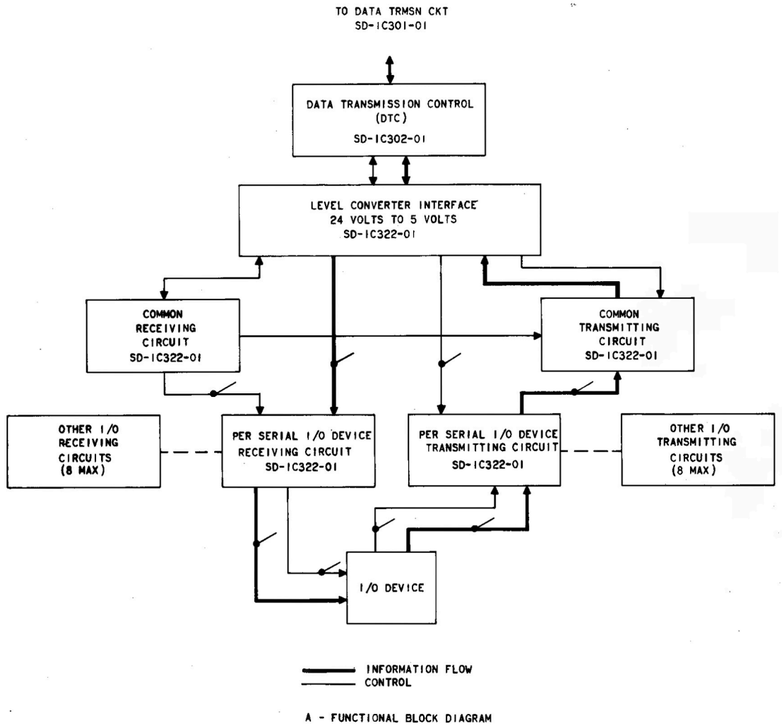
WORD FROM REMOTE IN RESPONSE TO A REQUEST FOR CONTACT CLOSURE

TO CENTRAL

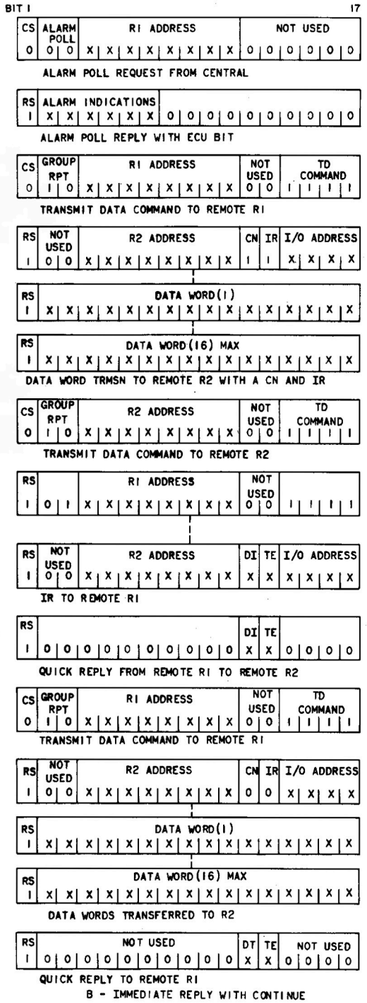
NOTE:
X INDICATES EITHER A LOGIC 0 OR 1.

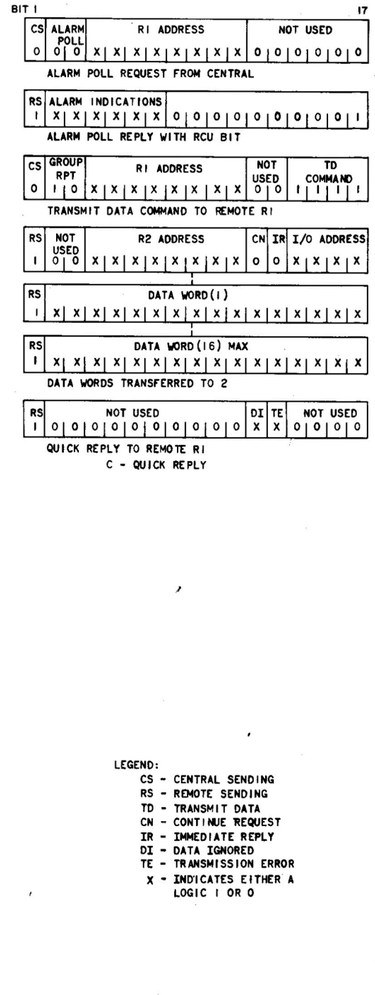
B. REMOTE SWITCHING WORD FORMAT

Fig. 8—Remote Switching Block Diagram and Word Format

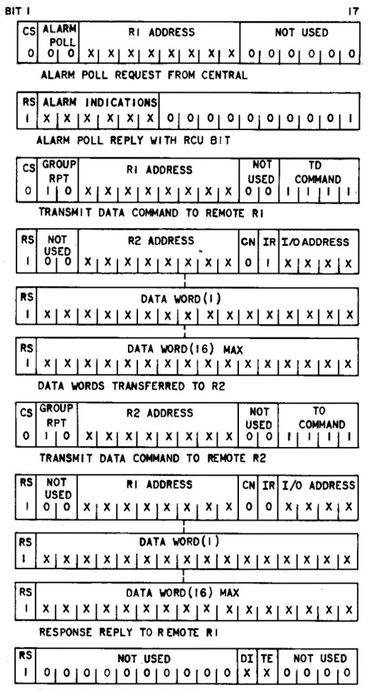


A - FUNCTIONAL BLOCK DIAGRAM





LEGEND:
- CS - CENTRAL SENDING
- RS - REMOTE SENDING
- TD - TRANSMIT DATA
- CN - CONTINUE REQUEST
- IR - IMMEDIATE REPLY
- DI - DATA IGNORED
- TE - TRANSMISSION ERROR
- X - INDICATES EITHER A LOGIC 1 OR 0



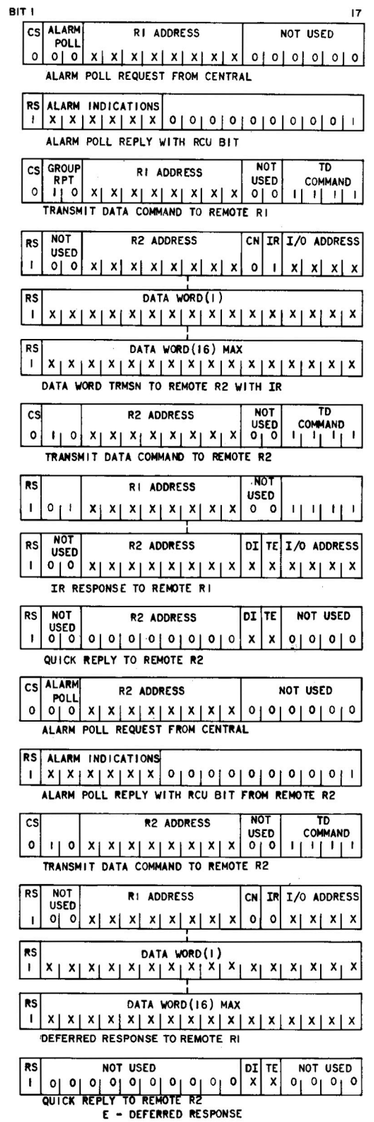


Fig. 9—Remote Call-Up Data Transfer Block Diagram and Word Format