

# MANUAL ALARM CENTRAL

## DESCRIPTION

### E2 STATUS REPORTING AND CONTROL SYSTEM

CONTENTS	PAGE
1. INTRODUCTION . . . . .	1
2. PHYSICAL DESCRIPTION . . . . .	1
A. Single-Network Bay . . . . .	1
B. Two-Network Bay . . . . .	1
3. OPERATING FEATURES . . . . .	2
A. Alarm Polling . . . . .	2
B. Status Display Reporting . . . . .	4
C. Remote Switching . . . . .	4
4. FUNCTIONAL DESCRIPTION . . . . .	4
A. Word Format . . . . .	4
B. Transmitting and Receiving . . . . .	5
5. REMOTE CALLUP (RCU) DATA TRANSFER . . . . .	9
6. MAINTENANCE CONSIDERATIONS . . . . .	9
7. REFERENCES . . . . .	9

#### 1. INTRODUCTION

1.01 The E2 Status Reporting and Control System is a solid-state general purpose telemetry system specifically tailored to the requirements of each customer. Connected to and controlled by a central are a number of remote stations (Fig. 1) which constantly monitor a number of points for abnormal conditions. The manual alarm central can provide automatic alarm reporting, status

display reporting, remote switching, and remote callup (RCU) data transfer operations. The maximum capability of the manual alarm central is the ability to monitor 32 remote stations on a maximum of two data networks. Each remote can monitor a maximum of 4096 statuses.

1.02 This section is reissued to include the new RCU turnaround feature. Since the changes in this reissue are general, arrows ordinarily used to indicate changes have been omitted.

#### 2. PHYSICAL DESCRIPTION

##### A. Single-Network Bay

2.01 The J92617E (7-foot) central bay shown in Fig. 2A consists of a single filter-and-fuse panel and a single data module (data set) panel. Located below these panels is a jack strip for access to the data facility and two control logic shelves. The alarm display panel, below the logic panel, consists of one or two 6 by 8 displays of magnetic indicators, which convey status or alarm information, and a row of station fail indicators. The status display panel, located below the alarm displays, is an 8 by 8 display of yellow/black magnetic indicators used for detailed status reports (status display reports). The right side of the panel contains the control switches necessary for the manual operations performed at the central. Below the status and control panel is a writing shelf, a data regenerator and its associated jack strip, an RCU panel, and two shelves containing the spare circuit packs needed to maintain the central. The data regenerator is described in detail in Section 201-644-110.

##### B. Two-Network Bay

2.02 The J92617C, 11-foot 6-inch, and the J92617D, 9-foot, central bays, shown in Fig. 2B, are

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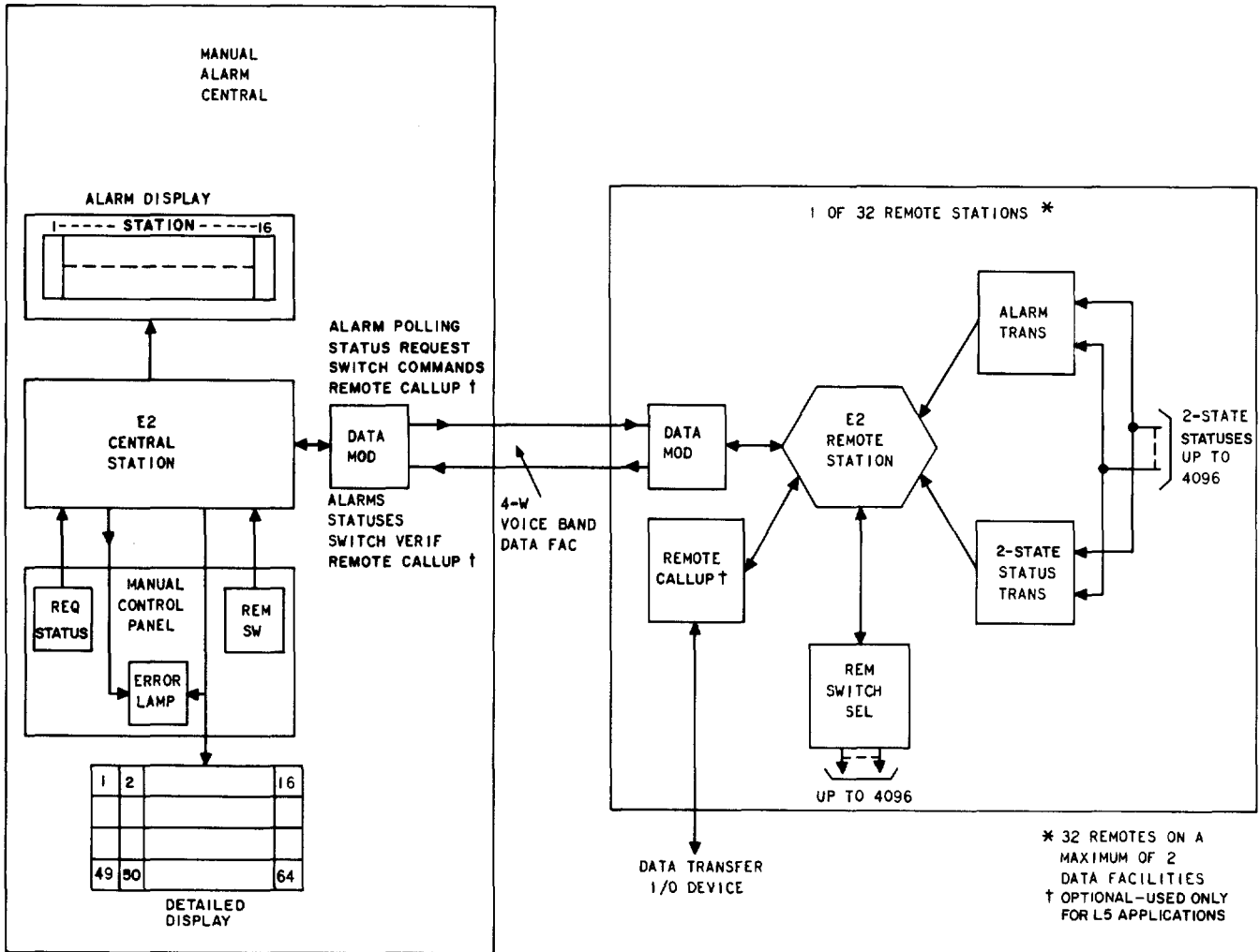


Fig. 1—Basic E2 Manual Alarm System

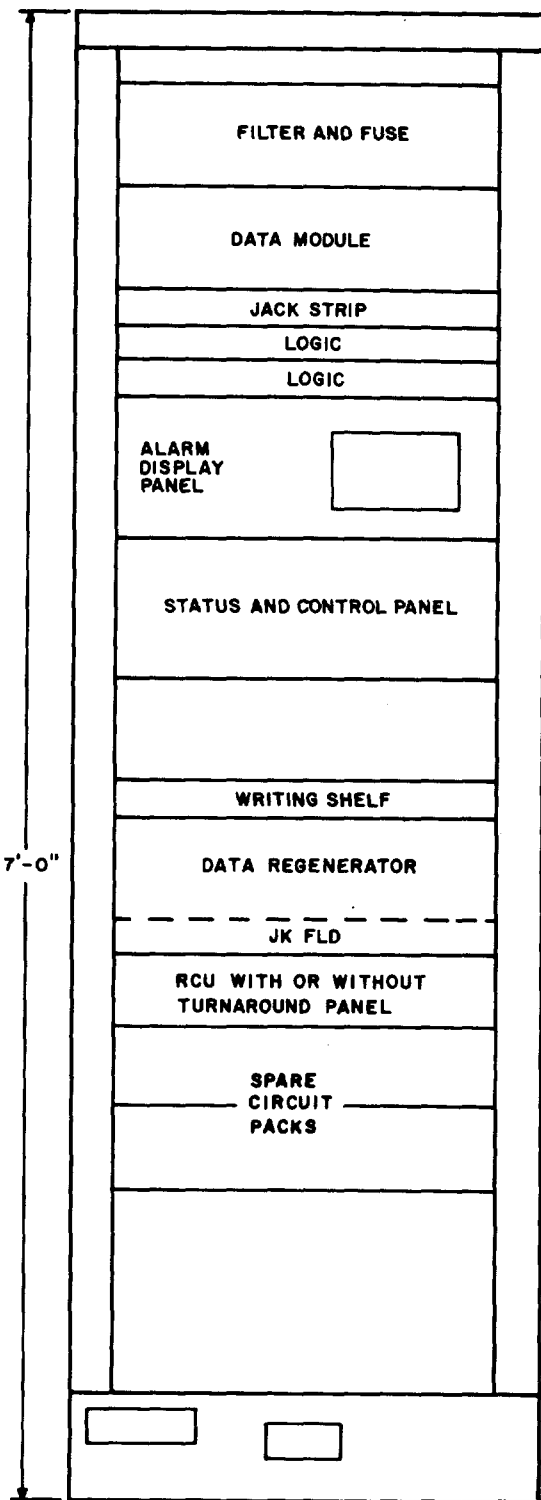
equipped with a single filter-and-fuse panel and a single data module panel. However, if required, a second filter-and-fuse panel and a data module panel can be added in the reserved sections (Fig. 2B). Below the data facility panels is a jack strip for facility access and three control logic shelves. Under the logic shelves are two alarm display panels (one for each data facility) each containing two 6 by 8 displays of yellow/black magnetic indicators for conveying status and alarm information, and a row (below station numbers) of station fail indicators. The status and control panel, located below the display panels, is an 8 by 8 display of yellow/black magnetic indicators used for display reporting. The right side of the panel contains the control switches necessary for the manual operations (display reports and remote switches)

performed at the central. Below this panel is a writing shelf, two data regenerators and associated jack strips, and two shelves containing spare circuit packs necessary to maintain the central. The data regenerator is described in detail in Section 201-644-110.

### 3. OPERATING FEATURES

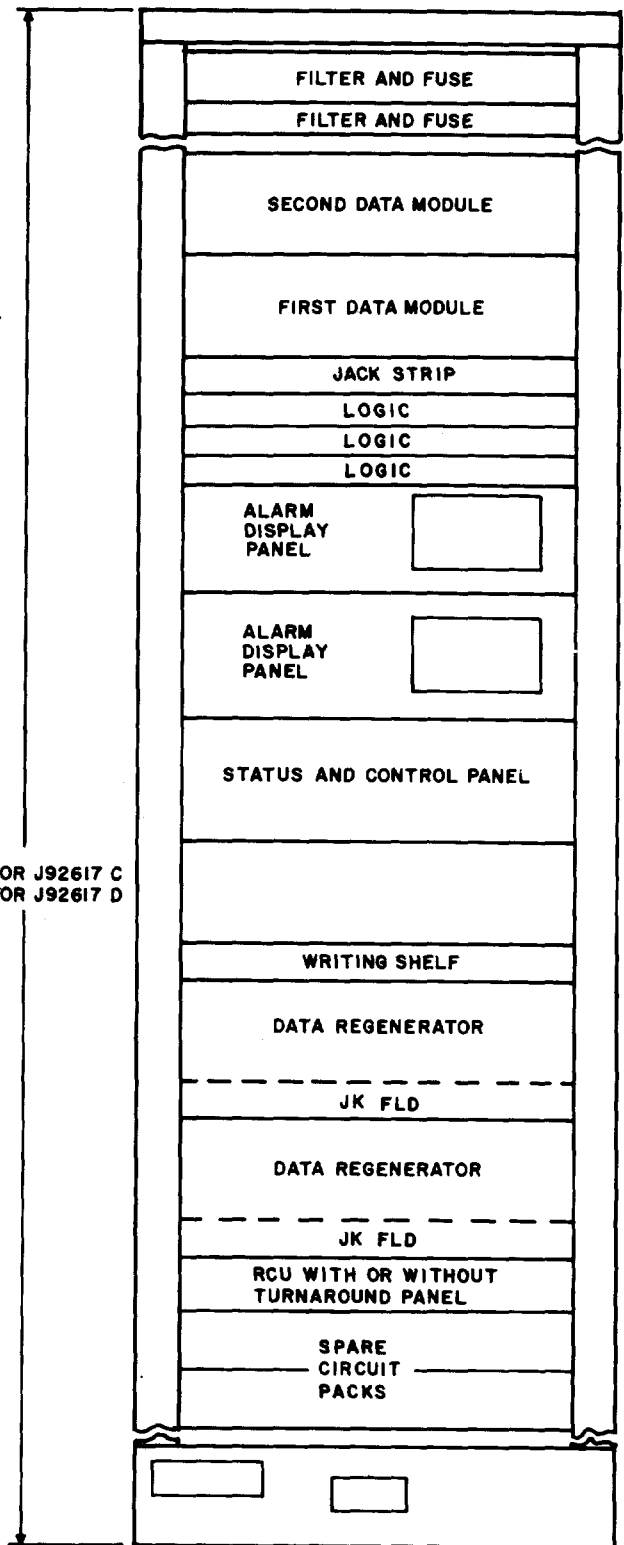
#### A. Alarm Polling

**3.01** Alarm polling is an automatic feature of the manual alarm central. The central transmits a word to a remote requesting an alarm transmission reply. The remote will reply with the requested information. When the central receives an alarm indication during alarm polling,



A - J92617E CENTRAL

11'-6" FOR J92617 C  
9'-0" FOR J92617 D



B - J92617C,-D CENTRAL

Fig. 2—Manual Alarm Central Bays

it may not be an indication of a specified alarm; but instead, it may indicate that one or more alarms have occurred within a group of statuses. A visual indication of this is given on the alarm display panel (Fig. 2). (To determine the particular alarm, such as a blown fuse or an air-conditioning failure, the operator has to manually initiate a status display report.)

**3.02** After the first remote station has been polled and the response received, the central polls the next station. Each remote station is assigned an address number. The central recognizes when a remote station has responded and automatically causes the next higher-numbered remote station to be addressed. After all remote stations have been polled, the process is repeated. If the central receives no reply from a remote or an error in the reply, the remote is polled again after an established time interval. If a correct reply is not received, the station fail indicator will indicate that the remote has failed.

**B. Status Display Reporting**

**3.03** Status display reporting is a feature allowing the state of individual statuses to be determined; unlike alarm polling, it is a manual operation. To request a status display report, the operator sets the manual control switches on the status and control panel (Fig. 2) to address the appropriate remote and status display. The automatic alarm polling mode is interrupted during the status display operation, and the display of statuses will appear on the status display panel when a reply is received from the remote. Using these indications and an index of alarms for the particular station, the operator can determine the exact cause of a particular status indication. After the status display report is complete, the central automatically returns to alarm polling.

**C. Remote Switching**

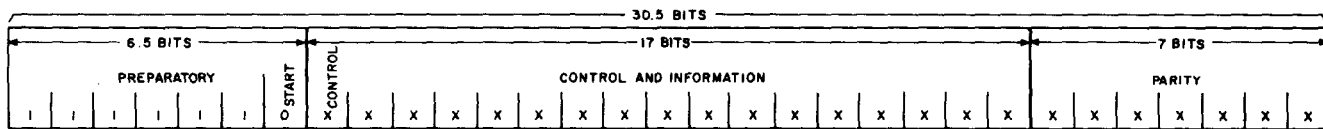
**3.04** The remote switching feature, like status display reporting, is a manual operation at the central in which the operator can initiate commands to cause momentary contact closures at a remote station. The operator sets the manual control switches to address the appropriate remote and switch. The remote switch command is then sent to the remote. The remote normally acknowledges receipt of the command; however, if an acknowledgement is not received, an error indication appears at the central, and the switch command must be reinitiated. After the remote switching operation is complete, the central automatically returns to alarm polling.

**4. FUNCTIONAL DESCRIPTION**

**A. Word Format**

**4.01** Transmission between central and remote is accomplished by E2 words. A word is a fixed length sequence of regularly spaced bits. The word is 30.5 bit intervals long, and is divided into three fields as shown in Fig. 3. The first field, *preparatory*, is 6.5 bits long and is used to enable all the remote receivers on the facility. One of these bits, *the word start bit*, is always logic 0 and informs the receiver that the second field, *information*, follows. This second field contains all the useful information in the word and will be discussed further in the following paragraphs. The 7-bit *parity* portion is the last field and is used for detecting errors.

**4.02** Alarm polling is accomplished by the central sending one word to the remote, requesting an alarm poll request. The information portion of this word (Fig. 4A) contains the remote station address and information which will inform the remote that this is an alarm poll word. The



NOTE:  
X INDICATES EITHER A LOGIC 0 OR 1.

**Fig. 3—Basic E2 Word Format**

remote will reply with six alarm indications in its word response (Fig. 4B) to the alarm poll. The remaining bits in the remote response word are not used with the exception of bit 17 which is reserved for RCU operations.

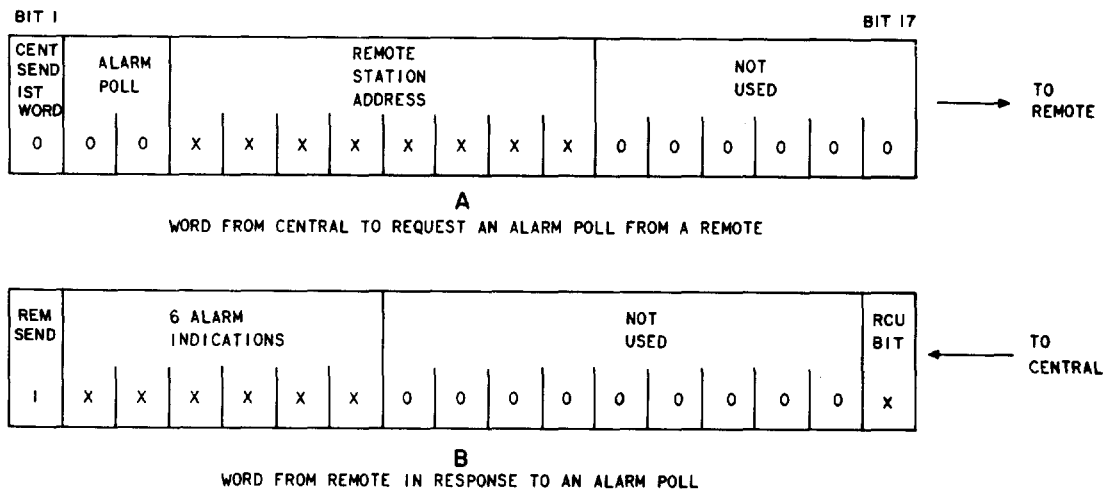
**4.03** Status display reporting is accomplished by the central sending two words to the remote, requesting a display report. These words (Fig. 5A) contain the remote station address, the display requested, and an identifying code to indicate that the word is a display report request. The remote will reply with four words (Fig. 5B) containing 64 status indications which will be displayed on the status display panel.

**4.04** Remote switching is accomplished by the central sending two words requesting a remote switch (relay contact closure). These words (Fig. 6A) contain all the information needed for the remote switch. After the remote receives this request, a single word containing 16 logic 0s in the information field (Fig. 6B) will be sent to the central. This word acknowledges receipt of the remote switch command but does not verify that the actual remote switch was made.

**B. Transmitting and Receiving**

**General**

**4.05** Figure 7 is a block diagram of the manual alarm central. Words are transmitted and received over voice-frequency facilities by the data transmission circuit. This figure shows only one data network. As mentioned previously, a central can control a maximum of two data networks, each requiring one data transmission circuit, one data transmission control (DTC), and one polling circuit. The remaining circuitry in Fig. 6 is not duplicated when the central is connected to more than one data facility. The DTC has four main functions: storage of the E2 word, control of receiving and transmitting, control of errors, and generation of the seven parity bits. The central is provided with two controlling circuits, the polling circuit and the command circuit, in which only one is active at any one time. In the automatic mode of operation, the polling circuit controls the system while the command circuit controls only during the manual modes. The central also has a group receiving circuit and matrix selector circuit. These two circuits drive the status display panel and alarm display panel in the console circuit.



NOTE:  
X INDICATES EITHER  
A LOGIC 1 OR 0.

**Fig. 4—Alarm Poll Word Format**

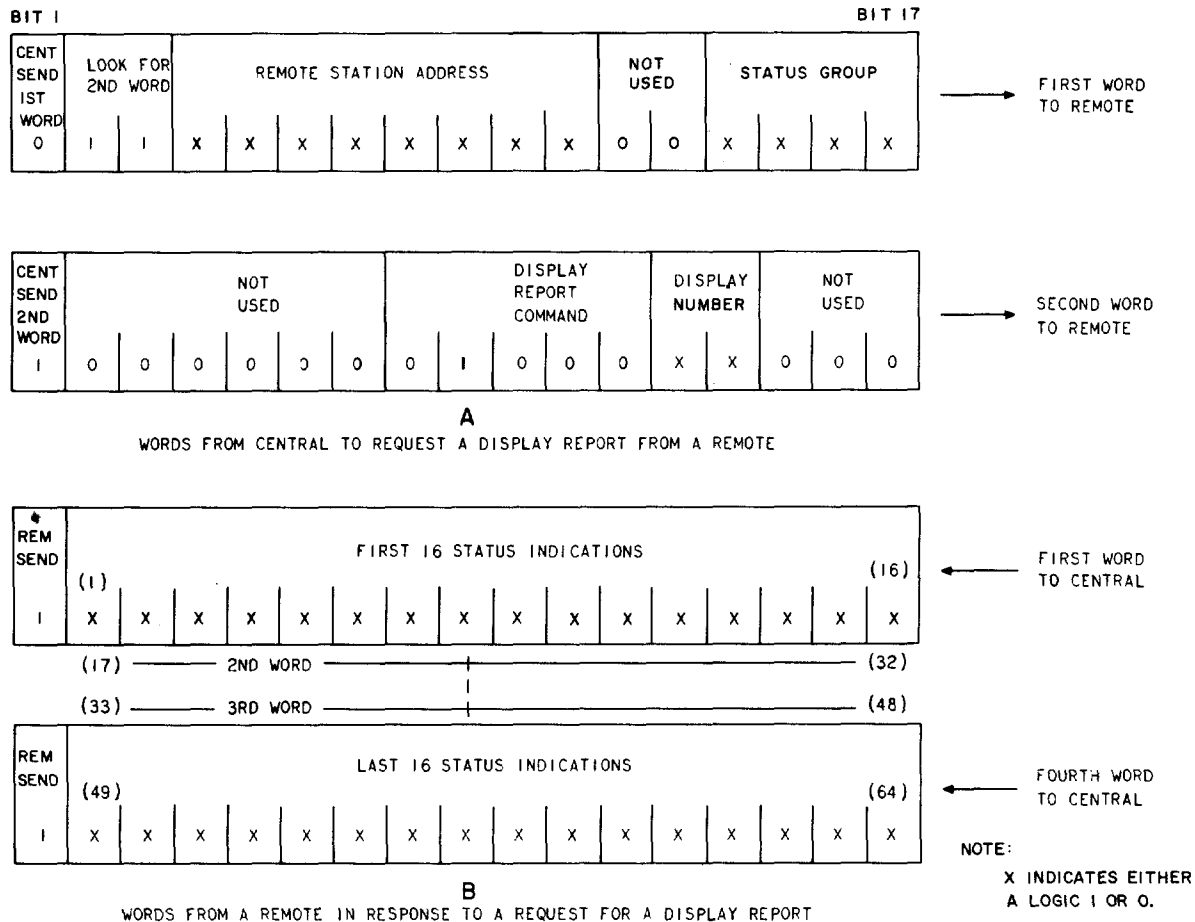


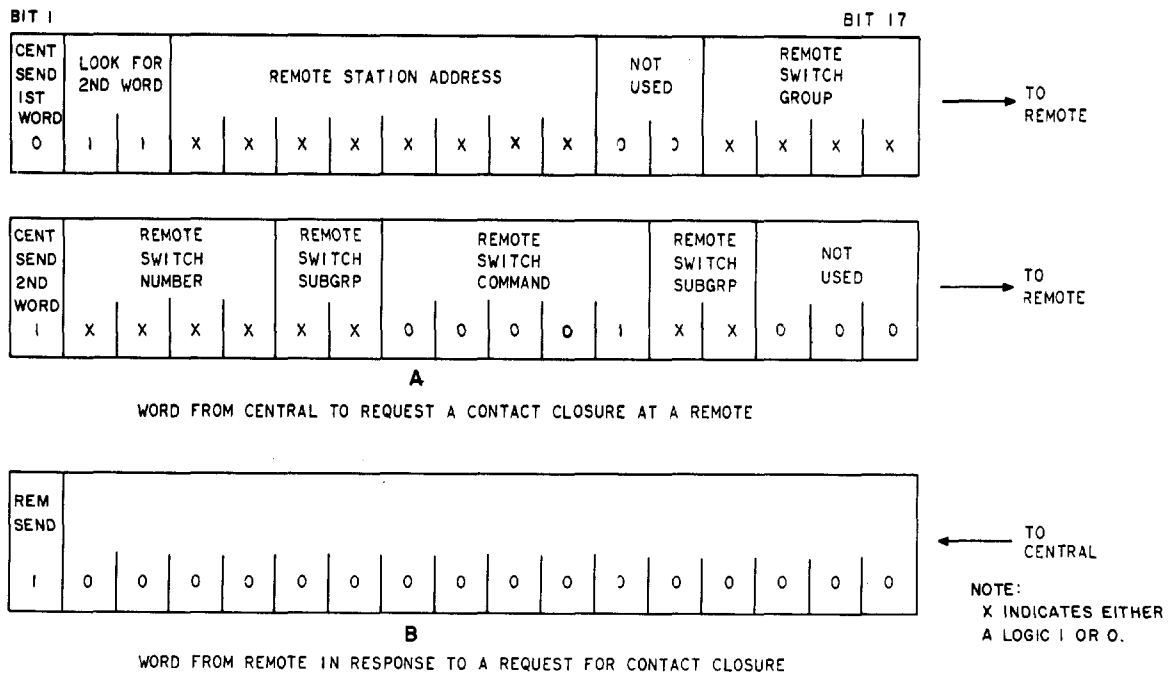
Fig. 5—Status Display Report Word Format

**Automatic Mode**

**4.06** During the automatic mode of operation, the DTC must receive the STM1 pulse from the polling circuit in order to begin transmitting. The transmission control activates the timing control which sends out the first 5.5 preparatory bits of the E2 word. These bits will appear on the TD lead after passing through the transmission control. Following this, the shift register is cleared and the word start bit is sent (also on the TD lead). At this point, the DTC tells the controlling circuit (the polling circuit in the automatic mode), that it is time to load the shift register. The contents of the address counter will then be loaded, via R0A, into the shift register. Now that the shift register is loaded, the timing control sends 17 pulses to the shift register, serially shifting the contents (bits) into the transmission control. These

bits are, in turn, gated to the TD lead and the error control which forms the parity bits. Now, the preparatory and information portions of the E2 word have been formed and sent to the data transmission circuit. Next, the timing control tells the error control to send the seven parity bits already formed to the transmission control. Again, the transmission control gates these bits to the TD lead. These bits form the last part of the E2 word.

**4.07** The TD lead is connected to the transmitter of the data transmission circuit. This transmitter will convert the E2 word into mark-space tones and transmit the word to the remote station. The remote station will process the received word and send a reply back to the central as mark-space tones in the E2 word format.



**Fig. 6—Remote Switch Word Format**

**4.08** The receiver in the data transmission circuit at the central will detect this word, convert the received mark-space tones to 2-state voltage levels which are sent to the DTC. The DTC will ignore the preparatory part of the word, shift the information portion into the shift register, and gate the parity bits to the error control. The error control will check these bits for errors. If any occur, or if a reply is not received from the remote after an established time interval, the central will poll the remote again. If, after another established time interval, a reply is not received, the station fail indicator for that remote will indicate a station failure.

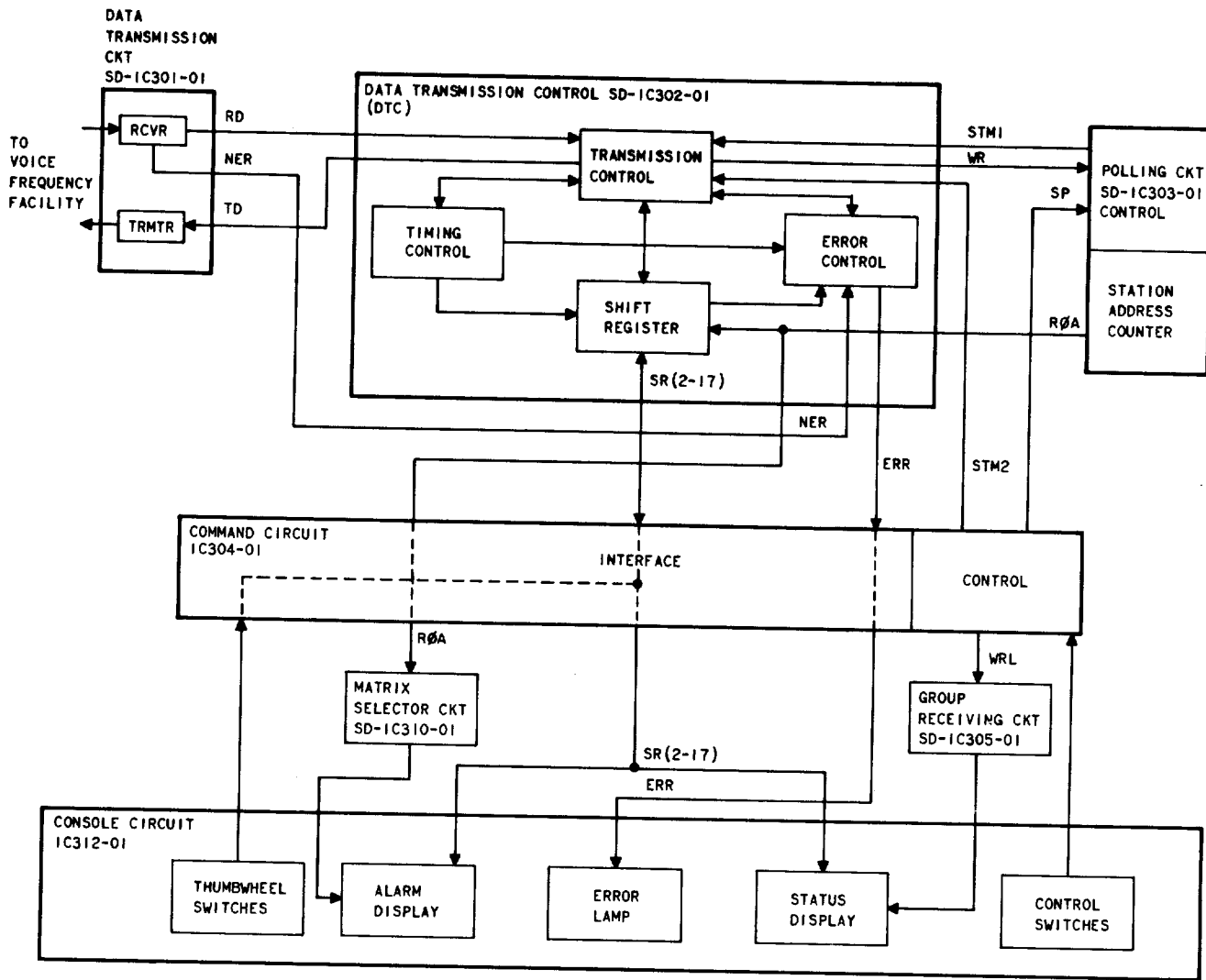
**4.09** The polling circuit will be informed by the DTC (via the WR pulse) that the word has been received and checked for errors. Then, the polling circuit will increment the station address counter and begin polling the next remote.

#### Manual Mode

**4.10** The two manual modes of operation, status display reporting and remote switching, require the proper setting of the manual control switches on the console. After the correct setting of these switches, the command circuit requests

control of the central from the polling circuit via the SP lead. It is important to know that there is no immediate takeover of control. If the polling circuit is currently polling a remote, the command circuit will receive control when the polling of that remote is complete. If an RCU procedure is in process, the command circuit will receive control when the next data transfer is complete. If RCU has requested to continue, the central will poll all stations and revert back to the RCU operation from the polling remote requesting a data transfer.

**4.11** After switching control to the command circuit, the DTC is placed in the transmit mode via STM2. The DTC and the data transmission circuit will then transmit the E2 word in the same manner as in the automatic mode with one exception. After the word start bit, instead of loading the shift register from the address counter, the contents of the manual control switches are sent through the interface and dumped into the shift register. When the remote station replies, the information part of the reply is stored, as in the automatic mode. If the remote fails to reply, the error lamp will light. Note that this is different from the automatic mode where the station fail indicator indicates a failure to reply.



- LEGEND:**
- | PULSE    | FUNCTION   |
|----------|--|
| RD       | RECEIVED DATA, THE LINE FROM THE RECEIVER OVER WHICH THE WORD IS SENT.                                 |
| TD       | TRANSMITTED DATA, THE LINE FROM DTC OVER WHICH THE WORD IS SENT.                                       |
| NER      | NOISE IN ERROR, INDICATES AN ERROR IN RECEIVED WORD.   |
| STMI     | SET TRANSMIT MODE, TELLS THE DTC TO ENTER THE TRANSMIT MODE. (FROM POLLING CIRCUIT)                    |
| STM2     | SET TRANSMIT MODE, TELLS THE DTC TO ENTER THE TRANSMIT MODE. (FROM COMMAND CIRCUIT)                    |
| WR       | WORD RECEIVED, INDICATES THAT THE WORD WAS RECEIVED.   |
| WRL      | WORD RECEIVED TO WORD LENGTH COUNTER, ADVANCES THE WORD LENGTH COUNTER IN THE GROUP RECEIVING CIRCUIT. |
| SP       | STOP POLL, TELLS THE POLLING CIRCUIT TO STOP POLLING.  |
| R0A      | REMOTE ADDRESS, THE REMOTE ADDRESS.  |
| SR(2-17) | SHIFT REGISTER BITS 2-17, THE CONTENTS OF THE INFORMATION SHIFT REGISTER.                              |
| ERR      | ERROR, INDICATES THAT AN ERROR HAS BEEN MADE.  |

**Fig. 7—Block Diagram of the E2 Manual Alarm Central**



**4.12** If the command circuit were placed in the remote switch operation, the control of the system would be switched from the command circuit to the polling circuit. It is important to note that the end of the remote switch operation is the receiving of a word from the remote. No action is taken on this word and its only purpose is to tell the central that the remote has acknowledged the remote switch command. In no way does this mean that a remote switch had been made. To verify the operation, the central would have to request a status display report in order to check the status in question.

**4.13** When the command circuit is status display reporting, the contents of the shift register and the group receiving circuit are sent to the status display in the console circuit. The command circuit then returns control to the polling circuit upon completing the status display report.

## 5. REMOTE CALLUP (RCU) DATA TRANSFER

**5.01** The RCU data transfer feature provides the capability of transmitting up to 16 binary coded words at a time between E2 alarm reporting remote stations under the control of the RCU central panel located at the manual alarm central. RCU is initiated at a remote station by any one of several I/O devices. This request can be initiated at any time but will only be recognized by the central during the alarm poll of the requesting remote.

**5.02** Data transfer between an I/O device connected to E2 remote R1 and the I/O device connected to E2 remote R2 is executed as follows:

- (1) Logic 1 is inserted in bit position 17 of the alarm poll reply word and requests RCU data transfer.
- (2) After receiving the RCU request, the central transmits a one-word (Fig. 8A) transmit data reply to remote R1.
- (3) R1 then transmits the address word (Fig. 8B) containing the following:
  - Address of desired remote R2
  - Address of I/O device connected to R2

- Either a *continue bit* or an *immediate reply bit*.

- (4) R1 then transmits up to 16 words of data to remote R2.

**5.03** If the *continue bit* is a logic 1, the central will transmit the *transmit data command* to R1 for a second data transfer. If the *continue bit* is a logic 0, the central will resume alarm pulling at the end of the transfer.

**5.04** If the *immediate reply bit* is a logic 1, the central will transmit a *transmit data command* to remote R2 which will reply with either a two-word immediate reply or a data transmission of its own. If the immediate reply bit is a logic 0, the central will resume alarm polling at the end of the data transfer.

**5.05** The RCU turnaround feature is used for testing between the E2 manual alarm central, (this may be controlled by SCOTS) and the remote units with I/O devices. A test is initiated by the control when it sends a **TD** command and a data pattern to a remote. When the remote receives the **TD** command, it will make a loopback at the remote turnaround panel and transmits the data pattern back to the central. The central will verify that the same data pattern received from the remote is the same as the one it transmitted. This test improves the trouble test procedures and integrity of the remote. The turnaround test sequence is shown in Fig. 9.

## 6. MAINTENANCE CONSIDERATIONS

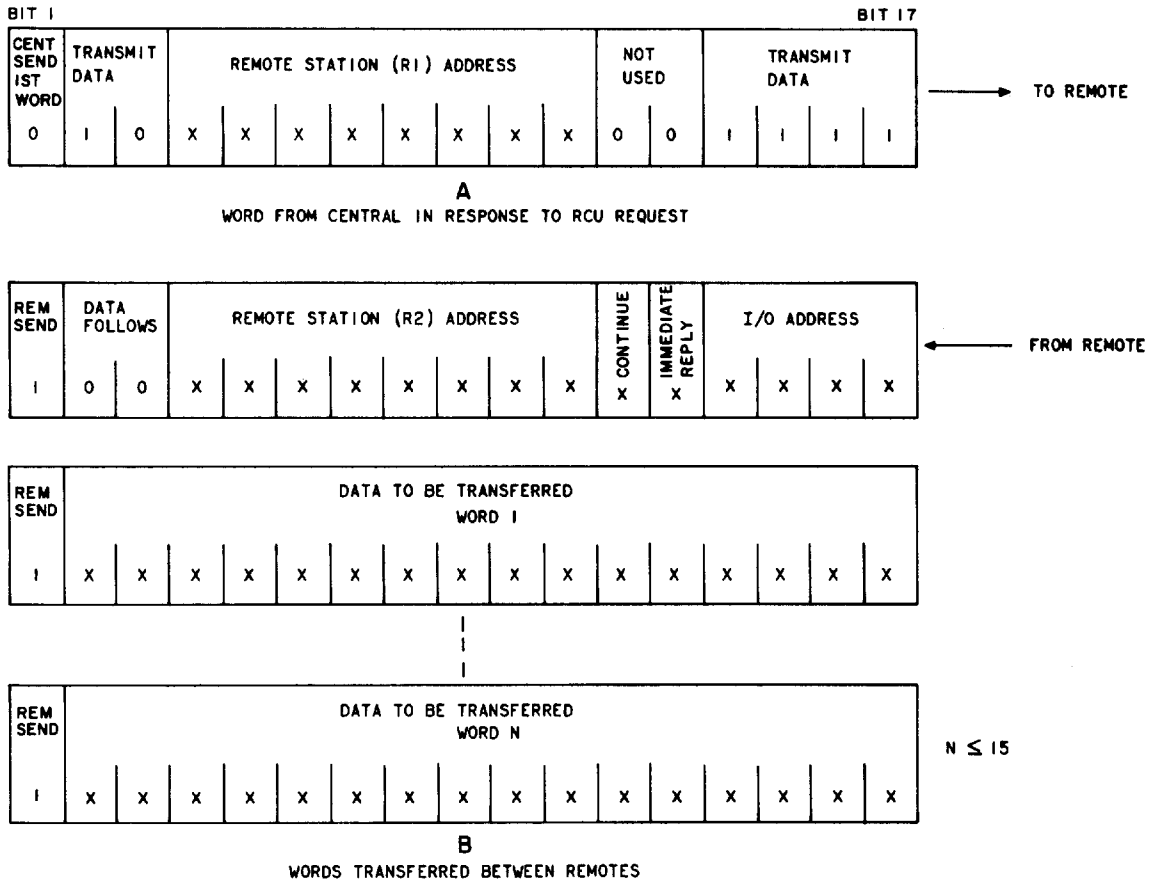
**6.01** In the event of failure of the central, it is expected that the trouble can be isolated to a circuit pack(s) using an E-telemetry station test set (KS-20937) and the RCU test set. The circuit pack(s) can then be replaced with the spares provided.

## 7. REFERENCES

**7.01** The following is a list of schematic diagrams (SD), circuit descriptions (CD), and Bell System Practices associated with the manual alarm central.

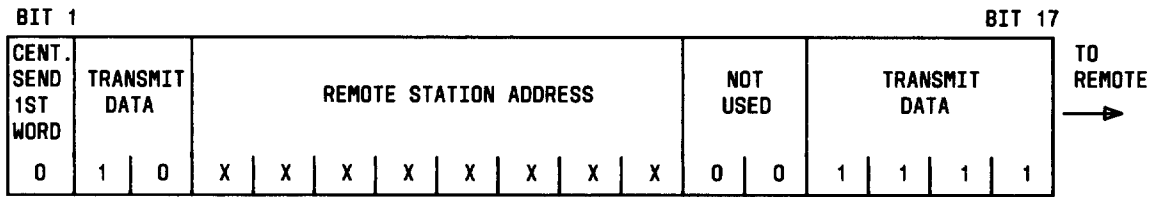
SECTION 201-644-112

DRAWING	TITLE	SECTION	TITLE
1C301-01	Data Transmission Circuit	201-644-100	Overall System—Description
1C302-01	Data Transmission Control Circuit	201-644-110	Data Regenerator—Description
1C303-01	Polling Circuit	201-644-111	Alarm Reporting Remote—Description
1C304-01	Command Circuit	201-644-142	RCU Test Set—Description
1C305-01	Group Receiving Circuit		
1C310-01	Matrix Selector Circuit		
1C312-01	Console Circuit		
1C314-01	Filter, Fuse, and Grounding Circuit		
103-117-101	E-Telemetry Station Test Set—Description		

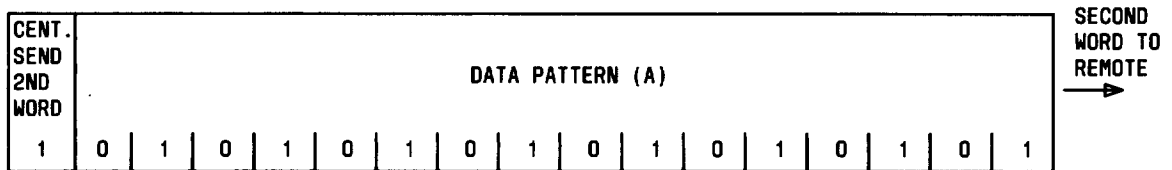
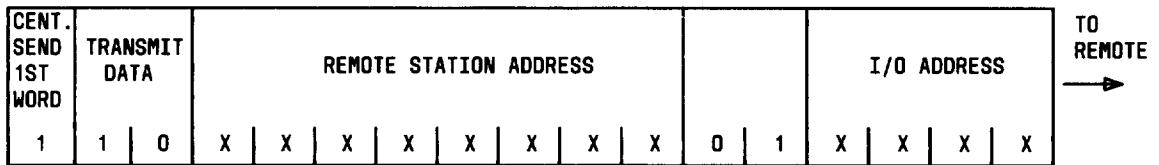


NOTE:  
X INDICATES EITHER  
A LOGIC 1 OR 0.

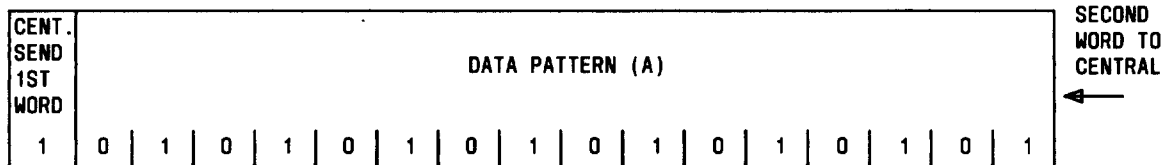
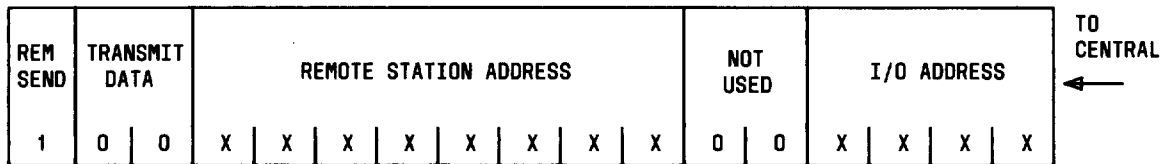
Fig. 8—Remote Callup Data Transfer Word Format



A  
TD COMMAND TO STATION (X)



B  
TR COMMAND TO STATION (X), WITH DATA PATTERN (SECOND WORD)



C  
RESPONSE REPLY FROM REMOTE STATION (X)

NOTE: DATA PATTERN (B) IS THE COMPLIMENT OF (A)

Fig. 9—Response Reply Test Word Format