E2 STATUS REPORTING AND CONTROL SYSTEM
MANUAL ALARM CENTRAL
DESCRIPTION

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1. INTRODUCTION

1.01 The E2 Status Reporting and Control System is a solid-state general purpose telemetry system specifically tailored to each customer's requirements. Connected to and controlled by a central are a number of remote stations (see 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 2 data networks. Each remote can monitor a maximum of 4096 statuses.

1.02 This section is reissued to reflect current arrangements in the central bay equipment and to incorporate information on the 2-network bay. Since the changes in this reissue are general, arrows ordinally 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 logic, 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 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 (see Fig. 2B). Below the data facility panels is a jack

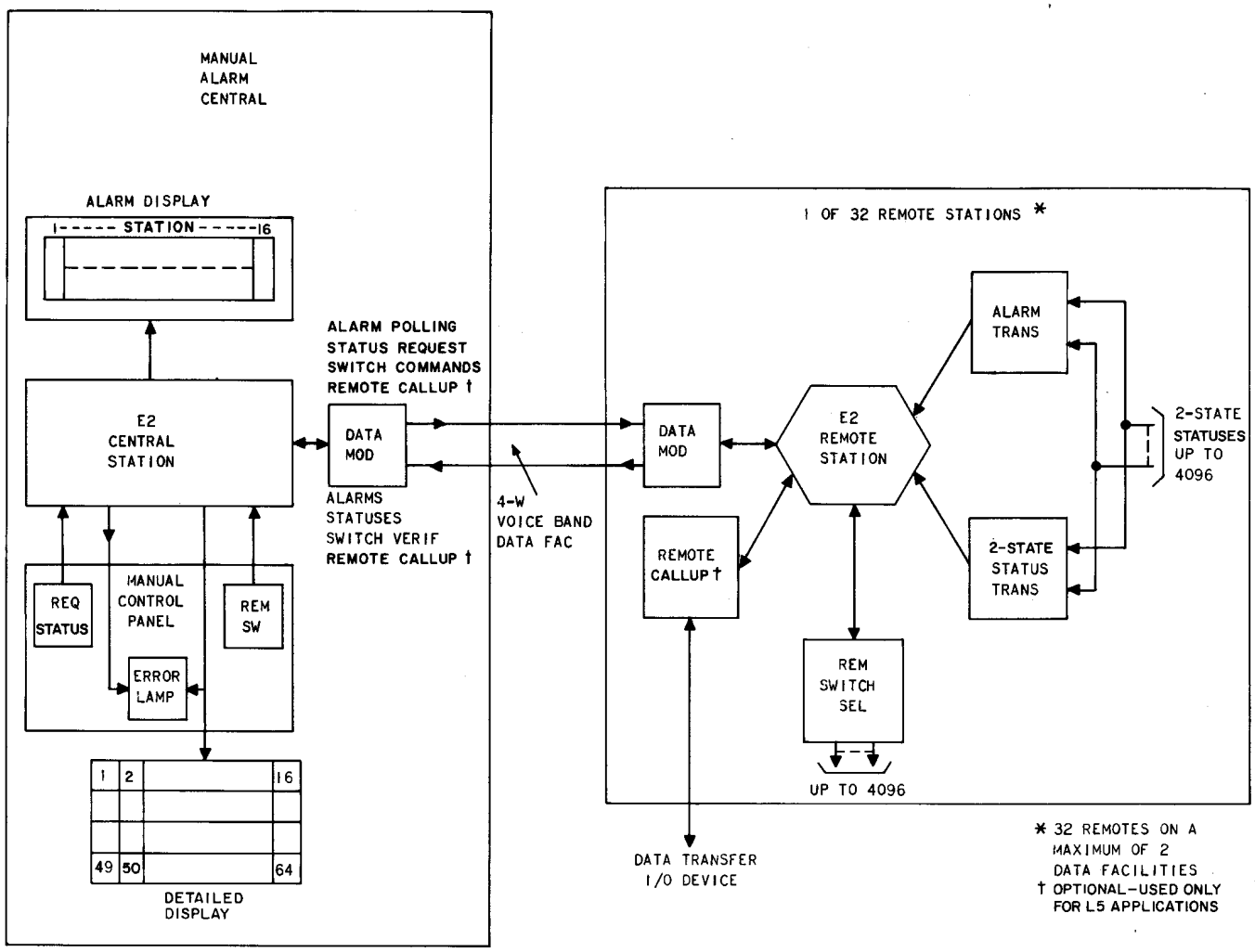


Fig. 1—Basic E2 Manual Alarm System

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, it may not be an indication of a specific alarm but instead 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.)

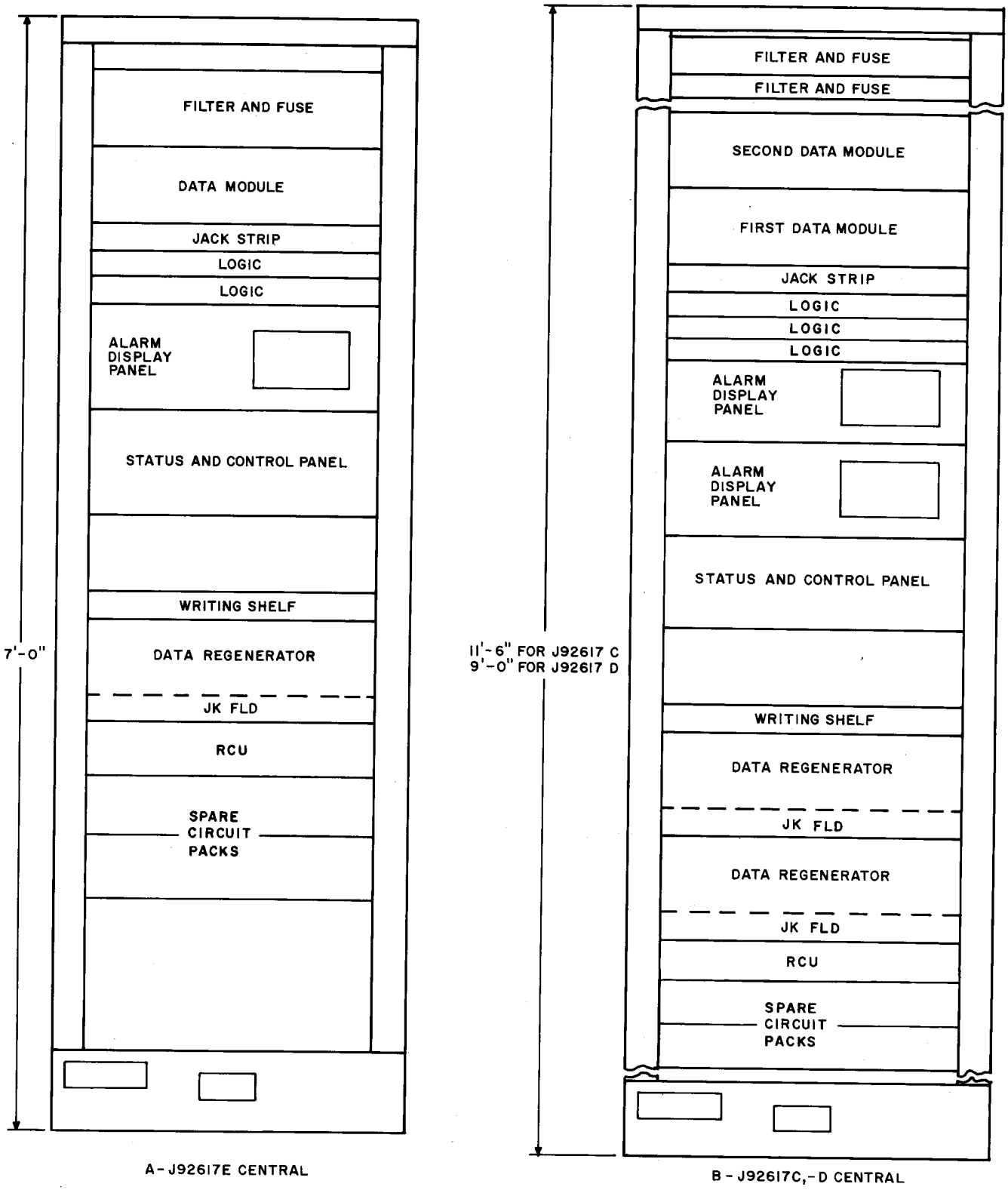


Fig. 2—Manual Alarm Central Bays

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 replay 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.

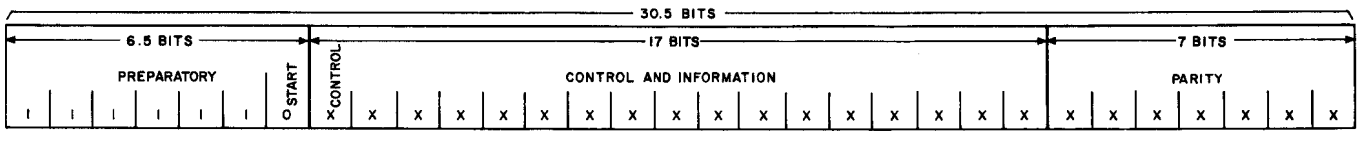
4. FUNCTIONAL DESCRIPTION

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 consists of 30.5 bits which 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 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)



NOTE:
X INDICATES EITHER A LOGIC 0 OR 1.

Fig. 3—Basic E2 Word Format

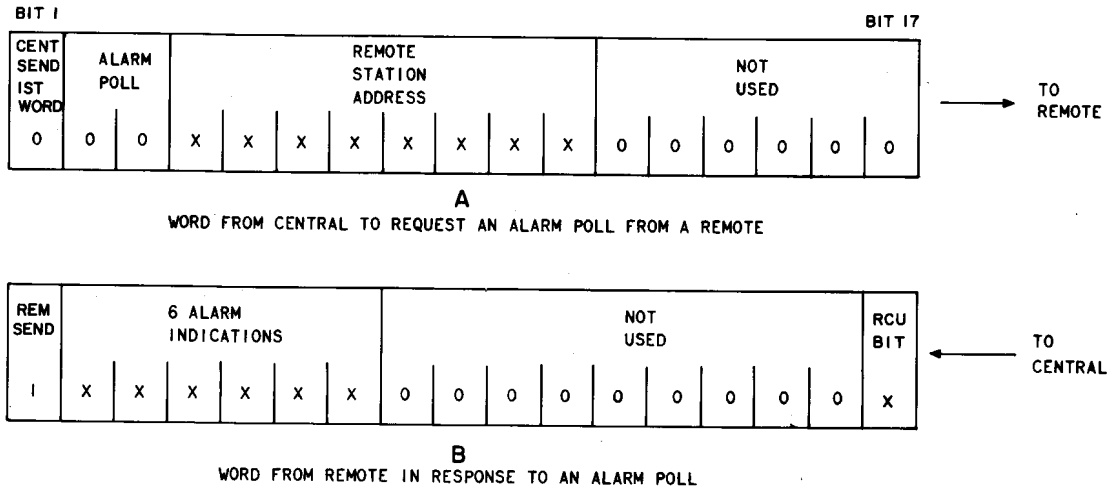


Fig. 4—Alarm Poll Word Format

contain the remote station address, the display requested, and an identifying code which will tell the remote that this 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 2 data networks, each requiring one data transmission circuit, one data transmission control (DTC), and one polling circuit. The remaining circuitry in Fig. 7 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.

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 RØA, into the shift register. Now that the shift

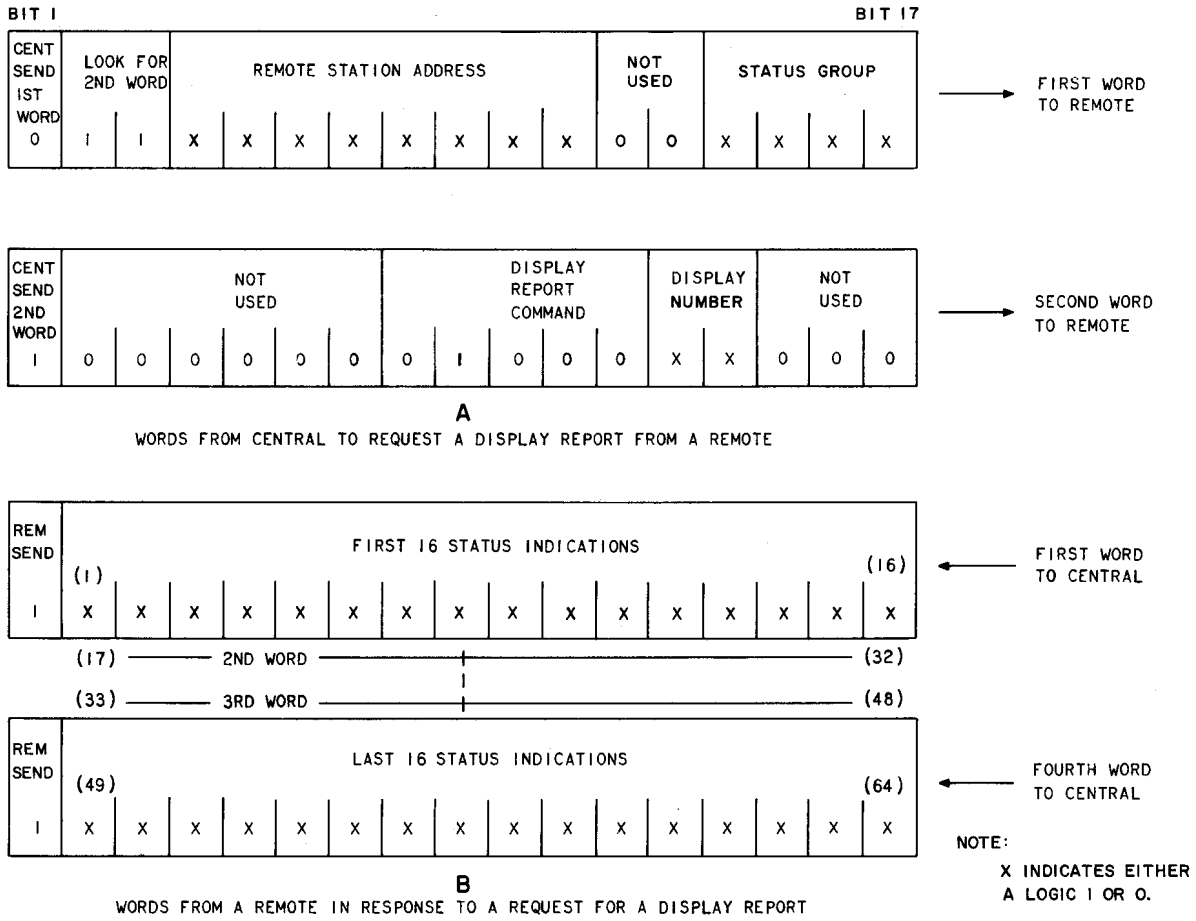


Fig. 5—Status Display Report Word Format

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.

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

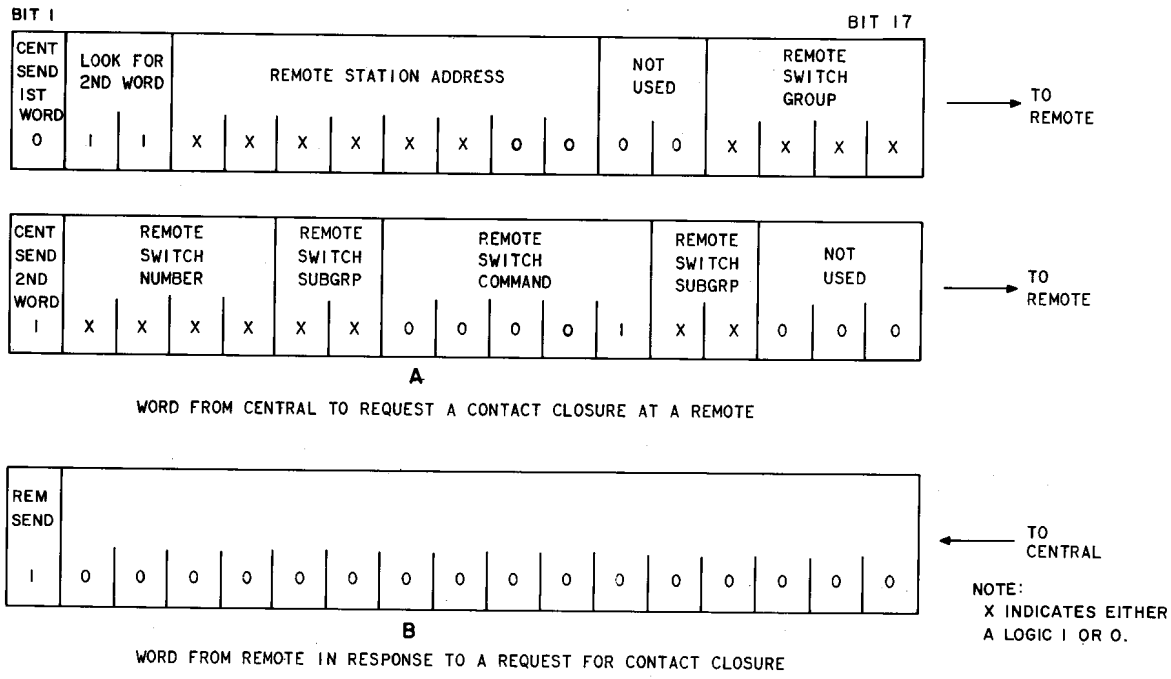


Fig. 6—Remote Switch Word Format

been received and checked for errors. Then, the polling circuit will increment the station address counter and begin polling the next remote.

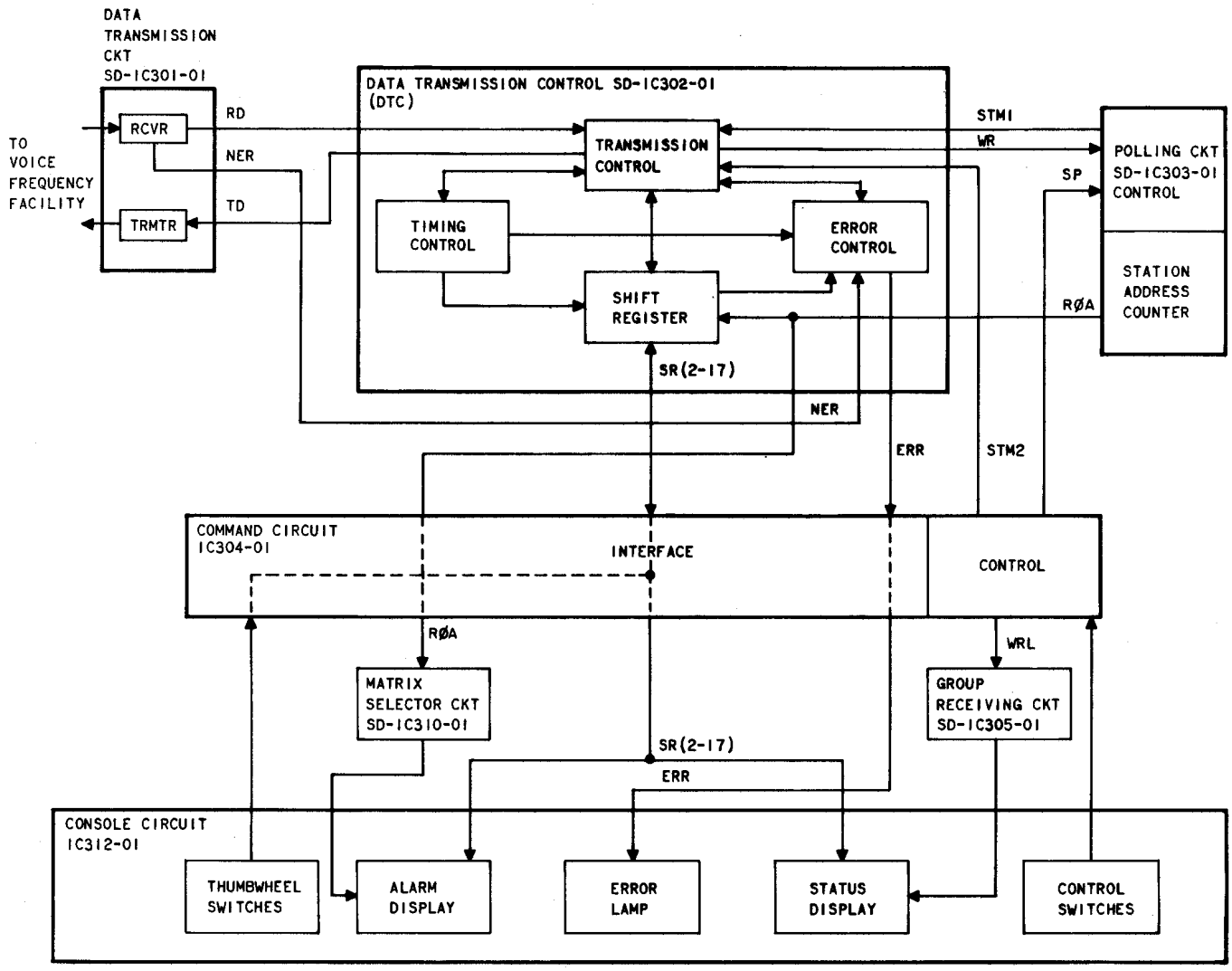
Manual Mode

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.

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 If the command circuit were status display reporting, the contents of the shift register and the group receiving circuit would be sent to



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.
RØA	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

the status display in the console circuit. The command circuit would then return control to the polling circuit.

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 To request an RCU data transfer, a logic 1 is inserted in bit position 17 of the alarm poll reply word. The central will then recognize the RCU request and send a 1-word (Fig. 8A) reply to remote R1 which contains a transmit data command. Remote R1 responds to this command by sending a word (Fig. 8B) containing the address of the desired remote, R2, and the I/O address of the device to which the data is to be directed. This word can also contain a *continue bit* and an *immediate reply bit.* Once the address word has been sent, the remote R1 can then send up to 16 words of data to remote R2. If the *continue bit* is a logic 1, the central will send another transmit data command to R1 for a second data transfer. If the *immediate reply bit* is a logic 1, the central will send a transmit data command to remote R2 which will then reply with either a 2-word immediate reply or a data transmission of its own. If neither the continue bit nor the immediate reply bit is a logic 1, the central will resume alarm polling at the end of the data transfer.

6. MAINTENANCE CONSIDERATIONS

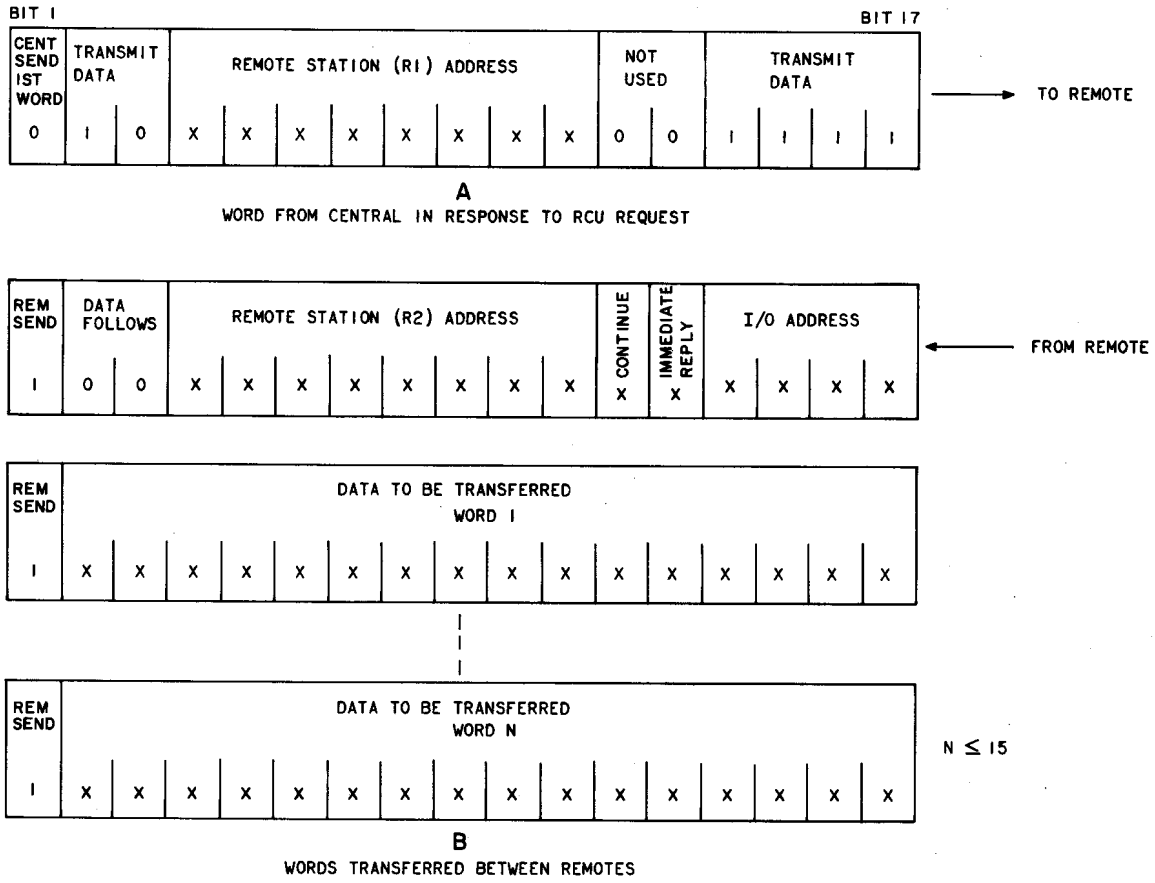
6.01 In the event of failure of the central, it is expected that the trouble can be isolated to a circuit pack(s) using an E-telemetry station test set (KS-20937) and the RCU test set. The circuit pack(s) can then be replaced with the spares provided and the presumed defective circuit pack(s) tested on an E-telemetry circuit pack test set (KS-21448). The good circuit packs, if any, are then returned to the spares shelf and the defective circuit pack(s) replaced or repaired.

7. REFERENCES

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

DRAWING	TITLE
1C301-01	Data Transmission Circuit
1C302-01	Data Transmission Control Circuit
1C303-01	Polling Circuit
1C304-01	Command Circuit
1C305-01	Group Receiving Circuit
1C310-01	Matrix Selector Circuit
1C312-01	Console Circuit
1C314-01	Filter, Fuse, and Grounding Circuit

SECTION	TITLE
103-117-101	E-Telemetry Station Test Set—Description
103-107-100	E-Telemetry Circuit Pack Test Set—Description
201-644-100	Overall System—Description
201-644-110	Data Regenerator—Description
201-644-111	Alarm Reporting Remote—Description
201-644-142	RCU Test Set—Description



NOTE:
X INDICATES EITHER
A LOGIC 1 OR 0.

Fig. 8—Remote Callup Data Transfer Word Format