CIU931
Computer Interface Unit
for DATANET-30

GENERAL ⊛ ELECTRIC

CIU931

COMPUTER INTERFACE UNIT

For DATANET-30

REFERENCE MANUAL

Appendix D to DATANET-30
Programming Reference Manual
(CPB-1019)

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GENERAL ELECTRIC

INFORMATION SYSTEMS DIVISION

PREFACE

This appendix covers the operation and programming of the CIU931 for the DATANET-30 computer.

Information for the operation and programming of the CIU931 for a GE-400 or -600 Series system will be found in the appropriate manuals for the computer interfacing with the DATANET-30 CIU931.

Suggestions and criticisms relative to form, content, purpose, or use of this manual are invited. Comments may be sent on the Document Review Sheet in the back of this manual or may be addressed directly to Documentation Standards and Publications, B-90, Computer Equipment Department, General Electric Company, 13430 North Black Canyon Highway, Phoenix, Arizona, 85029.

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COMPUTER INTERFACE UNIT (CIU931)

GENERAL DESCRIPTION

The CIU931 Computer Interface Unit provides the means for connecting the DATANET-30* and a GE-400 or -600 Series computer (Figure D-1).

The computer interface unit (CIU) connects into the buffer selector of the DATANET-30 and into one standard input/output channel of the other computer. The buffer selector address of the CIU is specified by the buffer selector address channel for the CIU. Since the CIU connects the DATA-NET-30 with either a GE-400 or -600 Series computer, for the purposes here, both of these computers will be referred to as the "external computer."

DATANET-30   I/O CHANNEL

```
┌──────────┐                          ┌──────────┐
│          │                          │    ↙     │   GE-400 Series Computer
├──────────┤                          │  ┌──┐    │   GE-600 Series Computer
│  CIU931  │◄────────────────────────►│  │  │    │
├──────────┤                          │  └──┘    │
│          │                          │          │
└──────────┘                          └──────────┘
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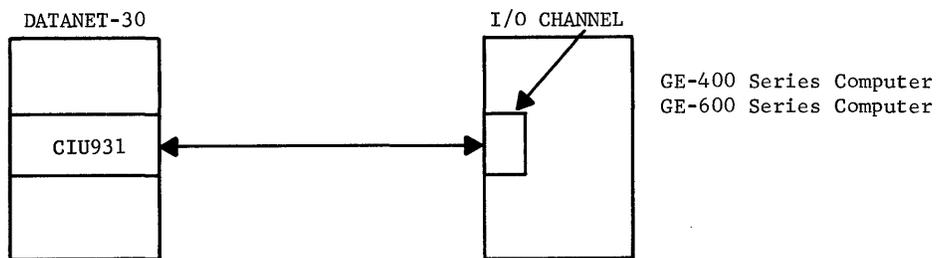
Figure D-1.   CIU931 Connecting a DATANET-30 with an External Computer

Data is transferred in both directions but only in one direction at a time. Control of the direction of data flow is established and maintained by either the external computer or the DATANET-30. Should both the DATANET-30 and the external computer desire control at exactly the same time, the external computer is given priority.

As shown in Figure D-2 more than one CIU can be installed in a DATANET-30. Each CIU occupies two modules. There is no restriction on the number used, other than the physical space occupied.

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*DATANET, Reg. Trademark of General Electric Company.
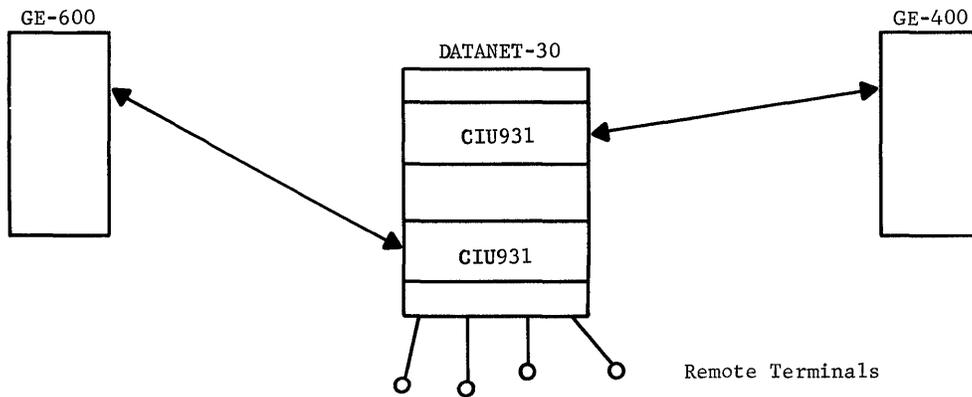
Figure D-2. DATANET-30 with Two CIU931's

Data Transfer

The CIU has an 18-bit buffer. Data is transferred one character at a time to or from the external computer and one DATANET-30 word at a time to or from the DATANET-30. The CIU contains the necessary shift circuitry to accumulate characters into words and separate sequential characters, depending on the direction of data transfer. Data transfer is illustrated in Figure D-3.
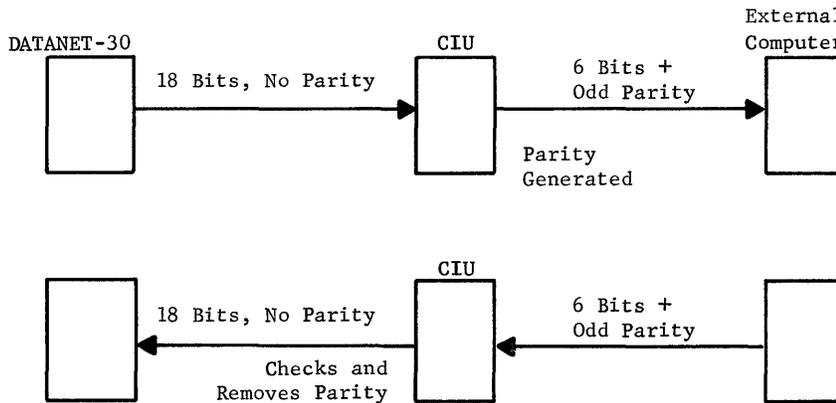
Figure D-3. Data Transfer Through a CIU931

DATANET-30 TO THE COMPUTER INTERFACE UNIT. When the CIU has received a word from the DATANET-30, a signal for the external computer to read is generated. The external computer initiates the transfer of one character at a time from the CIU. When the three characters have been transferred, the CIU notifies the DATANET-30 that another word can be transferred. The DATANET-30 program then transfers another word to the CIU. This process continues until the DATANET-30 or external computer sends an End Data Transfer signal to the CIU.

EXTERNAL COMPUTER TO THE COMPUTER INTERFACE UNIT. When the CIU has received three characters from the external computer, a signal for the DATANET-30 to transfer the three characters is sent to the DATANET-30. The DATANET-30 program must detect this signal and

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transfer the data from the CIU. When the data has been transferred from the CIU, the external computer can transfer three more characters to the CIU. This process continues until the external computer or DATANET-30 sends an End Data Transfer signal to the CIU.

DATA FLOW THROUGH THE COMPUTER INTERFACE UNIT. When data is transferred from the CIU to the external computer, the most significant character of the DATANET-30 word is transferred first and the least significant last.

Characters received by the CIU from the external computer are assembled into a three-character word. The first character is transferred to the most significant part of the DATANET-30 word and the third character is transferred as the least significant.

If an End Data Transfer signal is received from the external computer before a full three-character word is shifted into the CIU, the characters in the data register are shifted to the most significant positions. Zeros are inserted by the CIU into the unfilled character positions before the word is transferred to the DATANET-30.

Performance Summary

The following lists the performance characteristics of the CIU931:

Data medium--Contents of memory.

Speed--Up to 39,000 character per second, depending on the DATANET-30 program and the type of a standard channel in the external computer.

Data format--Oriented in accordance with the program.

Operational mode--On line under program control.

Checks--Parity check performed by the CIU on each character during data transfer from the external computer to the CIU and parity generated on each character during data transfer from the CIU to the external computer.

Controls and indicators--None in the usual sense, except for manual reset button on the control panel of the DATANET-30. All other controls and indicators are by program only.

STATUS CONDITIONS

A total of six status indications may be presented to the DATANET-30. Status is transmitted on the four external status lines, numbers 3, 4, 5 and 6. Status codes are defined in Figure D-4.

CODE	STATUS	MEANING
NES 6543		
0000	Ready	The CIU is ready to receive a Write Initiate instruction.

CODE	STATUS	MEANING
1000	Busy	The previous command has been accepted. No more commands may be transmitted until termination of this command.
0010	Command Rejected	This status is caused only by an improper sequence of instructions from the DATANET-30. The DATANET-30 is not notified if a command by the external computer is rejected by the CIU.
0100	Intermediate	The CIU is waiting for a Read Response command from the computer to which Intermediate status is presented.
0001	Parity Error	This indicates that a parity error occurred.
0011	Time-Out	This indicates a time-out occurred.

Figure D-4. Permissible Status Returns to the DATANET-30.

ERROR CONDITIONS

Parity Error

A parity error occurs only during data transfer from the external computer to the CIU. A Time-Out or Parity Error status and a Terminate are presented to both the external computer and the DATANET-30. The status must be detected by each.

Detection of a parity error on data from the external computer causes the data transfer to cease. The data flag (NES1) is not set. Data included in that transfer to the CIU is lost. The DATANET-30 program needs to determine Time-Out or Parity Error status because the external computer will try to send the same data again, starting with the functional message. The Time-Out and Parity Error status and Terminate must be reset by the DATANET-30 program.

In the event of a parity error, the following conditions prevail:

1. The external computer must start entire transmission over again.

2. The external computer must start with a Write Initiate instruction.

3. The status remains in the CIU until the external computer issues a Write Initiate instruction. Prior to the Write Initiate, the following status is presented to the DATA-NET-30:

   a. Time-Out or Parity Error
   b. Terminate
   c. External status line 1 (NES1) not set

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After the Write Initiate, the following status is presented to the DATANET-30:

    a.   Time-Out or Parity Error
    b.   Terminate
    c.   Special Interrupt
    d.   NES1 not set

The DATANET-30 must interrogate for over-all status and operating conditions. Time-Out or Parity Error and Terminate must be reset. The Special Interrupt indicates a Write Initiate instruction from the external computer. The above combination indicates that the preceding transmission will probably be sent again.

The indication to the DATANET-30 that the entire data transfer has taken place is that a Terminate has been received with a Ready status and/or that the total number of words received agrees with the functional message.

Data Transfer Timing Error (Time-Out)

The data transfer timer is used as an error condition check on the operation of both programs. The timer is set for 100 milliseconds and is started from zero after each of the following:

    1.   A Write Initiate (DEF 8) instruction from the DATANET-30.

    2.   A Write Initiate (WDN) instruction from the external computer.

    3.   A Read Response (DEF 9) instruction from the DATANET-30.

    4.   A Read Response (RDN) instruction from the external computer.

    5.   Data transfer to or from the CIU.

The timer is running upon the completion of the functional message. Thus the DATANET-30 and the external computer must analyze the functional message and reply within 100 milliseconds after the last part of the functional message is transferred from the CIU.

In the event that the timer reaches 100 milliseconds (time-out) without either a Read Response or data transfer taking place, an error condition is assumed; and a Time-Out status with Terminate is presented to both the DATANET-30 and the external computer. Special Interrupt to the DATANET-30 is reset if the DATANET-30 does not answer a Write Initiate from the external computer.

Should a time-out occur, the data transfer from the external computer ceases and the data flag (NES1) is reset. The entire data transfer must be sent again regardless of the direction of data transfer. The same status conditions prevail as for a parity error.

The DATANET-30 must detect the over-all status. Time-Out status and Terminate must be reset. If the direction of transfer was from the DATANET-30, the transfer sequence must start with a Write Initiate instruction, functional message, etc. The status to the external computer must be reset by the external computer. The timer starts again when the DATANET-30 issues the Write Initiate.

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If the direction of transfer was to the DATANET-30, the status in the CIU must be reset; and the DATANET-30 must wait for the external computer to start the transfer sequence.

Terminate

The Terminate signal normally indicates the termination of data transfer. The Terminate signal is transmitted to both the external computer and the DATANET-30 along with the current status. The Terminate signal results normally from an End Data Transfer instruction to the CIU. The Terminate signal must be reset by the DATANET-30 program. A Terminate signal is also generated because of a time-out or parity error.

Special Interrupt

The Special Interrupt signal indicates to the receiving program that a valid Write Initiate has been accepted by the CIU. The CIU is now waiting for a Read Response from the program receiving the Special Interrupt.

Functional Message

The functional message consists of four DATANET-30 words. The CIU circuitry detects the transfer of the first four words (12 characters to the CIU) and temporarily halts data transfer.

The contents of the 12 characters of the functional message can be in any format or sequence and contain whatever information is desired by the two operating programs. The functional message can contain the number of words to be transferred, the type of data, what is to be done with the data (store on DSU, punch on cards, request a reply), etc. Depending on the system operation, the first 12 characters can also be the first part of a message--that is, a header plus part of the text. In short, the first 12 characters transferred can be anything agreed upon by the two operating programs.

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INSTRUCTION REPERTOIRE

The instructions are classified under buffer selector instructions for the DATANET-30. They are the Drive External Function (DEF), External Status Lines (NES), and Register Transfer (TRA) instructions. The rules for using these instructions are the same as those for other DATANET-30 buffer selector instructions.

Drive External Function Instructions

DEF1
Reset Data Flag--Resets the data flag of the shift register and enables three more characters to be transferred into the CIU from the external computer.

DEF2
Reset Data Flag--Resets the data flag of the shift register before another word is transferred into the CIU from the DATANET-30.

DEF3,4
Not assigned.

DEF5
Reset Terminate--This instruction must be given each time Terminate is presented to the DATANET-30.

DEF6
Reset Status--Resets all status conditions to the DATANET-30 except Intermediate. The CIU goes to Ready status.

DEF7
Not assigned.

DEF8
Write Initiate--Establishes control in the CIU for direction of transfer of data. The CIU sends a Special Interrupt signal and Intermediate status to the external computer. In order to start data transfer, the external computer receiving the Special Interrupt must then issue a Read Response command.

A Write Initiate command is terminated by any of the following actions:

Either the DATANET-30 or the external computer generates an End Data Transfer signal.

When the Write Initiate is from the external computer and after data transfer from the external computer has started, the DATA-NET-30 issues a Write Initiate instruction (after the functional message).

The CIU is reflecting Busy status to either the DATANET-30 or external computer or both and no data has transferred for 100 milliseconds.

If the CIU receives simultaneous Write Initiate instructions, the external computer is given priority. The instruction issued by the DATANET-30 is not accepted and Intermediate status is indicated to the DATANET-30.

The external computer can also take priority if the external computer issues a Write Initiate after the DATANET-30 instead of a Read Response. The Write Initiate from the DATANET-30 is canceled, and Intermediate status with Special Interrupt is indicated to the

DATANET-30. A Read Response instruction must now be given by the DATANET-30. The Write Initiate from the external computer replaces and cancels the Write Initiate from the DATANET-30.

DEF9   Read Response--Enables transfer of data from the external computer to the CIU. This is issued by the DATANET-30 in reply to a Special Interrupt from the CIU and after the functional message.

A Read Response instruction is accepted by the CIU only when it is reflecting Intermediate status. Acceptance of the instruction changes status to Busy.

DEF0   End Data Transfer--Indicates to the CIU that data transfer has ceased. This instruction is issued by the program when the entire data transfer has been completed by the DATANET-30.

The End Data Transfer signal causes the CIU to:

1. Store the End Data Transfer signal until the external computer has taken all three characters before issuing the Terminate signal.

2. Send a Terminate signal to both the external computer and the DATANET-30.

3. Leave the CIU data flag (NES1) in a reset state.

4. Indicate Ready status to both.

External Status Lines

NES1   The data flag--Set when the CIU is ready to transfer another word to or from the DATANET-30. Reset when a word is transferred to or from the DATANET-30. This condition is indicated for data flow in both directions.

NES2   Not used.

NES3
NES4   CIU status lines--These four lines represent the code for the status
NES5   conditions. Status is present at all times on these lines.
NES6

NES7   Not used.

NES8   Not used.

NES9   The Special Interrupt signal--Set when the CIU sends a Special Interrupt as the result of a Write Initiate command from the external computer to the CIU. The DATANET-30 program must test this line every basic program cycle or in time to prevent the 100-millisecond timer from running out.

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NES0   The Terminate signal--Set when the CIU sends a Terminate signal
                            indicating end of data transfer.

Register Transfer Instruction

    TRA   FROM, TO   Data is transferred from or to the CIU.

Examples:

    TRA R,B   Data is transferred from the CIU to the B-register, and the CIU data
                            flag (NES1) is reset.

    TRA B,T   Data is transferred from the B-register to the CIU, and the CIU data
                            flag (NES1) is reset.

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PROGRAMMING CONSIDERATIONS

Output Signals to the DATANET-30

Output signals from the CIU to the DATANET-30 are generated in the CIU as shown in the following table.

From External Computer to the CIU	From the CIU to DATANET-30
End Data Transfer	Terminate with Ready status
Data transfer causing a parity error or a time-out error	Terminate with Parity Error status
Write Initiate	Special Interrupt with Intermediate status; Terminate with Intermediate status
Read Response	Data flag (NES1) set with Busy status
3 characters	Data flag (NES1) set with Busy status
Commands being Rejected because of Parity error Invalid code Improper sequence	No signal
Request status	No signal
Reset status	No signal

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Instruction Sequence of Operations

<u>EXAMPLE A.</u> In Figure D-5, assume that nothing is happening and the CIU is in Ready status. When the external computer issues a Write Initiate (WDN) instruction, the CIU sends a Special Interrupt signal to the DATANET-30. The CIU is now busy to the external computer and in Intermediate status to the DATANET-30. When the DATANET-30 issues a Read Response, the CIU goes busy to the DATANET-30; and data transfer occurs. The functional (control) message is transferred first. After the functional message has been transferred, the CIU halts data transfer and sends a Terminate and Intermediate status to the DATANET-30. There are two possibilities at this point:

1. The DATANET-30 can accept data (Figure D-5). A Read Response is issued by the DATANET-30, and data transfer continues until an End Data Transfer is sent from the DATANET-30 or the external computer. The CIU sends Terminate signals to both computers.

2. The DATANET-30 cannot accept data (Figure D-6). The DATANET-30 issues a Write Initiate to the CIU, and a Terminate is sent to the external computer. The external computer issues a Read Response to find out why the DATANET-30 cannot accept data. A functional message is transferred, the DATANET-30 issues End Data Transfer, and the CIU sends a Terminate to both computers ending the sequence. This ends the sequence started by the external computer.

If the DATANET-30 issues a WRI for the purpose of rejecting a functional message, the DATANET-30 must issue an End Data Transfer after the functional message for reject. If the DATANET-30 is then to transfer data, it must originate a new WRI sequence.
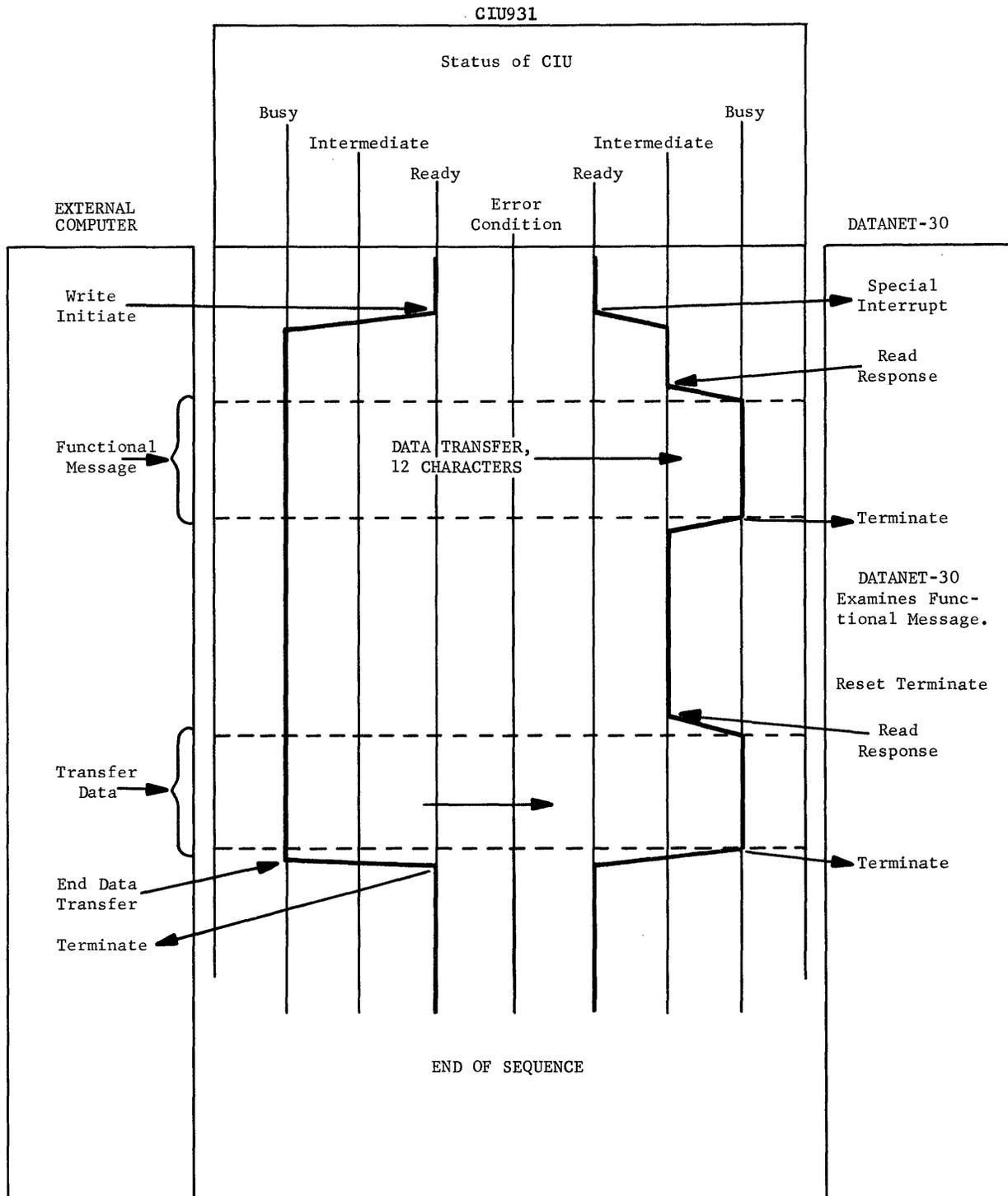
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Figure D-5. Transfer Sequence from External Computer
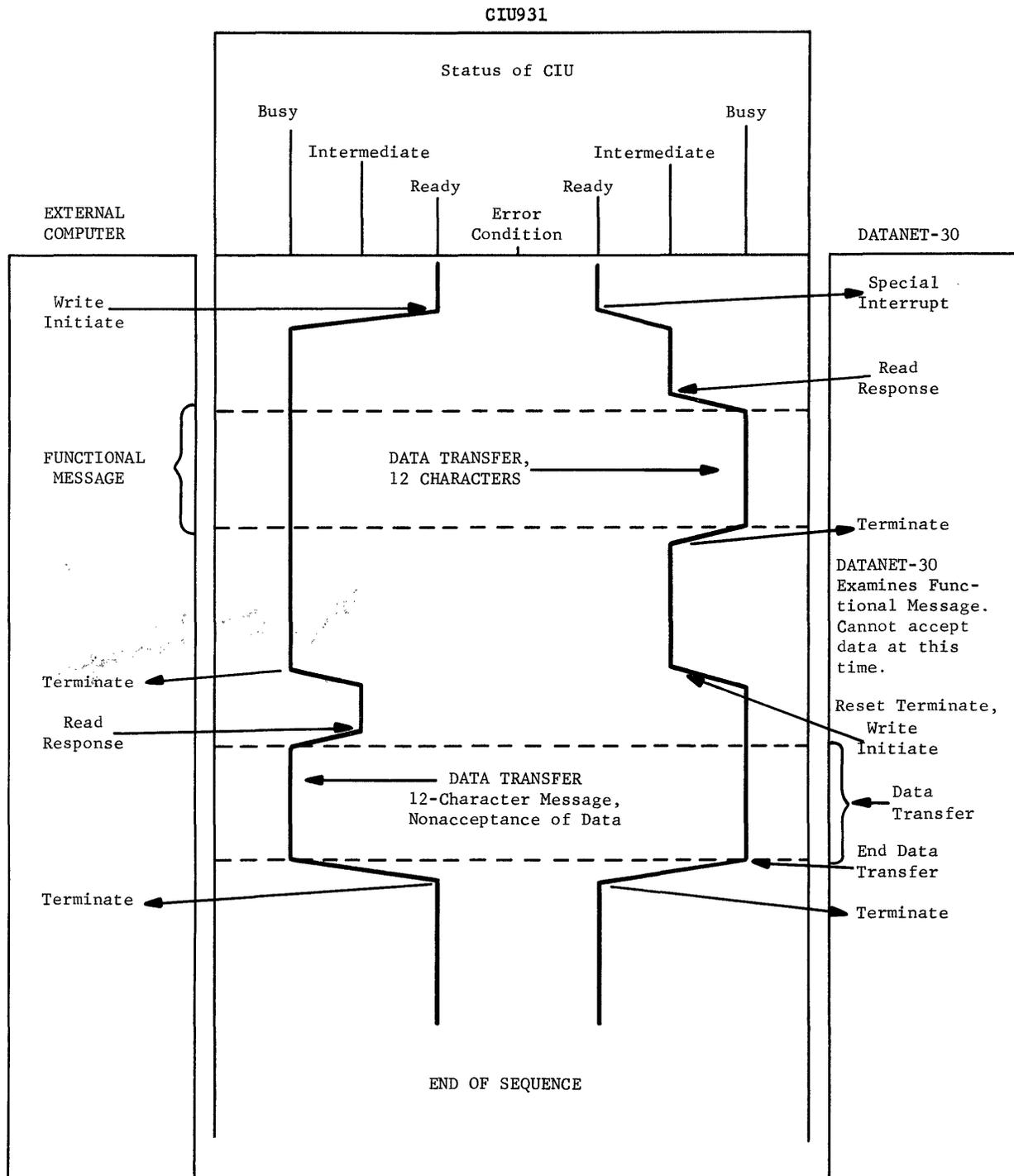
Figure D-6. Data-Not-Accepted Sequence (External Computer to DATANET-30)

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EXAMPLE B. In Figure D-7, assume that nothing is happening and the CIU is in Ready status. When the DATANET-30 issues a Write Initiate instruction, the CIU sends a Special Interrupt signal to the external computer. The CIU is now busy to the DATANET-30 and in an Intermediate status to the external computer. When the external computer issues a Read Response, the CIU goes busy to the external computer, the data flag is set (NES1), and data transfer occurs.

The functional (control) message is first transferred. After the functional message has been transferred, the CIU halts data transfer and sends a Terminate and Intermediate status to the external computer while the external computer processes the functional message. The CIU is again in an Intermediate status. This status remains until the external computer is ready to accept more data. When the external computer issues a Read Response, the data flag is set (NES1); and data transfer can again occur. Data transfer continues until an End Data Transfer signal from the DATANET-30. The CIU sends a Terminate to both computers and indicates Ready status to both.

The external computer may also issue and End Data Transfer command if it has received characters in a multiple of 3. A Terminate signal with Ready status is presented to both computers.
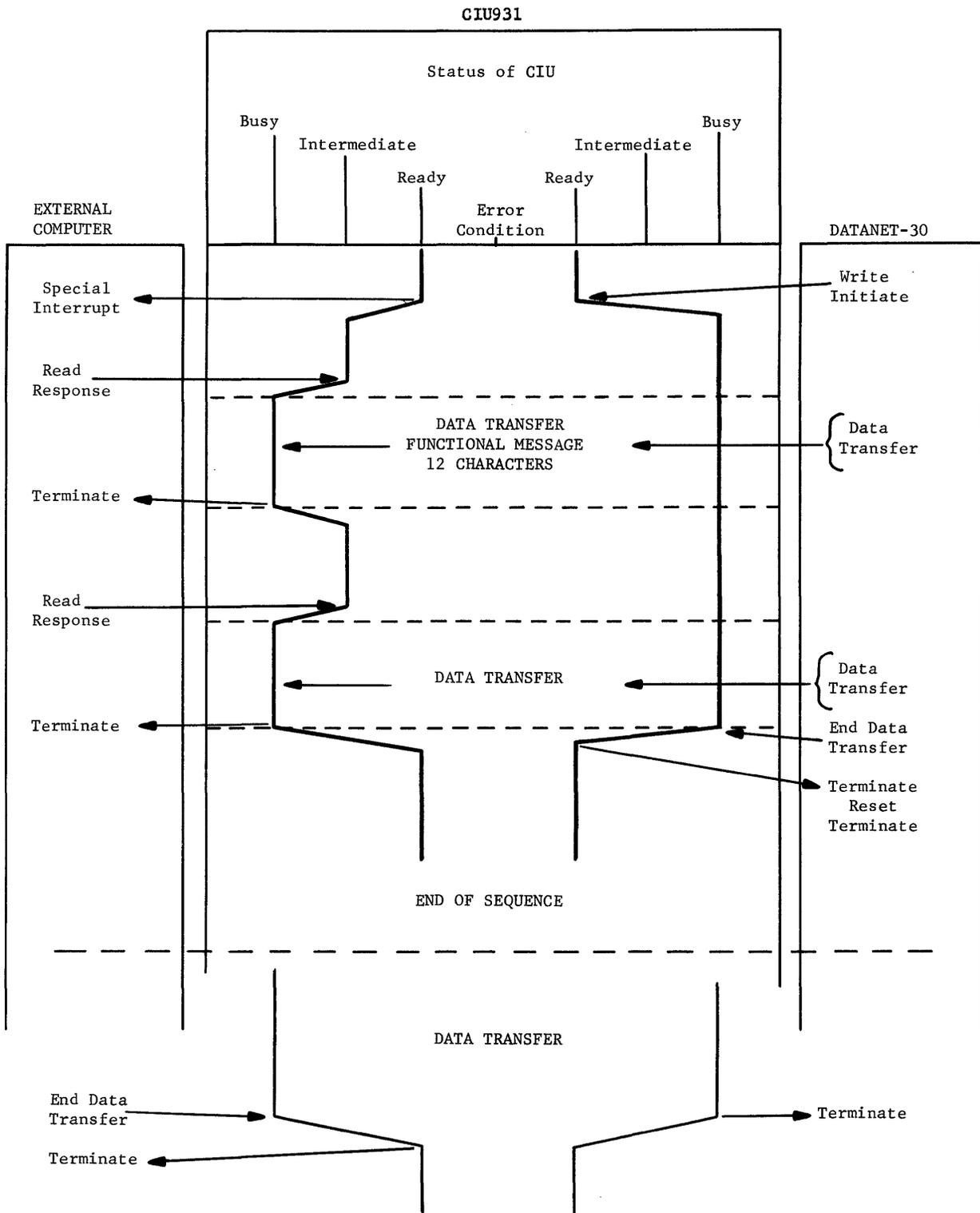
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Figure D-7. Transfer Sequence from DATANET-30

EXAMPLE C. Figure D-8 shows a sequence when the external computer cannot accept data. The CIU is in a Ready status, and the DATANET-30 issues a Write Initiate instruction. The sequence for transfer of the functional (control) message is the same as that described in the previous section. Having transferred the functional message, the CIU halts the transfer of data.

At this point, the external computer cannot accept the data and issues a Write Initiate instruction. This causes a Terminate signal to be sent to the DATANET-30 and causes Intermediate status. DATANET-30 must now answer with a Read Response. The external computer sends a functional message indicating nonacceptance of data. The DATANET-30 must now issue an End Data Transfer and terminate the sequence. The DATANET-30 receives a Terminate signal. The DATANET-30 cannot attempt to do another Write Initiate (DEF8) until the CIU is again in Ready status and Terminate is reset.
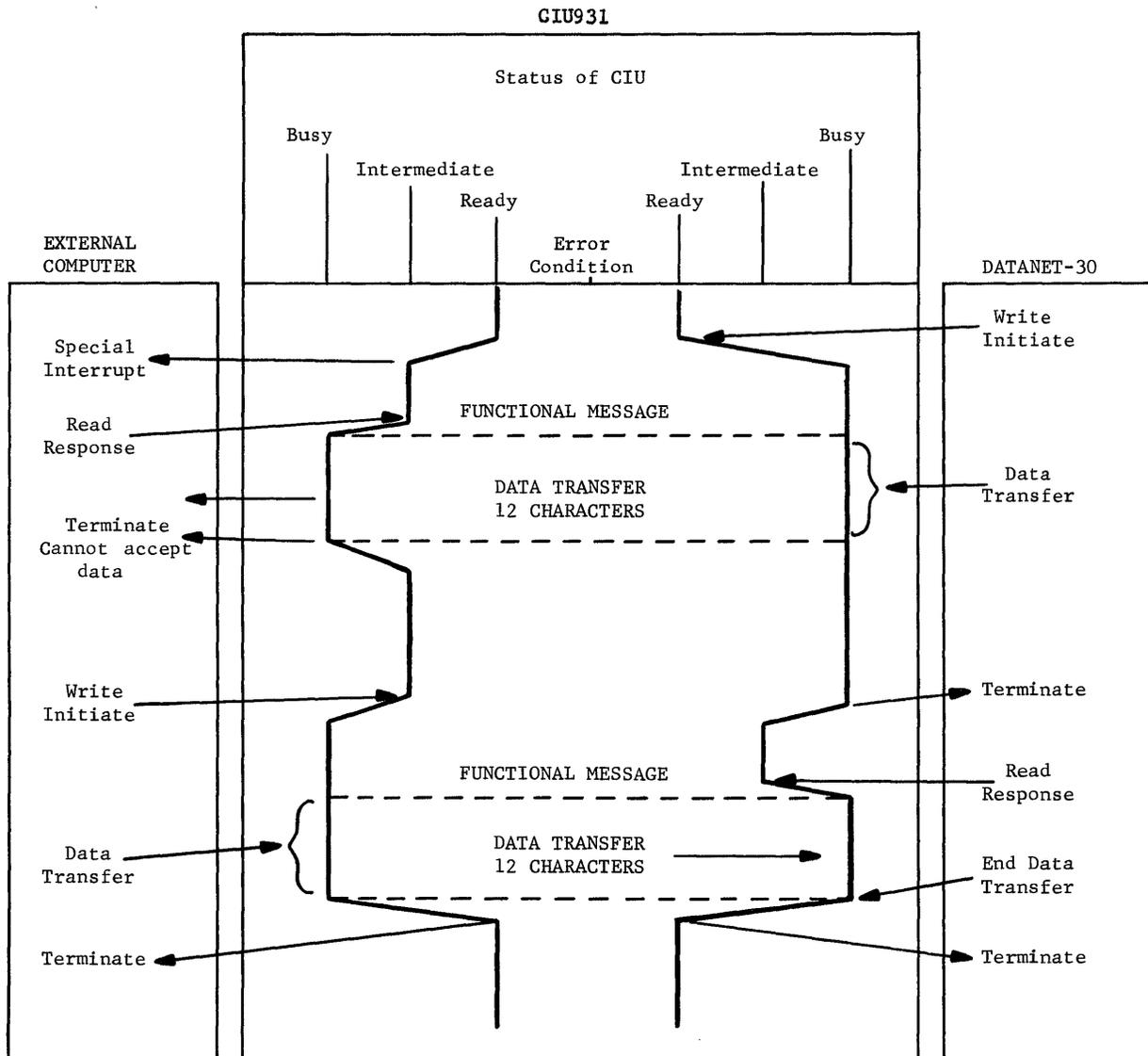
Figure D-8. Data-Not-Accepted Sequence (DATANET-30 to External Computer)

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EXAMPLE D. If a parity error occurs (Figure D-9), the CIU halts data transfer, sends Terminate to both the external computer and the DATANET-30, and indicates Parity Error status to both. A time-out condition has the same results.

Status of
CIU

Busy   Busy

EXTERNAL   Error   DATANET-30
COMPUTER   Condition

DATA TRANSFER
Either Direction

Parity   Ha lts
Error   Da ta
                Tran sfer
Terminate   Terminate

Time-   Ha lts
out   Da ta
                Tran sfer
Terminate   Terminate
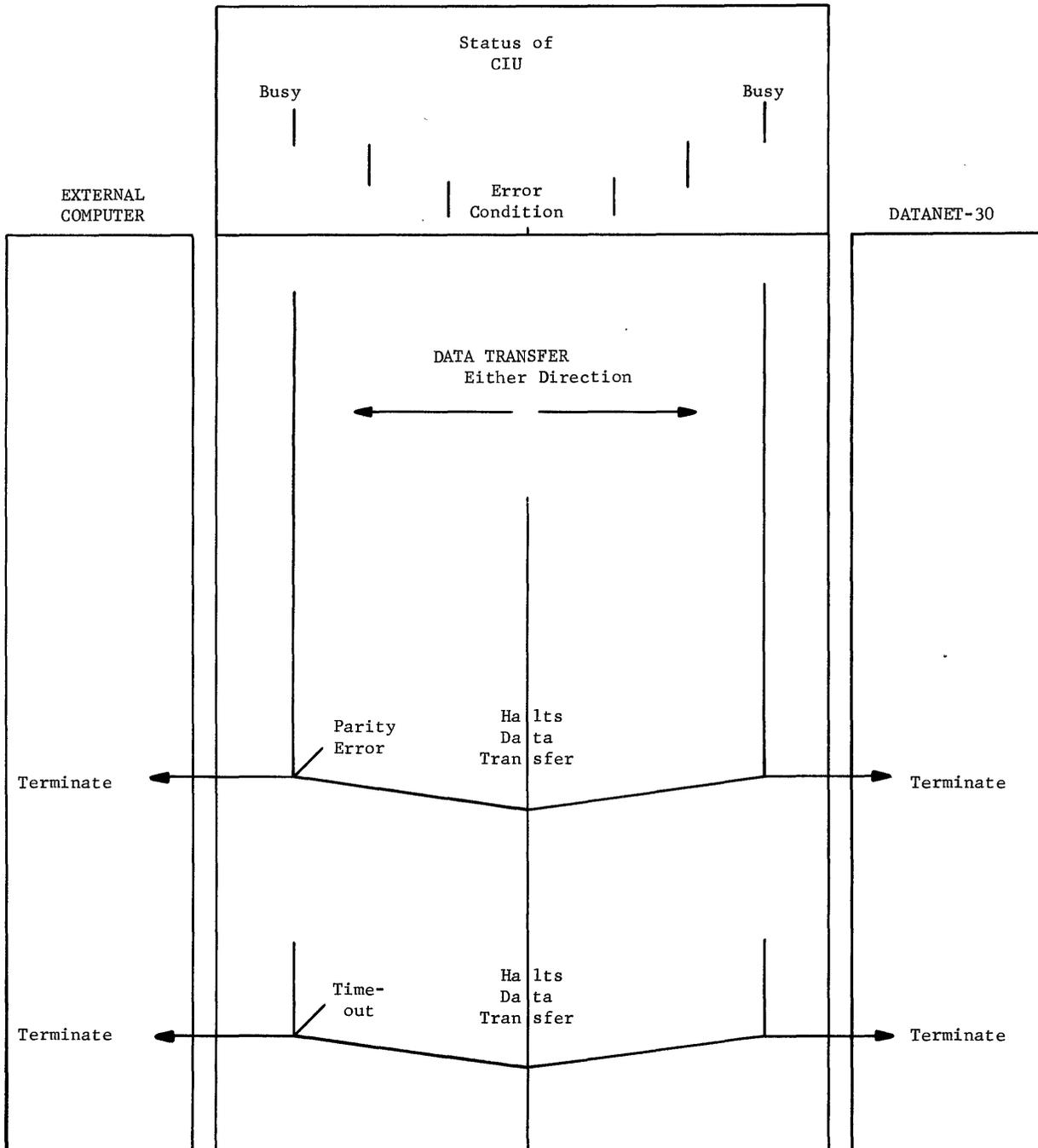
Figure D-9. Error Condition Sequence

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PROGRAMMING CONVENTIONS

The following items cover programming conventions, restrictions, and suggestions that must be considered for maximum programming efficiency.

DATANET-30 Conventions

The DATANET-30 conventions are as follows:

1. The status of the CIU is always indicated in the status lines (NES3, 4, 5, and 6).

2. External status line 9 (NES9) must be checked within every 100 milliseconds to prevent time-out in the CIU when a Special Interrupt condition exists.

3. External status line 1 (NES1) must be checked within every 100 milliseconds to prevent time-out in the CIU during data transfer.

4. A Reset Status (RSS) (DEF6) can reset any status except Intermediate. The instruction must be issued to reset Parity Error, Time-Out or Command Reject.

5. The CIU halts data transfer after the first four DATANET-30 words. This is the halt after the functional message.

6. If necessary, by issuing a Write Initiate instruction, the DATANET-30 can interrupt and terminate data transfer from the external computer during data transfer after the functional message. The external computer status goes from Busy to Intermediate. The DATANET-30 status remains Busy.

7. The program must always reset the Terminate signal (DEF5) if Terminate is present, before issuing a Read Response or Write Initiate.

8. If a time-out occurs before a Read Response by the DATANET-30 is given, Intermediate status and Special Interrupt are replaced with Time-Out status and Terminate.

9. An End Data Transfer signal at any time from the external computer terminates data transfer from the DATANET-30, providing a multiple of 3 characters have been received by the external computer.

10. There are two ready conditions. The first is Ready status (NES3, 4, 5 and 6), when the CIU is ready to accept a Write Initiate instruction. The second occurs when the CIU is ready to transfer data (NES1) either to or from the DATANET-30.

11. The DATANET-30 must send at least one more word to the CIU/external computer following the functional message.

External Computer Conventions

The CIU is in all respects a peripheral to the external computer, except that:

1. The CIU halts data transfer after the first 12 characters.

2. If the external computer issues a Write Initiate and does not get a Read Response from the DATANET-30 before the 100-millisecond timer times out, the CIU drops the WDN, sends Time-Out status and Terminate to both computers. The external computer must again try the Write Initiate.

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3. Data transfer from the DATANET-30 can be interrupted once the Read Response has been issued, if the external computer issues an End Data Transfer signal.

4. The DATANET-30 can interrupt and terminate data transfer from the external computer after the functional message has been transferred.

5. A Reset Status (RSS) instruction to either computer must be issued only to reset Parity Error or Time-Out status.

6. The timer starts after completion of each command sequence and after each transfer of data.

7. After transfer of the functional message from the DATANET-30, three more characters must be transferred from the CIU. If this transfer does not take place, a time out will occur. If only one or two characters are transferred and then an End Data Transfer is issued by the external computer, the CIU will time out.

8. The external computer must always receive data from the CIU in a multiple of three characters before issuing an End Data Transfer. If all characters are not transferred from the CIU, a time out will occur.

PROGRAMMING EXAMPLES

Receive Example

The example in Figure D-10 shows one way information may be received. This is not necessarily the way it would be done in an operating program. The example assumes that (1) the DATANET-30 can wait for the external computer to send data, (2) a block of 50 words will be received, (3) an area in memory has been reserved for the functional message, (4) a subroutine will analyze the functional message, and (5) the data will be stored in a properly assigned area. Also, some error checking has been omitted.

Three symbols have been left undefined intentionally. CHECK and EXIT serve as a means for checking status and returning to the main program. ANALCH1 will depend upon the contents of the functional message.

Transmit Example

The example in Figure D-11 shows one way information may be transmitted. This is not necessarily the way it would be done in an operating program. The example assumes that (1) the DATANET-30 can wait at various times in the program, (2) the functional message has been prepared, (3) the data is in memory ready to be transferred, and (4) a method for determining when to send the End Data Transfer signal has been established. Also, some error checking has been omitted.

Four symbols have been left undefined intentionally. These serve as means for checking status of the CIU and returning to the main program. The development of CHECK1, CHECK2, OUT, and EXIT will depend upon program design.

```
                              00010*                        SAMPLE  PROGRAM FOR THE CIU 931
                              00020*
                004000        00030            ORG 2048        ORIGIN LOCATION
    04000       104001        00040   FUNTAB   INA *+1         TABLE FOR FUNCTIONAL MSG
                000004        00050            BSS 4
*   04005A0     000000        00060   CHECK                    WHY STATUS IS NOT INTERMEDIATE
    04006       104007        00070   DATASTR  INA *+1         DATA RECEIVED STORAGE AREA
                000062        00080            BSS 50
*   04072U      000000        00090   ANALYCHR LNK ANALYCH1    ANALYSE FUNCTIONAL MSG ROUTINE
*   04073U      000000
*   04074A0     000000        00100   EXIT                     RETURN TO MAIN PROGRAM
    04075       000001        00110   D1       DEC 1           CONTROL CONSTANT
                000032        00120   CIUADDR  EQU 26          CIU ADDRESS
    04076       000062        00130   FIFTY    DEC 50          WORDS RECEIVED CONSTANT
                              00140*
                              00150*            RECEIVE FUNCTIONAL MESSAGE
                              00160*
    04077       011032        00170   READ     PIC CIUADDR     PUT CIU ADDRESS IN C REG
    04100       022400        00180   READ1    NES 9           IS SPEC INTERRUPT ON
    04101       120100        00190            BZE *-1         NO CHECK AGAIN
    04102       026400        00200            DEF 9           READ RESPONSE
    04103       022001        00210   DF       NES 1           IS DATA FLAG SET
    04104       120103        00220            BZE *-1         NO CHECK AGAIN
    04105       060044        00230            TRA R,B         YES RECEIVE WORD
    04106       704000        00240            STB FUNTAB,      STORE IN MSG TABLE
    04107       023000        00250            NES 0           IS TERMINATE SET
    04110       120103        00260            BZE DF          NO CHECK DATA FLAG
    04111       100112        00270            BRU RECDAT      YES TWELVE CHAR RECEIVED
                              00280*
                              00290*            RECEIVE DATA
                              00300*
    04112       022020        00310   RECDAT   NES 5           IS STATUS INTERMEDIATE
    04113       120005        00320            BZE CHECK       NO WHAT IS IT
    04114       026020        00330            DEF 5           YES RESET TERMINATE
    04115       110072        00340            BRS ANALYCHR    ANALYSE FUNCTIONAL MESSAGE
    04116       026400        00350            DEF 9           READ RESPONSE
    04117       060010        00360            TRA 0,A         SET COUNT IN A REG
    04120       022001        00370   DFD      NES 1           IS DATA FLAG SET
    04121       120120        00380            BZE *-1         NO CHECK AGAIN
    04122       060044        00390            TRA R,B         YES RECEIVE WORD
    04123       704006        00400            STB DATASTR,     STORE IN DATA WORD AREA
    04124       420075        00410            AMA D1          ADD ON TO COUNTER
    04125       570076        00420            XAZ FIFTY       IS COUNT FIFTY
    04126       120074        00430            BZE EXIT        RETURN TO MAIN PROGRAM
    04127       023000        00440            NES 0           IS TERMINATE SET
    04130       120120        00450            BZE DFD         NO CHECK DATA FLAG
    04131       026020        00460            DEF 5           YES RESET TERMINATE
    04132       100074        00470            BRU EXIT        RETURN TO MAIN PROGRAM
                004077        00480            END READ
```

Figure D-10. Sample Receive Program

```
                            PAGE  001

            007640    00010              ORG 4000          ORIGIN LOCATION
*   07640A0 000000    00020   OUT                          A ROUTINE TO CHECK
                      00030*                               WHY CIU IS NOT READY
*   07641A0 000000    00040   CHECK1                       A ROUTINE TO CHECK
                      00050*                               WHY CIU DID NOT GO BUSY
    07642    107643   00060   FUNWORD  INA **+1            FUNCTIONAL MSG AREA
            007643    00070            BSS 4
*   07647A0 000000    00080   CHECK2                       A ROUTINE TO CHECK
                      00090*                               WHY STATUS IS NOT BUSY
    07650    107651   00100   DATASND  INA **+1            DATA TO BE SENT
            007651    00110            BSS 50
            000032    00120   CIUADDR  EQU 26              CIU ADDRESS
    07733    000001   00130   DACOUNT  OCT 1               CONSTANT TO ADD TO COUNT
*   07734A0 000000    00140   EXIT                         RETURN TO MAIN PROGRAM
    07735    000000   00150   LAST     DEC 0               TOTAL COUNT TO BE SENT
    07736    000004   00160   LASTFUN  DEC 4               FOURTH FUNCTIONAL MSG WORD
                      00170*
                      00180*                      SEND FUNCTIONAL MESSAGE
                      00190*
    07737    011032   00200   WRITE    PIC CIUADDR         PUT CIU ADDRESS IN C REG
    07740    026020   00210            DEF 5               RESET TERMINATE
    07741    022074   00220   WRITE1   NES 3456            IS STATUS READY
    07742    131640   00230            BNZ OUT             NO GET OUT
    07743    026200   00240            DEF 8               YES ISSUE WRITE INITIATE
    07744    022040   00250            NES 6               IS STATUS BUSY
    07745    131747   00260            BNZ **+2            YES
    07746    101641   00270            BRU CHECK1          NO WHAT IS IT
    07747    060010   00280            TRA 0,A             LOAD ZEROS IN A REGISTER
    07750    022001   00290   W1       NES 1               IS DATA FLAG SET
    07751    121750   00300            BZE *-1             NO CHECK AGAIN
    07752    605642   00310            LDB FUNWORD,        YES TRANSFER FUNCTIONAL MSG
    07753    060401   00320            TRA B,T             TRANSFER WORD
    07754    421733   00330            AMA DACOUNT         INCREMENT WORD COUNT
    07755    571736   00340            XAZ LASTFUN         IS THIS THE FOURTH WORD
    07756    131750   00350            BNZ W1              NO SEND NEXT WORD
    07757    101760   00360            BRU SEND            YES SEND DATA
                      00370*
                      00380*                      TRANSMIT DATA
                      00390*
    07760    060010   00400   SEND     TRA 0,A             LOAD ZEROS IN A REGISTER
    07761    022040   00410   S1       NES 6               IS STATUS BUSY
    07762    121647   00420            BZE CHECK2          NO WHAT IS IT
    07763    022001   00430            NES 1               IS DATA FLAG SET
    07764    121761   00440            BZE *-3             NO CHECK STATUS
    07765    605650   00450            LDB DATASND,        LOAD DATA WORD
    07766    060401   00460            TRA B,T             TRANSFER WORD
    07767    421733   00470            AMA DACOUNT         INCREMENT WORD COUNT
    07770    571735   00480            XAZ LAST            IS THIS THE LAST WORD
    07771    131761   00490            BNZ S1              NO TRANSFER NEXT WORD
    07772    027000   00500            DEF 0               YES END DATA TRANSFER
    07773    101734   00510            BRU EXIT            GO TO MAIN PROGRAM
*        U  000000    00520            END READ
```

Figure D-11. Sample Transmit Program

DOCUMENT REVIEW SHEET

TITLE: <u>CIU931 Computer Interface Unit for DATANET-30</u>

CPB #: <u>1251</u>

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Position: _____

Address: _____

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