

TERMINAL SUBSYSTEMS

MODE 4B/C (714 MULTISTATION) INTERFACE SPECIFICATION

In last month's PSI Excerpts, some introductory information was provided on protocols, particularly as related to the 200 User Terminal and the communication information exchange procedure known as Mode 4A. This month's information will be provided on Mode 4C protocol as utilized by the recently developed 714 multistation.

The 714-10/20 remote terminal consists of a station and one or more communications devices. The devices available for connection to the station include:

- A display/keyboard for input or output
- An impact printer for printout originating from the control station or printout locally from a display/keyboard
- A non-impact printer with the same functions as the impact printer

The 714-10 has, in addition to the standard 240-word read/write character memory, a 240-word memory for buffering information directed to a printer. The 714-20 model has seven of these additional 240-word memories for buffering printer information.

Unlike a batch terminal, the 714 multistation can function up to sixteen of the previously mentioned devices. The necessity to address many devices on one station controller requires unique device address and the communications capability to optimize input/output to the devices. Device recognition and operation cannot be performed strictly through the use of escape codes {E1, E2, E3, E4} and operation control codes, as is the case when using 200 UT Mode 4A protocol.

Communicating with the remote multistation is accomplished through messages that have the same general format as specified for 200 UT Mode 4A. The required additional communication procedure capabilities are attained by employment of configuration and status message sequences to the remote station as basic message types, the ability to communicate message sequences to the station or a specific device at the station, and an expanded set of printer and keyboard/display control codes.

The message types received by the terminal are:

- A. Poll
- B. Alert
- C. Write
- D. Reset Write
- E. Clear Write
- F. Diagnostic Write
- G. Status Request
- H. Configuration Request

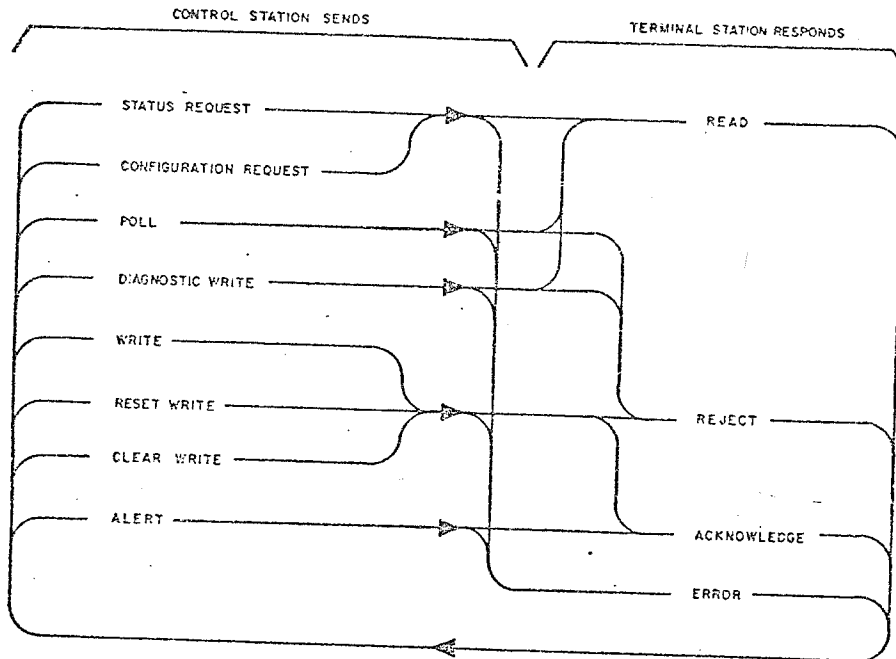
The messages sent in response to a received message are:

- A. Acknowledge
- B. Reject
- C. Read
- D. Error

The interaction of these messages is as follows:

TERMINAL SUBSYSTEMS

MODE 4B/C {714 MULTISTATION} INTERFACE SPECIFICATION {cont'd}



The description of these message types remains basically the same as was described for the 200 UT Mode 4A protocol, except for reference made for card data and the absence of the configuration and status message types from Mode 4A. Information in the following paragraph will further clarify and explain these differences.

As previously mentioned, the escape codes under Mode 4C are not used as device-addressing mechanisms when used with the various message types as is the case in Mode 4A. Under Mode 4C, the significance of the E codes is intended to be consistent from system to system, although their interpretation by the terminal controllers will remain device-dependent.

In the WRITE messages, the escape codes have the following general interpretation:

- E1 - Release device - Should release the addressed device from a read-active state and make it available for initiation of the next sequence.
- E2 - Execute command - For buffered devices signifies end of characters, begin print or punch if data was received without error for output devices only. This code does not release the device.
- E3 - Read device - On multiple record device, read next record for input device only. This code does not release the device.

TERMINAL SUBSYSTEMS

MODE 4B/C {714 MULTISTATION} INTERFACE SPECIFICATION {cont'd}

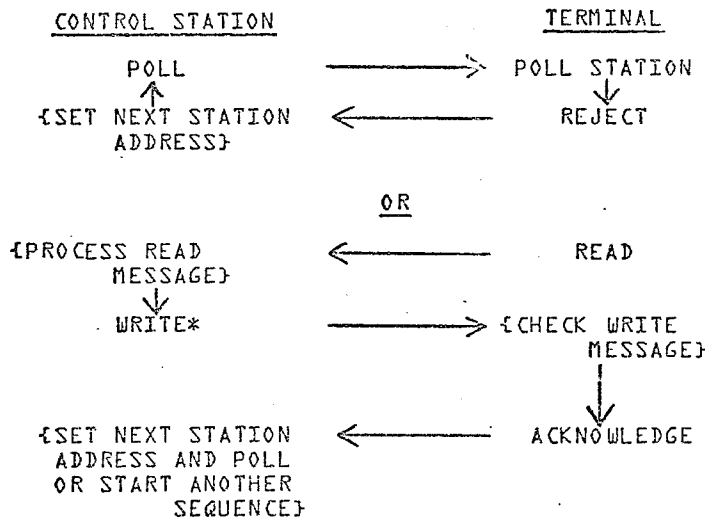
For READ messages, the E codes signify:

- E1 - Device sequence complete - End of data or test record.
- E2 - Device not available - Indicates that the device cannot perform another function at this time.
- E3 - Device available - Device may continue to be used under data source control, device has completed previously requested function.

The sequences of messages to the multistation can either be directed to the station itself or a particular device at the station. Three message sequences are directed to the station as a whole: the poll, configuration, and station status sequence. The following are examples of the various sequences.

Poll Sequence

A poll message sequence can be sent either to an individual device within a terminal {device poll} or to the entire terminal {station poll}. In the first instance, only the addressed device may respond to the poll. In the second case, however, the devices in a station are scanned in order of ascending device address, and the first device encountered with an active read request responds to the poll. If no read request is active, the terminal returns a reject message as a response to the poll.



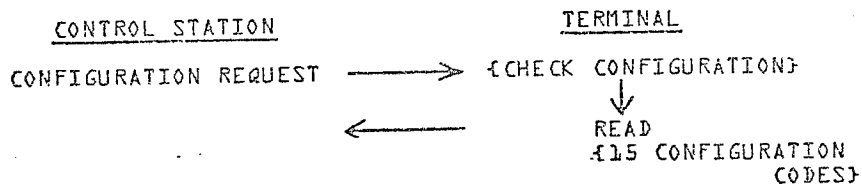
*RESET WRITE or CLEAR WRITE may also be sent. The WRITE message ending in an E1 releases the terminal's keyboard unless the message also contains a lock-keyboard code.

TERMINAL SUBSYSTEMS

MODE 4B/C (714 MULTISTATION) INTERFACE SPECIFICATION (cont'd)

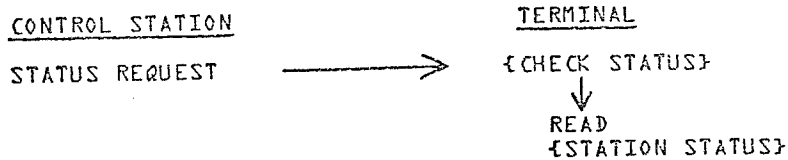
Configuration Sequence

The configuration sequence is used to determine what devices are active at a terminal. It consists of a configuration request addressed to a terminal (device address 140 or 160) and a read response containing 15 configuration codes, one for each device address, 141 through 157 (or 161 through 177).

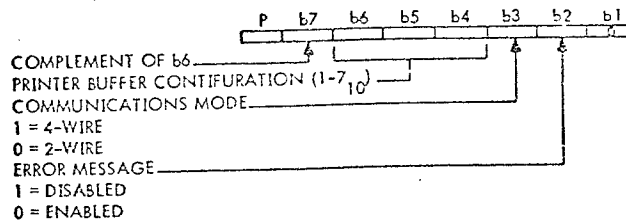


Station Status Sequence

The station status sequence begins with a status request message addressed to a station, or terminal (device address 140 or 160). The response is a READ message containing the station status word followed by device status words for addresses 141 through 157 (or 161 through 177). Status words for display/keyboards and printers are described later in this section. The device status word for an address which has no device active is 100 octal.



Station status bits are:



The display on the 714 handles two message sequences in addition to those for both the station and terminal. The display's additional sequences are the alert sequence and the device status sequence.

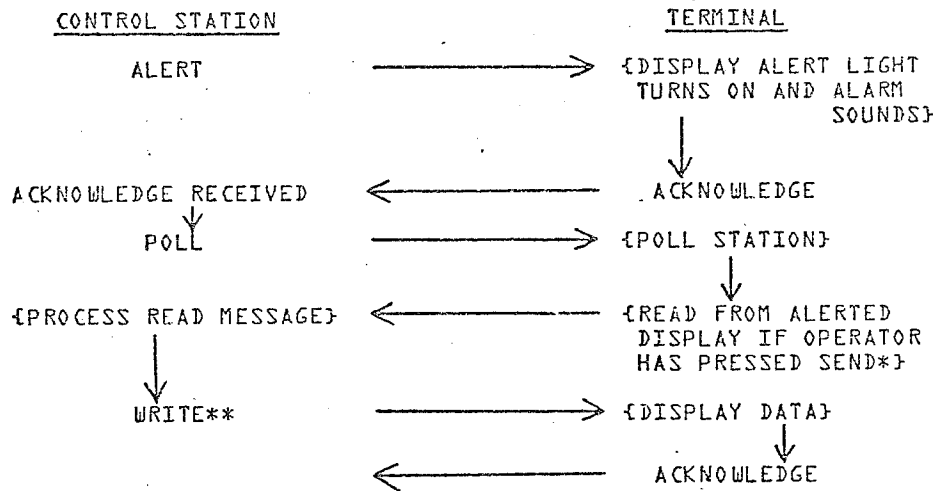
TERMINAL SUBSYSTEMS

MODE 4B/C {714 MULTISTATION} INTERFACE SPECIFICATION {cont'd}

Alert Sequence

A write message received by a display writes over the data which is currently being displayed. Therefore, an alert sequence is normally used to inform the operator that the control station wishes to send a write message. The operator has the opportunity to inform the control station when he wants the write message to be sent.

The data content of display read and write messages consists of display characters and control codes. When the end of the display is reached in a write message, the next character wraps around to the beginning of the display. When the operator presses SEND, CNTRL, or a function key, the keyboard is locked. It is unlocked when a write message is received correctly, provided the message does not contain a lock keyboard control code. If the data content of a write to a display ends with an E1 code, the send symbol is displayed; however, the E1 code is not required.

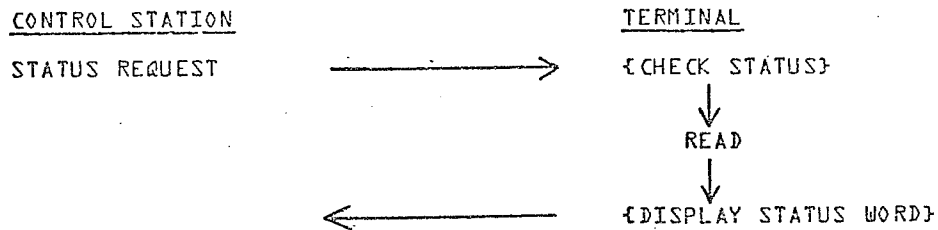


* If operator has not pressed send, response is reject or read from another device and the station must be polled again.

** Reset write, or clear write may also be used. If a diagnostic write is sent, the response is a read message instead of acknowledge.

Device Status Sequence

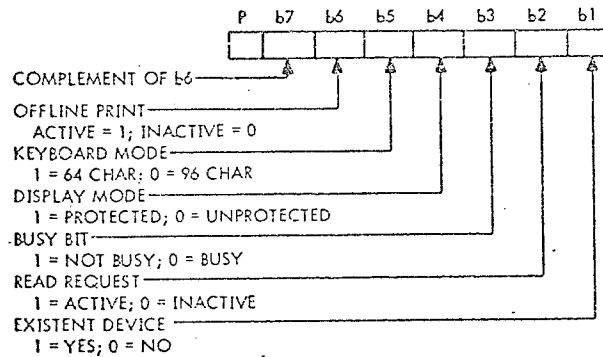
The status sequence display/keyboard returns a read message containing the display status word in response to a status request addressed to the display/keyboard.



TERMINAL SUBSYSTEMS

MODE 4B/C (714 MULTISTATION) INTERFACE SPECIFICATION (cont'd)

Display status word format:



The printer like the display/keyboard handles two message sequences: the alert sequence and the status sequence.

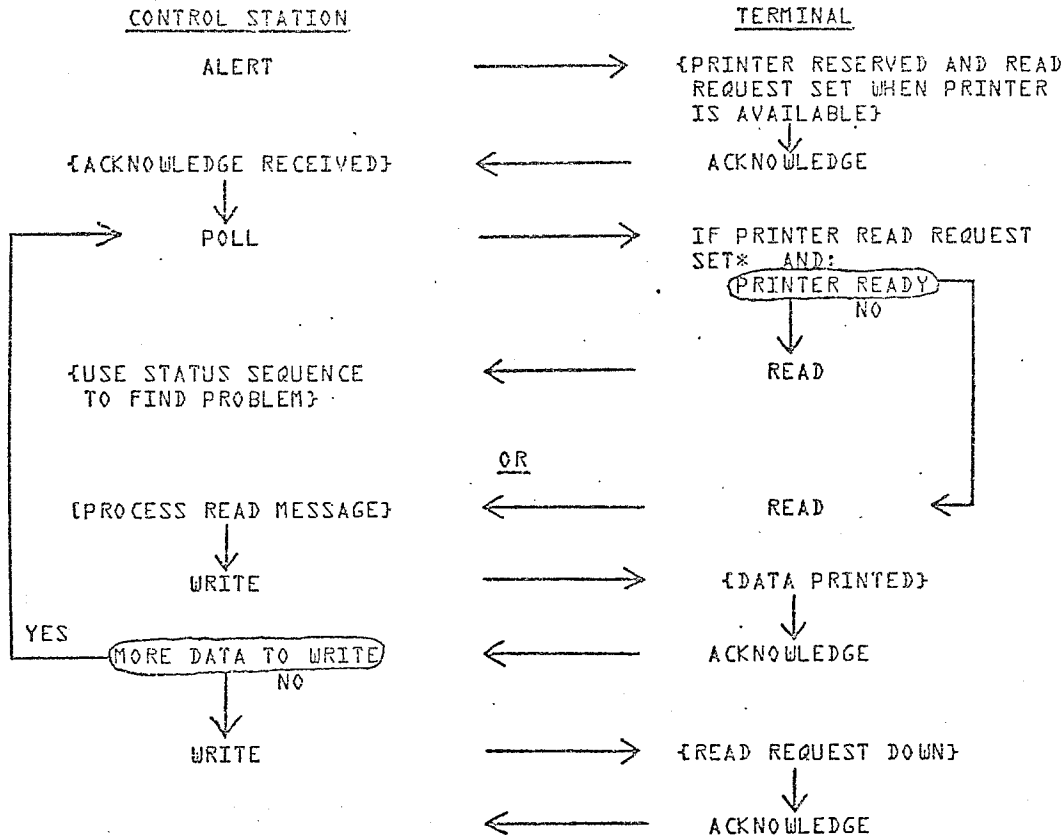
Printer Alert Sequence

A printer alert sequence is used to reserve a printer for on-line use. This prevents the terminal operator from starting or continuing to use a printer off-line when the control station requires the printer for on-line printouts or for control-station-initiated display-to-print operations.

When a terminal receives an alert message addressed to a printer, the printer becomes reserved and its read request sets as soon as it becomes not busy. When the terminal is subsequently polled, a read message containing an E3 code is returned as a response to indicate the printer is ready to accept the output. Data for printing is then sent and should be accepted. The data portion of a write message to a printer is immediately followed by the escape/E2 codes. The maximum length of any write message to a printer is restricted to one buffer full of data, or 240 characters. Once a printer completes a printout operation, it responds to a poll with a read-E3 message, and the control station may either continue the write-data operation by sending another write message or it may terminate the write-data operation by sending a write-E1 message (with no other content) to release the printer.

TERMINAL SUBSYSTEMS

MODE 48/C {714 MULTISTATION} INTERFACE SPECIFICATION {cont'd}



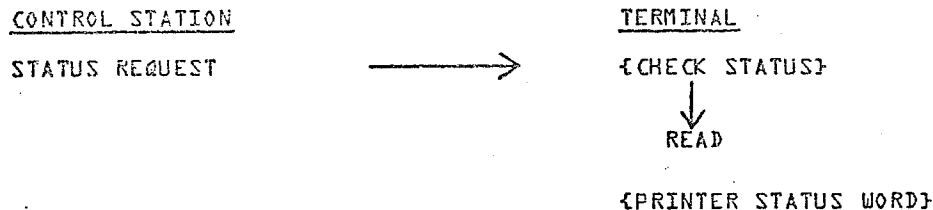
*Otherwise, response is rejected or read from another device and station must be polled again.

Write Printer-Data Sequence

This sequence is similar to a printer-alert sequence with the exceptions that: 1) the alert message does not precede the write sequence, and therefore 2) the printer is not reserved for only on-line use between buffered printout operations. There is a possibility of interleaving an on-line print message that is greater than one buffer in length with off-line print data. In all other respects, this type of write-data sequence {unsolicited write} is the same as an alert-write {solicited or reserved write}.

Printer Device Status Sequence

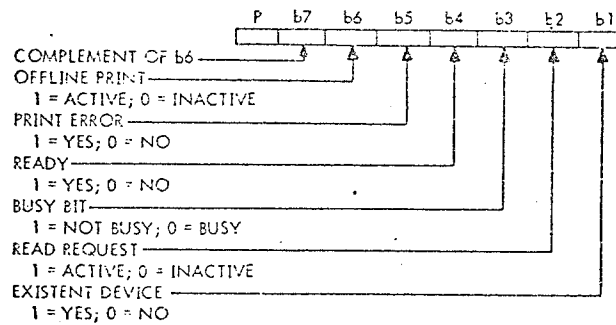
The response to a status request message addressed to either an impact or a non-impact printer is a read message containing a status word. The status words for the impact printer and the non-impact printer are identical.



TERMINAL SUBSYSTEMS

MODE 4B/C (714 MULTISTATION) INTERFACE SPECIFICATION (cont'd)

Printer status word format:



In diagramming the flow of the various message sequences, the occurrence of the error response has been avoided to simplify the understanding of the procedures. Concerning error processing, the methods used for recovery are similar to those used with Mode 4A, especially the use of redundant response address for check receipt of proper messages (see PSI Excerpts 67-108 for a description of this process).

At the end of this article are two tables which may prove useful for anyone considering converting from a current buffered terminal product to the 714-10/20. Several inquiries have been made for this type of information.

In summary, this article is intended to show how a different version of Mode 4 protocol is used and to provide some background on the 714-10/20 multistation. Anyone desiring more information on this remote terminal or protocol standards is requested to contact K. E. Flies on X398 at Roseville facility or send the information via TWX to RVLD27.

TABLE I. PRODUCT FEATURE COMPARISONS

Message Types	714	711-10	216	215
• Configuration Request	Yes	Yes	No	No
• Disconnect	No	No	No	No
<u>Features</u>				
• All Kybd Features Operable from the data source	Yes	Yes	No	OK
• Use of ANSI Col. 0 and 1 as well as ESC	Yes	Yes	No	No
• Blink	No	No	Yes	OK
• Start Index	Multiple	Single	Single	OK
• Function Keys	7 {Implemented}	6 {Implemented}	10 {Implemented}	OK
• Status Keys	No	No	Yes {4}	OK
• Code Set	64/96 ANSI	64 ANSI	64 ANSI	64 ANSI
• Print Cont. Write to CRT	Yes	No	No	OK
• Printer Reservation	Yes	Yes	No	OK
• Attended/Unattended Switch	No	No	Yes	OK
• Poll Wait Switch	No	No	Yes	No
• Keyboard Lockout Indicator	Yes	No	Yes	N/A
• Repeat Key	No	No	Yes	N/A
• Select Print	Yes	Yes	No	N/A
• Tab Protect Code	No	No	Yes	OK
• Start Blink Code	No	No	Yes	OK
• EDIT Key	No	No	Yes	N/A
• Delete Key	Yes	Yes	Yes	N/A
• Insert Key	{1 operation} Yes	{1 operation} Yes	{2 operations} Yes	N/A
• LINE DOWN/INSERT LINE	SIMILAR	SIMILAR	SIMILAR	N/A
• LINE UP/DELETE LINE	SIMILAR	SIMILAR	SIMILAR	N/A
• Manual Release	No	No	Yes	N/A
• Clear to End of Page Code	Yes	No	No	OK
• Lock Keyboard Code	Yes	No	No	OK
• Release Keyboard Code	Yes	No	No	OK
• Status Request Message Code	ETB-Mode 48 FS -Mode 4C	ETB	ETB	ETB
• ASCII Device Controls {BS,HT,LF,VT,FF and CR}	ESC-Mode 4B ASCII-Mode 4C	ESC	ESC	ESC
• Scroll	No	Yes	No	N/A

TERMINAL SUBSYSTEMS

MODE 4B/C (714 MULTISTATION) INTERFACE SPECIFICATION (cont'd)

TABLE II. STATUS WORD COMPARISONS

<u>STATION</u>	<u>714</u>	<u>711-10</u>	<u>216</u>
1	0	0	Poll Wait Switch
2	Disable Error Message	Disable Error Message	Error Disable Switch
3	Comm. Mode	0	0
4	} Printer Buffer Configuration	0	0
5		0	0
6		0	0
7	Complement of b6	1	1
8	PARITY	PARITY	PARITY

DISPLAY

1	Existent Device	Existent Station	Station Available
2	Read Request	Read Request	Read Request
3	Not Busy	Busy	Kybd Status Switch 1
4	Display Mode	} Encoded Function Keys	Kybd Status Switch 2
5	Keyboard Mode		Kybd Status Switch 3
6	Off-Line		Kybd Status Switch 4
7	Print Active		
8	Complement of b6	1	Complement of b6
	PARITY	PARITY	PARITY

PRINTER

1	Existent Device	Existent Station	Station Available
2	Read Request	Read Active	Read Request
3	Not Busy	Busy	0
4	Ready	Paper Out	0
5	Print Error	Print	0
6	Off-Line	Select Print	0
7	Print Active		
8	Complement of b6	1	1
	PARITY	PARITY	PARITY