OPERATION AND MAINTENANCE MANUAL

TRIVEX PLUS 70

INFORMATION DISPLAY SYSTEM

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APPENDIX

OPERATION

TRIVEX SYSTEMS AND PRODUCTS

Trivex, Inc. builds an interrelated line of products which, in their most common use, are combined to build computer communication and display systems. The products may also be used to add to or to modify an existing system.

Specifically, Trivex products and systems are interchangeable on a one-for-one basis with equivalent devices of the IBM 3270 Information Display System.

This interchangeability is accomplished in the Trivex unit by emulation. Making use of the well-known capability of digital computing devices to be "educated" or programmed to match the logical capabilities of any other digital device whose internal structure is known, the contents of programmable read-only memory, which is supplied as an integral part of every Trivex device, determine the characteristics of that device from the standpoint of all the rest of the system.

Since Trivex systems and individual devices are interchangeable in every instance with the corresponding IBM devices, it follows that familiarity with an IBM 3270 system will give one essential familiarity with the Trivex system. Therefore, familiarity with IBM literature on the 3270 will provide needed background for the user of Trivex equipment, and specifically of this manual.

In particular, the user of this manual should have available, and be familiar with, the following IBM publications:

1. An Introduction to the 3270 Information Display System GA27-2739
2. Operator's Guide for IBM 3270 Information Display Systems GA27-2742
3. IBM 3270 Information Display System Component Description GA27-2749-6

GENERAL SYSTEM DESCRIPTION

Every Trivex PLUS 70 Information System is made up of display stations, printer stations, and a controller. The controller provides the control interface between the other system components and the computer, or the communication line, in the instance of a remote system.

The typical system has one or more display stations for operator communication. The keyboard and its associated display together make up a display station.

A typical system also includes one or more print stations. The print station, consisting of the printer and its control electronics, produces hardcopy record of system output, under direction of the application program, or under direction of the display station operator using local display print option.

Display and print stations are interfaced by means of a coaxial cable to a device adapter in the controller. Display stations and print stations, either of which is known as a device, are connected through the device adapter in any mix of devices. Each device adapter connects up to eight devices. The basic controller can service up to eight devices (hence having the equivalent of one device adapter). Device adapters are added to increase the controller's capacity in increments of eight devices up to a maximum of 32 devices.

PRODUCTS/SYSTEM COMPONENTS

The terms products and system component are, in general, interchangeable. All Trivex products are completely interchangeable with similar products in the IBM line. Thus not only may a complete Trivex system be coupled, locally or remotely, to applicable models of IBM computers, but also the various devices may be used individually, on a one-for-one basis, with corresponding IBM devices, as follows:

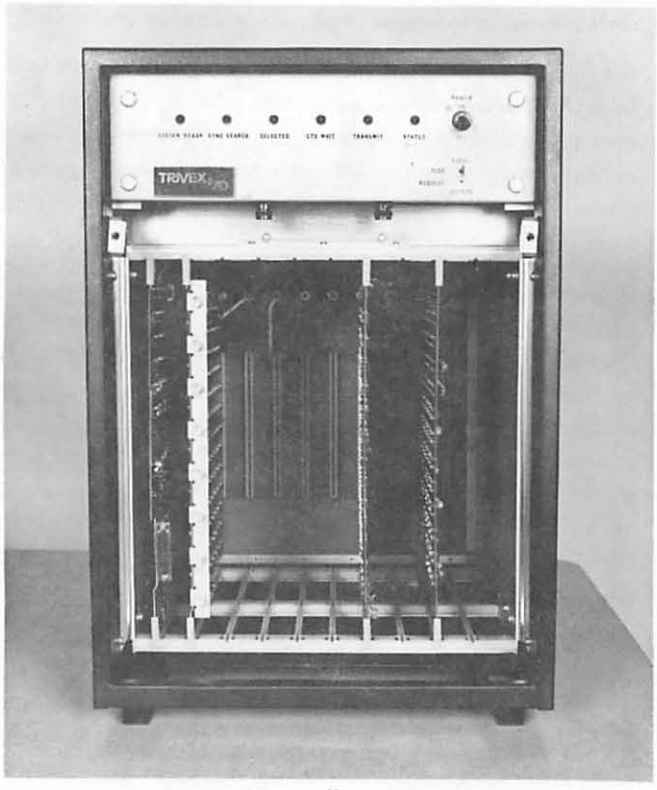
Trivex Model	IBM	Type
0722	3272	Local Controller
0712	3271	Remote Controller
0772	3277	Display Station
0752	3275	Standalone Display Station
0842	3284*	Print Station (80 CPS)
0862	3286*	Print Station (165 CPS)

*Note IBM 3284 (40 CPS), IBM 3286 (66 CPS).

CONTROLLERS

Remote Controller (0712)

The Trivex 0712 controller may be used remotely, inter-



Controller

facing to 360/370 data processing system via modems. It may also be interfaced to the TCU (Transmission Control Unit) by means of a special modem cable.

The 0712 controller uses binary synchronous communication (BSC) data link mode on full duplex facilities at switch-selectable line speeds up to 19,200 BPS.

The 0712 is 15 inches wide, 22 inches high, and 20 inches deep. It may be configured to operate on power sources of 115V, 208 V, or 230V, single phase, 50 or 60HZ. Its consumption is rated at 250 watts.

Local Controller (0722)

The Trivex 0722 controller is completely interchangeable with the IBM 3272 control unit. Like that unit, it interfaces directly to 360/370 data processing systems through a selector, multiplexer, or block multiplexer channel. It connects via the existing IBM channel cables. Data transfers at rates up to 650,000 characters per second (CPS), depending on the channel to which the controller is connected.

The 0722 is 28.5 inches wide, 34 inches high, and 19 inches deep. It may be configured to operate from the same power sources as the 0712 controller, and its power consumption is also rated at 250 watts.

Device Adapter (020)

Each basic controller can operate up to eight devices (display or print stations). Additional devices require the addition of one or more device adapters. Therefore a system with the maximum of 32 devices requires the installation of three additional device adapters in the controller.

DISPLAYS

Display Station (0772)

The screen of the display station is configured to display a maximum of 24 lines of 80 characters each, for a total of 1920 character positions. Any one of the four available keyboards may be specified for incorporation in the display station. The keyboard enables the user to enter, modify, or delete data, and to direct communication, via the controller, with the computer.

The 0772 display station in standard form contains a 768-word programmable read-only memory (PROM). The content of this memory determines the control program configuration, and, hence, the logical structure of the display and keyboard from the user's standpoint. Memory is loaded at the Trivex factory prior to delivery.

The display station also contains a random memory (RAM) of 2K (2048) words (bytes or characters). The contents of this memory provide the information currently being displayed.

Display Station

The display screen is a 14-inch cathode ray tube with an antiglare face, displaying characters in white against a black background. At the customer's option, the display may be configured to show green characters against a black background. The screen image is re-

freshed sixty times per second (fifty times per second where 50 HZ power is used). Characters are formed with a dot matrix which is seven dots wide (.08 inch) by nine dots high (.20 inch).

The cabinet housing the display screen (not including the keyboard) is 17.5 inches high, 16 inches wide, and 21 inches deep, and weighs 66 pounds. Power requirements of the display station are 115 or 220 volts, single phase, 50 or 60 HZ, at 200 watts.

Display stations are connected to their controller with RG62/AU single coaxial cable. Alternatively, IBM 2260 terminal cables may be used. Maximum cable length is 2,000 feet, permitting the display station to be located up to that distance from the controller. Cable connectors are BNC, AMP 225395-2, or equivalent.

Standard display station controls are located on the front of the cabinet. These are power on/off, contrast, brightness, and the self-test switch.

Display Operation

A Cathode ray tube (CRT) forms the display surface. Its contents are continually refreshed from display memory sixty times (fifty times where 50 HZ supply power is used) each second of operation, maintaining a steady screen image.

There is a fixed relationship between each screen character location and its corresponding memory location. Memory address location contents are displayed, starting in the upper left corner of the screen, left to right and top to bottom by line, beginning at memory location 0 to location 1919 whose contents are displayed in the lower right corner. Various indicators are also displayed to the right of the screen data display, as is more fully explained in the section on maintenance of the display station.

In addition to the displayable set of characters, certain characters are used as control, or as data attribute characters. Control characters call for defined actions of a system component. Attribute characters relate to the attributes of those data characters which follow them in the data stream until the next attribute character is encountered.

Data characters between any two successive attribute characters are known as a "field". Attribute characters may define the following field characteristics for all characters contained in the field which follows them:

1. PROTECTED (from modification by the display station operator), or UNPROTECTED (available for operator modification or entry). An unprotected field is typically an input field.
2. ALPHAMERIC or NUMERIC (corresponding to equivalent keyboard keys).
3. CHARACTER DISPLAY (non-display, display, or intensified display).
4. DETECTABLE or NON-DETECTABLE (by use of light pen).
5. TAB STOP (tabs to first character in an unprotected field. An option permits the above, or, alternatively, tab to first position right of a following colon).

Additional controls are included in the display station keyboard. Their functions are as follows:

1. EDITING:

   The INS mode key permits a character to be inserted into a field at the cursor position. All other characters in the field following the insertion position are shifted to the right of that position. NOTE that there must be a null position to the right in the field. This null position is filled with the rightmost field character. The insertion operation is field-dependent only, and will wrap around the end of a line which falls in the field.

   The DEL key allows a character to be deleted from a field at the cursor position. All other characters in the field following the deletion position are shifted left so that the deleted space is filled. The rightmost character of the field is filled with a null.

2. PROGRAM ATTENTION:

   PF (program function) keys cause input data to be sent via the Controller to the CPU (central processing unit), preceded by a code identifying the PF key pressed.

   PA (program access) keys send a code to the controller, which, in turn, identifies the key pressed to the CPU, but no data is sent to the CPU.

3. NUMERIC LOCK:

   This is not a key, but a function which alerts the operator to certain keying errors. With a data entry keyboard (Model 0631) when the cursor is positioned anywhere within a field designated numeric by its preceding attribute character, the Display Station upshifts the keyboard automatically. With numeric lock in effect, the keyboard is locked

and the alarm is sounded (if enabled) if any key other than numerals 0 through 9, minus (-), period (.) duplicate (DUP) or space is depressed.

4. SHIFT:

   All keyboards except the data entry model (0631) are equipped with SHIFT and LOCK keys. Their functions are equivalent to those of the similar keys on a typewriter.

Attribute characters each occupy one of the 1920 character positions in display memory when they are stored therein. These characters, however, are not displayed or printed. They are displayed or printed as spaces.
The operator may communicate with the system at a display station in two basic ways: formatted and unformatted. In formatted mode the display is organized and arranged by the application program. In unformatted mode the operator may place data on the screen in a free-form manner.

KEYBOARDS

Four keyboard models are available for use in the system. The type of keyboard used determines the characters and symbols that may be entered at the display station, but does not determine which characters may be transmitted or displayed.

The small keyboards have 66 keys each (Models 0630 and 0631). The keyboards are 15 inches wide, 4 inches high, and 7.5 inches deep.

The larger keyboards have 78 keys, twelve of which are program function entry keys (Models 0632 and 0633). These keyboards are 15 inches wide, 4 inches high, and 8.5 inches deep.

All keyboard models are connected to their display stations with a three-foot connecting cable. Keyboard configurations are shown in the accompanying diagram.

Model 0630 (66-key typewriter)

This keyboard uses a standard typewriter layout with upper and lower case, shift, and shift lock.

Model 0633 (78-key typewriter)

The layout of this keyboard is similar to that of the Model 0630 with the addition of twelve program function keys.

Model 0631 (66-key data entry)

This is an upper-case-only keyboard with a ten-key numeric pad overlaid in the U-O, M-. position. Shifting to the numeric position permits the use of these keys for rapid numeric entry, plus entry of a wide selection of symbols. Five program function keys are built into the standard layout.

Model 0632 (78-key operator console)

This keyboard has an arrangement similar to that of the IBM 1052 Model 7. It incorporates twelve program function keys. The cancel key replaces the PA2 key on this keyboard. There are no DUP or FIELD MARK keys on this keyboard.

Keyboard Operation

The keyboard provides the basic means by which the operator communicates with the system. A passable knowledge of typewriter operation permits the operator to input the available data characters.

Since the keyboard typically "writes" on the display station CRT face, some keyboard controls are different from those of a typewriter, since, in this instance, there is no type mechanism and no paper platen.

"Present" position on the screen is indicated by a cursor, an underscore of light, which may be selected as either steady or blinking, and which changes position to the right with each successive character input. Thus, those typewriter controls which relate to spacing, backspacing, tabbing, carriage return, etc., on a typewriter, are replaced with cursor controls on the display station keyboard, as follows:

Cursor Positioning Controls

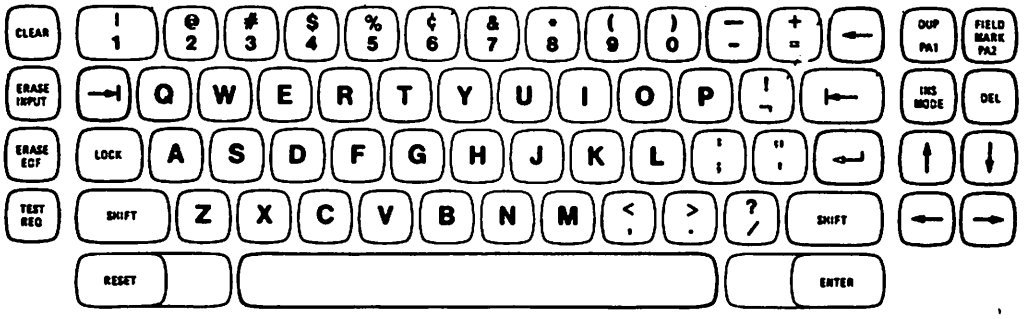
Up (↑), Down (↓), Left (←), Right (→) Keys
Backspace (←) Key
Tab (→|) or Skip and Backtab (|←) Keys
New Line (↵) Key
Home (|←) Reset and Backtab

Keyboards

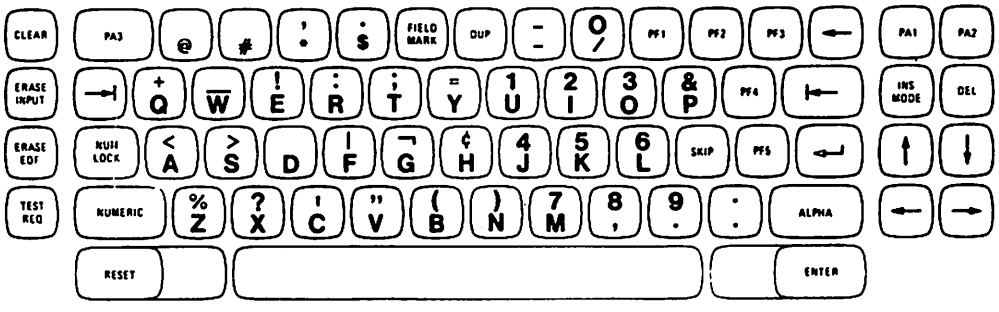
Data entry keyboard (0631) has ALPHA and NUMERIC shift keys. The ALPHA shift key overrides a numeric (input) field definition and the NUMERIC LOCK feature to input downshifted data into a numeric field purposely.

1. The NUMERIC shift key overrides the numeric field definition and NUMERIC LOCK condition to permit upshift character entry for other characters.

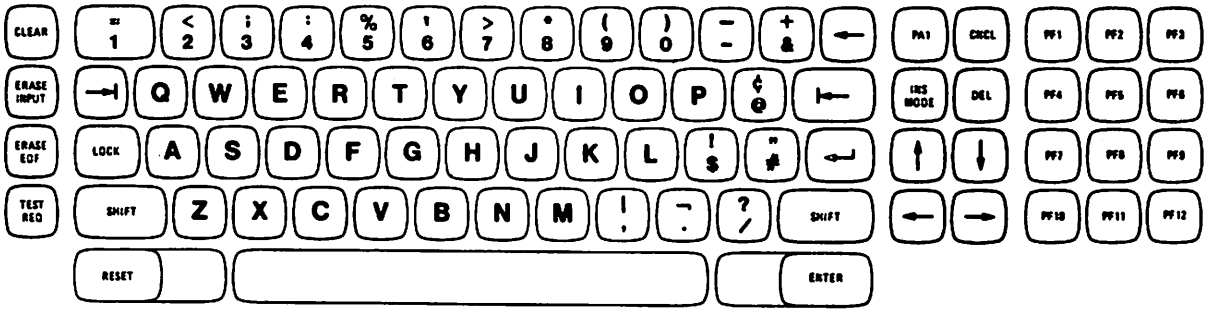
KEYBOARDS FOR TRIVEX PLUS 70 DISPLAY STATIONS



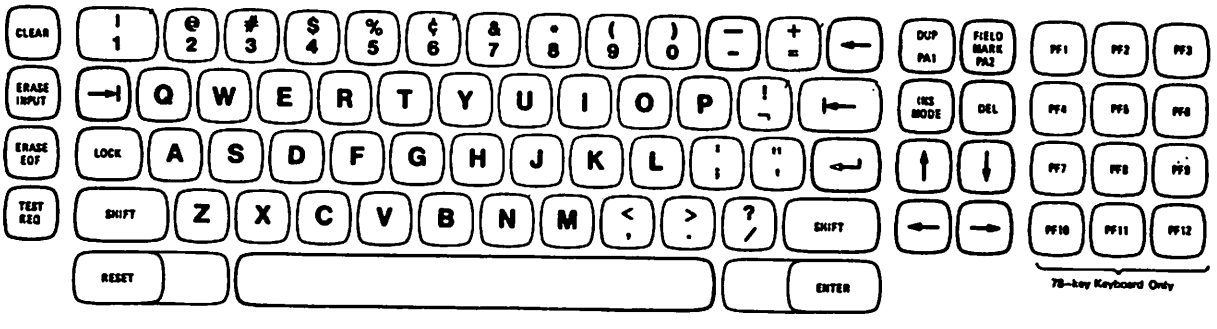
0630-KEYBOARD, TYPEWRITER 66 KEY EBCIDIC



0631-KEYBOARD, DATA ENTRY 66 KEY EBCIDIC



0632-KEYBOARD, OPERATOR CONSOLE 78 KEY EBCIDIC



0633-KEYBOARD, TYPEWRITER WITH 12 FUNCTION KEYS, 78 KEY EBCIDIC

2. The Duplicate (DUP) key, displayed as an asterisk (*), sends a code to the controller. The cursor is advanced automatically to the next input field. The DUP code is interpreted to cause a duplication of the field in which it is depressed from the previous record in the corresponding field.

Erasing: Three keys provide differing capabilities in erasing contents of display memory, and corresponding screen image:

1. CLEAR erases the entire display and image format. It causes a program interrupt to be sent to the CPU.
2. ERASE INPUT erases all input field contents and clears all modified tags (MDT bits) for all input fields.
3. ERASE EOF (end of field) erases all characters of an input field from the cursor position at which the key is depressed to the end of that field, and sets the modified tag for that field.

PRINT STATIONS

Trivex printers, assembled into print stations, are interchangeable with IBM 3284/3286 printers. Four models are available. These differ only in print and slew speeds, and packaging. Models 0842 and 0844 operate at 80 characters per second (CPS). 0862 and 0864 operate at 165 CPS.

Models 0842 and 0844 have a paper slew rate of 44 milliseconds per line. Models 0862 and 0864 have a paper slew rate of 25 milliseconds per line.

Models 0842 and 0862 are packaged each in a single cabinet. Models 0844 and 0864 have electronics divorced from the print mechanism, and are connected thereto by a 20-foot cable, making these models especially useful where space is limited.

All printer models are alike in the rest of their characteristiscs. The print method is impact, bidirectional, character-by-character, and one line at a time. Characters are structured with a 7 by 9 dot matrix. The standard character set is 64 characters with 96 or 128 character sets optionally available.

Maximum print line is 132 characters.

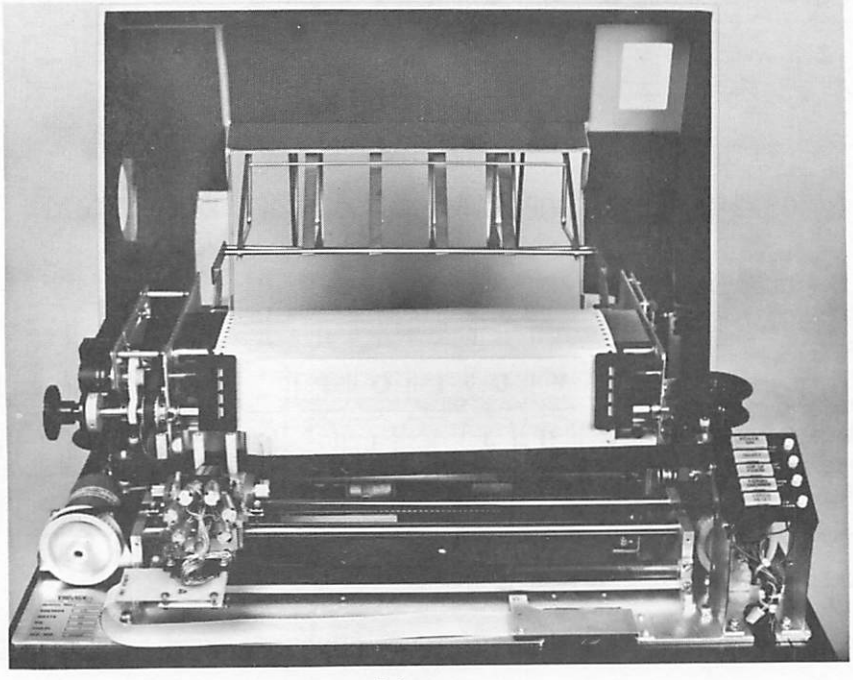
All printers are buffered with a 1920-character buffer. Models 0842 and 0844 are 28.5 inches wide, 42 inches high, and 19 inches deep. Both weigh 160 pounds.

Switch controls on the front of the printer include power on/off, select, error reset, forms override, top of form, print test, and line feed.

Non-electronic forms control is by means of a one- inch paper tape loop which controls top of form and vertical tab. Two channels of the tape are used.

Every Trivex printer can produce an original plus as many as four carbons. Recommended paper weights are as follows:

Single part form	15 to 20 pound paper
Multi-part form	12 to 15 pound original
	9 to 12 pound copies
Carbon	7 to 7.5 pound paper



Printer

Standard formats include six or eight lines to the inch spacing, vertically.

Printers are equipped with indicators for paper out, hardware alarm, and system available. They are also equipped with a two-second audible tone alarm to alert the operator to determine the specific condition.
Electrical requirements for printers are 115 or 230 volts, single phase, 50/60 HZ, at user specification. Power consumption is rated at 600 watts.

Formatting of the print line can be specified as a part of the WRITE command to the system. This command portion can define print line lengths of 40, 64, or 80 character positions. If line length is not program-formatted, it is selectable by switches in the print station for any line length up to 132 character positions.

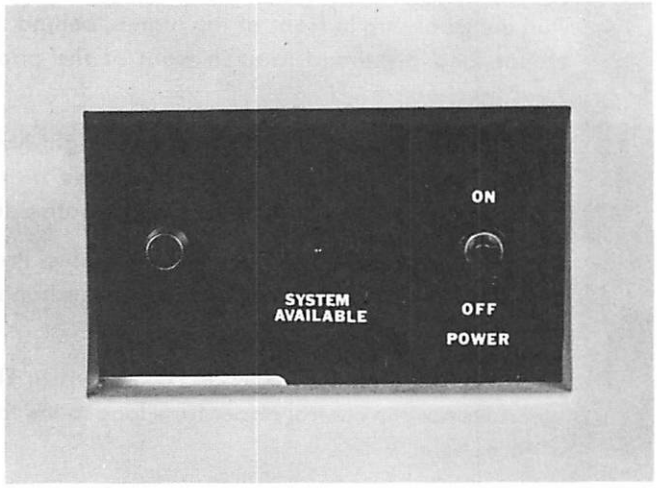
Operator Controls

All operator controls and indicators are located in a small panel on the right side of the printer cabinet face. Seven switches are located in the panel, as follows:

1. POWER ON applies AC power to the printer. The system cannot select the print station unless this illuminated switch is ON.
2. SELECT is used by the operator to select or "deselect" the printer.
3. TOP OF FORM initiates a paper advance to the next hole position in Channel 7 of the punched paper tape control loop.
4. FORMS OVERRIDE allows the operator to override the paper-out switches and continue printing of a form that is partially complete.
5. ERROR RESET clears the hardware alarm indicator light and allows the printer to resume operation following a mechanical malfunction. It also activates the READY control line to notify the system program that the printer is again ready for operation.
6. LINE FEED initiates a one-line paper advance.
7. PRINT TEST allows the operator to print a few lines of characters manually when setting print head pressure.

Two indicator lights are also located on the printer panel. Their functions are as follows:

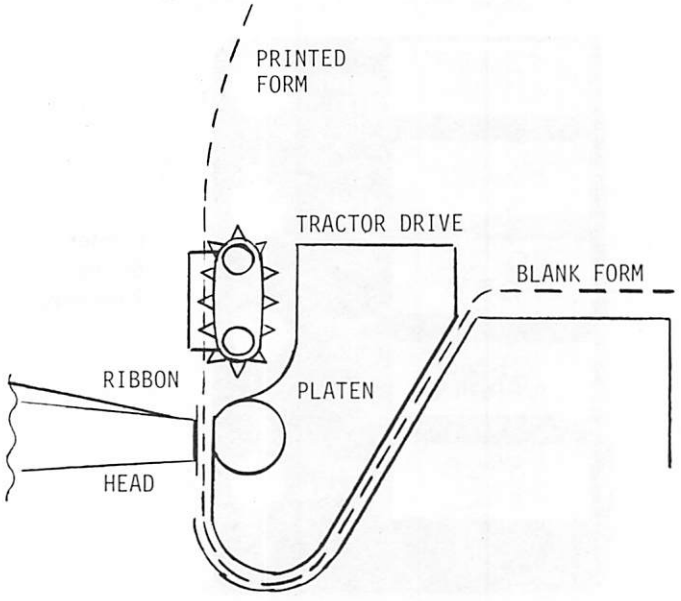
1. PAPER OUT shows that the paper-out switches have detected the end of the fanfold paper forms. Printing is stopped automatically.
2. HARDWARE ALARM indicates that a mechanical malfunction has occurred.



Printer Control Panel

Loading Printer Paper

The paper loading path is shown in the following diagram.

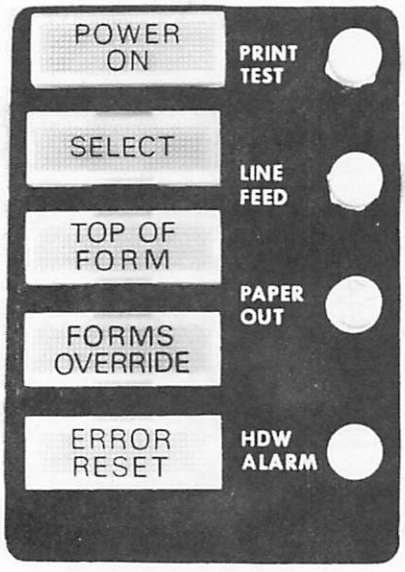


Paper Loading Path

Following is the recommended procedure for paper loading in the Trivex printer:

1. Pull out knob on the left side of the printer and rotate platen to extract remainder of paper from the previous print run.
2. Open the gates on the tractor feed mechanism.

3. Insert leading edge of the new form pack in the slot behind the platen assembly.
4. Pull the paper up in front of the platen, behind the ribbon and printhead, and in front of the paper feed mechanism.
5. Make any necessary adjustment in the right-hand paper feed mechanism so that the holes in the paper are aligned with the drive pins on both sides.
6. Position the paper holes over the drive pins. Press the paper in place, and close both drive-mechanism gates.
7. Press POWER ON, then TOP OF FORM switch. This will advance the control paper tape loop to the top-of-form hole.
8. Pull out the left hand knob and rotate the platen to position paper to top of the first form line to be printed. Release the knob.
9. Make any necessary adjustment in the printhead-to-platen gap. Markings on the printhead can be used as a guide, based on previous adjustments for paper forms of like thickness.



Printer Switch Assembly

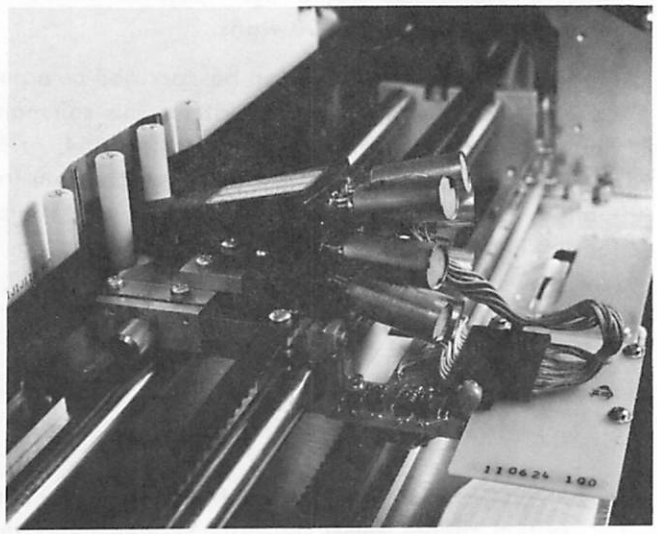
Printhead Adjustment

To adjust the printhead gap, loosen the lock knob on the right hand side of the printhead assembly. Turn the adjustment knob on the left hand side of the printhead assembly to increase or decrease the gap. Tighten the lock knob, then print two or three lines to evaluate the new setting.

NOTE: Always retighten the lock knob before activating the printer.

Markings on the adjustment knob may be used to return the gap to a previously-established position for specific paper weight or multi-part specification.

This procedure may be simplified by using the print test feature which will cause the printer to print a line of the character H for printhead adjustment, as is shown in the maintenance section following.



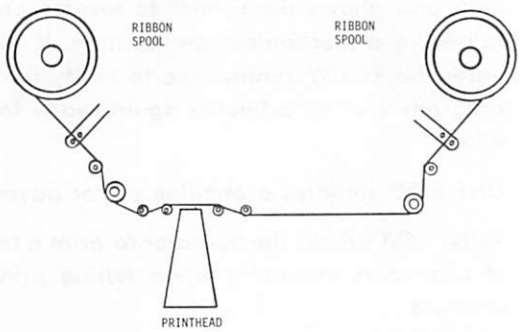
Printer Head

Ribbon Replacement

NOTE: Use only Trivex-specified ribbons, Part #907933-1.

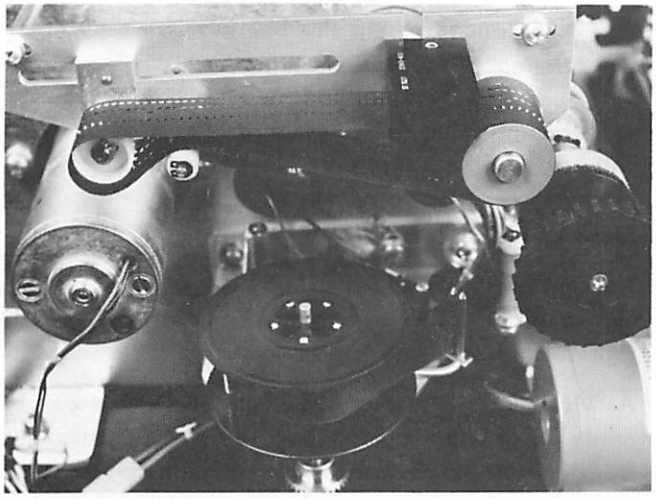
Remove the old ribbon and replace with a new one, following the ribbon path through guides and spooling mechanisms, as shown in the following illustration:

Ribbon Guides



Forms Control

Trivex printers make use of a standard, one-inch paper tape reader for forms control. Two channels of the tape loop are used.



Forms Control

Channel 5 is used for vertical tabbing. Channel 7 is used for Top Of Form. A hole is punched in Channel 5 at each interval corresponding to the number of print lines to be tabbed. A hole is punched in Channel 7 once for each form interval. The form interval is the total number of print line counts from the top printed line of one form to the top printed line of the following form.

Those printers equipped with electronic forms control are factory-programmed to the user's form specifications prior to shipment.

Printer Commands

Basic control of the printer, like that of the display, is found in the control characters which are included in the data stream of every printer message.

1. NL

   The new line command is executed when it is in a display field and unformatted print is specified. When executed, it causes the printer to advance paper one line.

2. EM

   The end-of-message command is executed when it is in a display field and unformatted print is specified. It prints as a space if it is in a non-display field. It prints as a 9 in a display field with line length specified. When executed, it terminates printing of the page in progress, and causes the printer to advance one line.

3. FF

   The form feed command causes the printer Top of Form control to advance to the next page position identified by a punched hole in tape loop Channel 7. The form feed command must be placed in one of the following locations in the data stream:

   a. The first character position of a printer message;

   b. After a valid NL command;

   c. After the last printable character position of any line (i.e., in position L + 1 where L is the position of the last character in a line with specified format of L characters, or in character position 133 where a line length is not specified).

The position occupied by the FF control character prints as a space. If it is invalid (in a non-allowed position of the data stream) it prints as a <.

Error Conditions of the Printer

Errors detected at the print station result in various actions, as follows:

1. NOT READY

   Indicates that the printer is out of paper or mechanically disabled. The NOT READY message is sent to the controller whenever such condition occurs, or whenever such condition still holds and a printer operation is initiated. Presence of the NOT READY conditions terminates any print operation in progress, and precludes any further operation until the condition is cured.

2. PARITY ERROR

   If the printer detects parity error in any character, an underscore is printed in place of the character. Printout continues until all printable characters in the message are printed. Then an X is printed to indicate presence of parity error in the page.

3. COMMAND CHAINING

   In local operations, if any command is chained to a command that initiates a print operation, an error condition occurs. No printout is performed, the command is aborted, and error message is sent to the CPU. In remote operations, if command chaining is attempted, error status is sent to the CPU, but the printout is completed.

Local Display Print

This option allows the production of hard copy with the operation initiated at a display station, via the conroller and bypassing the computer.

There are two modes of local display print:

1. PRIORITY PRINT
   The first available printer (counting addresses in sequence from the address of the originating display station) will print the entire contents of display memory following holding down the RESET and pressing the PF3 keys in that order. Clearly this operation cannot be originated from an 0630 typewriter keyboard which has no PF3 key.

2. ASSIGNED PRINT

   The address of the selected printer (expressed as two hex digits) is entered at the display station keyboard. The printer is then assigned by holding the RESET and pressing the PF2 keys, in that order. Printing of the entire contents of display station memory is then initiated by holding the RESET and pressing PF1 keys, in that order. This operation cannot be initiated from an 0630 keyboard.

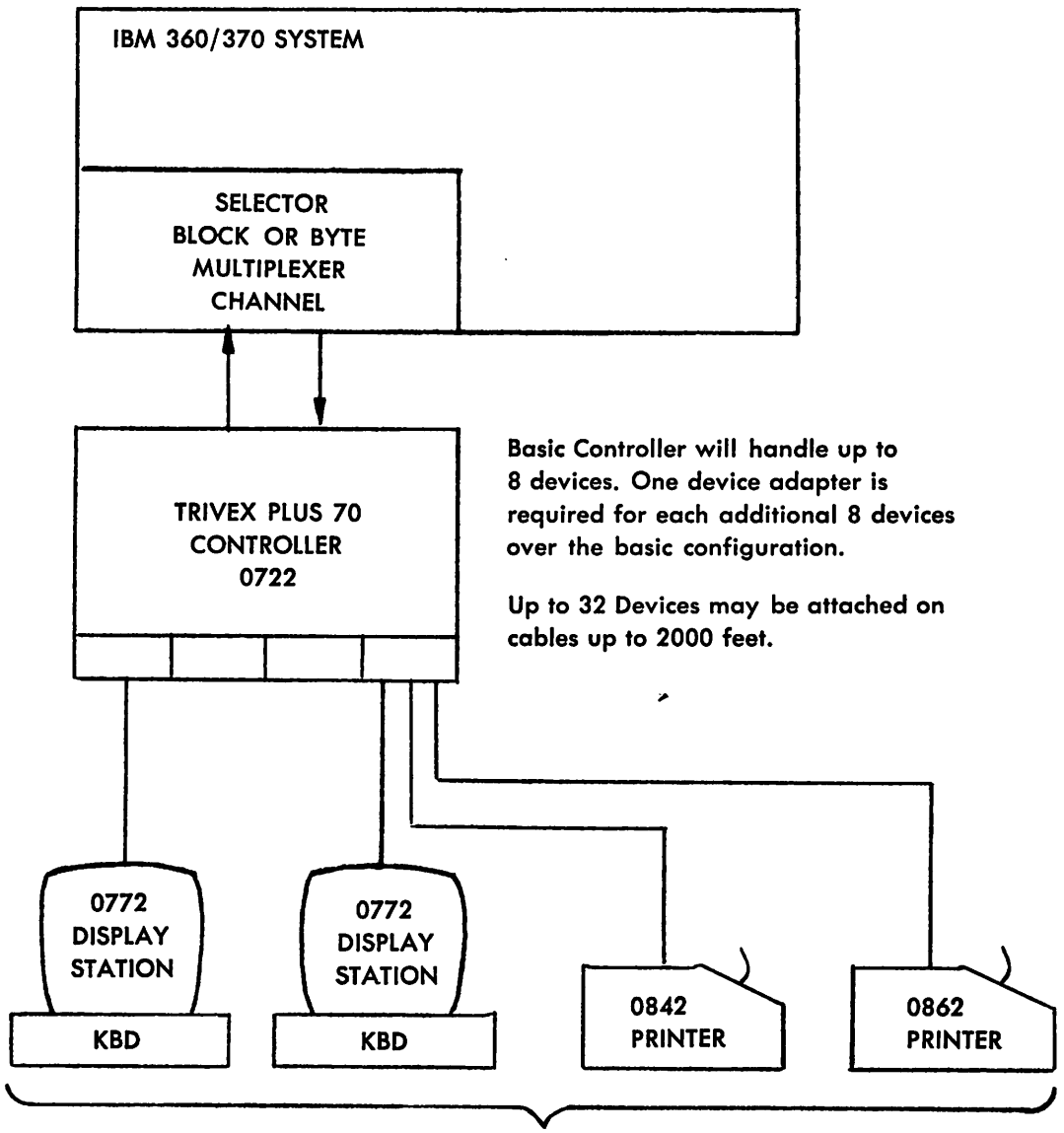
SYSTEM CONFIGURING

The configuring of a Trivex PLUS 70 System encompasses two broad topics which may be called the psysical configuration and the logical configuration.

As was noted previously, a PLUS 70 System can be made up of either a local or a remote controller with from one to 32 devices (display stations or printers). Typical local and remote physical configurations are shown on the two pages which follow.

Local PLUS 70 System Configuration

The PLUS 70 Local Controller connects to either a 360 or 370 system through a block multiplexer, byte multiplexer, or selector channel via one of the eight control unit positions on the channel interface:

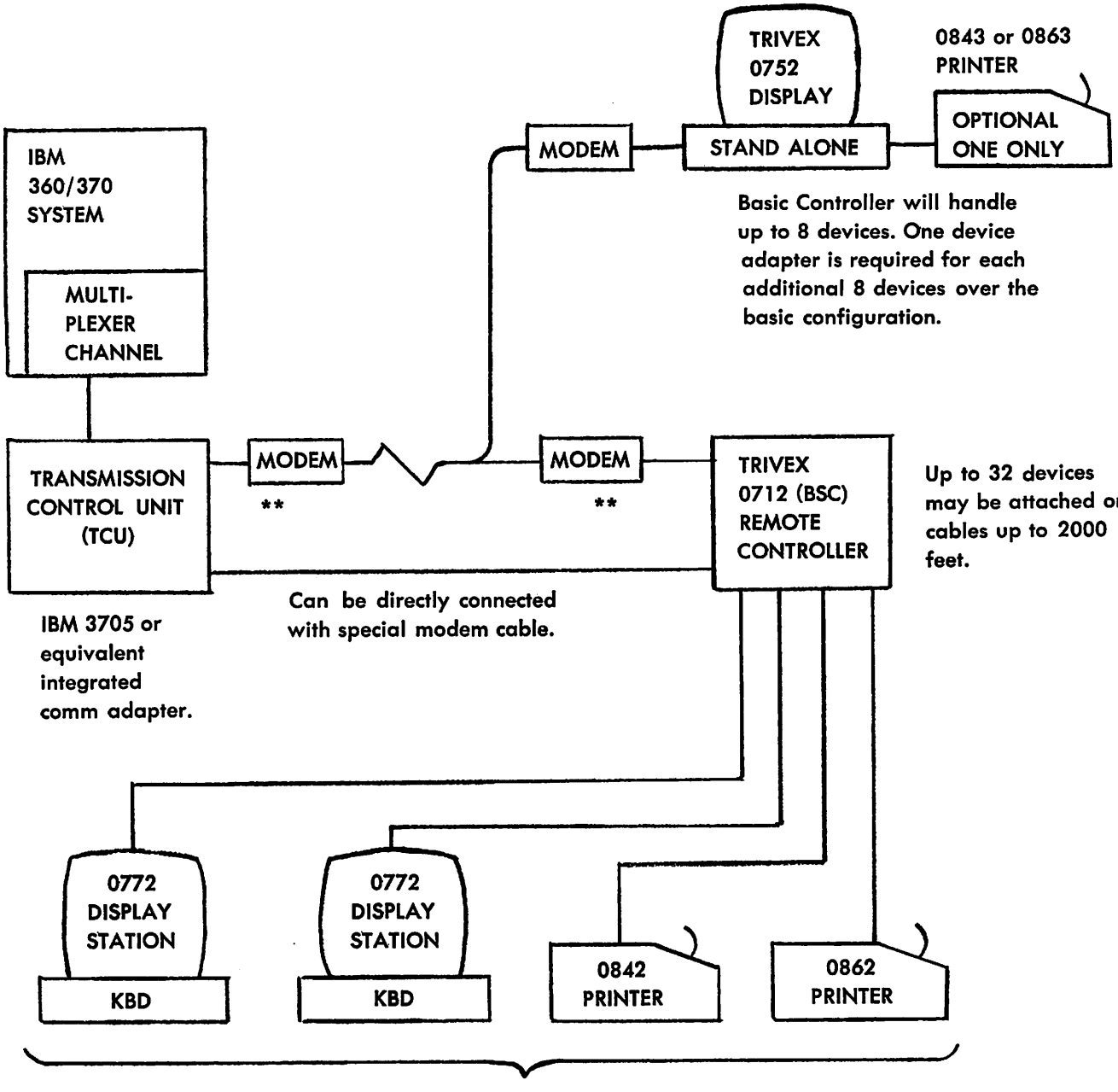


Basic Controller will handle up to 8 devices. One device adapter is required for each additional 8 devices over the basic configuration.

Up to 32 Devices may be attached on cables up to 2000 feet.

User may configure 32 of any combination of the following devices:
0772 Display Station
0842 Printers
0862 Printers

In a remote configuration a transmission control unit is cabled directly to the 360/370 system multiplexer channel. The TCU relays data and control information in (BSC) mode over modems to the Remote Controller, or Stand Alone Display Station.



User may configure 32 of any combination of the following devices:

- 0772 Display Station
- 0842 Printers
- 0862 Printers

**
Modems 110 to 9600 BPS

STANDARD SYSTEM FEATURES

Every Trivex PLUS 70 System has the following features:

At the Controller:

1. Built-in capability to poll all attached devices sequentially, or to select a particular device by its address.
2. Ability to select an upper limit on the number of devices controlled, polled, or selected. This ability is not dependent on the device being physically attached.
3. Ability to select external clocking (from the data set or modem), or internal clocking.
4. Ability to select transmission rate if internal clocking is in use.
5. Ability to enable or inhibit certain system capabilities (i.e., TEST REQuest key, local or system).
6. Capability to gather and organize system status information and enable its display locally, or transmit it to the CPU. The status report includes information on all devices in the system (including the controller) and is displayed following depressing the TEST REQ key. Status report can also be requested by the CPU, in which case it can be displayed or printed at the computer site.

At the Display Station

1. Switch-selectable blink or non-blink cursor.
2. Nulls displayed as dots in unprotected displayable fields. In this switch-selectable feature, the dots are, in turn, replaced by characters entered by the operator. The dots show null counts, and hence, available number of character spaces in the field.
3. Audible alarm (switch-selectable) to alert operator to illegal entry.

At the Print Station

1. Form feed control which advances forms under program control. The FF command refers paper vertical advance to the pre-programmed paper tape loop.
2. Underscore printing which replaces any character which has detected parity error.
3. Programmable line lengths from one to 132 characters.
4. Switch-selectable line spacing (single or double).
5. Expanded character printing providing a BOLDFACE effect. This is a switch-selectable feature. With expansion enabled, the line to be printed will be expanded upon detection of an SO command in the data stream.

ACCESSORIES AND SUPPLIES

The following accessories and supplies are available for use with a Trivex PLUS 70 System:

1. (045) Forms stand which allows simple stacking of printed forms.
2. (046) Printer ribbons.
3. (047) Printer dust cover.
4. (051) Printer table for use with 0844 and 0846 printers which have detached interface electronics.

LOGICAL SYSTEM CONFIGURING

Every PLUS 70 System is expandable, and may be planned to grow with time and expanded use by the simple addition of device adapters and additional devices. The logical configuration of the system is also important. It is in the structure of the computer programs, and the controller and device microprograms, that the working modes of the system are built, and, hence, the ultimate usefulness of the system from the user's standpoint.

Standard software available in the computer systems with which PLUS 70 Systems interface offers the capability of great flexibility in the profitable use of display and communication systems. The user should, prior to finalizing his system specifications, lay out his intended system uses clearly, and confer with Trivex application personnel on the system configuration.

The microprogram capabilities are found in standard configurations of control memory contents, but the selection of the needed set of these (as well as the elimination of unneeded ones) on a most logical and thoughtful basis will provide the user with the maximum of system performance.

STATUS DISPLAY

Status display is a standard feature of all Trivex PLUS

70 remote systems. It is more fully explained in the section on maintenance.

This feature can be used in two key ways:

1. Operationally, status display is especially useful if the user selects the display print (021) option. This option allows exclusive assignment of a selected print station to a particular display station. Field 2J of the status display shows this assignment so it is easily determined.

2. Status display is extensively useful in test and system maintenance. With proper internal switch settings, pressing the TEST REQ key originates a status display request. IBM also assigns this key in their test support software. Some system configuration decisions are thus required, of which the following two examples are typical.

EXAMPLE SYSTEM CONFIGURATIONS

If you select the Trivex display print option, your system can make use of both display print and status display without manual change to internal system switch settings, as in optional System Configuration A, below. If you do not select the display print option, you must define operational usage of the TEST REQ key. The position of the TEST REQUEST switch on the controller determines whether depressing the TEST REQ key will result in status display, or other program-defined operation, as is shown in optional System Configuration B, below.

OPTIONAL SYSTEM CONFIGURATION A

(With system test request, Trivex status display, and display print.)

Required features:

1. Trivex 0712 remote controller with program version 6271, or later.
2. Trivex display station with program version 6252. may also incorporate display print (021) or LITE PEN (035).
3. 78-key or data entry keyboard.

Switch settings:

1. Controller: TEST REQUEST switch to SYSTEM.
2. Display Station: NORMAL/TEST switch to NORMAL.

Requesting Status Display:

1. While holding down RESET key, press either PF5 or PF9.
2. Status display should appear on the screen at the requesting Station.
3. If alarm sounds at the display station, an error in transmission has occurred between controller and display station.

NOTE that depressing the TEST REQ key will result in an operation as defined in the system support software.

OPTIONAL SYSTEM CONFIGURATION B

(With system test request or Trivex status display)
Required Features:

1. Trivex 0712 remote controller.
2. Program version 6271 or later.
3. Any Trivex display station.

Switch settings, system test request:

1. Controller: TEST REQUEST switch to SYSTEM.
2. Display station: NORMAL/TEST switch to NORMAL.

TEST REQ key, when depressed, will call the operation specified by the system software.

Switch settings, Trivex Status Display:

1. Controller: TEST REQUEST switch to LOCAL.
2. Display Station: NORMAL/TEST switch to NORMAL.

TEST REQ key, when depressed:

1. Should cause status display to appear on the screen at the requesting station.
2. If alarm sounds at the requesting display station, an error in transmission has occurred between controller and display station

SYSTEM COMPATIBILITY

The IBM publication which describes system compatibility, as cited previously, is:

IBM 3270 INFORMATION DISPLAY SYSTEM COMPONENT DESCRIPTION. GA27-49-6, File No. S360/S370/S3-09.

The user may make use of this document equally for IBM or Trivex manufactured equipment with respect to operational specifications. In device maintenance, however, Trivex procedures must be followed for Trivex equipment. The internal difference of equipment is necessary to achieve the Trivex design criteria, which include:

1. MAINTENANCE MODULARITY AND COMPATIBILITY

   Printed circuit boards used in Trivex equipment are compatible types, making use of compatible connections. The number of different boards is minimized. In general, each PC (printed circuit) board contains a single major function.

2. MAINTENANCE DIAGNOSTICS

The Trivex remote system maintains IBM compatibility for diagnostics performed from the 360/370 system. This is achieved by strict conformance to IBM interface specifications. System tests associated with the IBM "Test Request" functions are also compatible.

The Trivex remote systems includes the following unique maintenance/diagnostic tools:

1. Status display.
2. Trivex Model 0712 Remote Controller Maintenance.
3. Trivex Model 0772 Display Station Maintenance (standard and LITE PEN).
4. Trivex Models 0842, 0844, 0862, and 0864 Printer Maintenance.

It is the Trivex design criteria and modularity that makes system expansion simple, and makes possible installation of most system options at the user's facility. This is typically achieved with the substitution of optional printed circuit board assemblies.

MAINTENANCE

SYSTEM LOGICAL CONFIGURATION - CONTROLLER

Once the controller and device mix of the system has been chosen, and the various components put in place and inter-connected, the system is configured for use by setting a number of internal switches, and by the placement of internal cables.

This is a task typically reserved for the Field Service Technician. During the processs of system maintenance or trouble-shooting, certain of these internal settings may need to be changed temporarily.

CONTROLLER-DEVICE ADDRESSES

From the standpoint of the computer and its communication with the controller, each controller has two addresses used differently in calling each device. The computer makes use of one set of addresses when polling, and another set when selecting a particular device.

The controller remote interface board is fitted with eight switches (at location L9) which are logically divided into two groups by function.

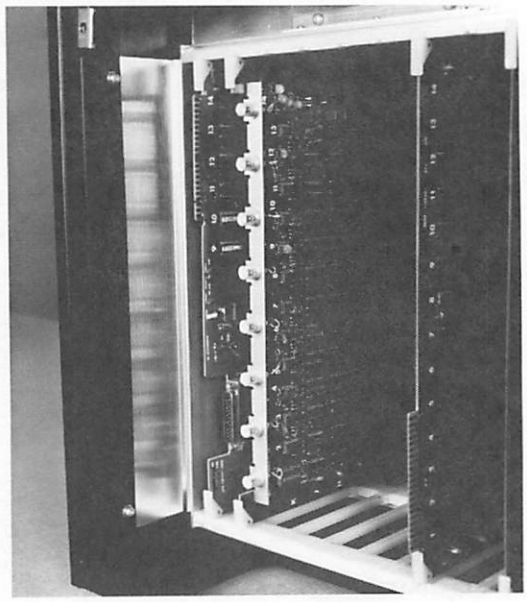
The switches in positions 4 through 8, inclusive, set up the controller address structure. Each address is a particular pair of hex characters (or EBCDIC I/O character) according to the list on the page following.

The physical connection of a particular device to a device adapter output assigns that device a unique device address.

The physical relationships between the controller-to-device interface and the device addresses are shown in the following example of a controller with three optional additional device adapters and a device attached at each of the possible 32 locations.

DAC	DAE	DAE	DAE
O(SP)	8(H)	16(&)	24(Q)
1	9	17	25
2	10	18	26
3	11	19	27
4	12	20	28
5	13	21	29
6	14	22	30
7(G)	15(|)	23(P)	31(¬)

Controller board locations are shown in the following photo:



Controller Board Locations

CONTROLLER - DEVICE LIMITS

Switches in positions 1, 2 and 3 of the controller remote interface board eight-position switch are set in one of a possible eight positions 2^3, which define the upper limit of the number of devices to be used, from four to 32, in increments of four devices.

The settings of these switches, and their identification in status display, are given in the following list.

REMOTE INTERFACE

(PCB) L9, CONTROLLER ADDRESS AND DEVICE LIMIT

	POLLING ADDRESS DEVICE SELECTION		CU SELECTION AND TEST REQUESTS						
CONTROLLER OR DEVICE NO.	EBCDIC I/O CHAR	EBCDIC HEX*	EBCDIC I/O CHAR	EBCDIC HEX	L9 OR L1 SWITCHES ON = 0 OFF = 1 4	5	6	7	8
0	SP	40	-	60	ON	ON	ON	ON	ON
1	A	C1	/	61	ON	ON	ON	ON	OFF
2	B	C2	S	E2	ON	ON	ON	OFF	ON
3	C	C3	T	E3	ON	ON	ON	OFF	OFF
4	D	C4	U	E4	ON	ON	OFF	ON	ON
5	E	C5	V	E5	ON	ON	OFF	ON	OFF
6	F	C6	W	E6	ON	ON	OFF	OFF	ON
7	G	C7	X	E7	ON	ON	OFF	OFF	OFF
8	H	C8	Y	E8	ON	OFF	ON	ON	ON
9	I	C9	Z	E9	ON	OFF	ON	ON	OFF
10	ç	4A	¦	6A	ON	OFF	ON	OFF	ON
11	.	4B	,	6B	ON	OFF	ON	OFF	OFF
12	<	4C	%	6C	ON	OFF	OFF	ON	ON
13	(	4D	_	6D	ON	OFF	OFF	ON	OFF
14	+	4E	>	6E	ON	OFF	OFF	OFF	ON
15	|	4F	?	6F	ON	OFF	OFF	OFF	OFF
16	&	50	0	F0	OFF	ON	ON	ON	ON
17	J	D1	1	F1	OFF	ON	ON	ON	OFF
18	K	D2	2	F2	OFF	ON	ON	OFF	ON
19	L	D3	3	F3	OFF	ON	ON	OFF	OFF
20	M	D4	4	F4	OFF	ON	OFF	ON	ON
21	N	D5	5	F5	OFF	ON	OFF	ON	OFF
22	O	D6	6	F6	OFF	ON	OFF	OFF	ON
23	P	D7	7	F7	OFF	ON	OFF	OFF	OFF
24	Q	D8	8	F8	OFF	OFF	ON	ON	ON
25	R	D9	9	F9	OFF	OFF	ON	ON	OFF
26	!	5A	:	7A	OFF	OFF	ON	OFF	ON
27	$	5B	#	7B	OFF	OFF	ON	OFF	OFF
28	*	5C	@	7C	OFF	OFF	OFF	ON	ON
29	)	5D	'	7D	OFF	OFF	OFF	ON	OFF
30	;	5E	=	7E	OFF	OFF	OFF	OFF	ON
31	¬	5F	"	7F	OFF	OFF	OFF	OFF	OFF

I/O Character Address (") is used as the device address to specify a general poll.

* ADDRESS DISPLAYED IS 00 - 1F IN STATUS DISPLAY.

REMOTE INTERFACE

(PCB) L9 CONTROLLER ADDRESS AND DEVICE LIMIT

DEVICES	L9 OR L1 SWITCHES			DISPLAYED
ENABLED	1	2	3	AS
0-3	ON	ON	ON	03
0-7	ON	ON	OFF	07
0-11	ON	OFF	ON	0B
0-15	ON	OFF	OFF	0F
0-19	OFF	ON	ON	13
0-23	OFF	ON	OFF	17
0-27	OFF	OFF	ON	1B
0-31	OFF	OFF	OFF	1F

CONTROLLER - OTHER FUNCTIONS

The remote interface board of the controller also has other function controlling switches (typically eight in each module), some of which have required positions, and some of which are used to set up the system for operation.

In board position K7 is a switch module with the following functions:

1	set OFF
2	set ON = continuous request to SEND
3	ON = modem clocking OFF = internal clocking
and	
4	ON OFF
5	set ON - continuous DTR
6	(not used)
7	(not used)
8	ON = 1920 char (set always ON)

In board position F13 is an eight-position switch which is used to set baud rate, if internal clocking is selected. In general, all systems operating at 2400 baud or higher require modem clocking (modem is the clock source).

The internal clock selection is set at the factory for 1200 baud (IBM's business machine setting). If lower baud rates are requested the area service technician should be notified.

1200 BAUD SETTING

F13-1 ON
F13-2 OFF
F13-3 OFF
F13-4 OFF

In board position L10 is an eight-position switch which relates to the following functions:

SWITCH NO.	FUNCTION
1	set OFF
2	(not used)
3	set OFF
4	(not used)
5	ON = inhibit priority print (operational option)
6	ON = inhibit FIFO display (maintenance option)
7	ON = enable COPY feature (operational option)
8	(not used)

Switch 2 in position K7 does not have its setting displayed in status display. This CRTS (continuous request to send) switch should only be selected on a point-to-point line. Its effect is an increased operating speed, eliminating the clear-to-send delay. Improper operation can occur if the modem has continuous carrier selected the controller does not have CRTS selected.

Switch 5 is associated with the local print option. If this device option has been selected, reference the local print option description in the Operations section.

Switch 6 is a maintenance tool to evaluate basic communication problems such as time-out, incorrect controller addressing, and incorrect line sequences. Reference the FIFO description included in the Remote Problem Determination section.

Switch 7 enables or disables the copy command feature which is only applicable to remote systems.

DISPLAY STATION

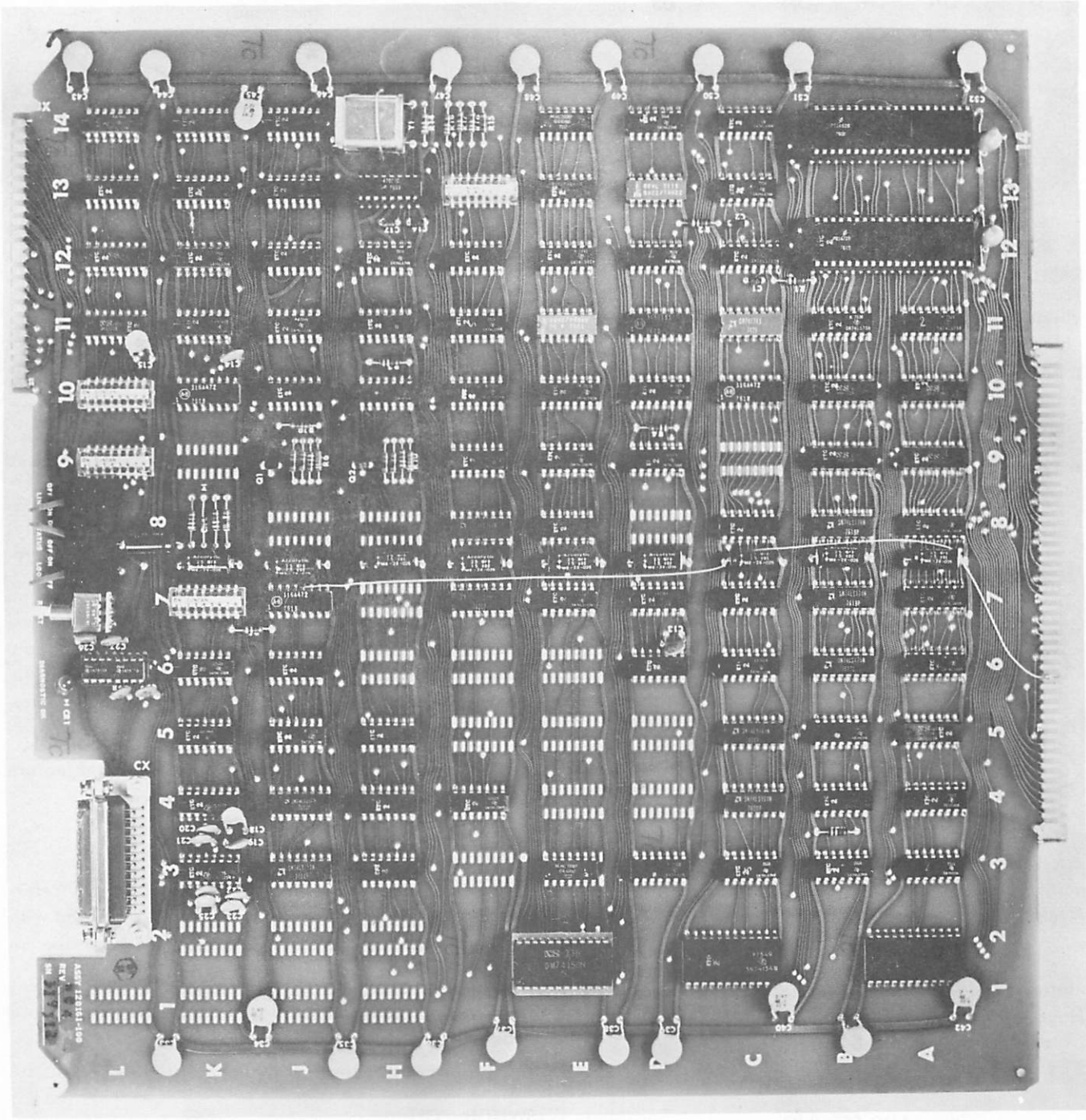
The coax I/O switches on the bottom PC board (reference page 19 of the display station have affiliated with them an eight-position switch. Since the printer uses an identical board, a similar switch will be found in it.

Switch settings which configure the display station are found in the list which follows:

DISPLAY STATION COAX I/O SWITCH SET (6056)

SWITCH	ON	OFF
1	Device is a printer	Device is a display
2	Inhibit numeric lock	Enable numeric lock
3	Inhibit I/O alarm	Enable I/O alarm
4	(not used)	

Remote Interface Board



5	Inhibit ATC change	Enable ATC (changes character in current cursor position to an attribute character)
6	No alarm on keyboard error	Alarm on keyboard error
7	Inhibit tab to colon	Enable tab to colon
8	1920 character buffer	

A typical setup is as follows:

#1 OFF
#2 OFF
#3 OFF
#4 OFF
#5 ON
#6 OFF
#7 ON
#8 ON

PRINT STATION

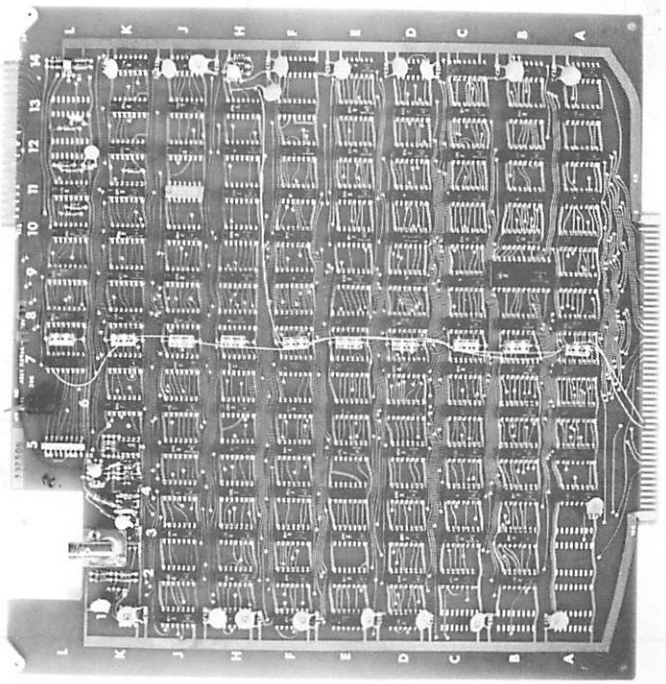
Since the printer uses the same coax I/O PC board as the display station, the only essential difference is in the settings of the eight-position switch affiliated with the coax I/O. Switch functions in the printer, with their typical settings, are defined in the following list:

SWITCH	ON	OFF
1	Device is a printer	Device is a display
2	Double space inhibited	Double space enabled
3	(not used)	
4	(not used)	
5	Inhibit form feed	Enable form feed
6	Inhibit vertical tab	Enable vertical tab
7	Inhibit expanded print	Enable expand print
8	1920 character buffer	

NOTE: Test switch on COAX I/O PC Board should be off when the print station is attached to an IBM controller. This is particularly critical in the case of an IBM 3272 (local controller), since this controller can "hang" when unusual input requests are received from a printer.

A typical setup is as follows:

#1 ON
#2 ON
#3 OFF
#4 OFF
#5 OFF
#6 ON
#7 ON
#8 ON



Coax I/O Board

FRONT PANEL INDICATORS (DIAGNOSTIC INDICATION ONLY)

O SYSTEM READY	O SYNC SEARCH	O SELECTED	O CTS WAIT	O TRANSMIT	O STATUS	
*INTERNAL DIAGNOSIS USAGE						
					X	Timer Failure
Data Set Ready and Carrier Detect				X	X	Buffer Failure
			X		X	Cursor/EOP Failure
			X	X	X	Internal Loop Back Failure
		X			X	External Loop Back Failure

*The diagnostic error indicator lights periodically to indicate error type.

CONTROLLER DIAGNOSTICS - MAP PROGRAM

Field maintenance of a Trivex PLUS 70 System is typically done down to the board level. That is, the problem, if it exists in a board, is located as being in that board. The board is then replaced with a spare. Diagnosis and repair within the board is another procedure. It makes good economic sense to have ample spares so that the system may be kept in operation. Thus there is little system downtime while boards are diagnosed and repaired.

The procedures for maintenance to the board level are related to, and make considerable use of, the configuration and operation of the system itself. Included within the micro-programs of the system, as well as their emulation capabilities which are used in operation, are routines for self-diagnosis. These routines can greatly simplify the diagnostic job, especially when used in conjunction with the abilities of the system to display and to print.

Because of the environment in which it works, and because it intercommunicates among its various devices, some problems in the system may not be internal to controller or to devices, but rather are communication-related. For this reason some of the diagnostic techniques are aimed at determination or evaluation of such communication problems.

THE MAP PROGRAM

MAP (Maintenance Aid Program) is a diagnostic program resident in every Trivex PLUS 70 remote controller.

The program includes the capability of sending a diagnostic message to the computer. This message describes the operation and status of the system.

Information about the controller, display stations, printers and the communications links is available to aid in immediate fault isolation.

OPERATION OF MAP

The same microprogram which achieves IBM 3271 compatibility (emulation) contains the MAP capability.

Status display is included within MAP. MAP also incorporates a group of diagnostic subroutines, a defined number of which must be completed successfully prior to initiation of, and entry to, the controller operational program. These include:

1. Timer test.
2. Buffer test.
3. Cursor/EOP (end of page) test.
4. BSC (binary synchronous comunication) internal loopback.
5. BSC external loopback (OFF LINE only).
6. Indicator test.

The front panel indicators show the nature of the error encountered. (See Page 20)

Sequence of MAP Tests

MAP always proceeds in order through the first four tests (timer, buffer, cursor/EOP, and BSC internal). If the ON LINE switch is in the ON position, MAP proceeds from test four (BSC internal) to the operational program. This action is necessary to prevent remote power-on sequences from causing line disruptions without operator intervention.

If the ON LINE switch is in the OFF position, MAP proceeds from test four (BSC internal) to test five (BSC external loopback) if the loop switch on the remote interface board is in the ON position.

If the loop switch is in the OFF position, MAP proceeds to the indicator test.

Test five (BSC external loopback) has two options, as follows:

Controller Closed Loop Test

By installing a loopback connector in the RS232 interface connector, the controller can be self-tested, including its interface drivers and receivers.

Controller/Modem Closed Loop Test (201 type with four-wire hookup)

The phone lines are disconnected. Jumpers are installed connecting the receive pair to the transmit pair on the data set, if the data set does not have a built-in capability to augment a loopback test.

If test five is successfully passed, MAP proceeds to the indicator test which turns on all indicators except SYSTEM READY. This shows all indicators except SYSTEM READY to be operational. Otherwise, an indicator light has failed, or the error indication is that given in the preceding table of front panel indicators.

After indicator tests are completed, the controller proceeds from step six to step one, repeating the test sequence as long as the system is off line.

DIAGNOSTIC/INDICATOR SUMMARY

On-Line Mode

If the SYNC SEARCH indicator lights the controller has successfully completed diagnostic steps one through four.

If on-line operations are not successful perform off-line mode tests.

Off-Line Mode

1. Install the loopback connector in the RS232 interface connector.

2. Set the ON-LINE/OFF-LINE switch to OFF-LINE.

The indicators should change repeatedly between two display indications.

1. All indicators ON (approximately 1.5 seconds).
2. System ready, selected, and transmit ON (approximately 2.0 seconds with SYNC SEARCH flash).

Data Set Cable

25-pin cinch connector:

PIN #	COLOR*	SIGNAL NAME
1	Blue	GND
2	Black	Transmit data
3	White	Receive data
4	Green	Request to send
5	Red	Clear to send
6	Red/Black	Data set ready
7	Blue/Black	Return (logic)
8	Red/White	Signal detect (carrier)
15	Orange	Transmit clock
17	Orange/Black	Receive clock
20	Blue/White	Data terminal ready
22	Black/White	Ring

*NOTE: Pin outs same as IBM. Cable colors may be different.

External Loopback Connector

1. Pin 2 to Pin 3.
2. Pin 4 to Pin 5.
3. Pin 6 to Pin 8 to Pin 20.
4. Pin 15 to Pin 17 to Pin 24.

STATUS DISPLAY

Trivex remote systems make use of a status display feature.

This feature permits the display of system status on a selected display station screen or, alternatively, printing of an equivalent status list on a selected printer.

The status display is useful in an operational sense, since it presents the current logical configuration of the system, making it unnecessary to keep other lists or records. It is also a powerful diagnostic tool, since it lists important keys to internal errors, and logs transmission errors.

Three kinds of information are presented in the status display, as follows:

1. Configuration information, which defines the system in terms of its present operational configuration.
2. Maintenance/diagnostic information, which defines the dynamic operational status of the system at the time at which the status display was requested.
3. Error accumulation information, which is called forth from the internal counters of the system at status display time. Accumulation of the designated errors is done on every interface connection, including the remote line, and all display and printer interfaces.

Since status display data is of potential interest to programming and operations personnel, as well as to maintenance people and Trivex customer representatives, it is also accessible at the 360/370 system via the remote line, as well as at any display station or printer in the PLUS 70 System.

ACCESS RESTRICTIONS

Certain procedures should be observed in requesting status display:

1. At the computer the status display should not be called whenever there is pending status. If any command is executed prior to a specific poll, pending status will be lost.
2. At a display station or printer the status display can be called in either on-line or off-line mode. However, in on-line mode the status will be retrieved only when the remote line allows access.

The status display results are formatted as a typical "page" on the display screen, or are similarly printed on the printer. The page following shows a typical status display message as output at a printer, along with the categories of information, and the meaning of each entry.

STATUS DISPLAY USAGE

Status display information covers a broad range of system data. Data of these types can be useful to an operator or a system analyst. It is beyond the scope of this manual to present information for the system analyst, but a summary form can be presented for the status display's most common usage.

TRIVEX REMOTE SYSTEM STATUS DISPLAY

1A	2A	1B	1C	1D	1E	2B	2C	2D	1F	2E	2F	2G	2H	3A	3B	1G	
01	00	1F	1	18	00	04	1000	10	11	7F	01	42	40	00	00	6271	
00	01	42	40	35	30	00	00			01	01	42	40	00	00	08	00
02	02	00	00	00	00	80	FF			03	03	00	00	00	00	80	FF
04	04	00	00	00	00	80	FF			05	05	00	00	00	00	80	FF
06	06	00	00	00	00	80	FF			07	07	00	00	00	00	80	FF
08	08	00	00	00	00	80	FF			09	09	00	00	00	00	80	FF
0A	0A	00	00	00	00	80	FF			0B	0B	00	00	00	00	80	FF
0C	0C	00	00	00	00	80	FF			0D	0D	00	00	00	00	80	FF
0E	0E	00	00	00	00	80	FF			0F	0F	00	00	00	00	80	FF
10	10	00	00	00	00	80	FF			11	11	00	00	00	00	80	FF
12	12	00	00	00	00	80	FF			13	13	00	00	00	00	80	FF
14	14	00	00	00	00	80	FF			15	15	00	00	00	00	80	FF
16	16	00	00	00	00	80	FF			17	17	00	00	00	00	80	FF
18	18	00	00	00	00	80	FF			19	19	00	00	00	00	80	FF
1A	1A	00	00	00	00	80	FF			1B	1B	00	00	00	00	80	FF
1C	1C	00	00	00	00	80	FF			1D	1D	00	00	00	00	80	FF
1E	1E	00	00	00	00	80	FF			1F	1F	00	00	00	00	80	FF
2I	2J	2K	2L	2M	2N	2O	3C										3C

Group 1 - Configuration Information

1A	CUPA:	Control Unit Poll Address
1B	HDVCA:	Highest Device Address
1C	MCL:	1 = Modem clocking selected
ID	BAUD:	Baud rate/100 in hex (on-line or off-line) Configured for external loop through data set
1E	CTSD:	Clear to Send Delay (in milli-sec)
1F	DIAG:	Diagnostic switch (status display) = 1 (local)
1F	ON-LINE:	On-Line switch (1 in high-order bit if on line)
1G	VERS:	Version of operational program

Group 2 - Maintenance/Diagnostic Information

2A	DVCA:	Device address of requesting terminal
2B	CUSNS:	Control unit sense register
2C	LINE:	Carrier, data set ready, CTS/RTS, received character ready

2D	XMIT:	Transmit register empty = 1, overrun error = 1
2E	LCR:	Last Command Received
2F	LDS:	Last Device Status, device address for SS bytes
2G	SSO:	Last status byte 0
2H	SS1:	Last status byte 1 (Ref. Table 18 component description)
2I	DA:	Device Address
2J	PA:	Printer Assignment
2K	SSO:	Status byte 0
2L	SS1:	Status byte 1 (Ref. Table 18 component description)
2M	LCR:	Last Command Received
2N	DA HOLD:	DAC received from device
20	DAC STATUS:	DAC detected information

Group 3 - Error Accumulation Information

3A	NKS:	Counter of NAKS sent to remote channel (TCU)
3B	NKR:	Counter of NAKS received from remote channel
3C	RETRY:	Controller/device communication link (error counter)

Device Status

The most common usage of status display occurs when maintenance personnel arrive at a system site and need general information on system status. The system status includes:

1. Devices attached to the control unit.
2. Device operational status.
3. Controller status

Requesting Status

Merely receiving a status message tells a great deal about the total system status; namely, that there is a communication link from device to controller, and that the controller is not hung servicing the remote line. A controller left in the SELECT mode will not present status.
Reading the Individual Device Status
Sequence:

1. Field 20 contains 00 or 08.
   There is a device on that port, (00 = CRT; 08 = printer) and the device has no controller/device errors displayed.
2. Field 2N contains 00 through 1F.
   The device is not reporting any device errors.
3. Field 2K/2L contains 42/40.
   The device has communicated with the computer. The device has responded to a poll sequence and submitted a normal device end status. If other devices are still operational, there has been no error status on this device since submitting that device end status.
   If the controller is not operational this field may have normal status due to the fact that the controller is preventing the device from submitting error status.
4. Field 3C - error counter.
   This error counter will accumulate errors when the controller is powered on and the devices are turned off. This is a common condition in many installations; namely, that devices are turned off on off shifts, but the controller is still powered on. The 3C field will indicate FF (maximum error count).
   To re-initialize this counter the controller's remote interface loop switch must be toggled from off to on to off. After re-initialization the 3C field should contain a count of 00 for error-free operation. Turning the controller off will accomplish the same initialization.
5. Field 2M.
   This is used in system analysis.
6. Field 2I/2J.
   This is used operationally in conjunction with the local print option.

CONTROLLER INSTALLATION

The problem determination flow charts beginning on page 69-A are provided primarily for controller problem determination.

These flow charts use all display indicators that are available on the Trivex PLUS 70 System.

Detailed Summary

Group 1 - Configuration Information

1A CUPA: Control Unit Poll Address

This is the address to which the controller will res-

pond when either polled or selected. The address is displayed as 00 through IF, which corresponds to the EBCDIC characters on page 16A. The control unit address switch settings are on page 16A.

Note: The polling and selection address are given for each switch setting.

1B HDVCA: Highest Device Address
This is the device limit setting on the controller. The controller will not access any device that is attached to an address higher than the limit setting (page 17).

The control unit will time out if an address above the limit setting is polled or selected.

1C MCL: Modem or internal clocking (switches 3 and 4, remote interface board position K7. (See page 17).

Modem clocking selected. This is the setting used if the data set is supplying the clocks for the control unit. (Display = 1).

1D BAUD: Internal clock rate or modem clock rate. Off-line the baud rate is the internal clock rate unless external loop test is being run through the data set.

On-line the baud rate is the data set clock rate.

Note: The data set clock rate becomes valid after the first transmission. External loop test through the data set will also give the data set clock rate.

BAUD	STATUS DISPLAY BAUD/100 IN HEX
1200	0C
1800	12
2000	14
2400	18
3600	24
4800	30
7200	48
9600	60
19200	C0

IMPORTANT: If modem is internally strapped for continuous RTS/CTS, K7-2/L8-2 must be ON (continuous RTS selected).

1E CTSD: Clear to Send Delay

Off-line the clear to send delay will be 0 unless external loop back is being run through a modem.

On-line the clear to send delay becomes valid after any transfer of SS or text.

Group 2 - Maintenance/Diagnostic Information

2A DVCA: Device address of requesting terminal

This is the address of the station displaying the status.

2B CUSNS: Control unit sense register

This gives the position of the switch options on the remote interface.

Each switch is given a weighting value corresponding to one of the eight bits in the binary representation of a two-digit hexadecimal number. With the switch in the 1 position, this value is summed with all the other switch position values and the sum is displayed in status display as a two-digit hex number, as follows:

Decimal	Hex	Function	PCB
128	80	Not used (alway zero value)	L10-1
64	40	Inhibit FIFO display when on (on = 0)	L10-6
32	20	Not used (always zero value)	
16	10	External loop switch (on = 1)	
8	8	Should be set at one (off = 1)	L10-2
4	4	Enable priority print (on = 0)	L10-5
2	2	Enable copy when on (on = 0)	L10-7
1	1	Not used (always zero value)	L10-3

For example:

FIFO DISPLAY INHIBITED
EXTERNAL LOOP ON
COPY DISABLED

Control unit sense register display will read hex 1A (10+8+2 = 1A)

2C LINE: 1 = Yes 0 = No

Carrier - signal detect is present from modem (carrier)

Data set ready - line must be high from modem.

Clear to send/Request to send - must be 0.

Received character ready - program has just received a character from the line.

2D XMIT:

Transmit register empty - must be a 1 which means that controller is not transmitting at the time status display is generated.

Overrun error - must be a 0. A 1 means that the remote interface received a character before the program accepted the previous one.

2E LCR: Last Command Received (controller)

This is the very last command that the remote controller received from the CPU. Refer Appendix 1 for command code identification.

2F LDS: Last Device Status

This is the address of the device which had the last status information for the CPU.

2G SS0: Status byte 0

This is the last status byte 0 that the remote controller sent to the CPU. See below for code identification.

2H SS1: Status byte 1

This is the last status byte 1 that the remote controller sent to the CPU. See below for code identification.

STATUS BYTES DEFINITIONS

SS0: Always 4X

X: 8 - device busy
4 - unit specific
2 - device end
1 - transmission check (stand alone version only)

SS1:

80 - always a 0
40 - always a 1
20 - command reject
10 - intervention required
8 - equipment check
4 - data check
2 - control check
1 - operation check

NOTE: IBM's Component Description Manual includes a cross reference chart relating command execution to error status.

2I DA: Device Address

This is the device adapter address for each terminal.

2J PA: Printer Assignment

This is the printer address that is described in the display print section.

2K SS0: Status Byte 0

This is the last status byte 0 that this device sent to the CPU. Refer to page 57 for the code identification.

2L LL1: Status Byte 1

This is the last status byte 1 that this device sent to the CPU. Refer to page 57 for the code identification.

2M LCR: Last Command Received (device)

This is the last command prior to status display to be directed at this device. A poll command will only be displayed if a text block is sent in response to the poll.

NOTE: A status message is not considered a text block.

Command	Code
General poll	7F
Specific poll	Device address
Write	31
Erase/write	35
Read full buffer	32
Read modified	36
Copy	37
Erase unprotected	2F

NOTE: Poll command will be the most common.

2N DA HOLD: DAC received from device

This is data that the controller receives from the device.

The bit weights are summed as in the control unit sense register status display, and are presented as a two-digit hex number. The three high-order bits represent discrete functions, as shown, and the five low order bits are coded to present an AID code, if the device is a display station, or printer status, if the device is a print station.

Decimal	Hex	Function
128	80	Device check
64	40	Transmit check
32	20	Information pending
0 to 31	00 to 1F	AID code or printer status

Device check: device detected an internal LRC check or cursor error.

Transmit check: device detected an error while receiving information from control unit (coax).

Information pending: device has new data or status to be sent to the controller.

AID code or printer status: last keyboard function code or printer error (refer to following chart).

DISPLAY STATION AID CODE

Function	Code	Function	Code
ENTER	1D	PF10	1A
PF1	11	PF11	1B
PF2	12	PF12	1C
PF3	13	Selector Pen Att	1E
PF4	14	PA1	0C
PF5	15	PA2(CNCL)Key	0E
PF6	16	PA3	0B
PF7	17	Clear	0D
PF8	18	Test req	10
PF9	19	Card reader	06

PRINTER STATION STATUS

Code	
10	Not ready
8	(Not used)
4	Equipment check
2	Printer hang
1	(Not used)

20 DAC STATUS: DAC detected information
This is information about the condition of the device.

As in previous displays, the various bits are coded and summed into a hex display number, as follows:

Decimal	Hex	Function
128	80	Time out on coax (overrides all other status). Device failed to respond to command or poll.
64	40	Parity error detected in device response.
8	8	Device is a printer.
4	4	Device is busy.
1	1	Device switch is set at 480-character buffer.

Group 3 - Error Accumulation Information

3A NKS: Counter of NAKS sent to CPU
This is the current count of NAKS that the remote controller sends to the system. Resetting the controller or sending the proper WCC in a status write will clear this count to zero.

3B NKR: Counter of NAKS sent from CPU
This is the current count of NAKS that the system has sent to the remote controller. Cleared same as NKS.

3C RETRY: Controller/device communication link
This is the number of errors that the controller has detected during I/O with a device through the coax. The RETRY count is on a per device basis. Resetting the controller or sending the proper WCC in a status write or setting loop switch ON while on line, will clear all device retry counts.

FIFO DISPLAY, STATUS DISPLAY OPERATION

Various methods are available for calling forth status or FIFO display in the system, depending, in part, on the equipment and configuration of the system.

These methods are summarized as follows:

For Either Display

Required features:

1. A Trivex 0712 remote controller with program version 6271 or later.
2. Any Trivex PLUS 70 display station with any keyboard.

Switch settings:

1. Controller
   a. The status switch on the remote interface should be ON.
   b. With the external test request switch installed on the remote controller, this switch should be in LOCAL position.
2. Display station
   a. The test switch on the coax I/O board must be OFF if the external test switch is not installed.
   b. With the external test switch installed on the display station, this switch should be in NORMAL position.

   NOTE: With the external test switch, the test switch on the coax I/O should always be left on.

Status Display

Follow this procedure:

1. The switch at position L10-6 on the remote interface board (position L16-2 on an older style wire-wrap board) must be in the ON position.

2. Push the TEST REQ (test request) key on the display station keyboard. Status display should appear on the station screen.

3. If the display station alarm sounds, an error in transmission has occurred between controller and display station.

FIFO Display (Reference Appendix 5 for detailed description).

Follow this procedure:

1. The switch at position L10-6 on the remote interface board (position L16-2 on an older style wire-wrap board) must be in the OFF position.

2. Push the TEST REQ key on the display station keyboard FIFO display should appear on the station screen.

3. If the display station alarm sounds, an error in transmission has occurred between controller and display station.

NOTE: The normal position of the controller switch at L10-6 is ON. Return the switch to this position when you have finished with FIFO display.

Optional Alternate Status Display Procedure

Required features:

1. A Trivex 0712 remote controller with program version 6271 or later.

2. A Trivex PLUS 70 display station with A-105 RAM/CS or lite pen RAM with program version 6252 or later.

3. 78-key or data entry keyboard.

Follow this procedure:

1. Hold down the RESET key and push either the PF5 or the PF9 key.

2. Status display should appear on the station screen.

3. If the display station alarm sounds, an error in transmission has occurred between controller and display station.

NOTE: This option requires no specific switch settings in the controller.

Remote Status

Trivex remote controllers Model 0712 with program version 6271 or later permit the CPU to read the entire status display message from a controller, or to initialize data in the controller in preparation to send status display. This is done by use of the appropriate commands. Device addressing for these commands may be that of any on-line and error-free device, or address 7F, which selects the controller only and does not involve any device.

Other commands should not be chained to STATUS READ and STATUS WRITE commands. However, a STATUS WRITE may be chained from a STATUS READ.

Status Read

The command code for STATUS READ is hex 7E.
The command data stream is: -STX ESC 7E ETX.

The CPU-received data stream is the same as that for a READ MODIFIED command with one attribute character in the home position. The AID code is hex 60, and the cursor position will be random.

Status Write

The command code for STATUS WRITE is hex 7D.

The command data stream is -STX ESC 7D WCC ETX-

The WCC specifies which counts are to be reset, as follows:

1. Bit 2 resets NAKS sent.
2. Bit 3 resets NAKS received.
3. Bit 4 resets all device retry counts.
4. WCC of hex F8 resets all counts.

PROBLEM DETERMINATION PROCEDURES

AT THE COMPUTER CENTER:

Basically this method is useful in determining if there is a system problem or a line problem. Comparison of local with remote status display is often revealing in this respect, and can indicate whether FIFO display, useful in determining line problems, should be called forth.

The remote status display has the basics which permit an expansion in elegance, making use of the powers of the computer for those users who would care to do so. Status display, while cryptically encoding a good deal of information useful to the maintenance engineer, nonetheless has all the basic information permitting it to be expanded into a prose report for the layman, for instance.

AT THE REMOTE CENTER:

More typically, troubleshooting of the system is done at the system. It is quite possible to maintain the system without reference to the computer, and the built-in diagnostic tools make this a straightforward undertaking.

BASIC OPERATIONS AND ERROR STATUS

Without regard to the location of status reporting, a basic understanding of system operaion is essential. The following statements describe the basic operations, and their error status indications:

1. A computer command cannot be executed to or from a device that has error indication at the time the device is selected or polled.
2. A SELECT is prerequisite to any command execution except the READ command resulting from a poll sequence to a device with attention pending.
3. Both the SELECT sequence and the POLL sequence cause the device buffer contents to be read into the controller buffer. When this transfer occurs, error tests are performed on the contents.
4. If buffer transfer cannot be made without error, the sequence generates error status, as follows:
   a. In a POLL sequence, an error takes the form of status message sent to the computer. The message shows the type of error. Error status takes precedence over data.
   b. In a SELECT sequence, pending error status causes an RVI (reverse interrupt) to the computer. Error status is stored in the controller. This error status must be read by a specific POLL to that device, or the error status is lost.
5. It is important to note that there is distinction between buffer transfer error status and device-reported error status.
   a. Both error types may cause rejection of a SELECT sequence, or status entry to a POLL sequence . However, device-originated errors (device check) have a special error-reporting procedure, as follows:
   b. On detecting of the error, the device sets INFORMATION PENDING and DEVICE CHECK. INFORMATION PENDING is cleared at completion of a POLL sequence. DEVICE CHECK is cleared only by manual methods, a computer ERASE WRITE command, by a COPY command if the device is the receiving device, or by pushing CLEAR on the keyboard if the device is a display station. A SELECT sequence will not be rejected even if the device has DEVICE CHECK status. If an ERASE WRITE is executed, the device buffer will be cleared, and the DEVICE CHECK indication will also be cleared.

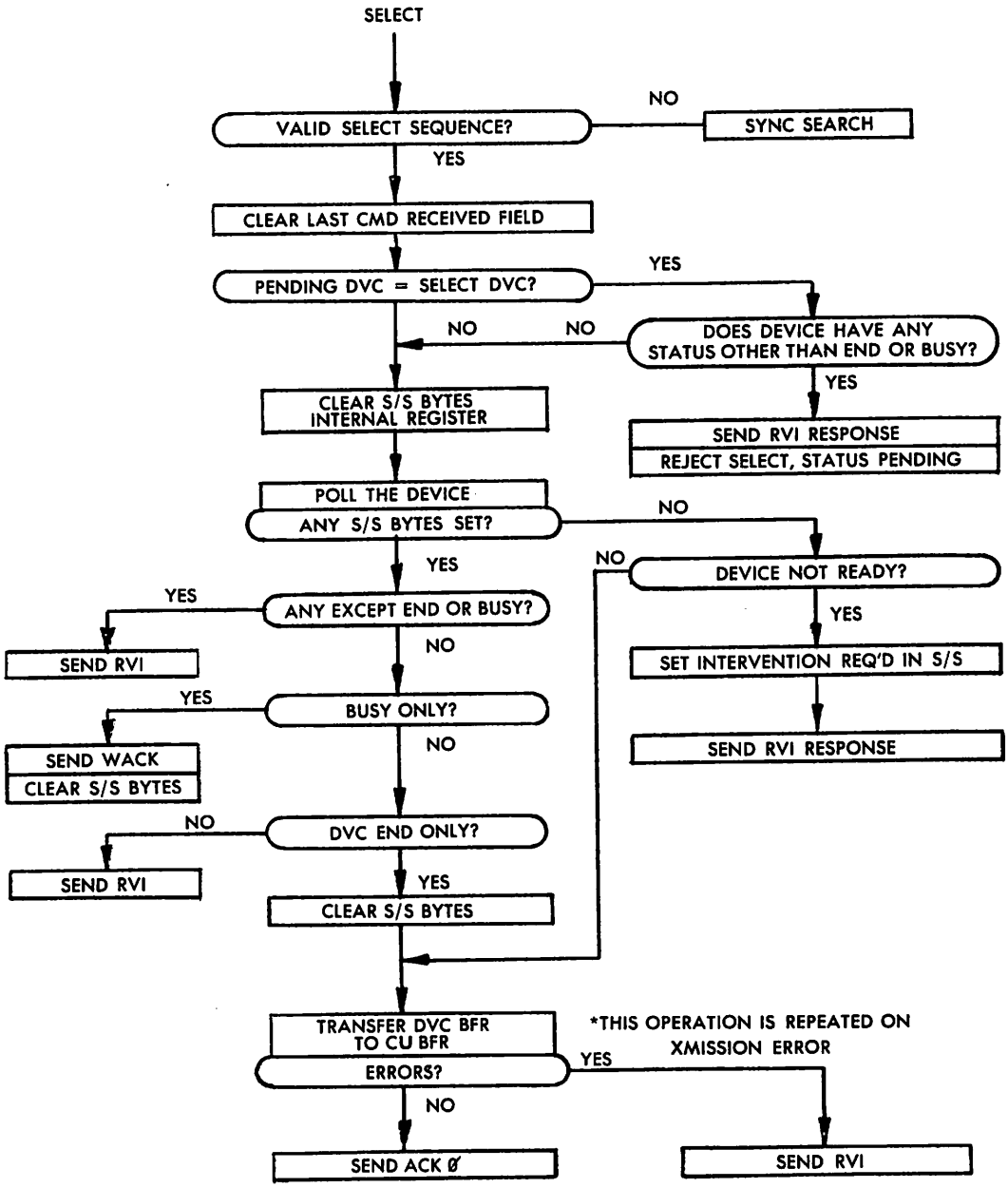
IN SUMMARY

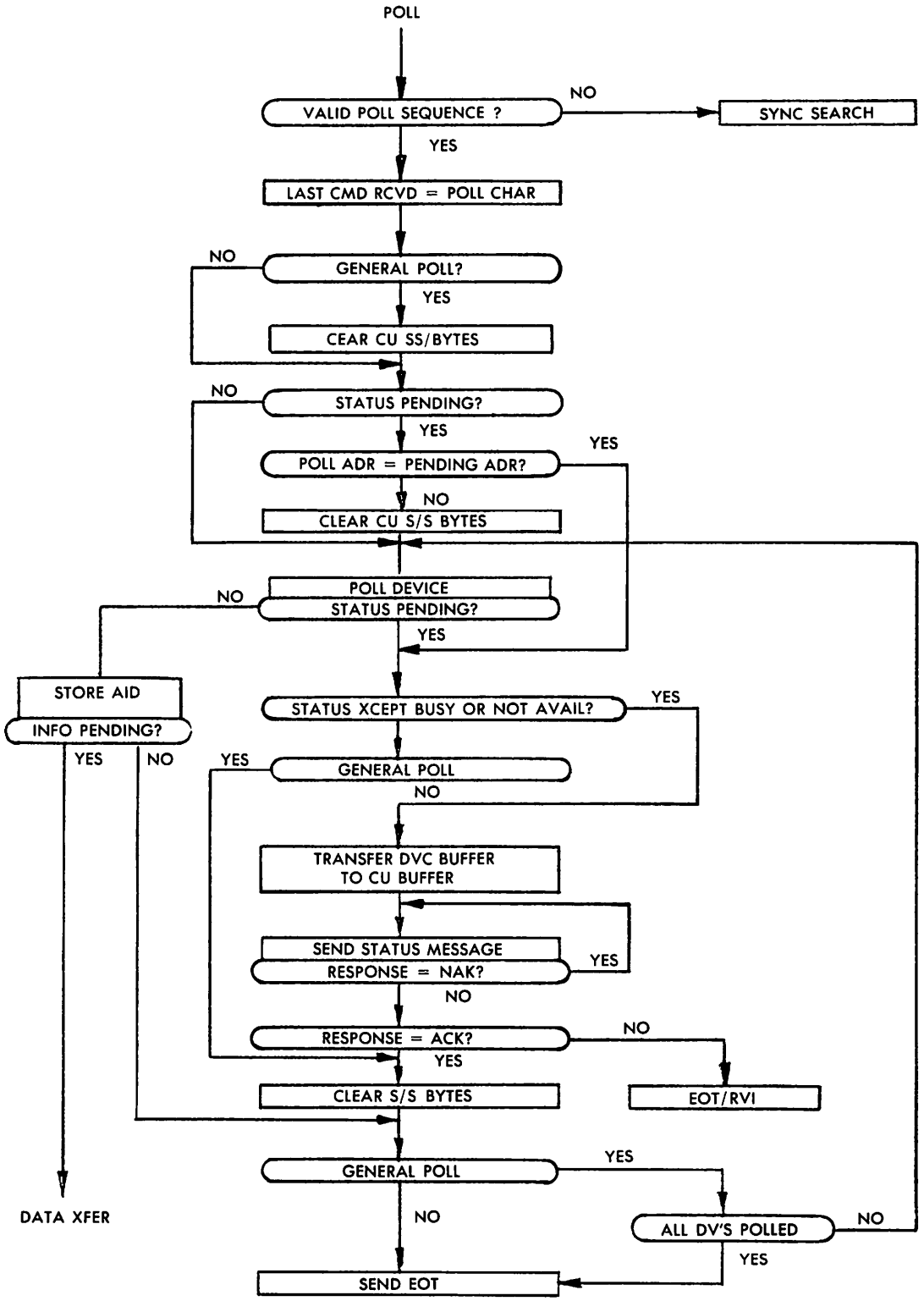
Error status recorded at the controller is based on buffer data validity. This data may be device, transmission, or controller related.

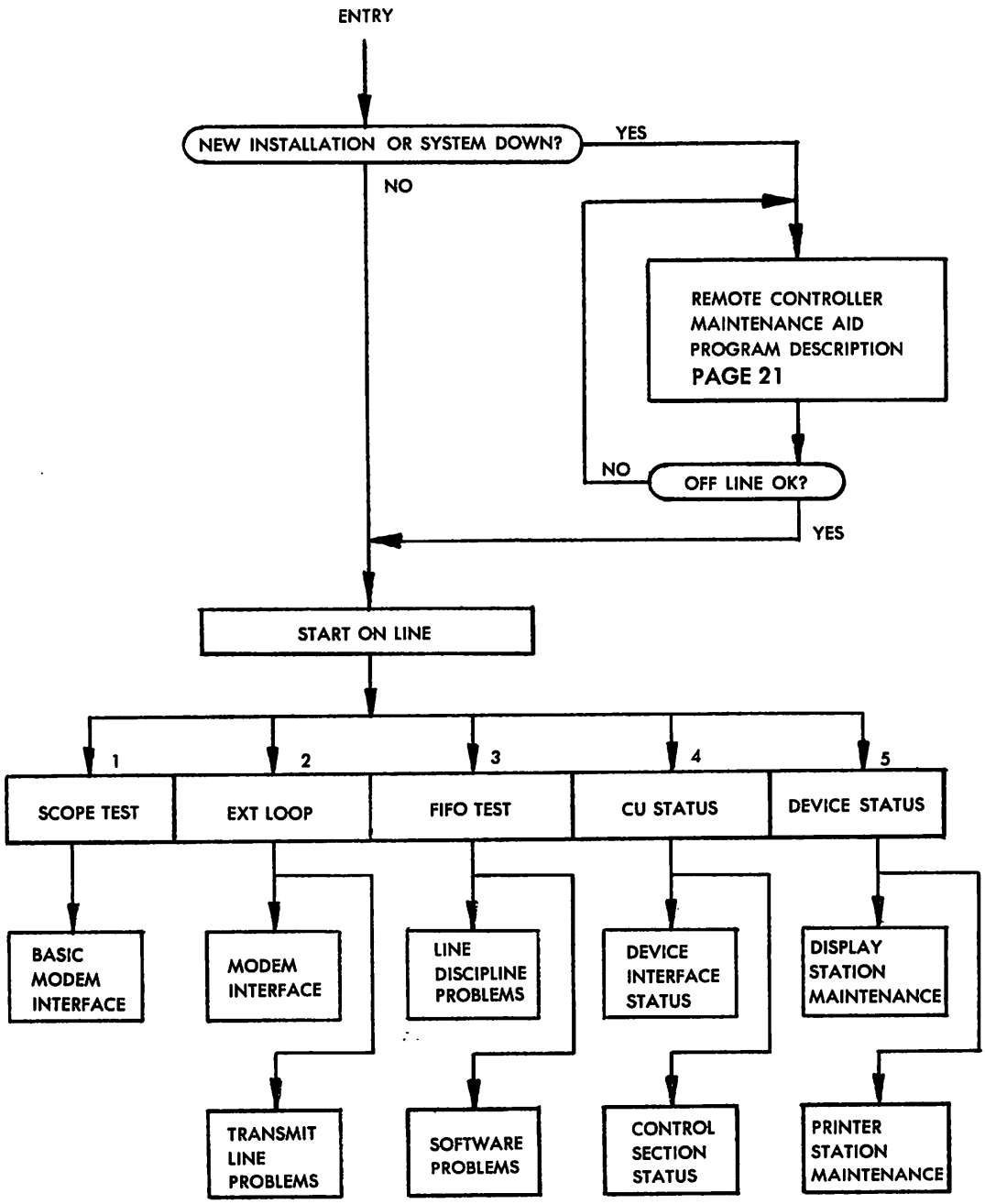
The following flow charts provide a set of interrelated guide paths for troubleshooting. The first two, which define the steps of SELECT and POLL, also show the factors affecting buffer validity and generation of error status.

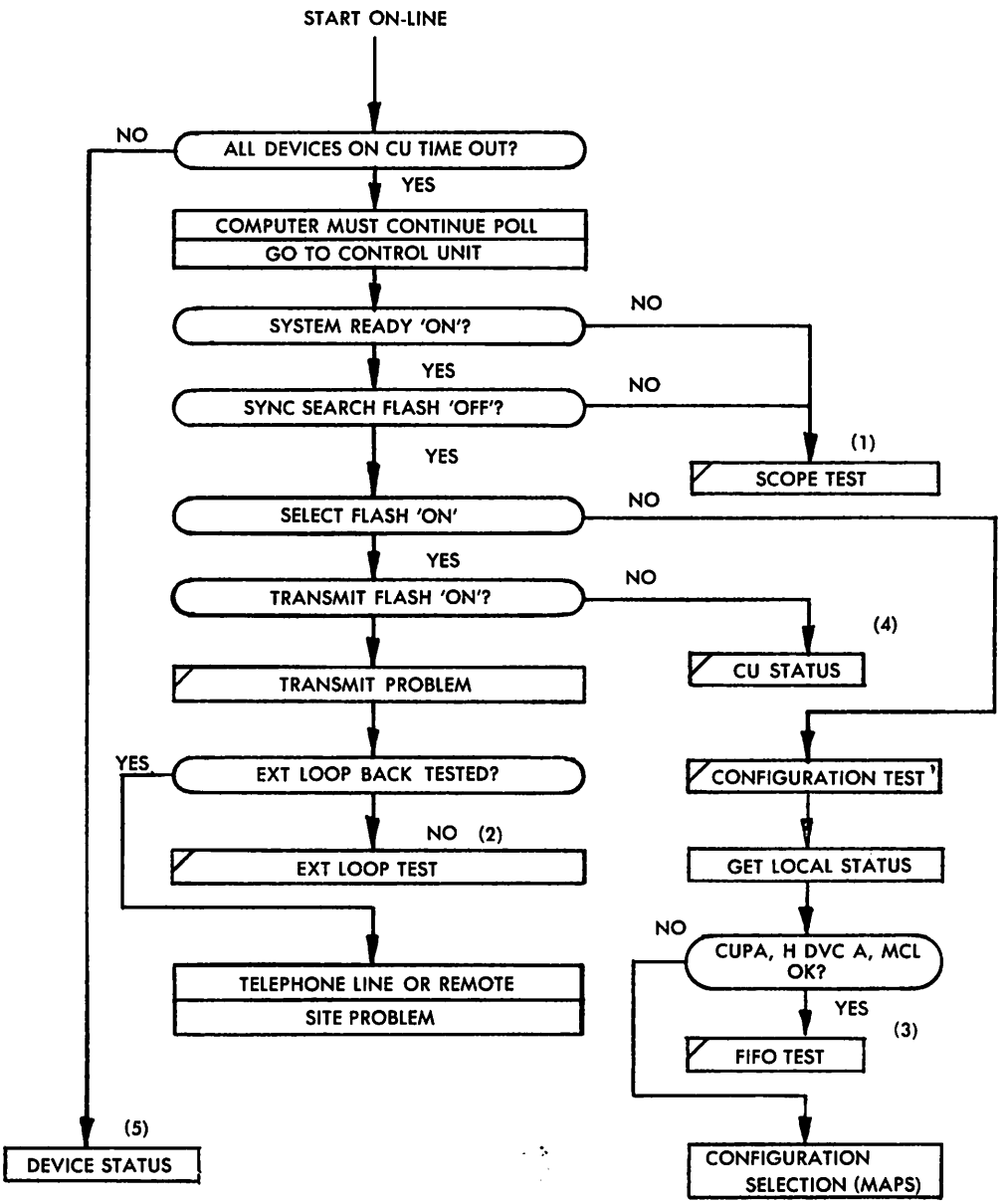
The balance of the charts and tables take one through the various troubleshooting procedures, step by step.

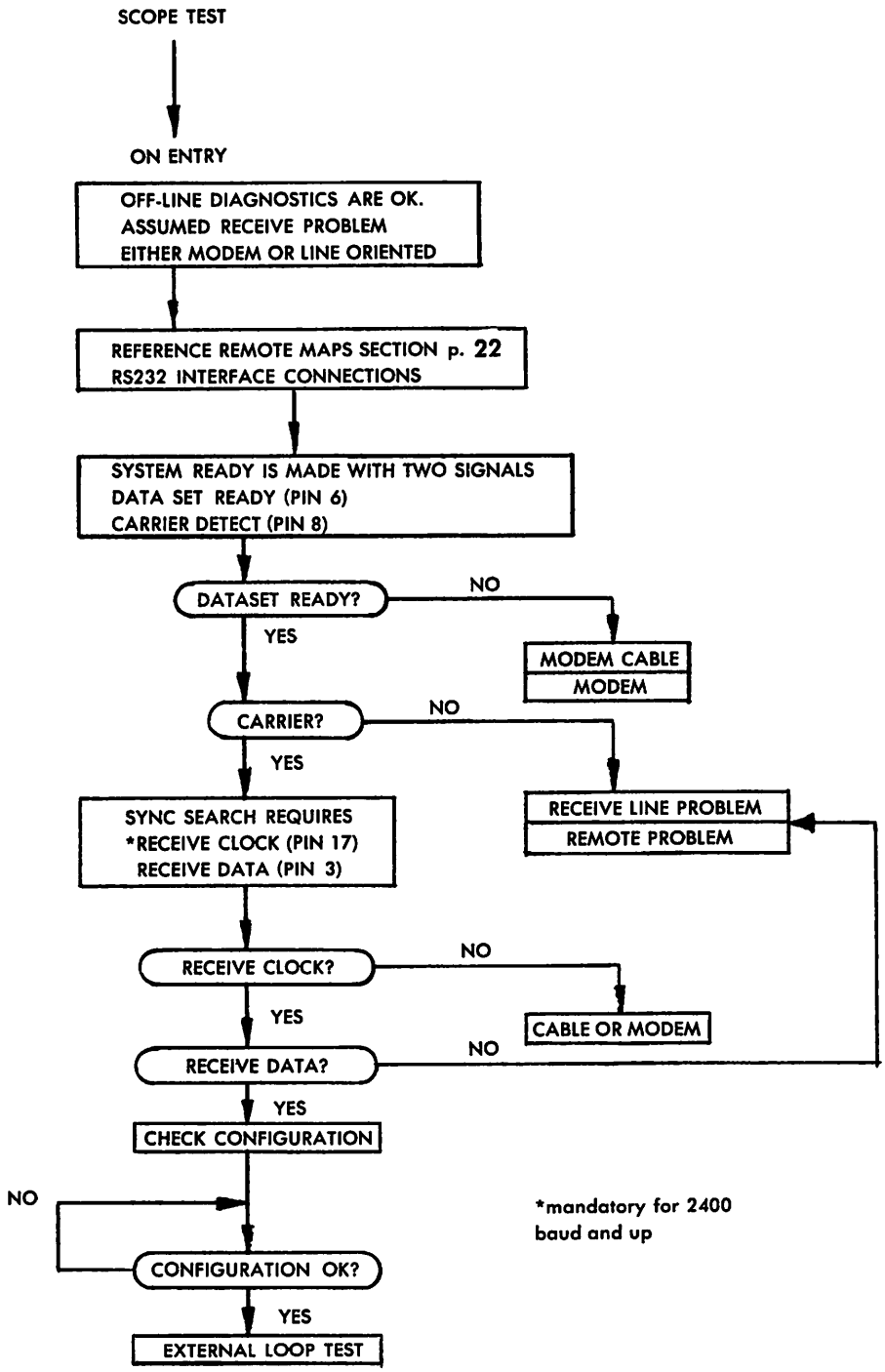
DVC = DEVICE
CU = CONTROLLER

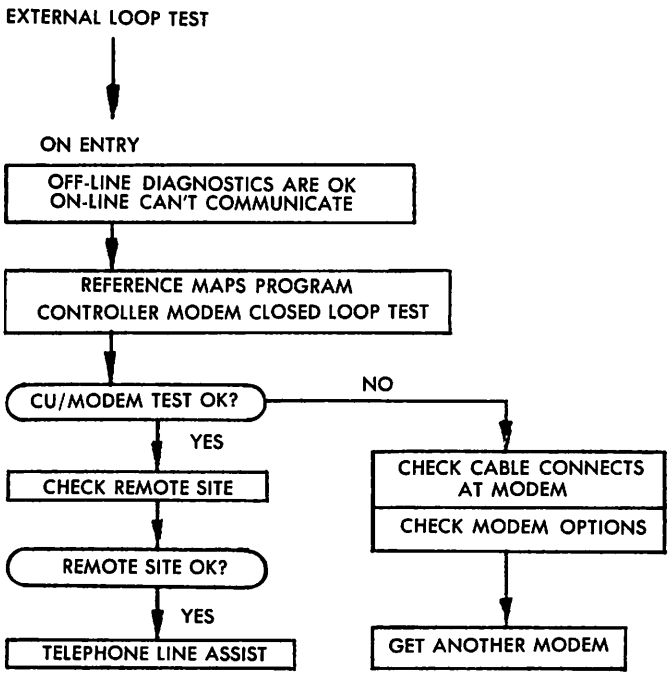



POLL
VALID POLL SEQUENCE ?
NO
SYNC SEARCH
YES
LAST CMD RCVD = POLL CHAR
NO
GENERAL POLL?
YES
CEAR CU SS/BYTES
NO
STATUS PENDING?
YES
YES
POLL ADR = PENDING ADR?
NO
CLEAR CU S/S BYTES
POLL DEVICE
NO
STATUS PENDING?
YES
STORE AID
INFO PENDING?
YES
NO
STATUS XCEPT BUSY OR NOT AVAIL?
YES
YES
GENERAL POLL
NO
TRANSFER DVC BUFFER
TO CU BUFFER
SEND STATUS MESSAGE
RESPONSE = NAK?
YES
NO
RESPONSE = ACK?
NO
YES
CLEAR S/S BYTES
EOT/RVI
GENERAL POLL
YES
DATA XFER
NO
ALL DV'S POLLED
NO
YES
SEND EOT

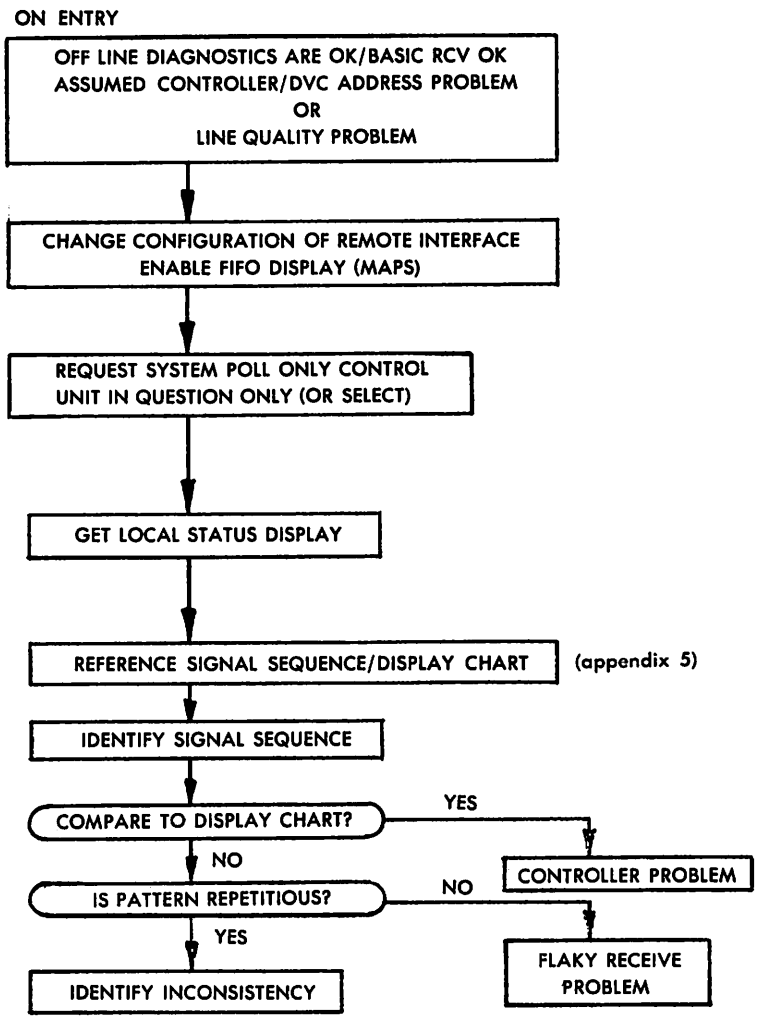

ENTRY
NEW INSTALLATION OR SYSTEM DOWN?
YES
NO
REMOTE CONTROLLER MAINTENANCE AID PROGRAM DESCRIPTION
PAGE 21
NO
OFF LINE OK?
YES
START ON LINE
1
2
3
4
5
SCOPE TEST
EXT LOOP
FIFO TEST
CU STATUS
DEVICE STATUS
BASIC MODEM INTERFACE
MODEM INTERFACE
LINE DISCIPLINE PROBLEMS
DEVICE INTERFACE STATUS
DISPLAY STATION MAINTENANCE
TRANSMIT LINE PROBLEMS
SOFTWARE PROBLEMS
CONTROL SECTION STATUS
PRINTER STATION MAINTENANCE


START ON-LINE
NO
ALL DEVICES ON CU TIME OUT?
YES
COMPUTER MUST CONTINUE POLL
GO TO CONTROL UNIT
SYSTEM READY 'ON'?
NO
YES
SYNC SEARCH FLASH 'OFF'?
NO
YES
(1)
SCOPE TEST
SELECT FLASH 'ON'
NO
YES
TRANSMIT FLASH 'ON'?
NO
(4)
CU STATUS
TRANSMIT PROBLEM
YES
EXT LOOP BACK TESTED?
CONFIGURATION TEST
NO (2)
EXT LOOP TEST
GET LOCAL STATUS
NO
CUPA, H DVC A, MCL OK?
TELEPHONE LINE OR REMOTE
SITE PROBLEM
YES
(3)
FIFO TEST
(5)
DEVICE STATUS
CONFIGURATION SELECTION (MAPS)

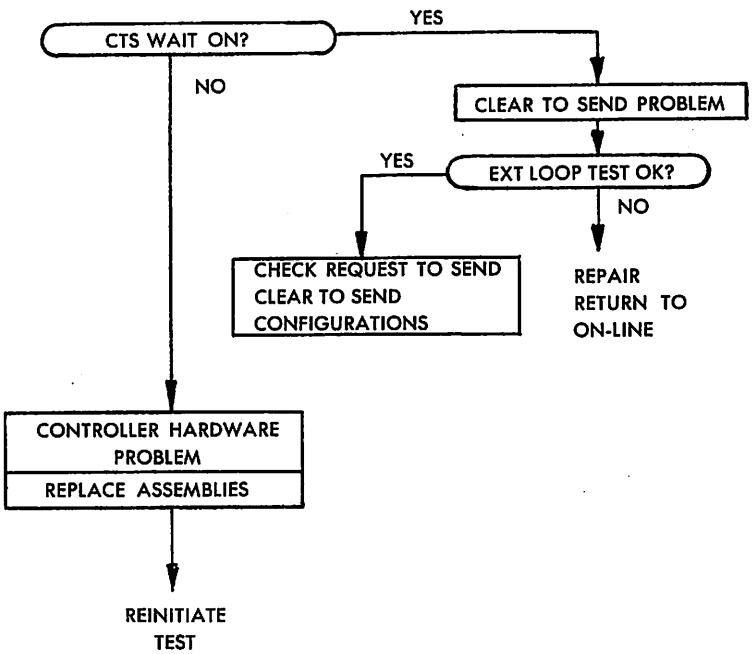

SCOPE TEST
ON ENTRY
OFF-LINE DIAGNOSTICS ARE OK.
ASSUMED RECEIVE PROBLEM
EITHER MODEM OR LINE ORIENTED
REFERENCE REMOTE MAPS SECTION p. 22
RS232 INTERFACE CONNECTIONS
SYSTEM READY IS MADE WITH TWO SIGNALS
DATA SET READY (PIN 6)
CARRIER DETECT (PIN 8)
DATASET READY?
NO
YES
MODEM CABLE
MODEM
CARRIER?
NO
YES
SYNC SEARCH REQUIRES
*RECEIVE CLOCK (PIN 17)
RECEIVE DATA (PIN 3)
RECEIVE LINE PROBLEM
REMOTE PROBLEM
RECEIVE CLOCK?
NO
YES
CABLE OR MODEM
RECEIVE DATA?
NO
YES
CHECK CONFIGURATION
NO
CONFIGURATION OK?
YES
EXTERNAL LOOP TEST
*mandatory for 2400
baud and up

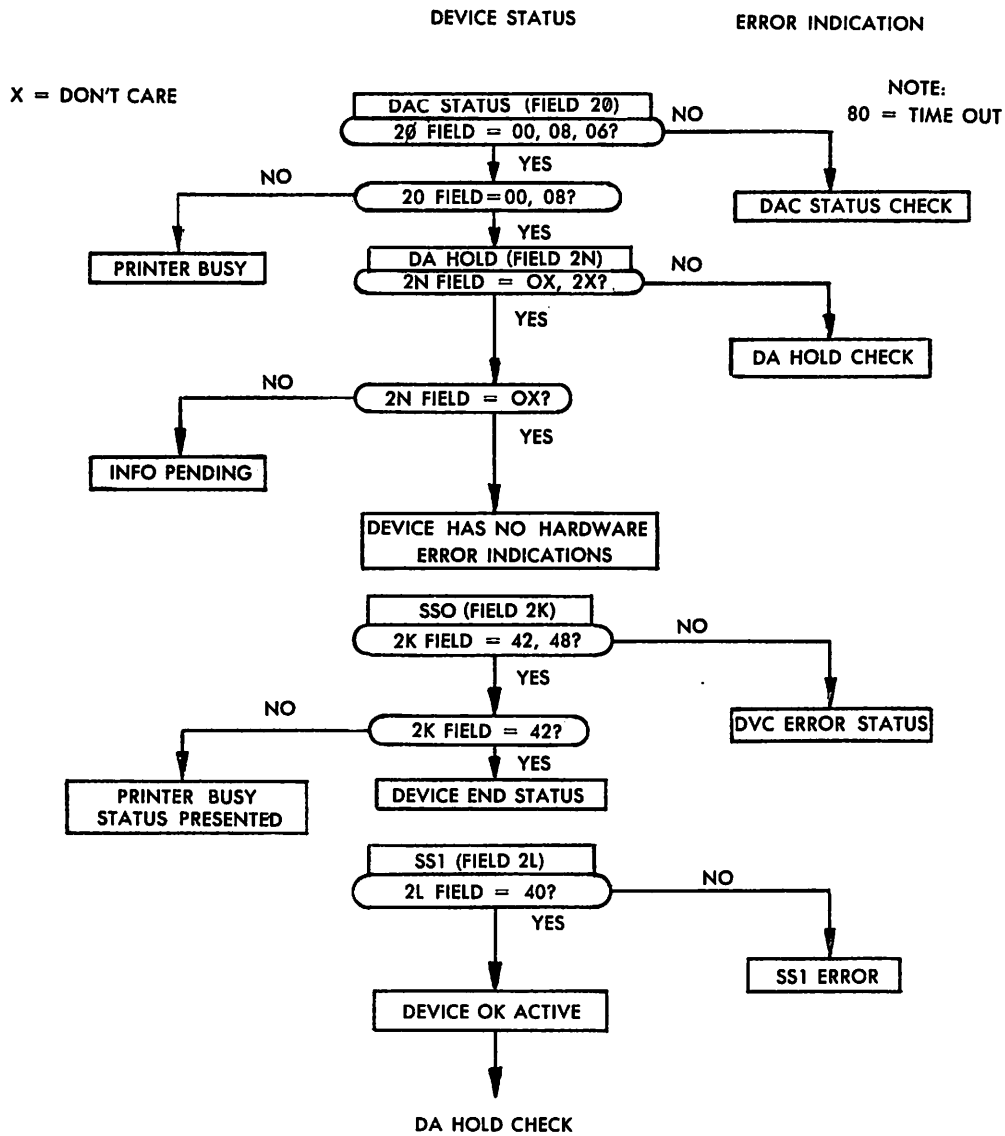

EXTERNAL LOOP TEST
ON ENTRY
OFF-LINE DIAGNOSTICS ARE OK
ON-LINE CAN'T COMMUNICATE
REFERENCE MAPS PROGRAM
CONTROLLER MODEM CLOSED LOOP TEST
CU/MODEM TEST OK?
NO
YES
CHECK REMOTE SITE
REMOTE SITE OK?
YES
TELEPHONE LINE ASSIST
CHECK CABLE CONNECTS
AT MODEM
CHECK MODEM OPTIONS
GET ANOTHER MODEM

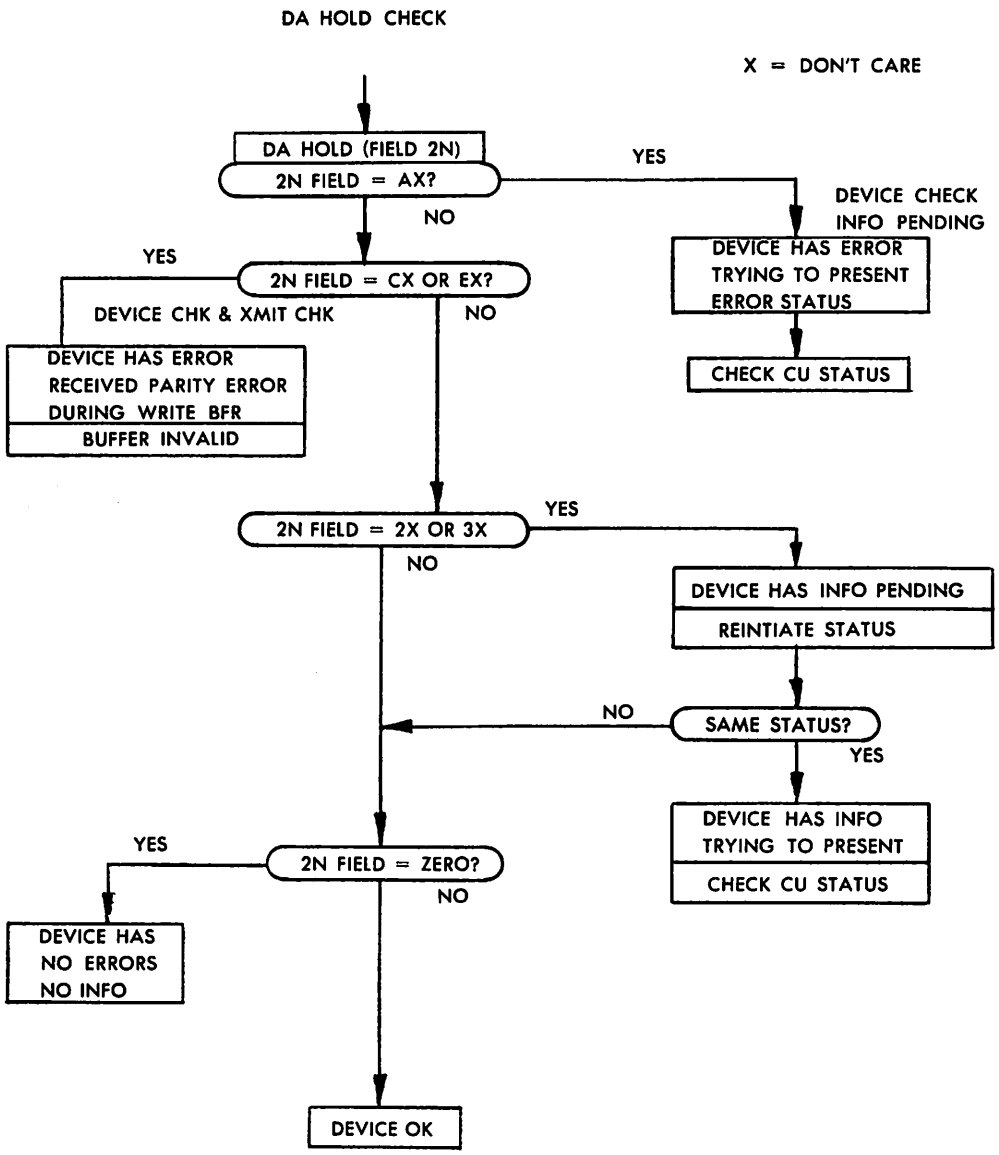
FIFO TEST


ON ENTRY
OFF LINE DIAGNOSTICS ARE OK/BASIC RCV OK
ASSUMED CONTROLLER/DVC ADDRESS PROBLEM
OR
LINE QUALITY PROBLEM
CHANGE CONFIGURATION OF REMOTE INTERFACE
ENABLE FIFO DISPLAY (MAPS)
REQUEST SYSTEM POLL ONLY CONTROL
UNIT IN QUESTION ONLY (OR SELECT)
GET LOCAL STATUS DISPLAY
REFERENCE SIGNAL SEQUENCE/DISPLAY CHART
(appendix 5)
IDENTIFY SIGNAL SEQUENCE
COMPARE TO DISPLAY CHART?
YES
NO
CONTROLLER PROBLEM
IS PATTERN REPETITIOUS?
NO
YES
FLAKY RECEIVE
PROBLEM
IDENTIFY INCONSISTENCY

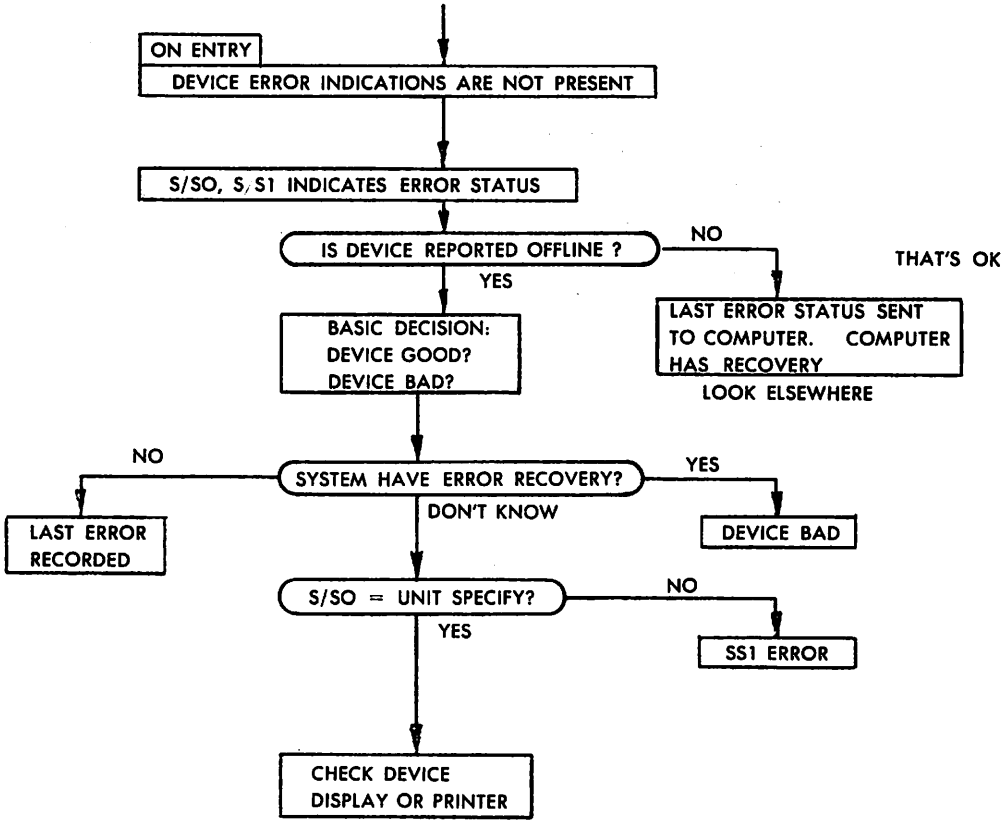
CU STATUS


CTS WAIT ON?
YES
NO
CLEAR TO SEND PROBLEM
YES
EXT LOOP TEST OK?
NO
CHECK REQUEST TO SEND
CLEAR TO SEND
CONFIGURATIONS
REPAIR
RETURN TO
ON-LINE
CONTROLLER HARDWARE
PROBLEM
REPLACE ASSEMBLIES
REINITIATE
TEST

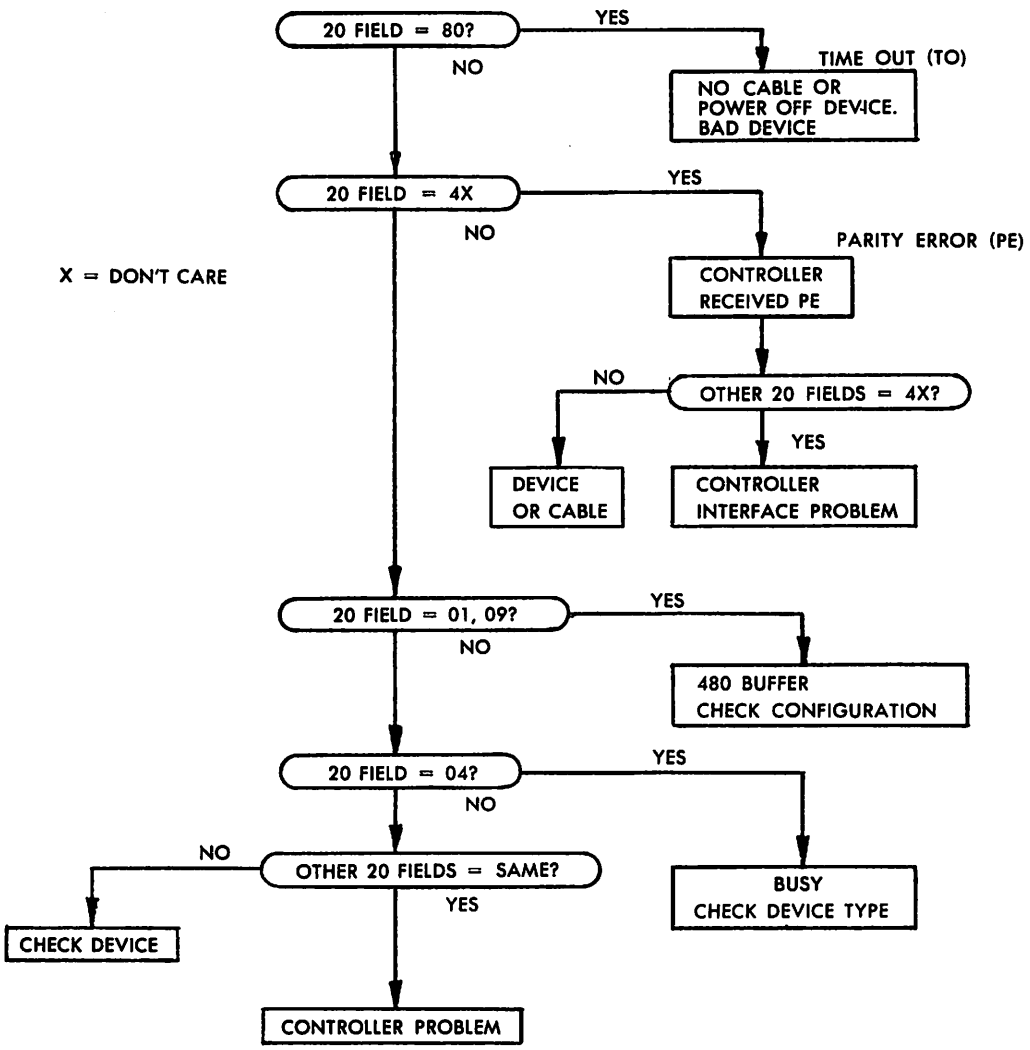

DEVICE STATUS
ERROR INDICATION
X = DON'T CARE
NOTE:
80 = TIME OUT
DAC STATUS (FIELD 20)
2Ø FIELD = 00, 08, 06?
NO
YES
DAC STATUS CHECK
NO
20 FIELD=00, 08?
YES
PRINTER BUSY
DA HOLD (FIELD 2N)
2N FIELD = OX, 2X?
NO
YES
DA HOLD CHECK
NO
2N FIELD = OX?
YES
INFO PENDING
DEVICE HAS NO HARDWARE ERROR INDICATIONS
SSO (FIELD 2K)
2K FIELD = 42, 48?
NO
YES
DVC ERROR STATUS
NO
2K FIELD = 42?
YES
PRINTER BUSY STATUS PRESENTED
DEVICE END STATUS
SS1 (FIELD 2L)
2L FIELD = 40?
NO
YES
SS1 ERROR
DEVICE OK ACTIVE
DA HOLD CHECK


DA HOLD CHECK
X = DON'T CARE
DA HOLD (FIELD 2N)
2N FIELD = AX?
YES
NO
DEVICE CHECK
INFO PENDING
DEVICE HAS ERROR
TRYING TO PRESENT
ERROR STATUS
CHECK CU STATUS
YES
2N FIELD = CX OR EX?
DEVICE CHK & XMIT CHK
NO
DEVICE HAS ERROR
RECEIVED PARITY ERROR
DURING WRITE BFR
BUFFER INVALID
2N FIELD = 2X OR 3X
YES
NO
DEVICE HAS INFO PENDING
REINTIATE STATUS
NO
SAME STATUS?
YES
DEVICE HAS INFO
TRYING TO PRESENT
CHECK CU STATUS
YES
2N FIELD = ZERO?
NO
DEVICE HAS
NO ERRORS
NO INFO
DEVICE OK

DEVICE ERROR STATUS



DAC STATUS CHECK



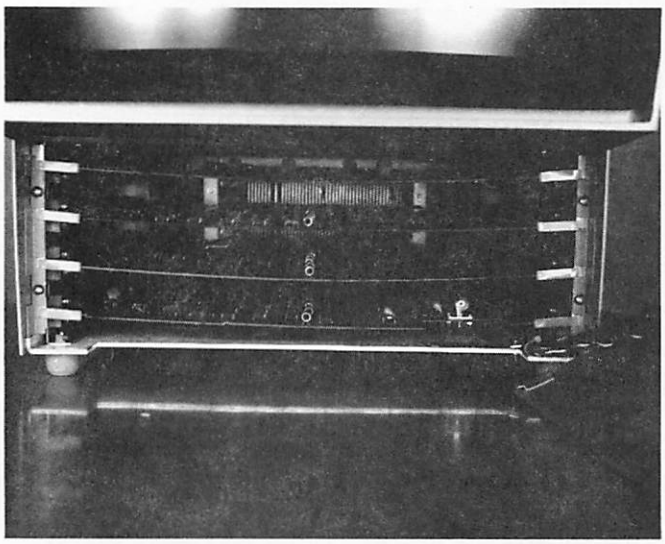
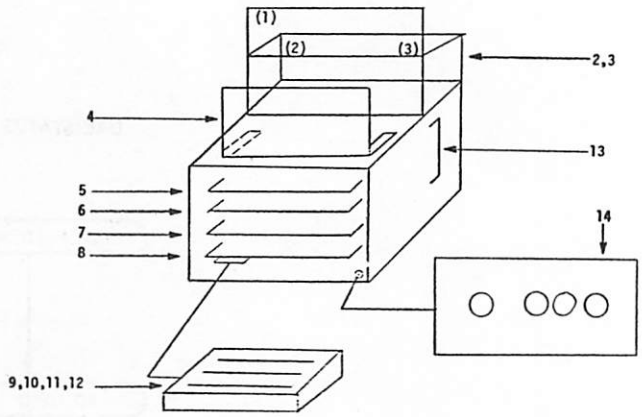


Photo - Display Station Boards

System View PLUS 70 - Sub Assembly Location



PLUS 70 DISPLAY STATION - SYSTEM VIEW

The Trivex display station with front cover removed is shown in the accompanying photo.

The physical arrangement of the display station is shown in the Sub Assembly Location diagram. The numbers, keyed to the list which follows, show the location of the various components, including those not visible in the photo.

ITEM	DESCRIPTION
1	Top Assembly - Reference A.C. Power Distribution
2	+5vdc Power Supply, Adtech Module Ass'y
3	±12vdc Power Supply, Adtech 120063-100
4	CRT Display, Motorola
5	RAM PC Board Assembly
6	Processor PC Board Assembly
7	Display PC Board Assembly
8	Coax I/0 PC Board Assembly
9	Keyboard Assembly, Typewriter 66 Key
10	Keyboard Assembly, Data Entry 66 Key
11	Keyboard Assembly, Typewriter 78 Key
12	Keyboard Assembly, Operator Console 78 Key
13	Motherboard Assembly
14	Control Panel

DISPLAY STATION TEST SPECIFICATIONS

The total display station is subjected to extensive environmental testing prior to shipment. Integrated circuits are tested at outside laboratories and subjected to procedures to minimize infant mortalities. The use of automatic testing equipment further reduces the possibility of shipment of defective equipment.

UNPACKING PROCEDURES

1. Verify that shipping damage has not occurred. If there is damage to the shipping container, do not unpack the display station. Trivex customer service personnel should be contacted.

2. One person is capable of unpacking the display station following the listed procedures.

3. Using a knife, cut open the top and sides of the container.

   CAUTION: The insertion should not exceed two (2) inches.

4. Remove the detachable keyboard assembly from the top of the shipping package.

5. Fold down the shipping material to expose the terminal.

NOTE:

Terminal weight	-	67 pounds
Keyboard weight	-	6 pounds
Packing weight	-	11 pounds
Total weight	-	84 pounds

6. Remove the display station from the packing.

INSTALLATION CONNECTIONS

It is recommended that installation connections be done in a two-part sequence:

1. Connections for off-line configuration.
2. Connections for on-line configuration - addition of the single coax interface.

The front control panel (item 14 on page 42) is detachably hinged at the bottom front of the display station. There is a finger hole access at the top of the control panel to allow pulling the control panel down and forward.

The cable connection to the control panel is configured to allow the control panel to be placed to the right of the display station. This allows access to the PC board connections. (reference photo on page 42)

KEYBOARD CONNECTION

The keyboard cable is rigidly connected to the external keyboard. The other end of he keyboard cable is connected to the bottom of the display station chassis.

The keyboard connector must be installed with the display station power ON/OFF switch in the OFF position. It is preferable to route the cable underneath the display station.

NOTE: During off-line configuration test the control panel may be placed to the right of the display station to allow access to the configuration switches.

A.C. POWER CONNECTION

All display stations may operate at 115, 208, or 230 volts A.C., 50 or 60 HZ (to customer specifications), 2 amp maximum. All use a standard three-prong male connector with a third-wire protective ground.

CAUTION: This ground connection should not be altered under any circumstances or severe equipment damage may occur.

POWER ON

1. Turn power on.
2. The unit requires a few minutes warm up to allow the CRT to stabilize.
3. Turn the brightness control clockwise until the background raster is visible, then turn counter-clockwise until the raster disappears.
4. Turn the contrast control for optimum viewing.

NOTE: There is interaction among the controls. Thus it may be necessary to adjust contrast control clockwise while setting the brightness control.

NORMAL POWER-ON CONDITIONS

The three visual indications of a normal power-on sequence are:

1. Cursor at the home position.
2. Indicators OFF.
3. Screen blank or filled with dots.

The third indication depends on the setting of the dot function switch, located on the display PC board (item 7 in diagram on page 42, left hand side.

NOTE: The cursor may be blinking or non-blinking, depending on the setting of the blink function switch. This switch is located on the right-hand side of the display PC board (item 7 in diagram on page 42).

CRT DISPLAY (33021-011)

The CRT display is a removable sub-assembly whose specifications are as follows.

Power requirements: 115, 230 volt A. C., 50 or 60 HZ, provided from the A. C. power terminal block located at the upper left behind the tube (position 1 in diagram on page 42).

CAUTION: This block has full line power present whenever the display is plugged into supply.

Input line fuse: two 0.5 amp slow-blow fuses located at the upper right corner of the CRT assembly near the power supply.

NOTE: Each fuse has line power present with the display plugged in.

Internal voltages: +30 volts D.C. and +73 volts D.C. R-74 is the common adjustment.

Internal adjustments:

Focus R-17
Master brightness R-96
Step scan adjustment R-92 (vertical step)
Vertical drive R-65
Vertical linearity R-59.
Horizontal set L-1
Horizontal frequency T-1

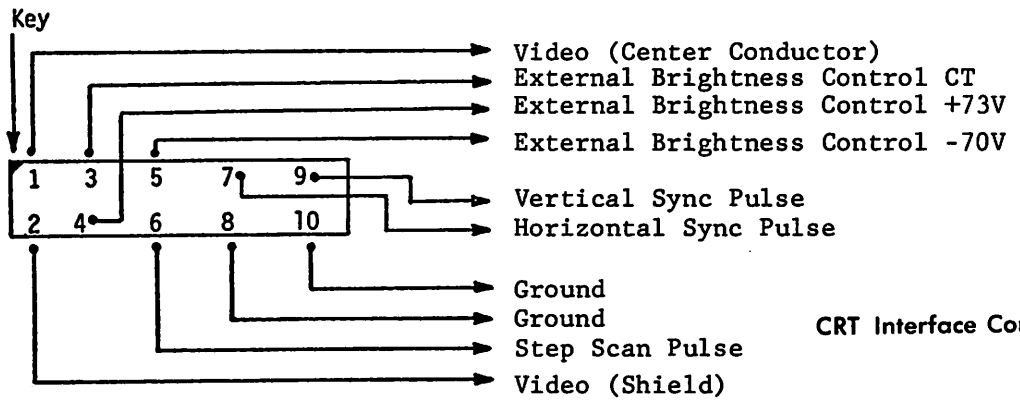
External adjustments:

Brightness
Contrast

NOTE: Internal adjustments are set at the factory and should not require frequent adjustment. Remove the power cord from the A. C. outlet any time the cover is to be removed from the display. Dangerous voltages are always present with the power cord plugged in.

INTERFACE SPECIFICATIONS

The following connector diagram references the CRT interface connector:



CRT Interface Connector

SIGNAL DESCRIPTION

1. Horizontal Sync Pulse: Level - TTL 0V, +4V Pulse repetition period - 54 microseconds Duty cycle - 4.5 microseconds at +4V Duty cycle - 49.5 microseconds at 0V
2. Step Scan Pulse: The step scan pulse is used to accelerate the vertical sweep rate between rows of characters, by efectively varying the distance between rows. Level - TTL 0V, +4V
   Pulse repetition period - 640 microsenconds Duty cycle - 160 microseconds at ±4V Duty cycle - 480 microseconds at 0V
3. Vertical Sync Pulse: Level - TTL OV, +4V Frequency - 60 HZ or 16.66 milliseconds Duty cycle - 160 microseconds at +4V Duty cycle - 16.5 milliseconds at 0V
4. Video: The video level is variable and is dependant on the external contrast control setting. Frequency - 19.8432 Megahertz

VIDEO COMPONENTS

Display information is divided into three separate components for presentation on the CRT.

1. Cursor - underscore type cursor.
2. Displayable data.
   a. 80 characters in the horizontal plane.
   b. 24 rows in the vertical plane.
   c. A full screen of 1920 characters.
   d. A seven by nine character font.
   e A display of the data in the display station buffer. memory (EBCDIC).
3. Indicator video.
   a. Eight indicators maximum.
   b. The indicators are positioned in character position 84 in rows 3, 5, 7, 9, 11, 13, 15, and 17.
   c. The indicators are under control of the processor PC board, and are set or reset under program control.

Following are the actions of the three components:

CURSOR

The cursor movement is dependent upon the data in the buffer memory. If the data has not been assigned a field definition, the cursor advances one position for each displayable keyboard entry.

If the fields have been defined the cursor reacts in the following manner:

1. Cursor motion keys will allow the cursor to enter any field, regardless of its definition. Depressing any alphameric key may result in input inhibit if the field has been defined and an entry error occurs.

   EXAMPLE: In a protected field any entry key will cause input inhibit. The protected fields cannot be determined visually.

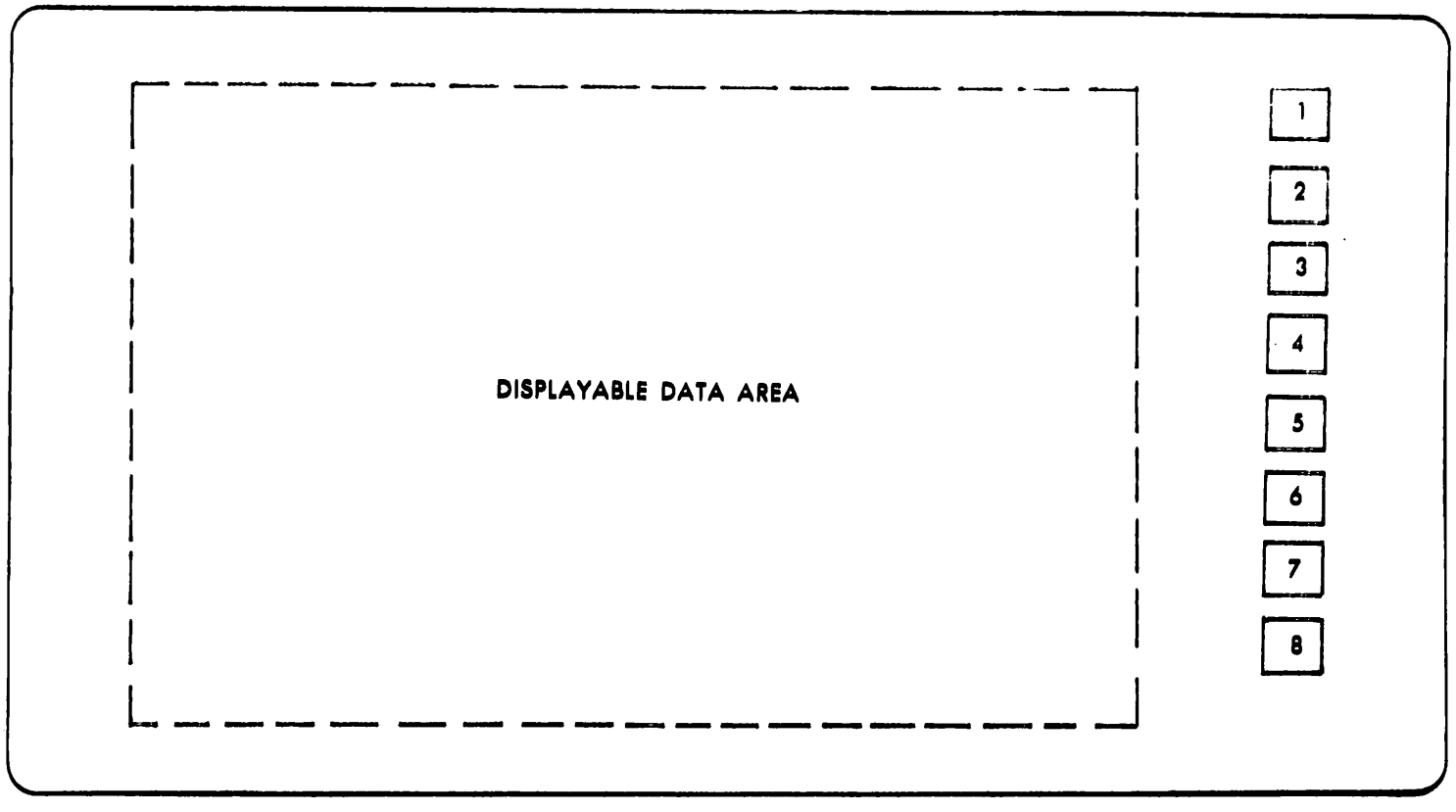
2. Tab, back tab, and NL keys will cause the cursor to skip a protected field.

DISPLAYABLE DATA

Data may be displayed in the following ways:

1. Normal intensity.
2. Increased intensity.
3. Non-displayed (displayed as blanks).

INDICATORS (as shown in the screen diagram following)



SCREEN INDICATORS:

1. OK Indicator
2. Information pending
3. Spurious ACK's
4. System Available
5. Insert Mode
6. Input Inhibit
7 Device Check
8. Transmit Check

Indicators 1, 2, 3, 7 and 8 are visible only with the test switch, located on the Coax I/O board, in the ON position.

OK Indicator is set and reset by the display processor in the idle loop. The indicator will blink at a fixed rate to show correct operation of processor idling. I/O lock will cause this indicator to remain off or on I/O lock is the result of a READ/POLL command which, normally, precedes a WRITE or READ command and is terminated by a POLL ONLY command.

Information Pending is set by any program attention (PF or PA Keys), and is also set at the same time as DEVICE CHECK. presence of the information pending bit causes a computer interrupt in local operation and a response in remote operation. The indicator is reset by response signals from the controller. either an acknowledge (ACK), or a KEYBOARD UNLOCK. The KEYBOARD UNLOCK does not reset the indicator if DEVICE CHECK is present.

Spurious ACK's may indicate that the display station is posting INFORMATION PENDING and the controller is responding with an ACK. These may occur only with the TEST/NORMAL switch in the TEST position.

System Available shows the controller completed a successful communication with the computer. It is set from the controller and reset by information pending.

NOTE: Clear, PA-1, PA-2, and PA-3 are all categorized as PA keys. SYSTEM AVAILABLE is reset when INFORMATION PENDING turns on. These two indicators should never be on simultaneously.

Insert Mode is set by pressing the INSERT key.

Input Inhibit shows that manual input is inhibited from the keyboard. This indicator has two functions:

1. Normal is caused by use of a PF or PA key type, a system-initiated I/O operation, or operation of any alphameric, DUP, FIELD MARK, ERASE EOF, or DELETE key with the cursor in a protected field.
2. Abnormal indicates a parity error in the display buffer or a cursor check function in the display.

The Input Inhibit indicator may be cleared in the following ways:

1. By pushing the RESET key, unless an I/O operation is in progress, or DEVICE CHECK is set.
2. By pushing the CLEAR key if DEVICE CHECK is set, attempting to clear the buffer and establish new parity. This also overrides INPUT INHIBIT which has established KEYBOARD LOCK.
3. By a system command unless DEVICE CHECK is set. The command may be either a WRITE control character with the KEYBOARD RESTORE bit set, or ERASE ALL UNPROTECTED.

Device Check is set by a display-originated error, such as buffer parity, cursor check, or incoming data parity. DEVICE CHECK may be cleared by:

1. Pressing the CLEAR key.
2. By a system ERASE/WRITE command.

Transmit Check is set by a parity error in incoming commands or data. Data parity error also sets DEVICE CHECK. The TRANSMIT CHECK indicator is reset by the END bit from the controller, or a successfully-executed WRITE.

NOTE: Do not vary on line if you get a permanent TRANSMIT CHECK when attaching the coaxial cable.

OFF-LINE DISPLAY STATION VERIFICATION (Display unattached to Controller)

Reference material: Page 47 Video presentation Indicator description

Reference material: Page 47 Command/Indicator reference chart

Off-line display station verification requires the use of the video presentation. Indicators are a component of the video presentation, and are used to indicate the display station status, both on and off line.

The Command/Indicator reference chart, (page 47) distinguishes between on-line and off-line indicator status. The on-line only shows the I/O commands controlling the indicators. These commands are strictly related to "controller to device" communications.

The off-line tests are controlled by the keyboard input and the self-test program. The off-line tests assume that

a normal power-on sequence has occurred, a normal power-on sequence being:

1. Cursor home.
2. Screen clear.
3. Indicators off.

The normal power-on sequence indicates that initial display station operation is satisfactory. The off-line tests extend these functions to include keyboard interface and function, buffer memory and display functions, and prerequisites for on-line testing.

The user configurations (optional features) are selected on the coax I/O PC board. IC location L-5 contains a slider switch with eight selectable options which are detailed in the section on configuration, preceding (see page 17). The options should be selected prior to the off-line diagnostic test to allow feature testing before going on line.

Options: Reference page 17 for detailed description of options.

NOTE: Slider switch is at location L-18 on wire-wrapped coax I/O PC boards, and at location L-5 on printed circuit boards.

Always check that each switch is in the fully engaged position, a half-engaged switch can cause intermittent problems.

OFF LINE TEST SEQUENCE

Place the TEST/NORMAL switch to TEST position.

1. The DEVICE CHECK indicator should be off. If it is on, it shows a hardware-detected error.
2. The OK indicator should flash at a five cycle-per-second rate, showing that the display processor is executing normal idling sequence.
3. The following indicators which are set by action of the coaxial I/O board should be off:
   a. TRANSMIT CHECK.
   b. SYSTEM AVAILABLE.
   c. SPURIOUS ACK's.
4. The following indicators which are set by keyboard action should be off:

Off/On Line		On/Line Only		Off/On Line		SYSTEM STATUS VISUAL INDICATORS
Keyboard Input		Controller I/0		Self Test Program		
Set	Reset	Set	Reset	Set	Reset	
				Idle Entry	Idle Exit	Ok Indicator
Any PF Key	Reset Key (2		I/O CMD ACK Unlock	Device Ck		Info Pending
	Any PF Key	I/O CMD ACK			Device Ck	Spurious ACK's
	Any PF Key	I/O CMD Sys. Rdy.			Device Ck	System Available
Insert Key	Reset Key					Insert Mode
Any PF Key	Reset Key	I/O CMD RD & Poll	I/O	Device CR	Clear Key	Input Inhibit
	Clear Key		I/O CMD WRT, Erase	MPE Curs. Ck		Device Check
		I/O Parity Err.	End			Xmit Check

1. If no device check present.
2. Unlock KBD clear info pending only if no I/0 parity error.
   Reset clears device input inhibit if no device check-clear key clears buffer and reestablishes device check.

I/0 Command Words (I 0 CMD)

Word 1	Busy	1	0	Poll RD		WRT	Sys Rdy	Unlk Kbd	Erase UnPro	End	ACK	P	O
Bit	1	2	3	4	5	6	7	8	9	10	11	12	13
Word 2	Busy	1	1	Poll Spare		Format		Strt Prnt	Sound Alarm	End	Spare	P	O

Bit 2 = 1 Identifies Control Word 0 0 = Variable Line Length up to 132 char/line
Bit 3 = 0 Identifies Control Word 1 0 1 = 40 char/line format
Bit 3 = 1 Identifies Control Word 2 1 1 = 80 char/line format

System Status Visual Indicators

a. INFO PENDING.
b. INPUT INHIBIT.

5. The INSERT MODE indicator should be off.

TESTING KEYBOARD TO PROCESSOR COMMUNICATION (Display may still be unattached to controller.)

1. Push the INS MODE key. The INSERT MODE indicator should light.
2. Push the RESET key. The INSERT MODE indicator should turn off.
3. Push the CLEAR key. The INPUT INHIBIT and INFORMATION PENDING indicator should light.
4. Push the RESET key. The INPUT INHIBIT and INFORMATION PENDING indicators should turn off.
5. Type various keyboard characters and verify that the character displayed is the same as the one typed.
6. Press the PA-1 key. The INPUT INHIBIT indicator should light. Type various characters and verify that there is no change in the data displayed.
7. Push the RESET key. Verify that INPUT INHIBIT turns off, and data may again be entered correctly.
8. Push the TEST REQ key and reference the table following. The display screen contents should match the table.

TEST REQUEST DEFINITION

To test the numeric lock feature, move the cursor to a field with an N in its definition (numeric field), and not a protected field.

NOTE: Line 4 is numeric, non-protected.

Depress an alpha key and verify the result. With feature enabled, the Input Inhibit indicator should turn on. With feature disabled, the Input Inhibit indicator should be off and the character loaded.

NOTE: The alarm should sound with the Input Inhibit if the keyboard error alarm feature is enabled. Depress the RESET key to turn off the Input Inhibit indicator.

PROTECTED FIELDS

1. Depress the CLEAR key, and then the RESET key.
2. Depress the TEST REQ key.
3. Depress the TAB key.
4. Verify that the cursor does not enter a protected field as listed in the table.

TAB TO COLON

1. Depress the CLEAR key and then the RESET key.
2. Enter colons on different lines of the display.
3. Depress the TAB key (→|). The cursor should move forward and stop one character after the next colon.
4. Depress the BACK TAB key (|←). The cursor should tab backward and stop one character before the next colon.

Having passed these simple tests, the display station may be presumed to be operable, and may be cabled preceeding colon.

PLUS 70 PRINT STATION - SYSTEM VIEW

GENERAL

Trivex PLUS 70 print stations are interchangeable with IBM Models 3284 and 3286. However, there is not a direct correspondence in printer speeds. Trivex printers operate at higher speeds.

Trivex	IBM
0842 80 CPS	3284 40 CPS
0846 165 CPS	3286 66 CPS

Trivex print stations are made from two basic equipment types. They are the printer and the printer controller.

Combined station:	Model 0842 80 CPS
	Model 0862 165 CPS
Separated station:	Model 0844 80 CPS
	Model 0864 165 CPS
*Printer controller:	Model 0845 Domestic
	Model 0845E Foreign

*A reduced size controller that can be located under tables, for installation convenience.

PHYSICAL DESCRIPTION

Models 0842/0862

Dimensions: 28 1/2" wide x 42" high x 19" deep.

Power requirements: 115VAC, 230 VAC, 50/60 HZ.
0842 425 watts.
0862 450 watts.

Weight: 160 pounds.

FORMAT = Graphic, Intensify, Selector Pen Detachable, Numeric
Symbol, I, SPD, N

	Null (Period)	A	B	C	D, SPD	E,SPD
	F, SPD	G, SPD	H,I, SPD	I,I, SPD	¢,I, SPD	
	Null, I, SPD					
Numeric	&,N	J,N	K,N	L,N	M,SPD,N	N,SPD
	N	O,SPD,N	P,SPD,N	Q,I,SPD,N	R,I,SPD,N	!,I,SPD,N
	$,I,SPD,N					
PROTECTED	-	/	S	T	U,SPD	V,SPD
	W,SPD	X,SPD	Y,I,SPD	Z,I,SPD	¦,I,SPD	
	,,I,SPD					
Numeric	0,N	1,N	2,N	3,N	4,SPD,N	5,SPD
	N	6,SPD,N	7,SPD,N	8,I,SPD,N	9,I,SPD,N	:,I,SPD,N
	#,I,SPD,N					
		A	B	C	D,SPD	E,SPD
	F,SPD	G,SPD	H,I,SPD	I,I,SPD	¢,I,SPD	
	Null,I,SPD					
Numeric	&,N	J,N	K,N	L,N	M,SPD,N	N,SPD
	N	O,SPD,N	P,SPD,N	Q,I,SPD,N	R,I,SPD,N	!,I,SPD,N
	$,I,SPD,N					
PROTECTED	-	/	S	T	U,SPD	V,SPD
	W,SPD	X,SPD	Y,I,SPD	Z,I,SPD	!,I,APD	
	,,I,SPD					
Numeric	0,N	1,N	2,N	3,N	4,N	5,SPD
	6,SPD,N	7,SPD,N	8,I,SPD,N	9,I,SPD,N	:,I,SPD,N	
	#,I,SPD,N					

Total of 128 15 BYTE Fields
A Field consists of 1 attribute character (ATC) and 14 graphics with the same code
Field starts at 00 Hex and ends with 7F Hex characters

Models 0844/0864

Controller dimensions: 15" wide x 22" high x 20" deep.

Printer dimensions: 28 1/2" wide x 12 1/2" high x 19" deep.

Power requirements: Controller 115, 230 VAC 50/60HZ 250 watts. Printer 300 watts.

Models 0845/0845E

Dimensions: 15" wide x 22" high x 20" deep.

Weight: 95 pounds.

MODULARITY

All construction is modular and is easily maintained by extensive use of electrical connectors. The major modules are listed in the component list in the following section.

UNPACKING PROCEDURES

The weight of model 0842/0862 is such that two people are required to unpack and install the system. The recommended procedure is as follows:

1. Verify that no shipping damage has occurred. If there is evidence of damage, contact the regional Trivex representative or factory prior to unpacking.
2. Cut the steel bands that are wrapped around the container.
3. Lift the top of the box straight up to gain access to the printer.
4. Lift the printer from its bottom packing.

NOTE: Unpacking should be performed near the installation site, unless portable carriers are available. The packing material should be retained for possible further shipment of the printer.

5. The print head is secured to one side of the carriage assembly. Cut the securing material and verify that the print head moves easily on the carriage assembly.

INSTALLATION

1. Remove the front panel from the printer controller. The front panel is attached by pressure type latches. The removal is performed by pulling on the top sides of the front panel.
2. Visual inspection procedures:
   a. Reseat the printed circuit boards in their motherboard connectors, visually checking that no damage has occurred.
   b. Verify that the power supply assembly is intact.
3. The A.C. power cord is routed to the outside by means of an access hole in the bottom of the controller chassis. This access hole should also be used for the coax connection from the controller.

   NOTE: Do not connect the coax connector until the off-line connections and tests have been completed.

POWER ON

There are two power-on switches on a printer station. One switch, a toggle that is located on the controller front panel, applies power to the controller, fan assembly, and printer. The other power-on switch is located on the printer front panel and applies power to the printer.

1. Turn on the power using the front panel toggle switch. Verify that the fan assembly is operating. There are no visual indicators on the controller to indicate controller status.
2. Depress the power-on switch on the printer front panel. The following conditions should be observed:
   a. Print head will initialized to the left hand margin of the carriage assembly.
   b.

Power on:	On
Select:	Off
*Hardware alarm:	Off

*The hardware alarm may light on older model printers. If it does, depress SELECT and verify that the indicator turns off.

If the hardware alarm remains on, there is a problem in the printer. The printer has one control PC board that plugs into two edge connectors. In general, after shipment all edge connector printer circuit boards should be reseated.

POWER SUPPLY

All voltages required by the printer are supplied by the modular power supply located in the rear of the printer. The supply is easily removed for maintenance by removing the two hex mounting screws at the rear of the assembly.

Four voltages are used to operate the electronics and electro-mechanical sections of the printer and should

be checked first for any problem indicating voltage level difficulty. These voltages are:

+5 VDC @	5 AMP	- Logic circuits
+12 VDC @	0.5 AMP	- Speaker driver
−12 VDC @	0.5 AMP	- Memory register character generator
+28 VDC @	10 AMP	- Motor drive, lights, solenoids

5-Volt Supply

CR-13 and CR-14 make up the full wave center tap rectifier. C5 and C6 make up the filter network. The unregulated input is applied to pin 3 of the internal reference LM305. The regulated 5-volt output is present at pin 8 of the LM305. R21 provides the output voltage adjustment.

R17 monitors current for the foldback. The over-voltage protection circuit operates when the voltage increases across R23 and R24, turning on Q8. This turns on the SCR crowbar SCR1.

± 12-Volt Supply

The plus and minus 12-volt supplies are identical in operation. CR1-CR4 and C1 make up the bridge rectifier filter network. R5 is the output voltage adjustment.

28-Volt Supply

The 28-volt supply is made up of full wave rectifier CR17 and CR18. C12 is the filter. This supply is unregulated and the output is fused by F3 located at the rear of the supply.

Input Voltage (± 10%)

The standard printer is factory wired for 115 VAC, 47-63 HZ. The printer may also be wired for 230 VAC by moving the input connections to terminals 2 and 3 on TB-1 as shown on the schematic. F1 and F2 are 2.5A fuses for the primary and are found at the rear of the supply. All four DC supplies receive power from input transformer T-1.

MAIN CONTROL PRINTER BOARD ACCESS

1. Lift the printer cover from the front and push backwards until the cover rests with the printer mechanism completely exposed.
2. In the rear there are two retaining screws that secure the control board to the chassis. Remove these screws, close the cover, and remove the four back panel retaining screws to gain access to the back edge of the control board.

   Reseat the control board by pressing the control board into its edge connectors located at the front.

Repeat the power on/select sequence to determine if the problem persists. If it persists, replace the control board, since it contains 98 percent of the electrical circuitry in the printer.

Removal

1. After lifting the cover, disconnect the two Molex (plastic) type connectors at the rear edge of the control board. In addition, remove the edge connector that connects the printer controller logic to the printer control board.
2. The control board can be removed from the rear by pulling the board directly backwards.

If the hardware alarm continues to light after a new control board is installed, the following electromechanical devices should be tested:

Margin Switches

Physically move the print head off the left margin switch. Depress ERROR RESET; if the alarm clears, the left margin switch is improperly set. The margin switches are reed relays mounted on small phenolic boards, and secured by one screw each. Verify that no physical movement is possible, and that they are parallel to the print carriage.

Left margin settings:

Too far left will cause carriage drive motor to run continuously against the left stop.

Too far right will cause printing in the wrong direction and the hardware alarm to be set.

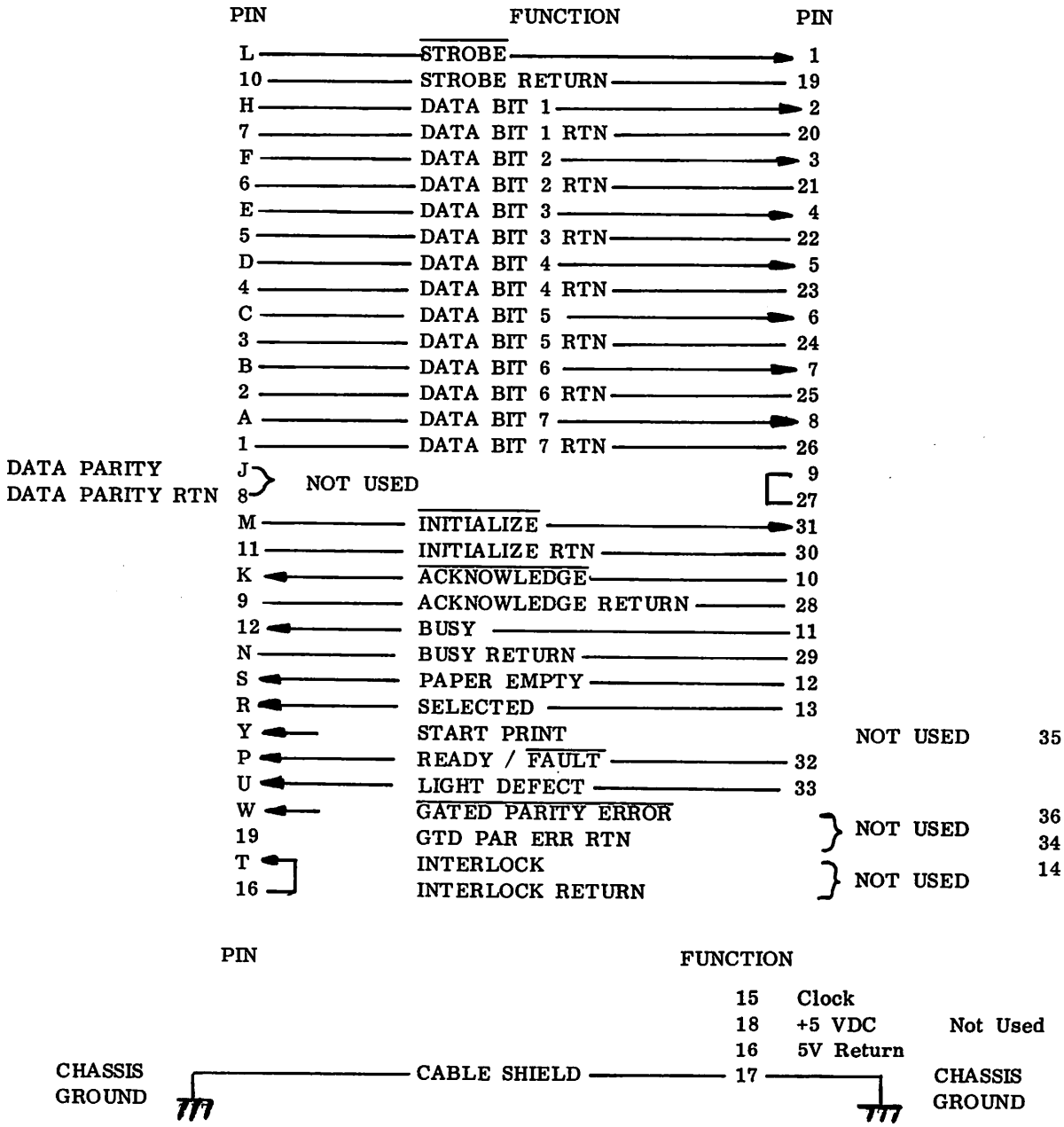
PRINTER CONTROLLER/PRINTER INTERFACE

The interface cable definition follows. It may be necessary to measure signal levels to determine which assembly is at fault when performing off line print tests.

CONTROLLER
44 Pin Card Edge
Connector to Printer I/O Bd. (BX3)

PRINTER
Connector
36 Pin "Blue Ribbon"

Cable P/N 120361



CONTROLLER		
(Source)		Low going signal from controller leading
STD TTL 16 ma	STROBE	edge occurs msec after data change signal width = 1 usec
STD TTL 16 ma Lo - ma Hi	DATA LINES	1 thru 7 and parity from controller signals are High true
STD TTL 16 ma (Load)	INITIALIZE	Low going signal from controller Pulse width = 1 usec Low going signal from Printer
STD TTL +750 Pullup	ACKNOWLEDGE	Pulse Width is 4 usec
8 T 14 + 1K Pullup	BUSY	A high level signal from Printer when performing an operation or if deselected.
8 T 14 + 1K Pullup	PAPER EMPTY	A high level signal from Printer when it is out of paper.
8 T 14 + 15K Puudown	SELECTED	A high level signal from Printer when it is selected.
STD TTL +4.7K Pullup or controller switch to ground	START PRINT	A low level signal or switch closure to Ground from Printer to Controller to print out buffer when "ON LINE" or controller test routine when "OFF LINE"
8 T 14 + 15K Pulldown	READY / FAULT	A high level signal from Printer I/F to ready to receive data
8 T 14 +1K Pullup	LIGHT DEFECT	A high level signal from Printer indicating that the character print synchronizing circuit is inoperative.
STD TTL +750 Pullup	GATED PARITY ERROR	A low going signal from Printer to Controller indicating that the character being sent has incorrect parity.
8 T 14 +1K Pullup	INTERLOCK	A high level signal from Printer when a hardware alarm condition exists.

OFF-LINE PRINT TESTS

There are two alternate off-line test methods. They are listed below.

1. Printer controller test.
   This test is valid regardless of the manufacturer of the printer.
2. Print station test request.
   This test requires exclusively Trivex manufactured equipment.
   a. Trivex printer.
   b. Trivex printer controller.
   c. Trivex controller (local or remote).

This description will emphasize the first off-line test, since it will cover all maintenance situations. It should be noted, however, that the second test gives the maintenance personnel a greater certainty of total system operation.

Printer Controller Tests

Set the following switches on the printer I/0 card as follows and manually select the printer.

1. ON-LINE/DIAG mode to DIAG mode.
2. Mode switch to mode 2.
3. Thumbwheel switches to 131.
4. Depress CE print switch.

The printer should begin printing an all H pattern at 132 characters per line for 15 lines, immediately following with an alphanumeric pattern beginning with a space character and followed with 127 additional alphanumeric characters, and finally 128 ATC characters (printed as space characters).

A more easily observed alphanumeric test pattern is obtained by setting the thumbwheel switches to 063.

At 131 characters per line there will be a line feed after the character quote ("). On this first line after the H's there will be four spaces at the end of the first line. The second line will end with the character G. The pattern will repeat for 30 lines.

At 063 characters per line there will be a pattern that is repetitious in vertical columns. Each line will begin with a space and end with a quote ("). There will be two lines of printed data followed by two lines of spaces. The pattern will repeat for 30 lines.

Mode 1 Test

Change the mode switch to mode 1. This switch setting will cause the contents of the printer buffer to be printed.

NOTE: On power up the contents of the buffer are cleared. As a result, the printer will merely line feed 24 times. It will appear as a form feed.

CONTROLLER/PRINTER STATUS

At this point in the tests the printer controller and printer are known good devices, exclusive of their interface to the controller.

When attaching to an IBM controller there are no further off line tests that con be performed. Set the ON LINE/DIAG mode switch to the ON LINE position. Turn the power off and back on to initialize the printer buffer. Reference the on line test procedures following.

TRIVEX CONTROLLER/PRINTER CONTROLLER/OTHER PRINTER (Connect coax to coax I/O)

With the printer in the ON LINE mode, and the CE print ENABLE/DISABLE switch on the coax I/O in the ENABLE position, depress the CE print switch on the printer I/O board.

The printer should print the status display information from the Trivex controller. Reference page 22 for detailed information on the status display message.

ON-LINE TEST

The following procedures should be followed prior to putting a printer on line to the system.

1. Configuration check.
   Reference print station coax I/O switch setting (page 19).
2. Printer I/O switch settings.
   ON LINE/DIAG switch to ON LINE mode.
3. Initialize printer.
   Power sequenced to initialize buffer.
4. Selection.
   Depress SELECT switch on the printer.

Indication of On Line

The SYSTEM AVAILABLE indicator located on the front panel of the printer controller indicates on-line status of a printer. This on-line status has different prerequisites depending upon the controller type.

On Line, Remote 0712

SYSTEM AVAILABLE indicates that a device on the controller has successfully communicated with the computer system. All other devices are then set to the system available condition. Any device changing from unavailable (disconnected) to available will cause the controller to submit device end status to the computer system. This device end status alerts the computer to the availability of a new device.

Therefore, if the maintenance personnel know that the device has changed from unavailable to available, and other devices are operational, the device should be on line even though no print operations are directed at the printer.

If the operator has previously performed the status display test (Trivex controller only) and verified that the device interface fields have the device logged as available, it is probable that the device is on line to the computer.

NOTE: An unsolicited WRITE command can prevent device end status from being submitted. Unsolicited WRITES are not recommended in normal system operation.

In the case of attachment to the IBM 3271 the operator does not have the assurance that the device has been recognized as available.

In either case the operator should request that a computer controlled print operation be performed prior to considering the printer to be installed.

On Line, Local 0722

The SYSTEM AVAILABLE indicator lights on a local controller when the computer communicates with the device changing from unavailable to available.

The device status change should cause asynchronous status to be submitted to the computer system. Computer acceptance would constitute a communication with that device and, therefore, cause SYSTEM AVAILABLE. It is important for the installation personnel to have performed all off-line tests prior to installation. In addition, configuration switches should be checked prior to on-line installation.

Appendix 1

LOCAL AND REMOTE COMMAND CODES

COMMAND	LOCAL EBCDIC HEX	REMOTE EBCDIC HEX
Write	01	F1
Erase/Write	05	F5
Read Buffer	02	F2
Read Modified	06	F6
Copy	N/A	F7
Select	0B	N/A
Erase all Unprotected	0F	6F
No Operation	03	N/A
Sense	04	N/A

Appendix 2

TABLE OF HEXADECIMAL DIGITS

DECIMAL	HEXADECIMAL	BINARY
0	O	0000
1	1	0001
2	2	0010
3	3	0011
4	4	0100
5	5	0101
6	6	0110
7	7	0111
8	8	1000
9	9	1001
10	A	1010
11	B	1011
12	C	1100
13	D	1101
14	E	1110
15	F	1111

United States I/O Interface Code - EBCDIC

Bits 4567	Hex 1	00				01				10				11				Bits 0,1
		00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11	← 2,3
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	← Hex 0
0000	0	NUL	DLE			SP	&										0	
0001	1	SOH	SBA					/		a	j			A	J		1	
0010	2	STX	EUA		SYN					b	k	s		B	K	S	2	
0011	3	ETX	IC							c	l	t		C	L	T	3	
0100	4									d	m	u		D	M	U	4	
0101	5	PT	NL							e	n	v		E	N	V	5	
0110	6			ETB						f	o	w		F	O	W	6	
0111	7			ESC	EOT					g	p	x		G	P	X	7	
1000	8									h	q	y		H	Q	Y	8	
1001	9		EM							i	r	z		I	R	Z	9	
1010	A					¢	!	¦	:									
1011	B						$	,	#									
1100	C	FF	DUP		RA	<	*	%	@									
1101	D		SF	ENQ	NAK	(	)	_	'									
1110	E		FM			+	;	>	=									
1111	F		ITB		SUB	¦	¬	?	"									

APPENDIX 4

INTERNATIONAL CODES AND KEYBOARDS OPTIONALLY AVAILABLE

(TO BE SUPPLIED)

APPENDIX 5

"Fifo" Display Description

The "Fifo" display is a visual record of the received data line to the control unit. The characters displayed are an EBCDIC character representation of the eight bit character being received. An example of "Fifo" use could be to assist in determining the cause for a control unit timing out, after all off-line tests have passed and the lines and TCU have been checked.

It is important to realize that there are 256 possible characters that can be received by the control unit. The display station with an upper case character set can only display 65 possible characters. (A null can be distinguished from a space by the use of the dot option). This means that 1 displayable character can possibly represent 4 eight bit characters from the line. (ex: STX, b, B will display as a B) table 1 shows the possible characters that can be displayed, by a display station.

It is necessary to have a basic knowledge of binary synchronous communications (BSC) to understand and use, the contents of the "Fifo". This information is contained in the 3270 component description manual under remote operations - BSC.

Since the "Fifo" is a copy of the receive line, it is being updated on every character that the control unit recognizes. To recognize a character, the control unit must be in sync, by receiving at least two consecutive syn characters, (table 7). The display station that is displaying the "Fifo" is only updated by requesting another display of the "Fifo". This procedure is explained in the status or Fifo display section.

The cursor is used to mark the location of the last entry in the "Fifo", at the time it was last requested. The characters to the left of and including the cursor location are the latest entries in the "Fifo". Each character received is stored to the right of the last character until the end of the "Fifo" is reached. At this time the next character received will be stored at home and the sequence will repeat with the new data taking the place of previous data.

The "Fifo" character entry process makes it difficult to use on intermitent control unit problems, since the "Fifo" cannot be halted when an error occurs, if the line continues to run. For this condition, the only way to save the contents of the "Fifo", would be to switch "off-line" when an error is detected. This is not recommended unless the customer agrees before hand.

The control unit must be SELECTED for a complete sequence to be stored in the "Fifo". As explained before, the control unit must be "in sync" to recognize a character. The control unit must also receive a valid control unit select sequence (Figs. A and B) to stay in sync. If the address is not correct, or is directed to another control unit, as in the case of a multi-point line, the control unit will drop "sync", after the first address character.

A text message (fig. C) will only be stored in the "Fifo", if a valid control unit select sequence preceeds it. Responses to a control unit transmission are given in fig. D. These responses will be displayed in the "Fifo" whether or not they were intended for the control unit. Thus, it is important to make sure a valid "select" was directed to ward the control unit prior to the response, in order not to mistake a response intended for another control unit.

The following flow sequences and tables should be helpful in following the display and determining the codes relating to each character.

POLL SEQUENCE FLOW

Fig. A

TERM	DESCRIPTION	DISPLAYED AS
SYN		2
SYN		2
EOT		7
SYN		2
SYN		2
POLL ADDRESS	CONTROL UNIT POLL ADDRESS*	(SP) to ¬
POLL ADDRESS	CONTROL UNIT POLL ADDRESS*	(SP) to ¬
DEVICE ADDRESS	GENERAL POLL (7F)/DEVICE ADDRESS*	" /(SP) to ¬
DEVICE ADDRESS	GENERAL POLL (7F)/DEVICE ADDRESS*	" /(SP) to ¬
ENQ		—
TRAIL PAD		"

SELECT SEQUENCE FLOW

Fig. B

TERM	DESCRIPTION	DISPLAYED AS
SYN		2
SYN		2
EOT		7
SYN		2
SYN		2
SELECT ADDRESS	CONTROL UNIT SELECTION ADDRESS*	- TO "
SELECT ADDRESS	CONTROL UNIT SELECTION ADDRESS*	- TO "
DEVICE ADDRESS	DEVICE ADDRESS*	(SP) to ¬
DEVICE ADDRESS	DEVICE ADDRESS*	(SP) to ¬
ENQ		—
TRAIL PAD		"

* Table 1 can be used to determine the control unit and device addresses as follows:

A) The left side of table 1 represents the control unit poll addresses as device addresses.

B) The right side of table 1 represents the control unit selection addresses.

FIG. C

TEXT OF COMMAND SEQUENCE FLOW

Initiated by a selection or poll sequence or previous command operation

TERM	DESCRIPTION	DISPLAYED AS
SYN		2
SYN		2
STX		B
ESC		X
CMD	See Table 3 for command codes	
WCC	See Table 5 for definition * 2	
TEXT	*1,2,3	
EXT		C
BCC	See Table 7 for explanation	

*1 Text and WCC are not transmitted for ERASE ALL UNPROTECTED or read commands.

2* For a copy command a CCC (Table 2) will be transmitted instead of a WCC. The text will contain the FROM devices address only.

*3 Table 7 lists the possible orders that can be contained in the text.

FIG. D

Possible responses to a control unit text or status transmission, following a poll sequence or select sequence with a read as the command.

I. Positive acknowledgements:

A) TERM: ACKO

Sequence	Display
SYN	2
SYN	2
ACKO	&
	O

B) TERM: ACK1

Sequence	Display
SYN	2
SYN	2
ACK 1	&
	/

C) TERM: RVI

Sequence	Display
SYN	2
SYN	2
RVI	&
	@

D) TERM TEXT

Sequence
Text or command sequence flow (Fig. C)

II. Negative akcnowledgement:

A) TERM: NAK

Sequence	Display
SYN	2
SYN	2
NAK	'

B) TERM: EOT

Sequence	Display
SYN	2
SYN	2
EOT	7
TRAIL PAD	"

TABLE 1

Assignment of 6 bits
for a WCC, CCC, or ATC

BITS 2-7	GRAPHIC	EBCDIC	BITS 2-7	GRAPHIC	ABCDIC
00 0000	SP	40	10 0000	-	60
00 0000	A	C1	10 0001	/	61
00 0010	B	C2	10 0010	S	E2
00 0011	C	C3	10 0011	T	E3
00 0100	D	C4	10 0100	U	E4
00 0101	E	C5	10 0101	V	E5
00 0110	F	C6	10 0110	W	E6
00 0111	B	C7	10 0111	X	E7
00 1000	H	C8	10 1000	Y	E8
00 1001	I	C9	10 1001	X	E9
00 1010	¢	4A	10 1010	:	6A
00 1011	.	4B	10 1011	,	6B
00 1100	<	4C	10 1100	%	6C
00 1101	(	4D	10 1101	—	6D
00 1110	+	4E	10 1110	>	6E
00 1111	|	4F	10 1111	?	6F
01 0000	&	5O	11 0000	O	F0
01 0001	J	D1	11 0001	1	F1
01 0010	K	D2	11 0010	2	F2
01 0011	L	D3	11 0011	3	F3
01 0100	M	D4	11 0100	4	F4
01 0101	N	D5	11 0101	5	F5
01 0110	O	D6	11 0110	6	F6
01 0111	P	D7	11 0111	7	F7
01 1000	Q	D8	11 1000	8	F8
01 1001	R	D9	11 1001	9	F9
01 1010	!	5A	11 1010	:	7A
01 1011	$	5B	11 1011	#	7B
01 1100	*	5C	11 1100	@	7C
01 1101	)	5D	11 1101	'	7D
01 1110	;	5E	11 1110	=	7E
01 1111		5F	11 1111	"	7F

TABLE 2

CCC - Copy control character bit definition reference Table 1 for bit structure of the graphic character

BIT	DEFINITION
2,3	Defines the print out format: 00 - unformatted print (NL or thumb-wheel switches define lenght) 01 - 40 character print line 10 - 64 character print line 11 - 80 character print line
4	Start printer bit. When a 1 initiates a printout at the "to" device after the buffer transfer
5	Sound alarm bit. When a 1, sounds the alarm on the "to" device after the buffer transfer.
6,7	Defines the type of data to be copied: 01 - only attribute characters are copied 0U - only attribute characters are copied alphameric fields (including nulls) are copied 10 - All attribute chars. and protected alphameric fields (including nulls) are copied. 11 - the entire buffer is copied

TABLE 3

CMD - Command	Codes	
Name	Hex Code	Displayed as
Write	F1	1
Erase/Write	F5	5
Read Buffer	F2	2
Read Modified	F6	6
Erase all unprotected	6F	?

TABLE 4

BUFFER CONTROL ORDERS AS DISPLAYED

ORDER	1st CHAR	2nd CHAR	3rd CHAR	4th CHAR
SF	)	Attribute char See table 6		
SBA	J	1st Address BYTE	2nd address BYTE	
IC	L			
PT	E			
RA	@	1st Address BYTE	2nd address BYTE	CHAR. TO BE REPEATED
EUA	K	1st Address BYTE	2nd address BYTE	

TABLE 5

WCC - Write control character bit definition reference Table 1 for bit structure of the graphic character.

BIT	DEFINITION
2.3	Defines the print format 00 - unformatted print (NL or thumb-wheel switches define line length) 01 - 40 character print line 10 - 64 character print line 11 - 80 character print line
4	Start print bit. When a 1, initiates a print after completion of the write.
5	Sound alarm bit. When a 1, sounds the alarm at the selected device.
6	Keyboard restore bit. When a 1, resets the input inhibited indicator and keyboard lock. Also resets aid BYTE at completion of the I/O command.
7	Reset MDT bits. When a 1, all MDT bits in the selected devices existing buffer data are reset before any data is written or orders are executed.

TABLE 6

ATC - Attribute character bit definition reference table 1 for bit structure of the graphic character

BIT	DEFINITION
2	0 = unprotected 1 = protected
3	0 = alphameric 1 = numeric
4,5	00 = display/not lite pen detectable 01 = display/lite pen detectable 10 = intensified display/lite pen detectable 11 = nondisplay, non print, non detectable
6	must always be a 0
7	MDT: identifies modified fields during a read modified operation 0 = Field has not been modified 1 = Field has been modified. Can also be sent set by the program

TABLE 7

Common Codes that will be encountered,
with the exception of a text message

TERM	HEX CODE	DISPLAYED AS
ACK0	1070	&0
ACK1	1061	&/
DLE	10	&
ENQ	2D	—
EOT	37	7
NAK	3D	'
RVI	107C	&@
SYN	32	2
TRAIL PAD	FF	"

Common Codes that will be encountered in a text message

TERM	HEX CODE	DISPLAYED AS
BCC (2 chars)	*1	*1
CCC	See table 2	
CMD	See table 3	
ESC	27	X
ETX	03	C
EUA *2	12	K
IC *2	13	L
PT *2	05	E
RA *2	11	J
SF *2	1D	)
STX	02	B
WCC	See table 5	

*1 Can be any 2 characters. These are generated by the TCU and follow the ETX in a text message

*2 See table 4 for the sequence these orders will follow.

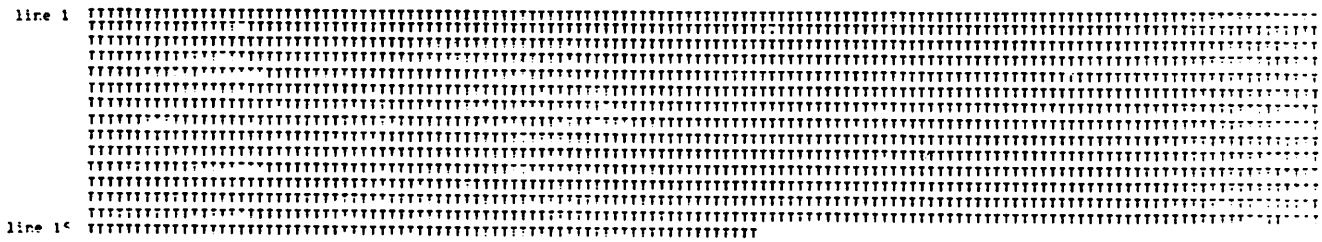
GLOSSARY OF ABBREVIATION

ACK0	—	Even Akcnowledge
ACK1	—	Odd Acknowledge
ATC	—	Attribute Character
BCC	—	Block Check Character
CCC	—	Copy Control Character
CMD	—	Command Code
DLE	—	Data Link Escape
ENQ	—	Enquiry
EOT	—	End of Transmission
ESC	—	Escape
ETX	—	End of Text
EUA	—	Erase Unprotected to Address
IC	—	Insert Cursor
MDT	—	Modified Data Tag
NAK	—	Negative Aknowledge
PT	—	Program Tab
RA	—	Repeat to Address
RVI	—	Reverse Interrupt
SBA	—	Set Buffer Address
SF	—	Start Field
STX	—	Start of Text
SYN	—	Synchronous Idle
TCU	—	Transmission Control Unit
WCC	—	Write Control Character

APPENDIX 6

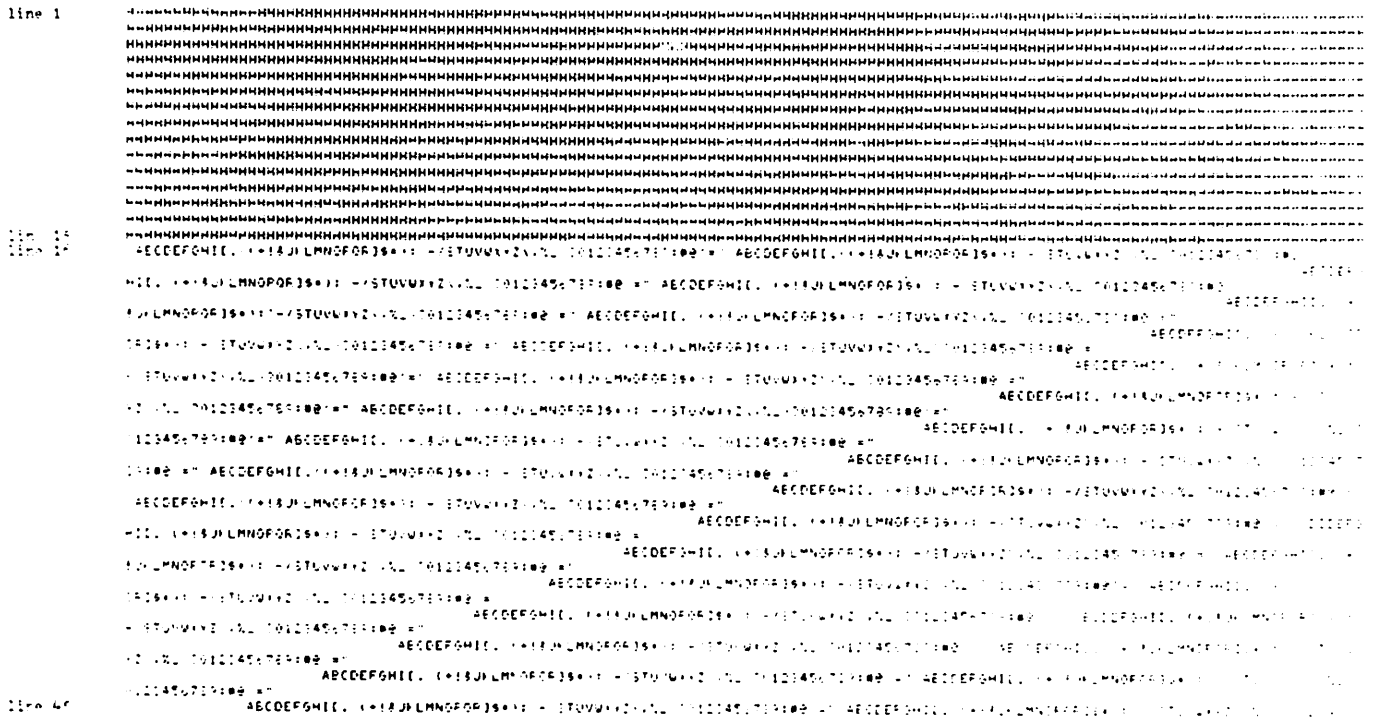
PRINTER OUTPUT EXAMPLES

APPENDIX sheet 6A



REFERENCE -
Unformatted print at 132 char/line - MODE 1

APPENDIX sheet 66



"Formatted print at 132 char/line - MODE 2

```
line 1    HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
          HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
          HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
          HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
          HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
          HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
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          HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
          HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
          HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
          HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
          HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
line 15   HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
line 16    ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="
           ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="


           ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="
           ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="


           ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="
           ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="


           ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="
           ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="


           ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="
           ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="


           ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="
           ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="


           ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="
           ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="


           ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="
line 45    ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="
```

REFERENCE

Formatted print at 64 char/line - MODE 2

```
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH      line 1
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
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HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH      line 15
 ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWX      line 16
YZ\,%_>?0123456789:#@'=" ABCDEFGHI[.<(+!
&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?01234567
89:#@'="


                 ABCDEFGHI[.<(+!&JKLMNOP
QR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="
 ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^-/STUVWX
YZ\,%_>?0123456789:#@'="


                                 ABCDEFG
HI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?
0123456789:#@'=" ABCDEFGHI[.<(+!&JKLMNOP
QR]$*);^-/STUVWXYZ\,%_>?0123456789:#@'="


         ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^
-/STUVWXYZ\,%_>?0123456789:#@'=" ABCDEFG
HI[.<(+!&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?
0123456789:#@'="


                         ABCDEFGHI[.<(+!
&JKLMNOPQR]$*);^-/STUVWXYZ\,%_>?01234567
89:#@'=" ABCDEFGHI[.<(+!&JKLMNOPQR]$*);^
-/STUVWXYZ\,%_>?0123456789:#@'="              line 45
```
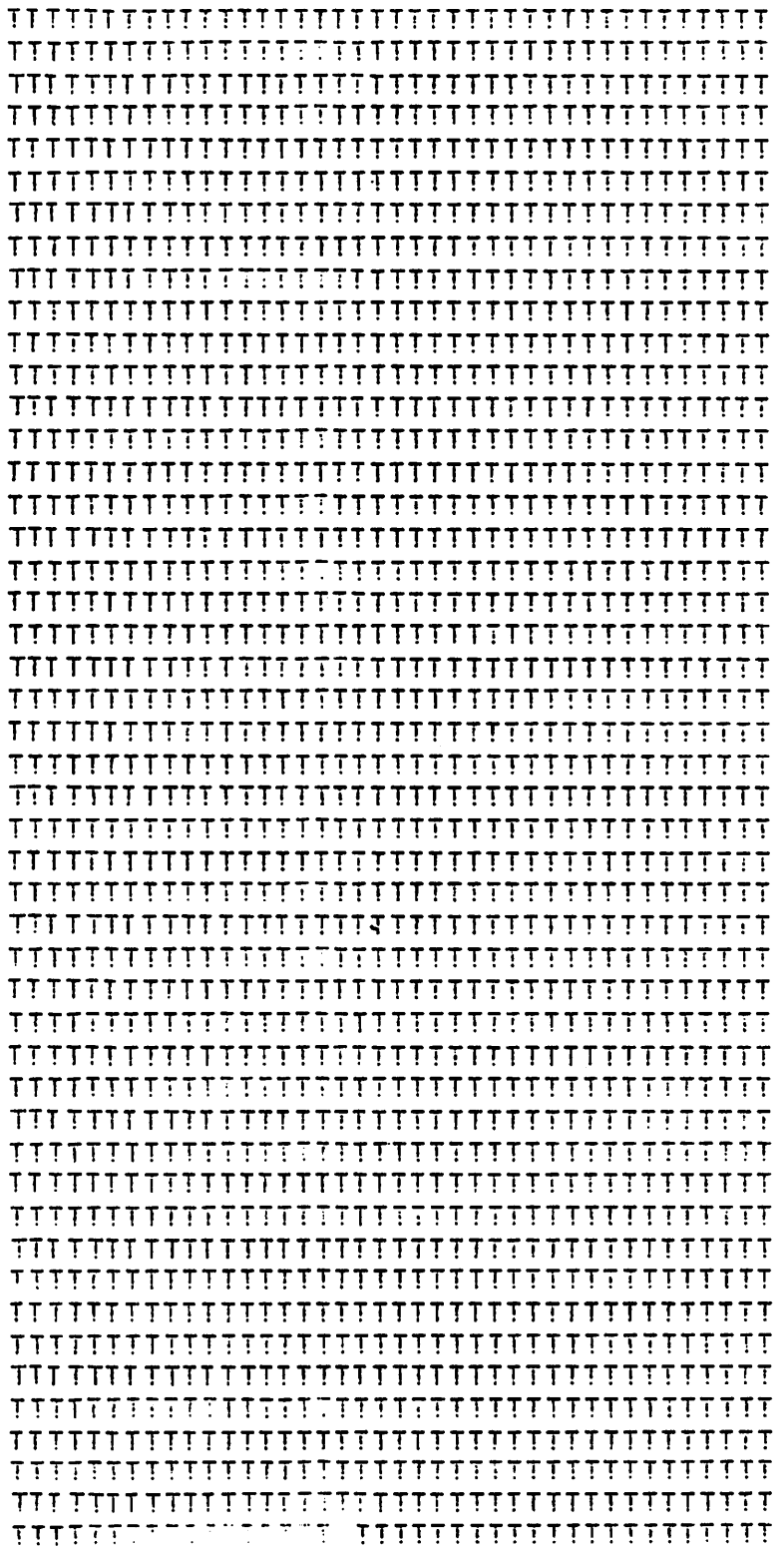

REFERENCE -

Unformatted print at 40 char/line - MODE 2

line 1

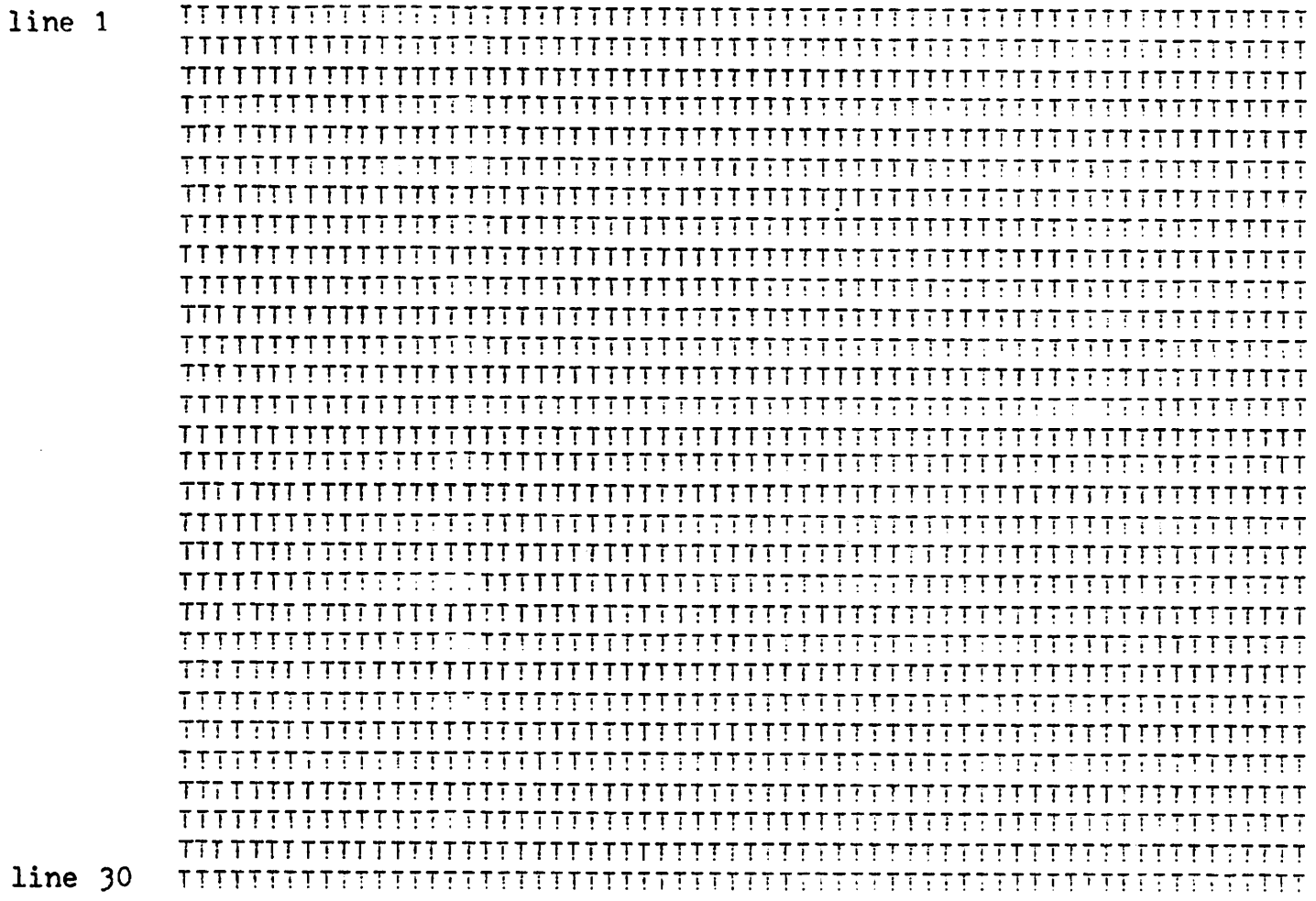


line 48

REFERENCE-

Formatted print at 40 char/line - MODE 1

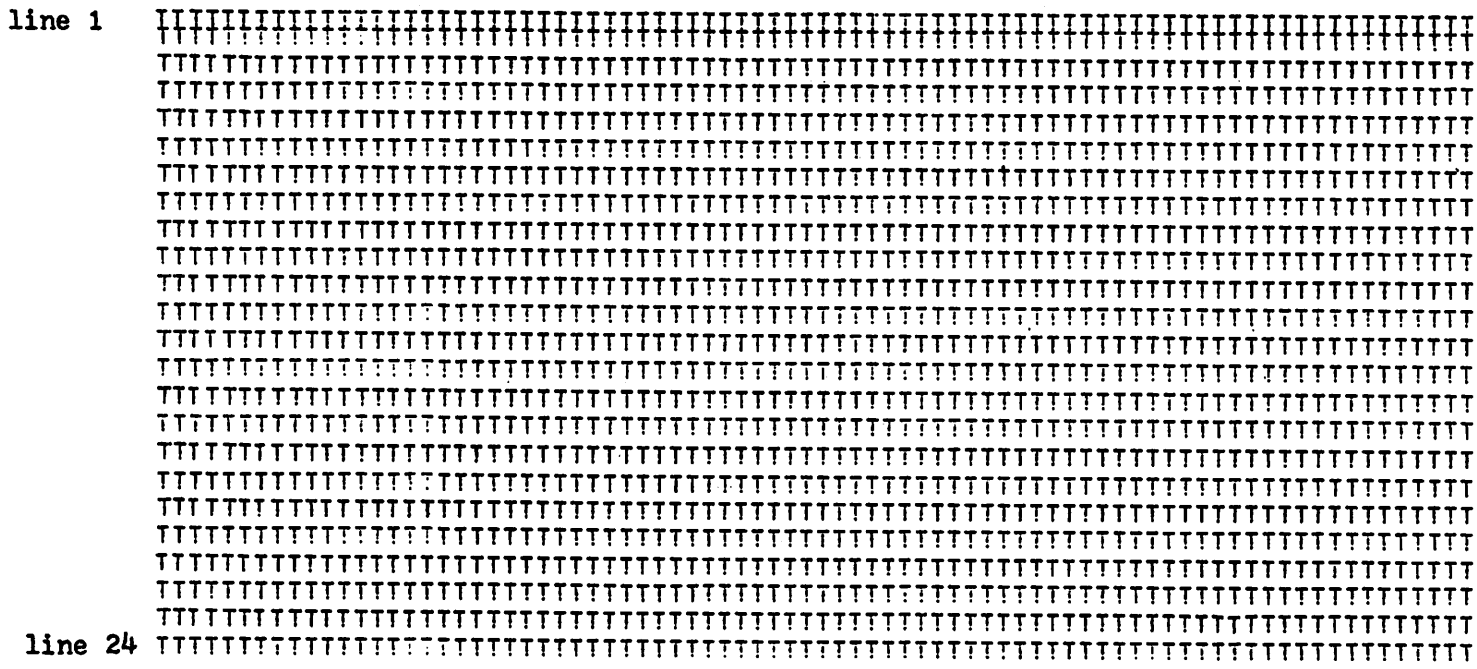
APPENDIX Sheet 6F



REFERENCE-

Formatted print at 64 char/line - MODE 1

APPENDIX Sheet 6G



REFERENCE-

Formatted print at 80 char/line - MODE 1

APPENDIX 7

FIELD REPLACEABLE SPARES LIST

FIELD REPLACEABLE SPARES LIST

MARKET AREA DOMESTIC			REMARKS	QUANTITIES PER MODEL NUMBER				
PRINTED CIRCUIT BOARDS			TRIVEX	0712	0722	0752	0772-1	0842/62
ENTRY	PART NUMBER	DESCRIPTION	IBM	3271	3272	3275	3277	3284/86
1	110739-100	Solenoid Drive Board						1
2								
3	110830-100	Motherboard					1	
4	110830-101	Motherboard						1
5								
6	110856-102	Main Printer Board (80 CPS)						1
7	110856-103	Main Printer Board (165 CPS)						1
8								
9	110960-101	Processor		1	1	1	1	1
10								
11	110966-100	Coax I/O					1	1
12								
13	120071-100	Motherboard		1	1			
14								
15	120076-100	Device Adapter Control		1	1			
16	120079-100	Device Adapter Expander	020	3	3			
17								
18	120083-100	Printer I/O						1
19								
20	120161-100	Remote I/F		1		1		
21								
22	120230-101	Display (110969-100 Old No.)				1	1	
23	120230-102	Display	035			1	1	
24	120230-103	Display	032			1	1	
25	120230-104	Display	032/035			1	1	

REMARKS COLUMN: an entry will be an option designation if the assembly is optional

FIELD REPLACEABLE SPARES LIST

MARKET AREA DOMESTIC PRINTED CIRCUIT BOARDS			REMARKS TRIVEX	QUANTITIES PER MODEL NUMBER				
				0712	0722	0752	0772-1	0342/62
ENTRY	PART NUMBER	DESCRIPTION	IBM	3271	3272	3275	3277	3284/86
26	120309-100	Local I/O			1			
27								
28	120385-101	Ram (110963-101 Old No.)					1	
29	120385-102	Ram (110963-102 Old No.)		1				
30	120385-103	Ram (110963-103 Old No.)						1
31	120585-104	Ram (110963-104 Old No.)						
32	120385-105	Ram (110963-105 Old No.)	035,021				1	
33	120385-106	Ram				1		
34	120385-107	Ram						
35	120385-108	Ram						
36	120385-109	Ram						
37	120385-110	Ram			1			
38								
39	120390-100	Motherboard				1		
40								
41	120422-100	Universal I/F	843/863			1		
42								
43								
44								
45								
46								
47								
48								
49								
50								

REMARKS COLUMN: an entry will be an option designation if the assembly is optional

FIELD REPLACEABLE SPARES LIST

MARKET AREA DOMESTIC OTHER THAN P.C. BOARDS			REMARKS TRIVEX	QUANTITIES PER MODEL NUMBER				
				0712	0722	0752-1	0772	0842/62
ENTRY	PART NUMBER	DESCRIPTION	IBM	3271	3272	3275	3277	3284/86
1	120477-101	Keyboard Assy. 66 T/W				1	1	
2	120478-101	Keyboard Assy. 66 D.E.				1	1	
3	120479-101	Keyboard Assy. 76 O.C.				1	1	
4	120480-101	Keyboard Assy. 78 T/W				1	1	
5								
6	120063-100	Power Supply Assy. 5V&12V				1	1	1
7	120572-100	Power Supply Assy. 5V		1				
8	120373-100	Power Supply Assy. 12V		1				
9	120431-100	Power Supply Assy., 5V&12V			1			
10								
11	120424-100	CRT Monitor				1	1	
12								
13	120252-100 or 33052-022	Light Pen Assy	035			1	1	
14	120379	Light Pen Holder	035			1	1	
15	913284-806	Soft Tip Set Screw 8-32x3/8	035			1	1	
16								
17	120395-100	KeyLock Assy	034			1	1	
18	120396-100	Harness, KeyLock Assy	034			1	1	
19								
20	33040-022	CRT Filter, Green Screen	011			1	1	
21	33040-011	CRT Filter, Gray Screen				1	1	
22								
23	921501	Fan						1
24	921505	Fan		2	2	1	1	1
25								

REMARKS COLUMN: an entry will be an option designation if the assembly is optional

SH 3 of 4

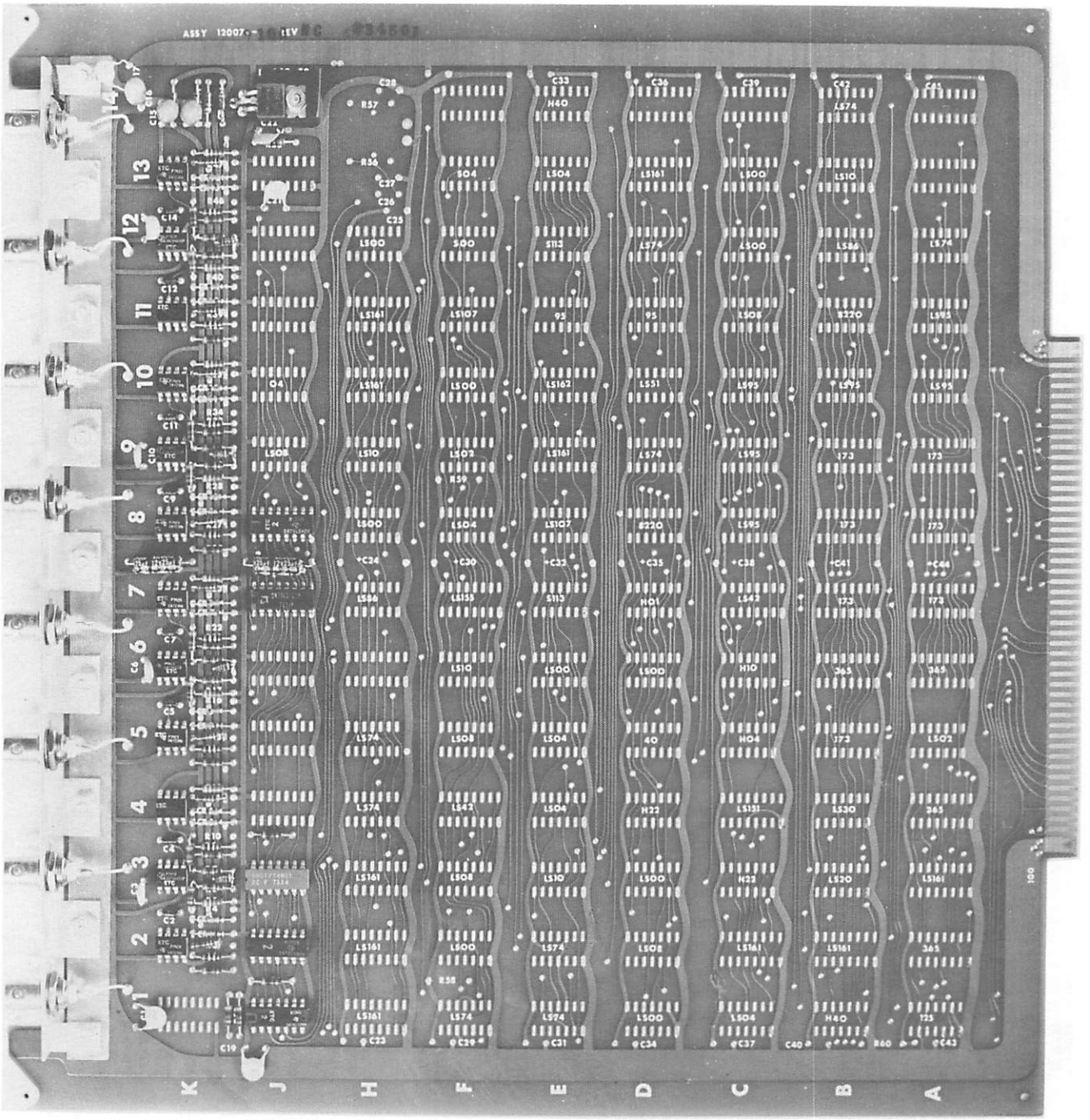
FIELD REPLACEABLE SPARES LIST

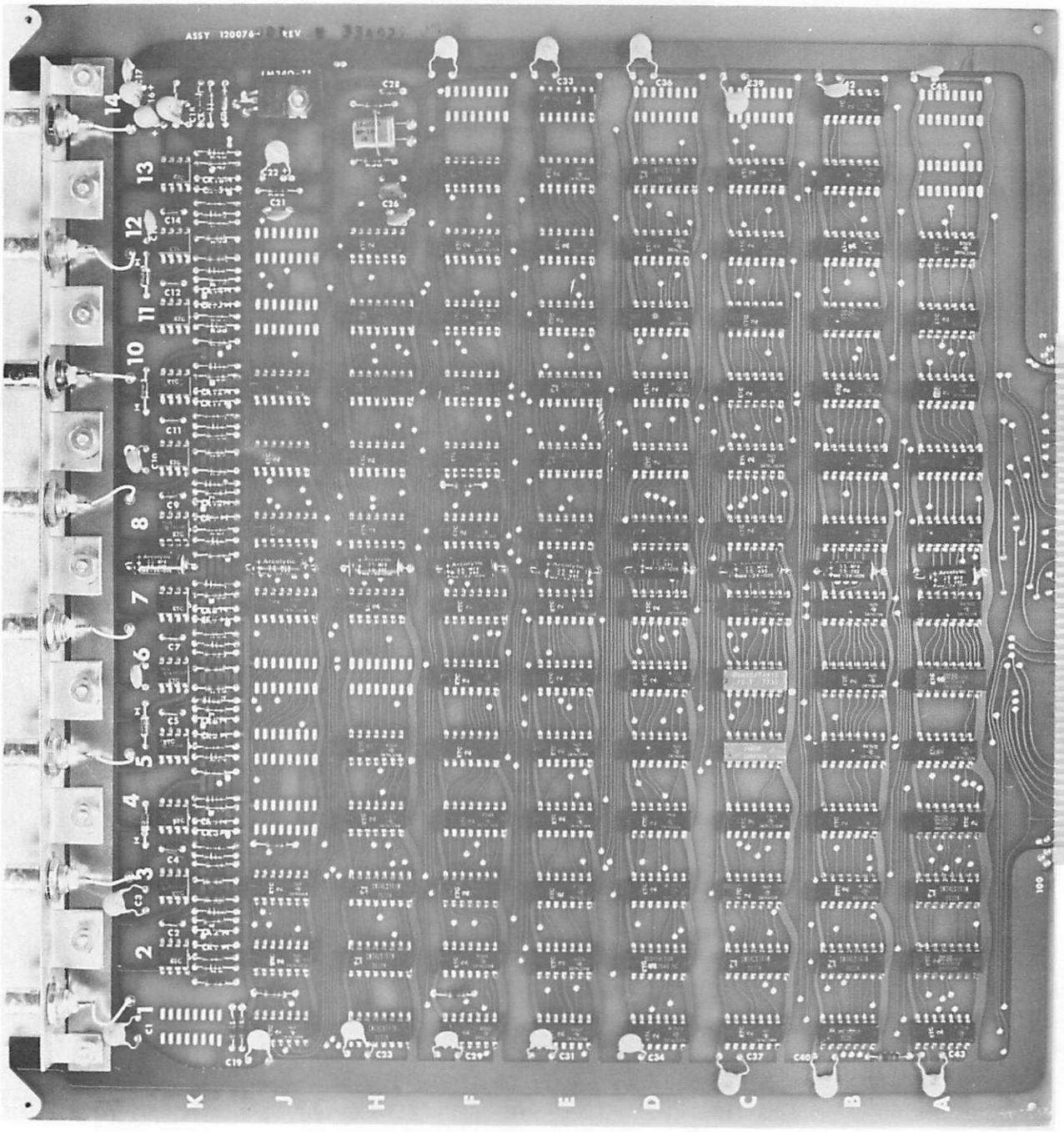
MARKET AREA DOMESTIC OTHER THAN P.C. BOARDS			REMARKS	QUANTITIES PER MODEL NUMBER				
			TRIVEX	0712	0722	0752-1	0772	0842/62
ENTRY	PART NUMBER	DESCRIPTION	IBM	3271	3272	3275	3277	3284/86
26	930900-1	Fuse, 1 AMP Slo Blo			1			
27	930900-5	Fuse, 5 AMP Slo Blo		2		1	1	
28	930300-7	Fuse, 7 AMP Slo Blo						1
29	930900-105	Fuse, 0.5 AMP Slo Blo				2	2	
30								
31	930902-1	Fuse, 10 AMP Fast Blo						1
32	930902-2	Fuse, 2.5 AMP Fast Blo						2
33								
34	931002-387	Miniature Lamp 28V, .04A			2			
35	933302-5	Indicator Cap Assy, Green			1			
36	933302-9	Indicator Cap Assy., White			1			
37	943705	LED		6				1
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								
50								

REMARKS COLUMN: an entry will be an option designation if the assembly is optional

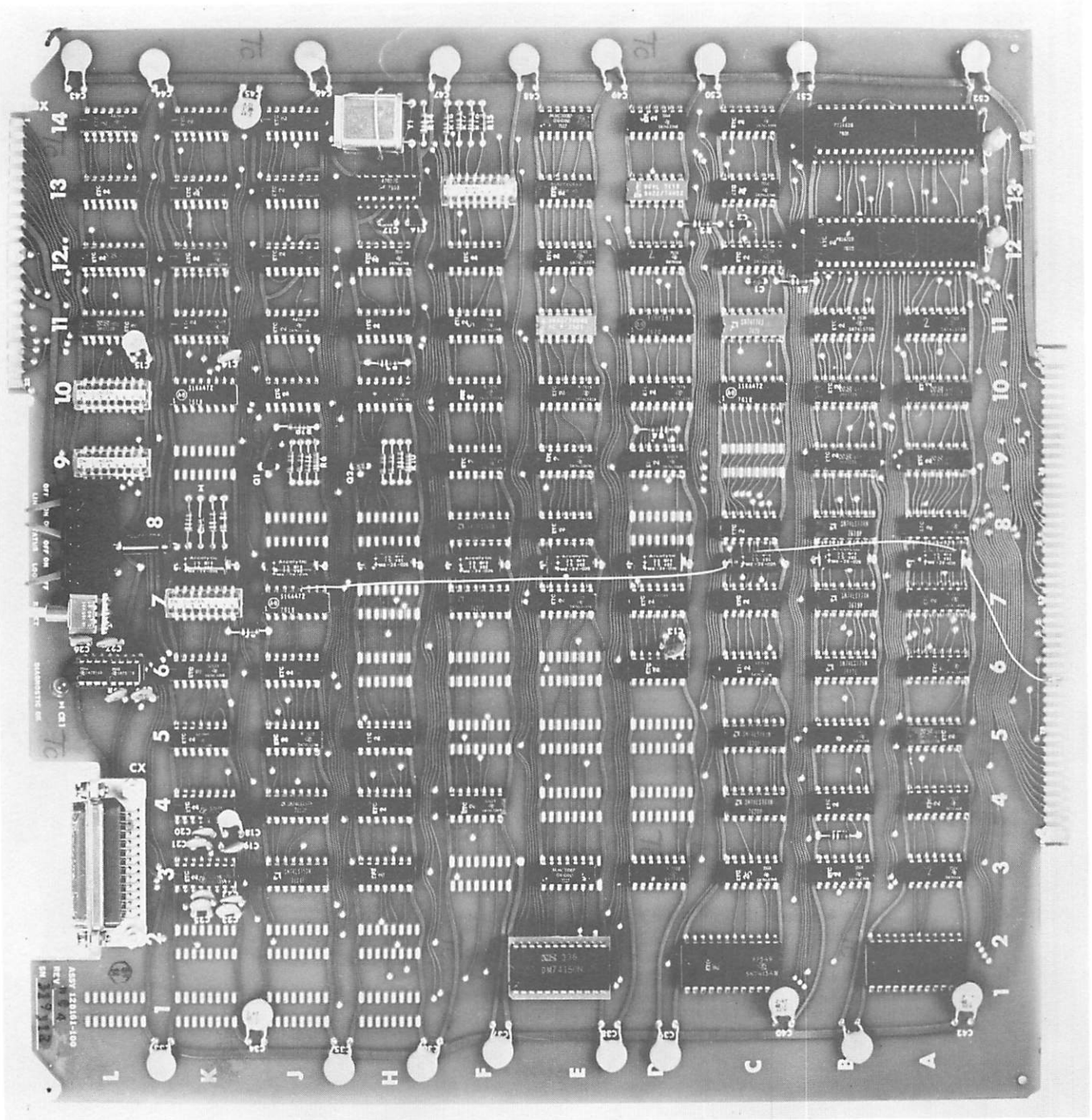
APPENDIX 8

Printed Circuit Board Identification

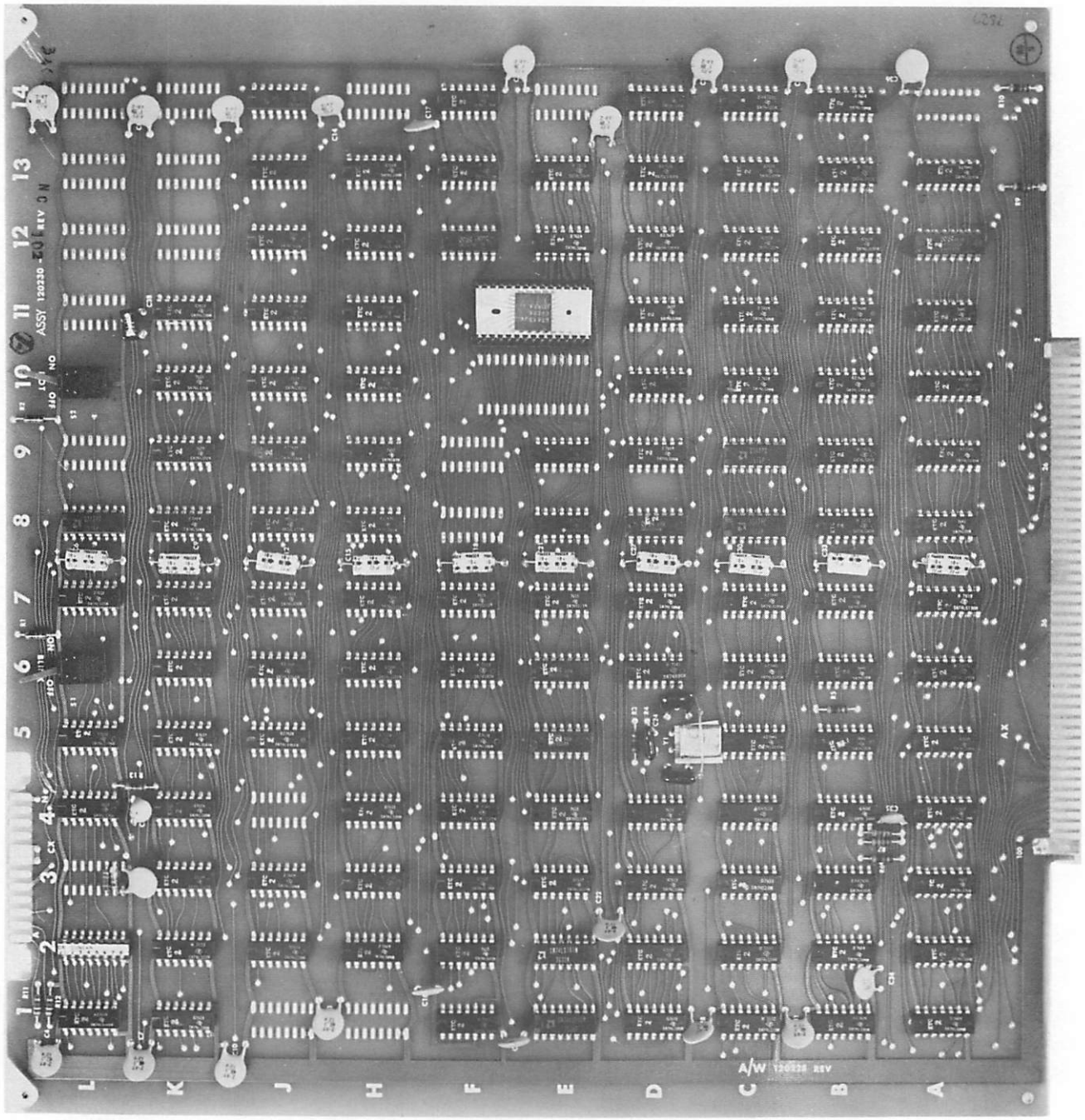


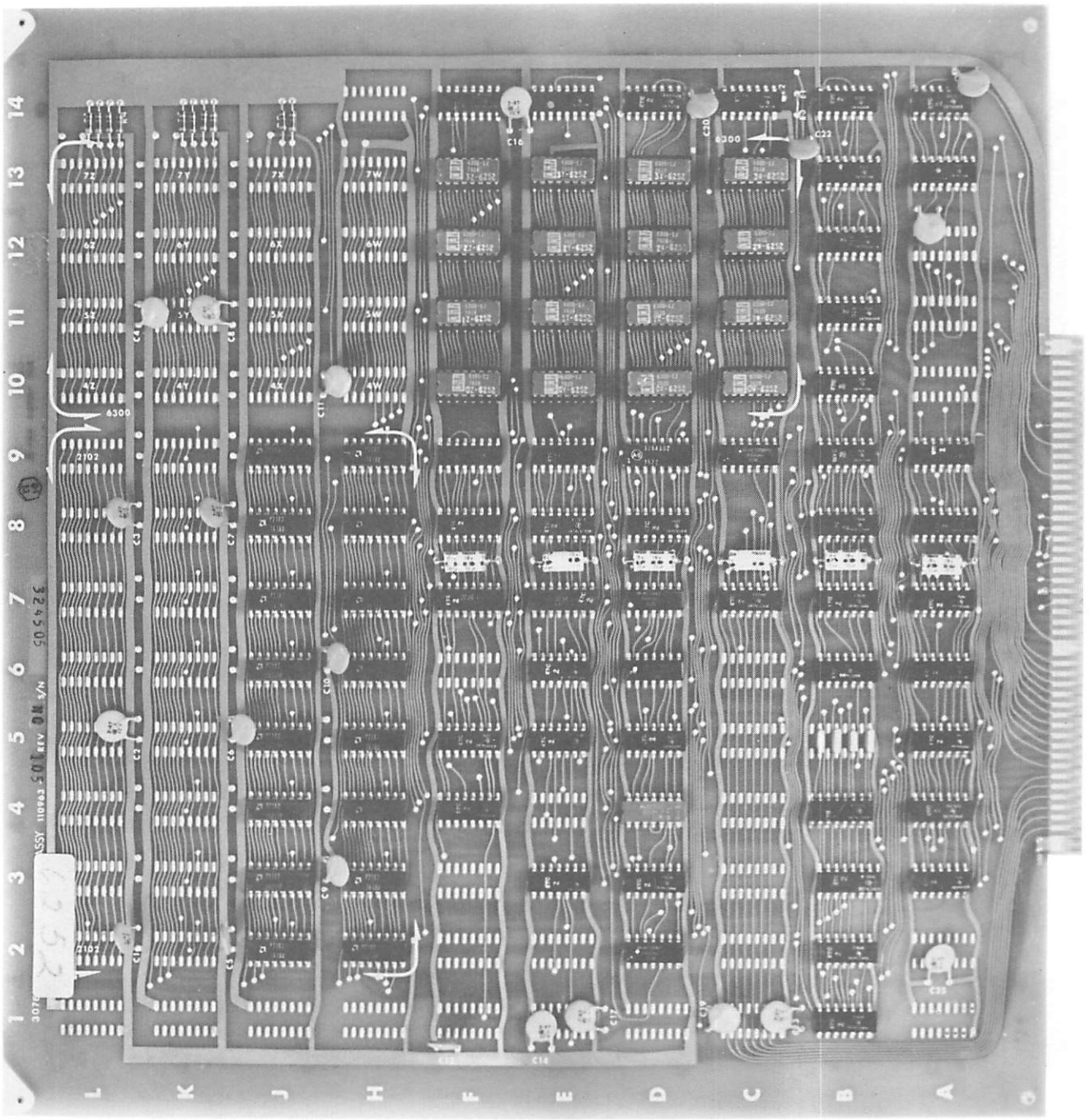


box

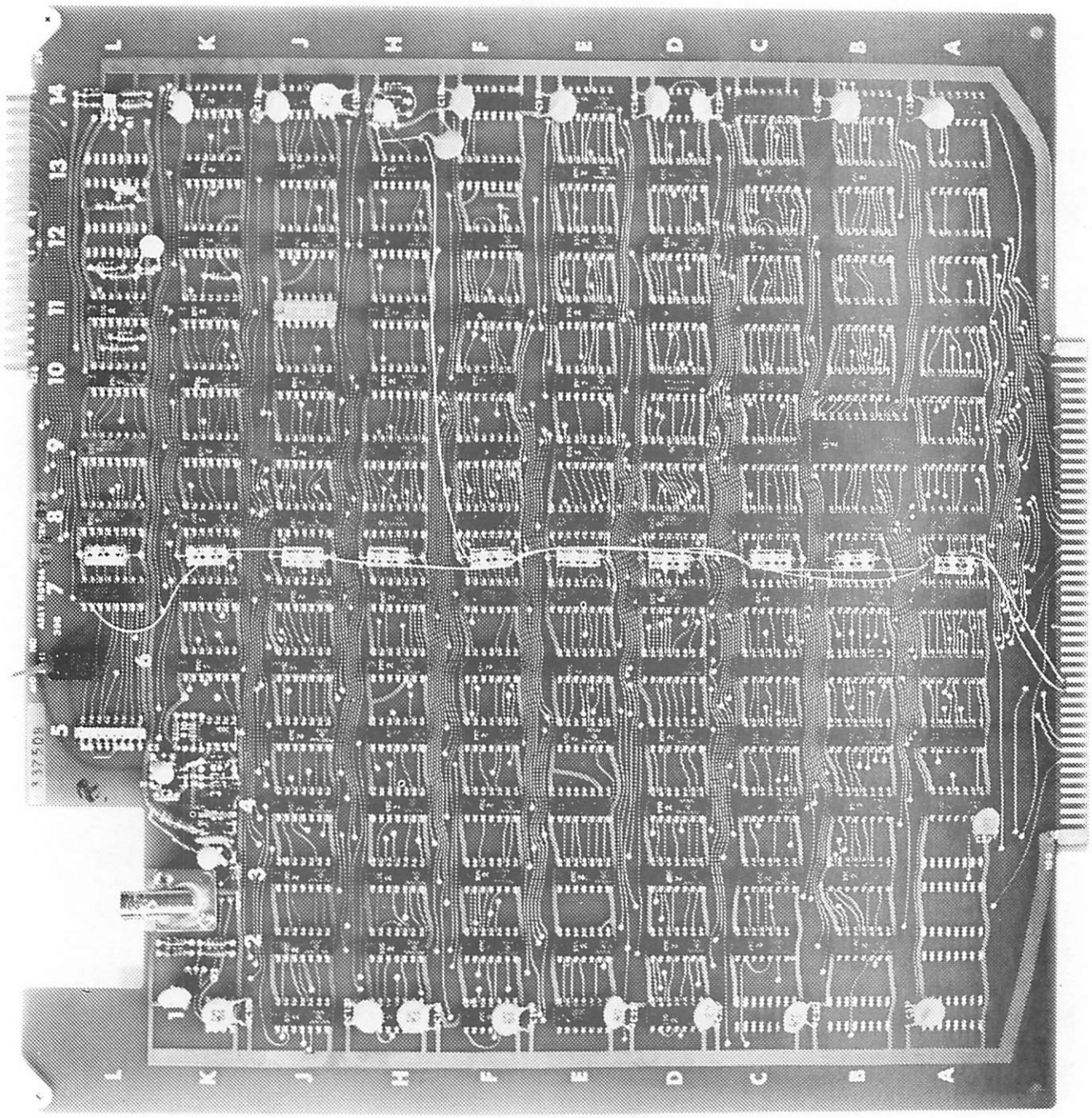


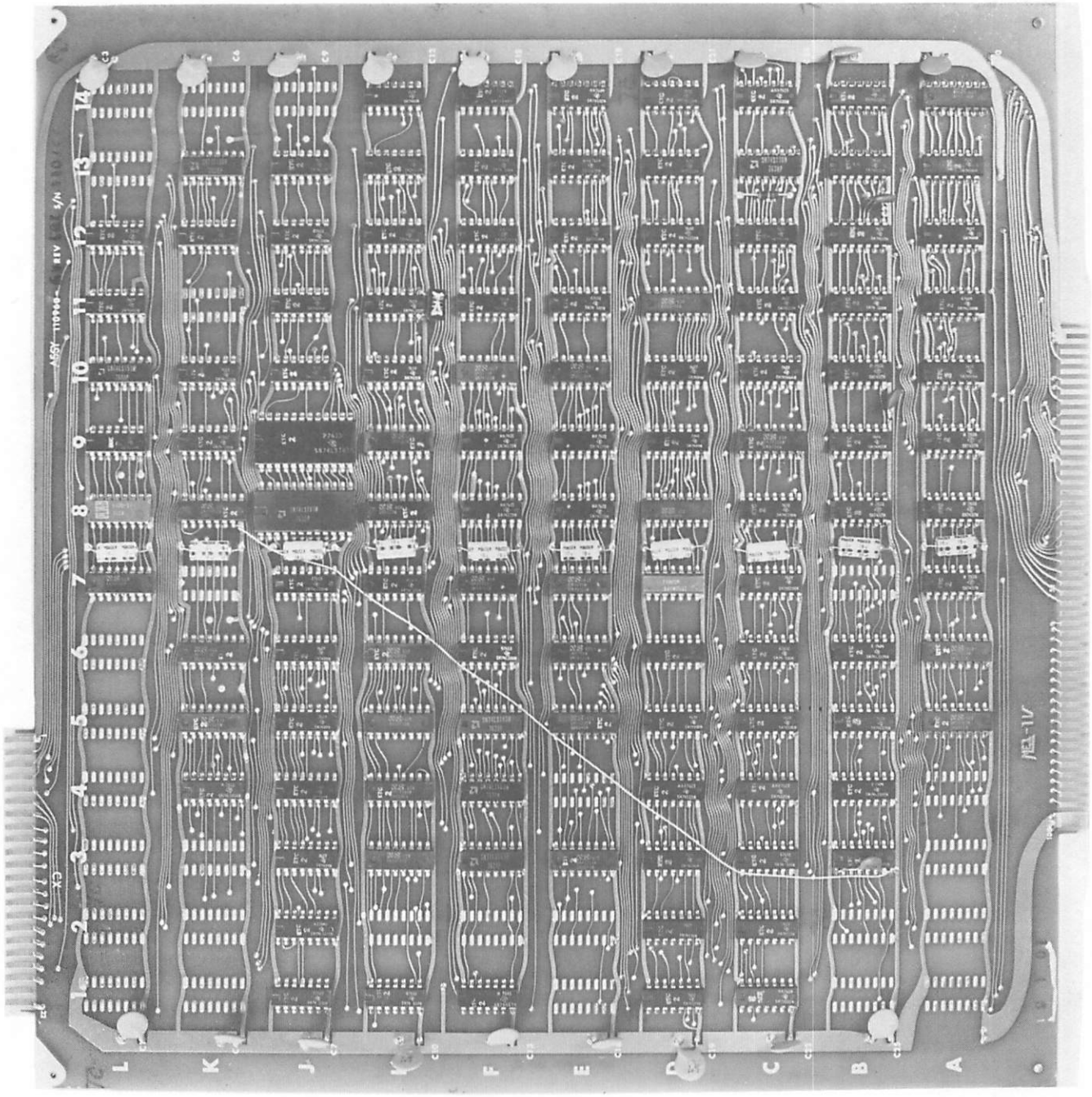
BSC adapter?
SDLC?
has 2 Western Digital
Bisynch USRT's
1472 - receiver
1482 - transmitter



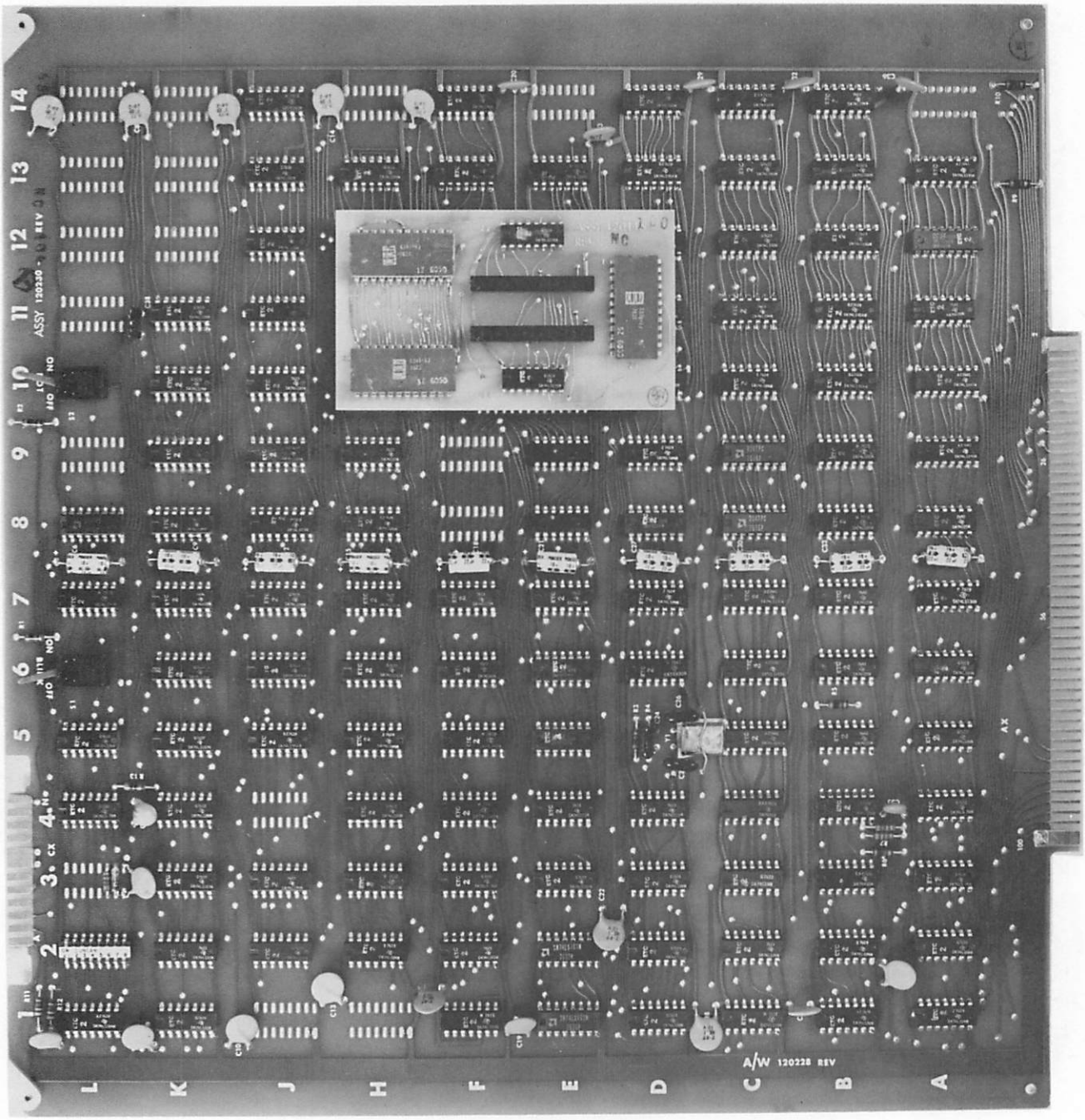


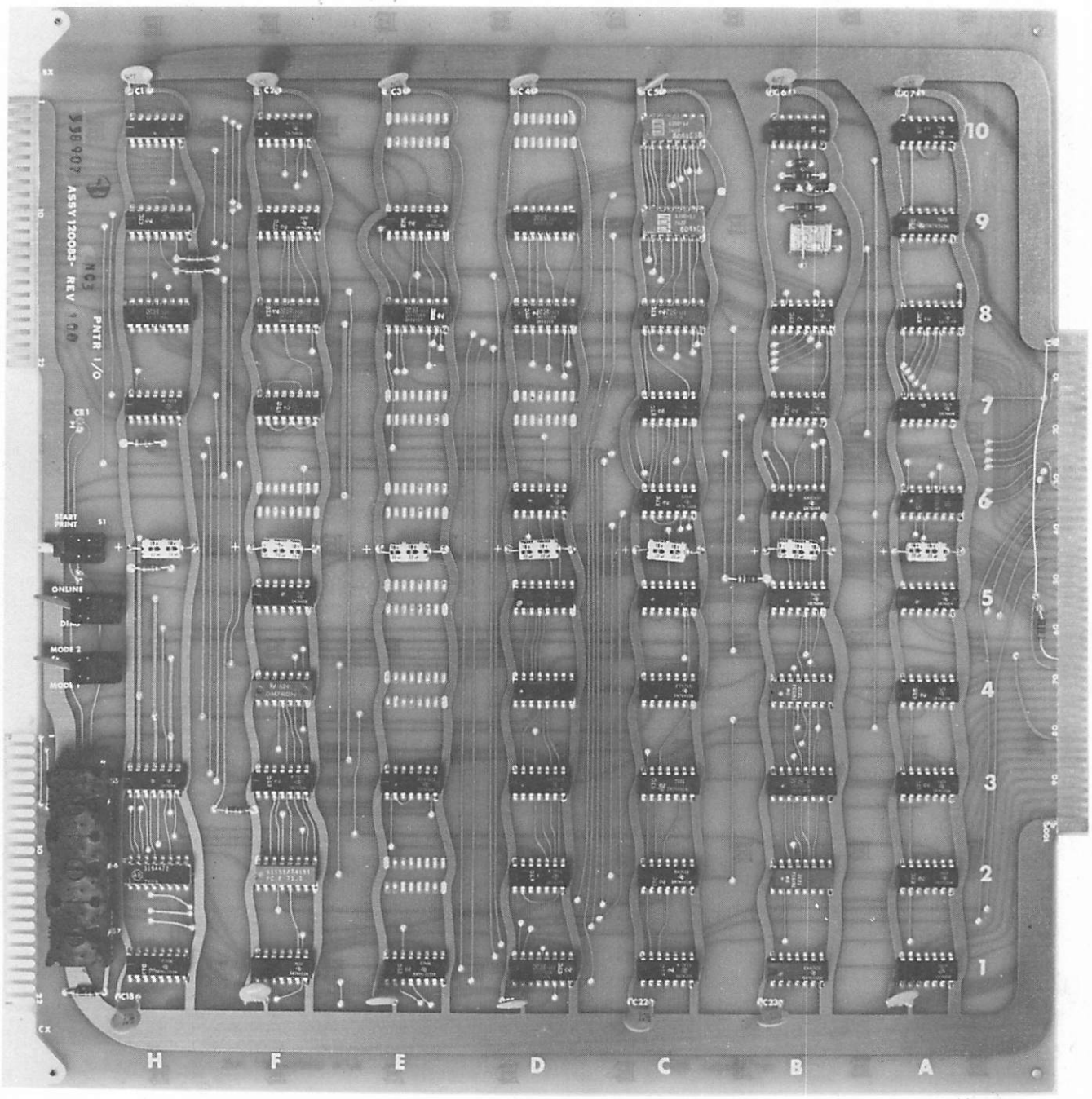
RAM 2K×8 ! (2102)

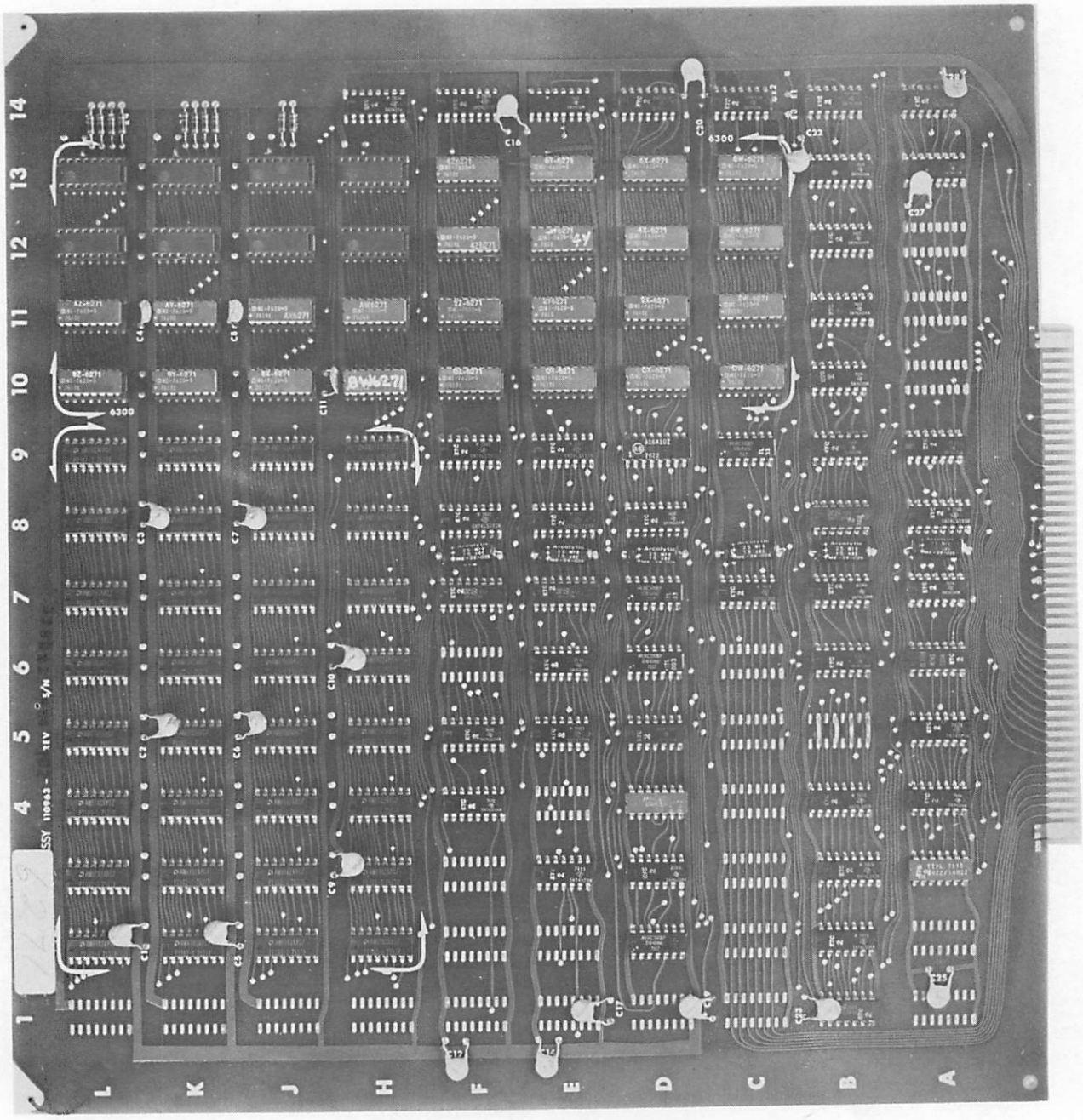


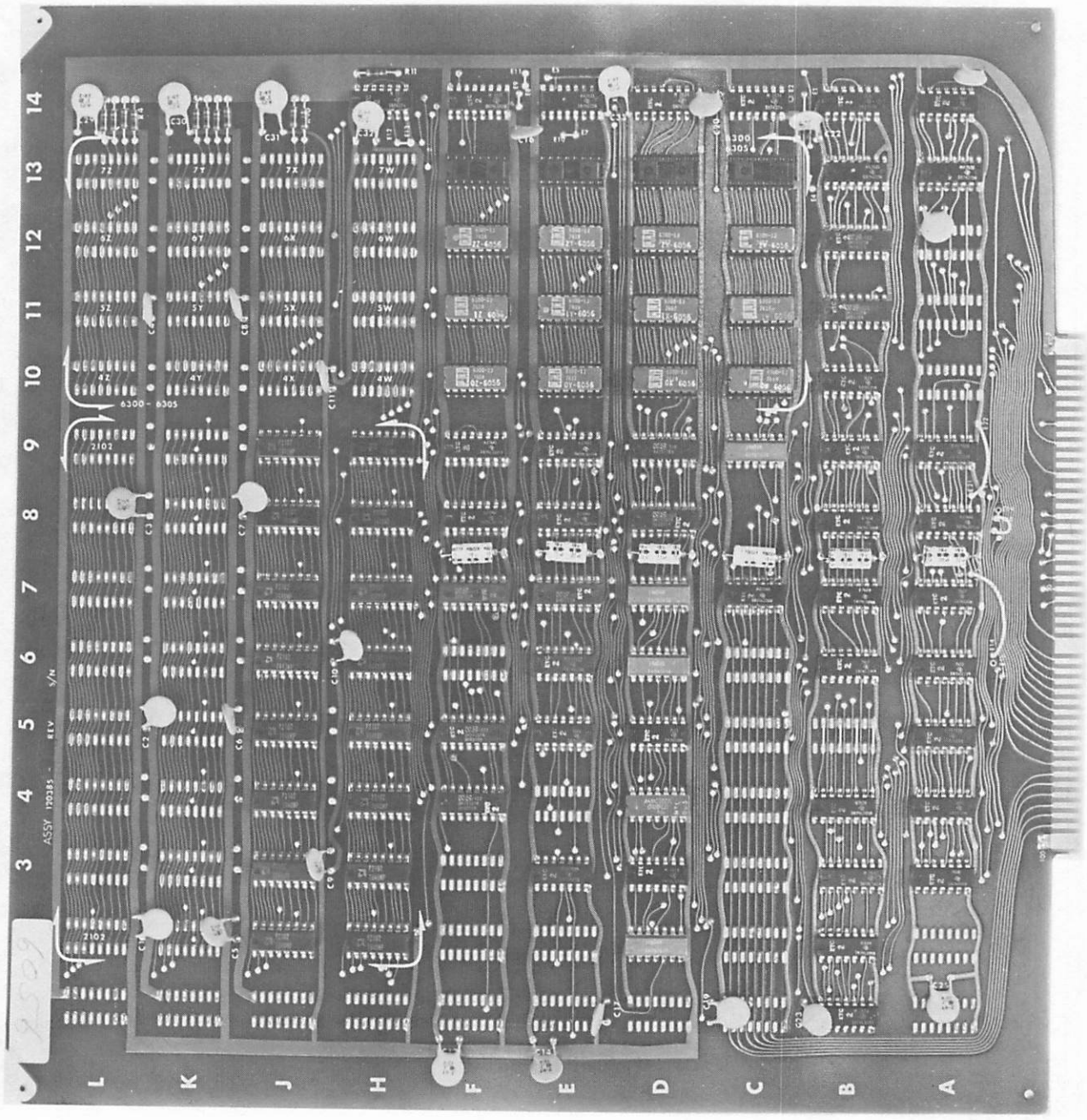


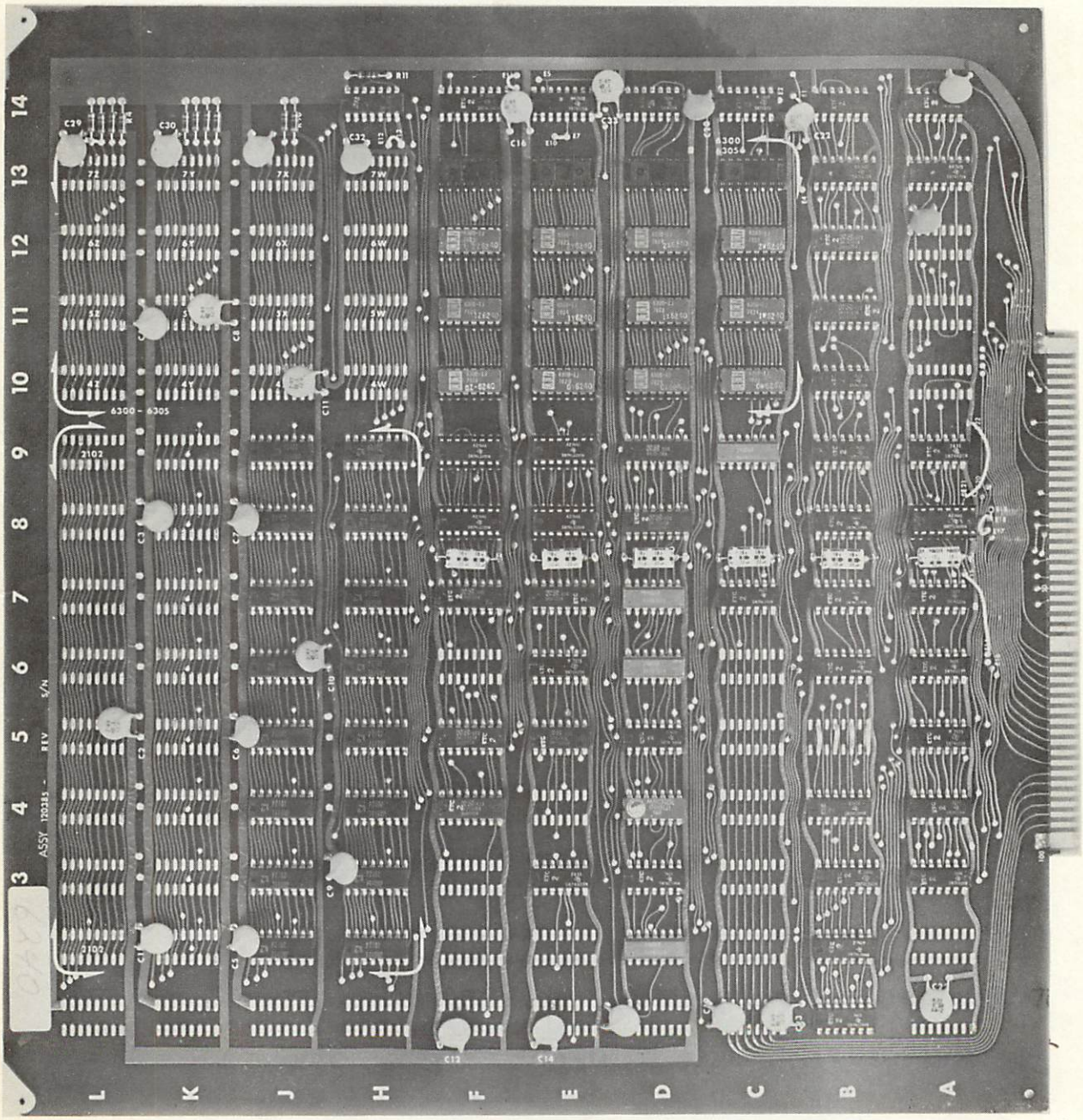
ALU - TTL microprocessor


A/W 120228 REV


598607 ASSY 120083-001 REV 100
PNTR I/O
START PRINT
ONLINE
MODE 2
MODE 1
H
F
E
D
C
B
A
10
9
8
7
6
5
4
3
2
1




14
13
12
11
10
9
8
7
6
5
4
3
L
K
J
H
G
F
E
D
C
B
A
6300 - 6305
2102
2102


ASSY 120385 - REV S/N
6300 - 6305
2102
2102