ISI 3270 COMPATIBLE PRINTER
TECHNICAL MANUAL

The ISI 3270 Compatible Printers are based on the Centronics printer line. This document is intended to be used with the applicable Centronics printer technical manual, but covers material particular to the ISI 3270 interface used in any Centronics printer. An Additional Centronics manual, "Operators Manual, Series XXX Printers," covers unpacking and setup procedures, operating instructions, forms handling, ribbon replacement, and the vertical format control.

The Centronics Technical Manual includes information necessary for the maintenance and service of the printer.

This document covers additional information required when the ISI 3270 interface is installed in any Centronics printer to replace the IBM 328X Model 2 series printer on the IBM 3271 or 3272 controller.

OPERATING INSTRUCTIONS

To operate the printer:

1. Plug the printer into the appropriate AC outlet. Always use a 3-wire grounded outlet. Check that the printer is powered off.

2. Plug the coaxial cable from the IBM controller onto the BNC connector at the left rear corner of the printer.

3. Insert paper as per instructions in the operators manual.

4. Press ON/OFF switch to power on printer.

5. Ensure that SELECT indicator is off.

6. Align the forms as desired for top of form (refer to Centronics Operators Manual).

7. Press SELECT switch on Operators Panel.

You are now ready to bein printing.

PROGRAMMING SPECIFICATIONS

The ISI 3270 compatible printers are software compatible with the IBM 328X series of printers. They will replace the IBM printer with no programming changes, however, there are several extra features requiring the use of special data codes in order to invoke these functions. The function and corresponding codes are:

	FUNCTION	HEXIDECIMAL CODE
1.	Top of form	0C
2.	Vertical tab	0B
3.	Elongate (boldface characters)	0E
4.	Line feed	0A
5.	Carriage return	0D

The functions; Top of Form, Vertical Tab, and Line Feed, are performed before the line is printed if their corresponding code is found anywhere in the line. For example, if the code "0C" is imbedded at any position in a line, the printer first skips to the top of form and then prints the line.

Top of Form and Vertical Tab functions are physically controlled by the vertical format unit (see operators manual).

The elongate function applies to all data characters in the line (66 elongated characters can be printed on a 132 character line). Both elongated and regular size characters can be printed on one line by separating the two groups with the Carriage Return Code (0D). For example, the line "Terms: COD" with "COD" elongated and starting in print position 9 would be executed by generating:

(0E)bbbbCOD(0D)TERMS:

or

TERMS:(0D)(0E)bbbbCOD

Note that the four spaces are elongated also and thus create eight regular spaces (the function codes do not use a print position).
The Carriage Return and Line Feed functions are not normally used since the IBM NL (New Line) code performs the equivalent function in unformatted mode and the line length in fixed format mode determines the equivalent functions.

FAULT ISOLATION

When the ISI printer fails to function correctly, four possible sources could contribute to the problem; 1) computer programming error, 2) IBM 3271 or 3272 Control Unit failure, 3) failure of the interface installed in the printer, or 4) failure of the Centronics printer. This information is intended to aid in isolating the problem to one of these four sources.

Nearly all IBM 3271 or 3272 control units will have at least one keyboard CRT installed. If the keyboard CRT is also not functioning, the problem will usually be at the computer system, the communication facilities, or the control unit; not the printer. If the keyboard CRT is functioning, it is still possible, not probable, that the printer port on the control unit could be malfunctioning. This can be determined by switching device coaxial connectors (and assignments) at the control unit if the site can accommodate a switch.

An indication of the failure mode also helps in identification of the malfunctioning unit. Failure modes are usually one (or combinations) of the following:

1. The alert light will be on or the printer has some obvious mechanical fault (does not manually line feed, the head doesn't return, paper jams, etc).

2. The printer does not print characters correctly (rows or columns of the 9 x 7 matrix are being dropped, line spacing is incorrect, etc.). This usually indicates failure of the printer electronics, not the interface.

3. The printer functions or usually functions, but generates error codes on the computing system. The error codes are two byte hexidecimal codes. Only the second byte (status) has valid information as follows:

   bit 0 and 1 on undefined
   2 on Command Reject (control unit error)
   3 on Intervention Required (printer not ready, out of paper)
   4 on Equipment Check (printer malfunction or not selected)
   5 on Data Check (Interface transmit or cursor check)
   6 on Control Check (Timeout - interface failure)
   7 on Operation Check (programming error or control unit failure)

   For example, an error code of 40C4 (C4 is status byte) indicates Data Check (bit 5 on).

4. The printer does not function (it cannot be put in service). The interface has two diagnostic lights mounted on the right side which can be viewed by removing the back panel. The upper light is on if the IBM control unit is properly polling the printer. The lower light is on if the printer is properly responding to the control unit (they will occasionally blink as the control unit services other devices). If neither light comes on, the control unit is not functioning properly, the coaxial cable is disconnected or damaged, or the 5 volt supply in the printer has failed.

   If the upper light is on, but the lower light (closest to the connector) off, the interface has failed and must be replaced.

Adjacent to the lights on the interface, a test switch can be used to reprint the buffer contents (the reprint will be in 80 character lines - fixed format - if user utilizes variable format mode, NL (New Line) and EM (End of Message) will be printed as 5's and 9's respectively.

The test switch can be used to examine for failures in the dot matrix makeup, and to determine whether wrong characters were received by the interface or were generated by the interface.

Any doubts as to whether the printer or the interface is malfunctioning can usually be resolved by removing the interface and testing the printer with a standard Centronics mini-exerciser. The exerciser will not show up all failure modes of the printer electronics, but most.

Exerciser testing will require manual line feed at the end of each line, since the printer has automatic line feed disabled.

Any further lack of isolation should result in changing of the interface and/or printer electronics boards.

NOTE: If it is necessary to switch the Centronics logic card, this new card must have the EBCDIC character generators installed; MCS2027-014 (upper) and MCS2027-015 (lower). The most common printer failure involves the power supplies to the interface. This can be diagnosed by checking the supplies with a scope while the printer is on and the interface is on.

INTERFACE INSTALLATION INSTRUCTIONS

All interfaces are serialized (for example, 347-2) the "-N" indicates the model number of the interface. It must be the same as the IBM control unit (347-2 can be installed on IBM 3271 or 3272 Model 2 control units only). A prefix on the serial number (L347-2) indicates a special option.

A prefix of "E" (eg. E342-2) indicates the interface is compatible with the IBM Extended Distance Option (the coaxial cable must be between 2,000 and 5,000 feet long).

1. Centronics logic card must have automatic line feed disabled and data strobe not gated with acknowledge.

2. Each printer thoroughly tested with an exerciser before installation of the interface. Exerciser testing will require a manual line feed at the end of each line, since the printer must have automatic line feed disabled.

3. Install the interface such that the innermost card is in front of the metal or plastic brackets and the black plastic card guides; so the brackets will be on the inside (foil side) of the innermost card of the interface.

4. Install the short coaxial from the interface to the printer back panel using the supplied Centornics connector plate (part number 63004100-1 "Plate"). The coaxial cable from the IBM control unit is then plugged into the BNC connection on the printer back.

5. Turn on the printer, select it, have the installation put it in service (usually from an adjacent keyboard-CRT), and send test messages repeatedly.

ISI 3270 INTERFACE

702, 703 OPTIONS REQUIRED

1. Logic Assembly #63703216 ONLY -- This is the Rev 3 Ass'y # put into production January 1978. Printers manufactured before this have different logic boards that are not fully compatible with the interface.

2. Jumper Option Packs:

   All boards with revision A, B, or C printed circuit artwork.

   X1 - not used
   X2 - 24
   X3 - not used

   For revision A or B printed circuit artwork:

with 5-2708 PROMS	with 1-4732 ROM AND 1-2708 PROM.
X4 - 34	X4 - not used
X5 - 02	X5 - 02
X6 - 14	X6 - 04
X7 - 36	X7 - 00
X8 - 20	X8 - 04

   For revision C printed circuit artwork:

with 5-2708 PROMS	with 1-4732 ROM and 1-2708 PROM.
X4 - not used	X4 - not used
X5 - not used	X5 - not used
X6 - 14	X6 - 14
X7 - 16	X7 - 04
X8 - 30	X8 - 14

3. Option PROM Type (ME 49): 10PF (6/8 lpi. disabled) or 10NN (6/8 lpi. enabled)

4. A) PROM Numbers: (when using 5-2708 PROMS)

	702	703
#1	1K52	1K52
#2	1J53	1J53
#3	1Q54	1P54
#4	1L55	1K55
#5	1A78-1	1A78-1
#6	not used	not used

B) ROM/PROM Numbers: (when using 1-4732 ROM and 1-2708 PROM)

#1	4732 - 702A1	4732 - 703A1
#2	not used	not used
#3	not used	not used
#4	not used	not used
#5	2708 - 1A78-1	2708 - 1A78-1
#6	not used	not used

5. Location ME 34 must have an EBCDIC conversion PROM in it. (1A06)
   Location ME 35 must have a 74LS273 in it.

6. Centronics parallel interface connector.

7. Centronics ECO #73700360 must be implemented.

702/703 SELF TEST PATTERN

```
/STUVWXYZ×,%_>?0123456789:#@'="-ABCDEFGHI≠.<(+|&JKLMNOPQR!$*);--ABCDEFGHI≠.<(+|&JKLMNOPQR!$*);
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 7E 00 00 00 04 23 80 80 00 80 09
```

← options

00 WHEN NO 6/8 LPI switch

Forms Control for the ISI 2240 and 2360 Printers

All 2240 and 2360 printers are normally equipped with a 2 channel vertical forms control unit (VFU). This feature, described on page 14 of the Operator's Manual, utilizes a punched paper tape strip identical to that used on the IBM 1403 printer. Channel 1 is used for Top of Form and channel 2 for Vertical Tab. Since the forms control information is stored in the printer memory, it is not necessary to use a permanently mounted tape loop, but only to load the tape (memory) after each power up of the printer. Further if the tape is not loaded after power up of the printer, the forms control automatically defaults to 11 inch forms length.

If forms not 11 inches long are used, the user must load the VFU table by running through a custom made tape (page 14) or down loading the VFU table from the computer. Since the table resets to 11 inches after a printer power up, ISI recommends down loading the table from the computer with each data buffer load, if at all practical, following the procedure below.

Append to the front of each data buffer:

a hexidecimal "1D"	(tells the printer to load, not print)
the characters, "A space"	(tells the printer to load top of form)
"N" spaces	(send 2 spaces for every print line in your form)
the characters, "A space"	(to tell the printer you are done loading)
a hexidecimal "1E"	(drops the printer out of load mode)
a "New Line" code	(to terminate that line in 3270 protocol)

In the event you wish to have a procedure that loads only once at startup time you send exactly the same information and end with an "End of Message" code, rather than a "New Line" code. If you use this method you must insure you initiate this procedure after every power off/on of the printer.

This procedure eliminates the need for a tape and can easily be changed for different size forms by simply varying the number of spaces within load codes.