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Systems

IBM 5973-L02
Network Interface Adapter
Specify Code 7042
Product Description Manual

The IBM 5973-L02 Network Interface Adapter (Frontal), Specify Code 7042, is used to connect an SNA host (with SDLC Communications Adapters) to another IBM 5973-L02 (NIA), Specify Codes 9843 or 7043 driving an SNA cluster through a Public Packet Switching Network (PPSN).

IBM

Preface

The IBM 5973-L02 Frontal Network Interface Adapter (NIA), Specify Code 7042, is used to connect an SNA host (with SDLC Communications Adapters) to another IBM 5973-L02 (NIA), Specify Codes 9843 or 7043 driving an SNA cluster through a Public Packet Switching Network (PPSN).

Third Edition (March 1982)
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TYPICAL CONFIGURATIONS IN AN SNA ENVIRONMENT

Two types of configuration may be chosen:

1. The Switched Virtual Circuit Configuration. This allows successive communications (one at a time) with different parties.

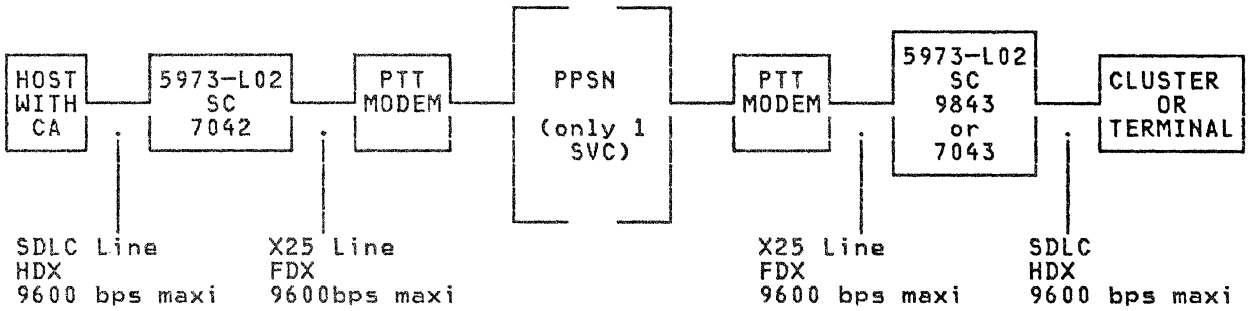


Figure 1. Typical Switched Configuration

2. The Permanent Virtual Circuit Configuration. This allows communications with another specific party. Up to 4 permanent VCs can be defined, allowing communications in a multipoint mode with up to four separate parties at a time.

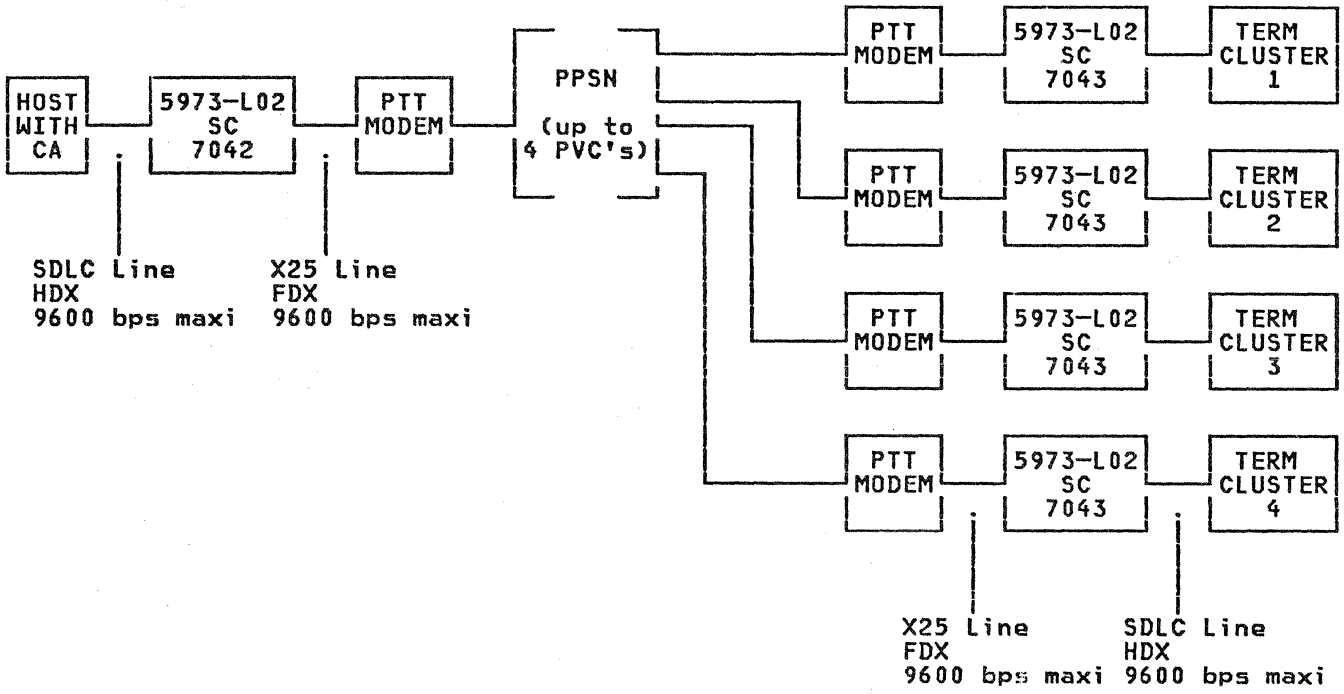


Figure 2. Typical Leased Multipoint Configuration

3. The SWITCHED NETWORK BACKUP Function Using a Frontal NIA: This funtion (SNBU) is a remote NIA function avalaible with a remote PN 8684649 cassette (this number is written on the remote cassette). The remote NIA must be plugged in permanent mode.

   The configuration is supposed to be basically a permanent virtual circuit configuration using an IBM 3705 + X25 NPSI PROGRAM PRODUCT or a frontal NIA plugged in permanent mode PLUS a frontal NIA plugged in switched mode for backup purposes. This last NIA must use a frontal PN 8684648 cassette (this number is written on the frontal cassette).

   This implies that there are two PTT subscriptions on the host side (two modems):

   - One X25 line with permanent virtual circuit(s) for the permanent configuration.
   - One X25 line with one switched virtual circuit for the frontal NIA plugged in switched mode for backup purposes.

Note that the SNBU function is particularly interesting when a permanent virtual circuit of the network has failed.

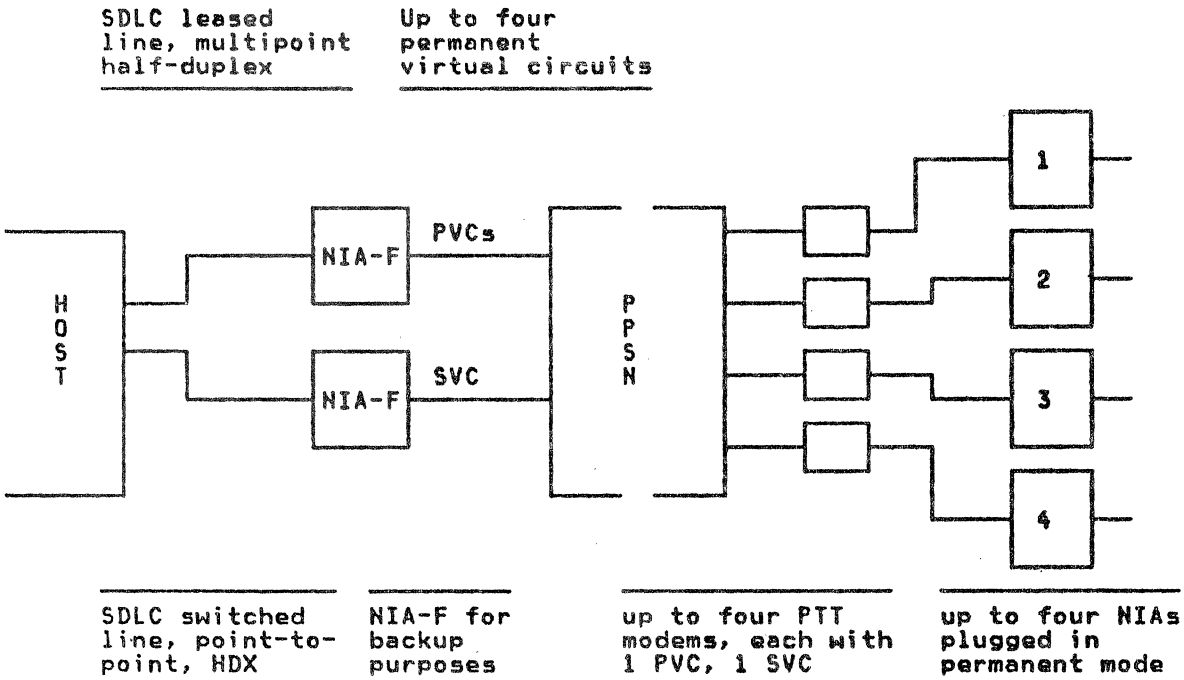


Figure 3. Typical Configuration to use SNBU with two frontal NIAs

GENERALITIES CONCERNING NIA FUNCTIONS

The 5973-L02 (SC 7042) is loaded automatically at power ON via an integrated microcassette reader. The initial machine loading takes approximately 90 seconds. Two microcassettes are provided (one spare and one operating). These microcassettes are written on one side only, as indicated by the labelling.

The 5973-L02 allows changing from the SDLC procedure to the X25 procedure to permit data packet exchange via the PPSN.

For the host system it is attached to, the NIA plays the part of the SDLC transmission modem and controls the data exchange according to SDLC rules, as a secondary station.

For the PTT modem interfacing the PPSN, the NIA plays the part of a host system able to control data transmission over the line, according to X25 rules. The user's data is transmitted over the PPSN in the form of discrete blocks of data called packets. These packets have a length which may be chosen at subscription time. They include headers which allow controlling their transmission via the PPSN.

The 5973-L02 may segment the Host System messages into data packets of the right length to go through the PPSN. This is the SEGMENTING function.

The 5973-L02 may also recombine several data packets received from the PPSN into a regular message for the Host System. This is the RECOMBINING function.

Note 1: The insertion of the NIA in a chain implies an additional delay of transmission. This additional delay is equal to the transmission time between the interfaces of the NIA and the host.

Note 2: When an error occurs at PLP level, certain X25 networks do not ensure recovery. Generally, the virtual circuit on which the error has been detected is reset (permanent mode), or cleared (switched mode). The data present in the network at the moment the error was detected may be lost.

For this reason, the 5973-L02 does not either ensure recovery in case an error should occur at PLP level: The cause/diagnostic of CLEAR or RESET are recorded, and the buffers are automatically re-initialized. Therefore, the data present at the time the error occurs is lost.

It is the user's responsibility to ensure data integrity by using the facilities offered by the IBM architecture (SNA), or by performing the complete data exchange again.

PARAMETERS TO BE DEFINED WHEN ORDERING THE 5973-L02 SC 7042

A set of parameters must be defined to adjust the 5973-L02 to your chosen configuration.

Please record the chosen values for future checking.

Note: The virtual circuit value or lower virtual circuit address is set at subscription time to '00' or to '01', and is selected by the Specify Code at ordering time, and by strapping at the time of manufacturing and/or installation.

When the 5973-L02 is used in a leased multipoint configuration, the virtual circuit addresses (up to a maximum of four) must be contiguous, starting from the lower VC address, for example, 00, 01, 02, and 03 for TRANSPAC.

1. PPSN line speeds between the PTT modem and the 5973-L02 (defined with the PTTs at subscription time). There is no Specify Code and no strapping of the 5973-L02 for PPSN line speed.

MODEM
1200 BPS
2400 BPS
4800 BPS
9600 BPS

2. Line speeds or Communications Adapter signalling rate between the 5973-L02 and the host system selected by the Specify Code at ordering time, and by strapping at the time of manufacturing and/or installation:

DTE
1200 BPS
2400 BPS
4800 BPS
9600 BPS

3. The PPSN line access procedure defined according to the characteristics of the network used at subscription time. Selected by the Specify Code at ordering time and by strapping at the time of manufacturing and/or installation.

L	LAP LAP-B

4. PPSN Circuit type (permanent or switched) through the network. It is defined with the PTTs at subscription time. Selected by the Specify Code at ordering time and by strapping at the time of manufacturing and/or installation.

S	Permanent Switched

5. The PPSN packet length is defined with the PTTs at subscription time, and is selected by the Specify Code at ordering time, and by strapping at the time of manufacturing and/or installation. It must be the same at the other side (remote NIA).

N1N	256 bytes 128 bytes

6. The PPSN timeout delay at LAP level. It is selected by strapping at ordering time or at the time of manufacturing or installation, according to the chosen PPSN line speed.

0.5 sec for 9600 bps
1.0 sec for 4800 bps
2.0 sec for 1200/2400 bps

7. The window value is the maximum number of frames (or packets) that can be anticipated, that is, sent or received without acknowledgement to or from a given point.

WN	Number of frames (PPSN LAP level) |7|

WP PPSN packet window size: 2 to 7, depending on the size of the packet and the number of PVCs.

1 or 2	3 or 4		
Up to 7	Up to 6	128	Packet Size
Up to 7	Up to 3	256	

Note: The SDLC window size from NIA to Host System is limited to 7. The SDLC window size from Host System to NIA (NAXOUT for VTAM and NCP, MAXNSEG for DPPX, ...) must be limited to 3 when the NIA is used in a

leased multipoint configuration with 3 or 4 stations. In other cases, the maxout value must be limited to 7.

The PPSN WN and WP values must be in concordance in both the network and the NIA (chosen at subscription time).

8. The retry value is the number of times a frame is retransmitted when it has not been acknowledged within the appropriate time limits (timeout recovery).

N2N	X25 Retry (fixed)	10
N2C	SDLC Retry (fixed)	5

HOST GENERATION INFORMATION

- SDLC half duplex mode, 2-wire, controlled request to send.
- CCITT V24 circuit 108.2, data terminal ready.
- NRZ (not NRZI).
- External modem clocking with WRAP option (leased or switched). The leased option is mandatory when using permanent virtual circuits. The switched option is mandatory when using a switched virtual circuit.
- Manual call, manual answer options.
- The MAXDATA value must be limited to 256 bytes of RU.

The station addresses on the SDLC line used must be xxxxxx01, xxxxxx10, xxxxxx11, xxxxxx00, where x can take any hexadecimal value, but xxxxxx has the same value for the four addresses which are contiguous (except for the sixth bit of the fourth address which is inverted). The station addresses must always start from xxxxxx01 if less than 4 stations are defined. For example, three SDLC lines are used, one in a switched point-to-point mode, and the others in a leased multipoint mode with, respectively, 2 stations and 4 stations. The station addresses can be:

C1 For the first SDLC line

C5} For the second SDLC line
C6}

C9}
CA} For the third SDLC line
CB}
CC}

The correspondence between the station address and the virtual circuit number as seen from the frontal termination is shown in the following table:

	SDLC STATION ADDRESS	VIRTUAL CIRCUIT WHEN STARTING BY LOWER VC 00	VIRTUAL CIRCUIT WHEN STARTING BY LOWER CIRCUIT 01
SDLC Line 1	C1	00	01
SDLC Line 2	C5	00	01
	C6	01	02
SDLC Line 3	C9	00	01
	CA	01	02
	CB	02	03
	CC	03	04

And so on. In the preceding examples, C1, C5, and C9 would be stations connected to the host via VC 00, for instance when used with a network in which the lowest virtual number is 00, three different modem terminations. C6 and CA would be stations connected to the host via VC 01 (with a network whose lowest virtual circuit number is 00), C6 being on the same modem termination as C5, and CA on the same modem termination as C9 (refer to the "Configurations" subsection at the beginning of this manual.

The SDLC Contact or Poll timeout must last at least 1.5 seconds at 9600 bps, 2.5 seconds at 4800 bps, 4.0 seconds at 2400 bps, or 7.5 seconds at 1200 bps.

This section describes the operator panel and the back panel as used in normal operations with the PPSN.

As an operator, you will use connectors, switches, the keyboard, and indicators and displays located on the front and rear of the 5973-L02.

- The front panel is called the OPERATOR PANEL. Located on this panel are: The power ON indicator, Check indicator, LED displays, Keyboard keys, Erase and Enter keys. (See Figure 4.)
- The rear panel is called the BACK PANEL. Located on this panel are: The Power ON/OFF switch, connector and cable, cassette reader and spare written cassette.

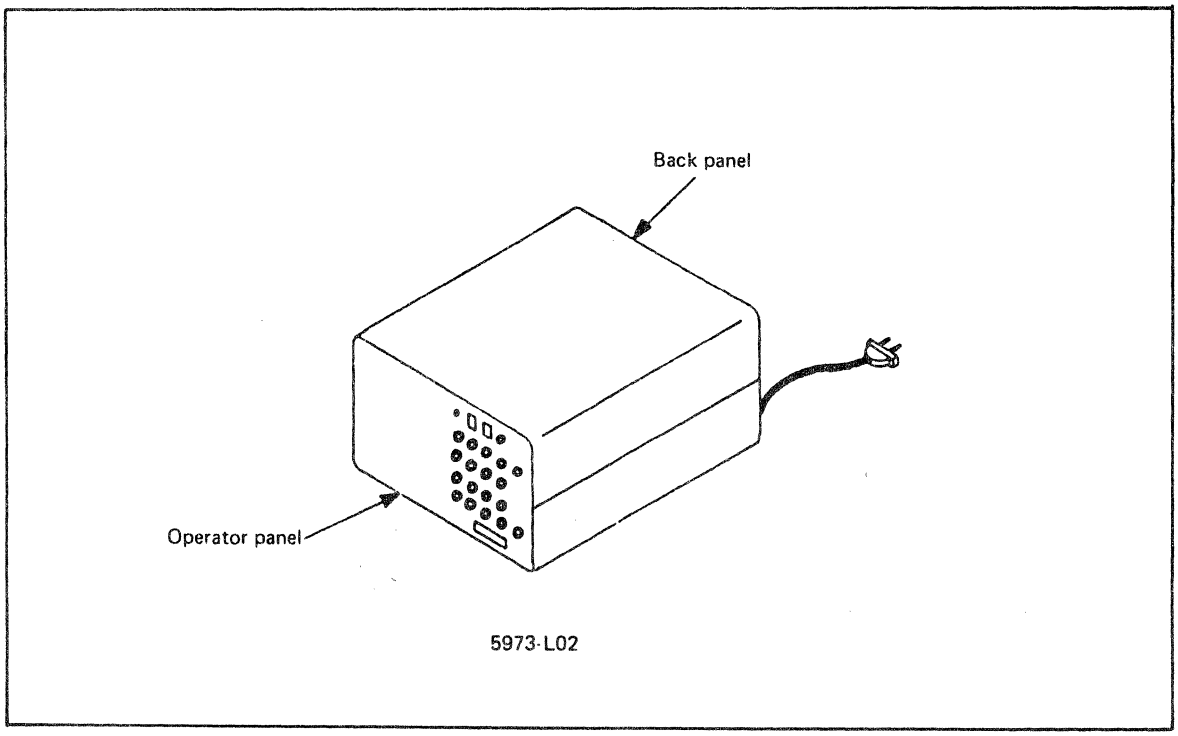
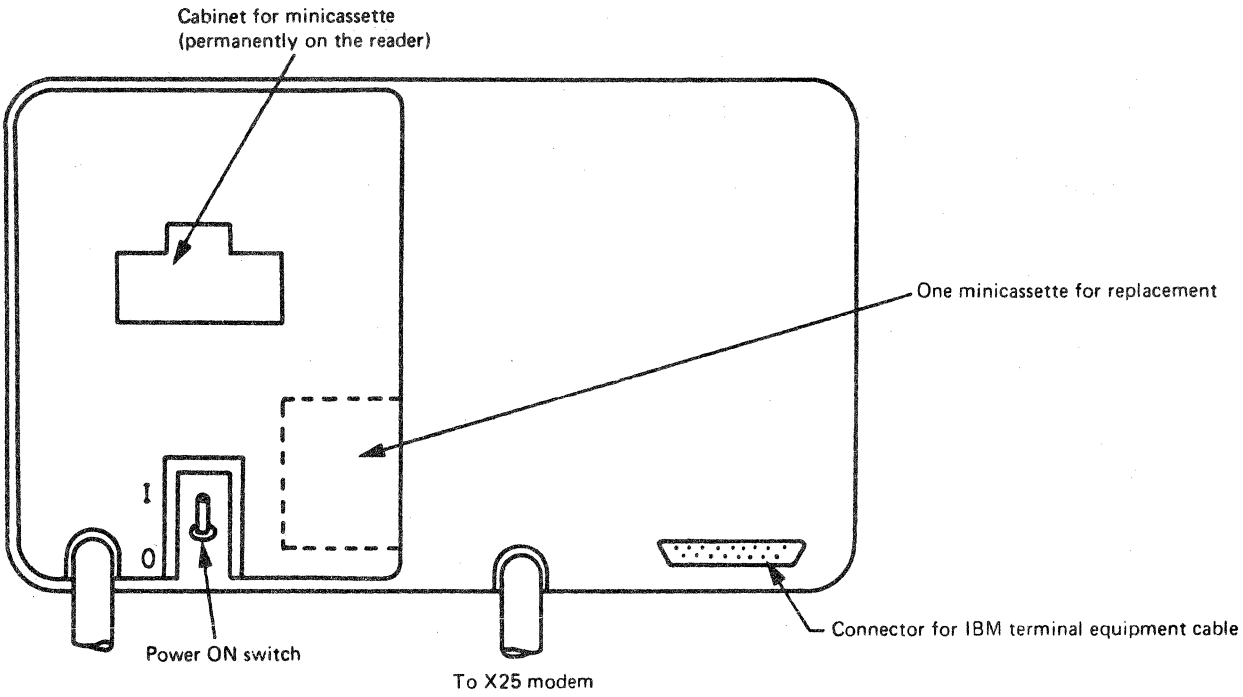


Figure 4. The IBM 5973-L02 Network Interface Adapter

Use a cloth dampened with a mild soap solution to clean the covers, the keyboard, the indicators and the display face. The soundhead of the microcassette reader must be cleaned with an alcohol dampened pad for correct operation.

CAUTION: Do not use spray cleaners on the operator panel or on the rear plastic cover.

Back Panel



Operator Panel

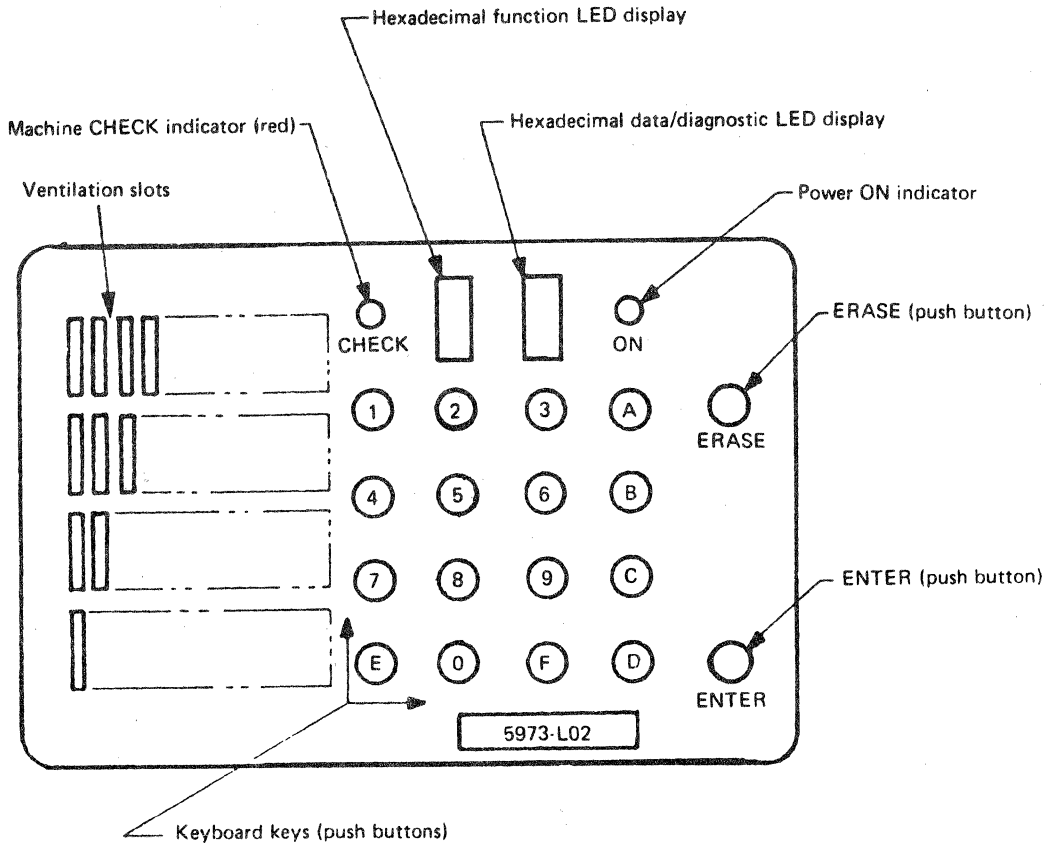


Figure 5. Details of the Operator Panel and of the Back Panel

- The CHECK Indicator

  This red lamp is normally OFF. If lit, it indicates either that a memory parity error was found, or that the program is not running correctly.

- The POWER ON Indicator

  It indicates that power is applied to the 5973-L02. Note that the power ON/OFF switch is located on the rear panel.

- The HEXADECIMAL Function LED Display (left LED)

  This red LED is used to display the alphanumeric code of the function entered from the keyboard, or to display the present status of the program during operations.

  Note: Certain error conditions may cause these indications to flash.

- The HEXADECIMAL Data/Diagnostic LED Display

  This LED is used to display the data, if any, entered from the keyboard. As there is only one LED to display several data characters, the last character entered, if any, is displayed first, followed by a blank (LED off). Then, all the characters entered are displayed one after the other, each one followed by a blank, and so on, until a new key is pressed.

  If the number of characters entered is greater than 30, only the last 16 characters entered are displayed.

  This LED is also used by the program to display a coded diagnostic character if an error occurs in the 5973-L02 X25/SDLC link control code operation.

- The Keyboard Keys

  There are 16 pushbuttons numbered from 0 to F. They are used to send functions or transmit data to the control code.

  The same key may be used as a function key or a data key. If used for data, an authorized function must have been sent before, or the data will be considered by the control code as a function or an error.

  The keyboard keys are used in combination with the ENTER and ERASE keys.

- The ERASE Key

  It is used to cancel a wrong function entered from the keyboard. In such a case, the function LED displays the last function requested by the control code before the wrong command was entered.

  It is also used to cancel data entered from the keyboard without having to re-enter the associated function. It is necessary to re-enter the correct data.

- The ENTER Key

  It is used to validate any function entered from the keyboard. It also indicates to the control code the end of the entered data.

THE OPERATING PROCEDURE

This chapter describes the normal procedure to follow to operate the 5973-L02.

If the 5973-L02 does not react as described herein, refer to the "Problem Determination" section of this manual.

INITIAL MACHINE LOADING (IML)

1. Check that physical connections are established between:
   - The 5973-L02 and the Host System Communications Adapter (host/CA)
   - The 5973-L02 and the PTT modem
   - The 5973-L02 and the mains.
2. Apply POWER to:
   - The Host System Communications Adapter
   - The PTT modem (check normal position).
3. Introduce one of the two control code tape microcassettes into the cassette reader if necessary (check the position of the label on the external side to ensure a correct positioning of the cassette).
4. Set the 5973-L02 to POWER ON to perform the control code loading automatically (the power ON indicator lights up on the operator panel).

   The left LED indicator displays nothing if the microcassette reader is rewinding the tape, or a flashing "0" while the cassette is being read (about 90 seconds).

   Note for information only: Once the cassette has been read, the control code performs the following steps automatically:

   a. CE routines running to check the 5973-L02 hardware interfaces: The left LED displays a succession of numbers chosen from the 1 to 7 range (usually you can see 3, 5, 6).

   b. Initialization of all the 5973-L02 registers.

   c. Automatic disconnection, then, automatic link setup at LAP level with the first node of the PPSN.

      The left LED displays "A" 0, 'D' during the disconnection phase, then 'A' until the automatic link setup is established.

      After these steps, the left LED displays "B" if in switched mode, or 'E' in permanent mode.

      Note 1: If in switched mode, when the 5973-L02 displays "B" (steady) on its left LED, it is able to receive an incoming call from the PPSN without any intervention from the operator.

      If this incoming call is accepted by the 5973-L02, it displays 'E'. In this case, skip to "Note for Information Only" below.

      Note 2: During all these phases (disconnection, link setup, reception of an incoming call), the left LED may display a flashing 'D', 'A', 'B', or 'E' with the right LED set to 1. If so, enable your host system communications adapter line to set DTR ON. When the DTR has been turned ON, the left LED steadily displays 'D', 'A', 'B', or 'E' with the right LED blank.

CALLING FROM THE HOST (SWITCHED VIRTUAL CIRCUIT ONLY)

If the 5973-L02 is in permanent mode, skip to "Note for Information Only" below.

1. Check that the 5973-L02 asks for a call entry:

2. Press the "B" and "ENTER" keys

   The LED display does not change.

   Note: If a wrong value has been entered, B flashes on the left LED and F appears on the rigth LED. Retry "B" and "Enter".

3. Successively press the keys to compose the called host's number. You can check the entered number on the right LED - cyclic display.

4. Press "F" (used as a separator, F is not displayed on the right LED and stops the preceding display.)

5. Successively press the keys to compose your calling number, if any. You can check on the right LED.

6. Press "F" (as in 4).

7. Successively press the keys to compose the chosen facilities if any, according to the table below:

Reverse charging	0 1 0 1	(see note)
Closed user group	0 3 x x	
Priority service (DATAPAC only)	0 1 0 2	

   Note: xx is the specific closed user group parameter.

8. Press "F" (as in 4).

9. Successively press the keys to compose user data if any (hexadecimal characters only).

10. Press the "ENTER" key to send the call request to the PPSN.

    When the call request has been accepted, the 5973-L02 displays:

IMPORTANT NOTE: Steps 1, 2, 3, 4, 6, 8, and 10 are mandatory even though steps 5, 7, and 9 are not performed.

Note for information only: When the left LED displays "E", the 5973-L02 is able to receive commands from the connected Host System Communications Adapter.

As soon as a CONTACT command has been answered by the CONTACT response, the 5973-L02 is in normal running mode for data exchange with the contacted station and displays:

When the connected host stops the data exchange with a station, it sends a DISC command to this station. As soon as the 5973-L02 has answered it by a DISC response, it returns to the "E" status if no more station is contacted and displays:

If at least one station (among the four stations available) is contacted by the host, the status stays "F" with F display.

Note: CONTACT and DISC are command/responses used in the IBM data link protocol.

END OF SESSION

1. Discontact all the used stations at the host system.
2. Check that the 5973-L02 asks for end-of-session (or new session)

3. Press the "C" and "ENTER" keys (in switched mode only).
   When the clear request has been accepted, the 5973-L02 displays:

(DSR is set off by the NIA to disconnect the switched SDLC line).

4. Press the "D" and "ENTER" keys. When the disconnect has been accepted by the PPSN, the 5973-L02 starts a new link automatically. This link is set up at LAP level with the PPSN.

5. Put the 5973-L02 power OFF (see note)

6. Take the usual actions concerning the Host System/Communications Adapter and the PTT modem.

Note: Steps 4 and 5 may be replaced by a new session with a host. In this case, restart as described above. (Calling from the Host for a Switched Virtual Circuit or Note for Info only for a Permanent Virtual Circuit).

PROBLEM DETERMINATION

This section describes the indicators and LED displays of the 5973-L02 in the case of abnormal runs.

The symbols used have the following meaning:

///	The LED is OFF
x	The alphanumeric data is steadily displayed by the LED
'x'	The LED flashes the alphanumeric data

This section is a guide for the operator to:

- Identify minor problems that can be quickly recovered
- Determine which maintenance service should be called to locate and correct the problems encountered.

AIDS FOR PROBLEM DETERMINATION

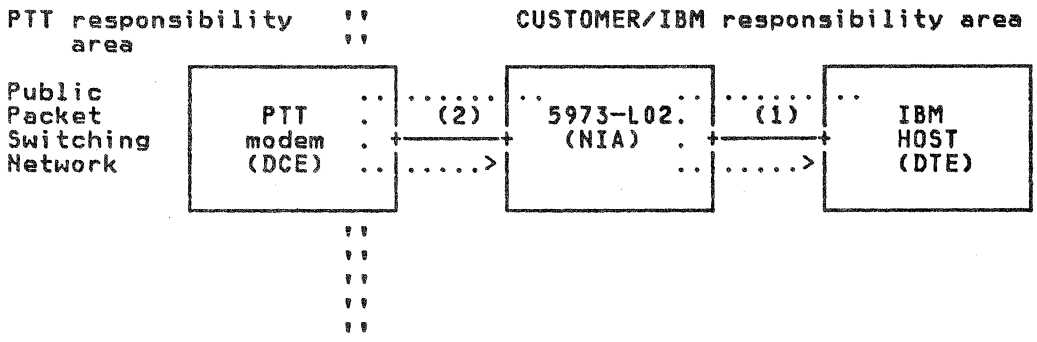


Figure 6. Simplified Configuration and NIA Tests

Two tests are available with the 5973-L02 (see Figure 6 above).

PROBLEM DETERMINATION AIDS

PROBLEM DETERMINATION AID 1

This consists in wrapping the host/CA through the 5973-L02 (only if supported by the host/CA used. See test 1, Figure 6).

- Load the 5973-L02 (Power ON)
- Enable the host/CA
- Initialize WRAP/DIAGNOSTIC at the host/CA
- Check the host/CA for test results.

Note: If unsuccessful, call the IBM CE.

PROBLEM DETERMINATION AID 2

This concerns the online wrap between the PTT modem and the NIA (Test 2, Figure 6).

- Put the PTT modem into the LOCAL LOOP position if it is available (for instance, loop 3 with TRANSPAC modems).
- Key 9 + ENTER.
- Check LED displays.

'A' 1	A ///	The line is OK. The problem is under PTT responsibility: Call the PTT.
'9' 1	9 /// / '9' 0	The line is not OK. See (19) in this section.

Note: In the case of a wrong manipulation (local loop position omitted for instance), re-initialize the 5973-L02 by entering "A" + Enter.

To stop the wrap test, perform the "A+ENTER" function. Once this function is performed, and before reconnection, it is advised to erase the log area (see Problem Determination Aid 5, in this manual).

PROBLEM DETERMINATION AID 3

This concerns the analysis of the CAUSE/DIAGNOSTICS delivered by the PTT network or by the NIA. When the network or the NIA has sent a RESTART, CLEAR, or RESET indication, answered with a confirmation, the NIA displays:

'B' E	or	'E' E
in switched mode		in permanent mode

If you want to know the CAUSE/DIAGNOSTIC sent by the network or the NIA, press "ENTER". The LED displays:

A i	x x	y y	z z

cyclically, where Ai is the address of the remote station concerned by the virtual circuit restarted, cleared or reset, xx is the coding of the RESTART, CLEAR or RESET command, yy the CAUSE and zz the DIAGNOSTIC. Entering a new function cancels this display.

xx=

FB	RESTART
13	CLEAR
1B	RESET

yy, zz: Refer to the tables provided by the public network used. (For certain PPSNs, zz is not significant).
When yy=00 the diagnostic is delivered by one of the remote NIAs.

In this case, refer to the
IBM 5973-L02 Specify Code 7043 Product Description Manual,
GA11-8643. Note that certain X25 networks replace zz delivered by the remote NIA with 00.

When YY=FF the diagnostic is delivered by the NIA itself.
Then the significance of zz is given in (15) below.

Note:
When a CLEAR, RESET, or RESTART is followed by others, the only one to be displayed will be the last one.

PROBLEM DETERMINATION AID 4

This concerns the use of the SDLC Link Test Function ("F3" SDLC COMMAND/RESPONSE).

When this function is available in your host, you can use it with the NIAs. Nevertheless, this test must be performed with a station in Normal Disconnected Mode (NDM) only. In the case of a leased multipoint SDLC line, and when the host allows it, this test can be run on one of the stations (this one being in NDM as above) without affecting the other stations which can continue working in Normal Response Mode (NRM). To get information on this function, consult your IBM Customer Engineer.

When the test response does not contain any data, it may mean that:

- The test was sent when the station was in normal connected mode (not accepted by the NIA).
- The test was sent with too much data for the virtual circuit (not accepted by the NIA).
- The test was sent with too much data for the terminal/cluster (not accepted by the terminal/cluster).

PROBLEM DETERMINATION AID 5: EVENT LOG FUNCTION

1. General Description:

   This function is provided as a tool to help the general problem determination which is normally performed using the normal LED display.

   It is suggested to use this function carefully and only if normal problem determination fails.

   This function is provided to automatically and dynamically log in a part of the memory called the LOG AREA, some events which may impact NIA operations on the network side, and offers the possibility of displaying on the LEDs this information in different ways, the operator using the keyboard for this purpose.

   The EVENT LOG function is composed of the following subfunctions:

   - The recording of events (automatic and internal)
   - Three special key functions:
     - Special erase key function
     - Special access key function
     - Special end-of-display key function
   - Fourteen specific key functions for the display:
     - Four quantitative display functions
     - Ten qualitative display functions

The meaning of these subfunctions will be explained later on.

The Log Area display is allowed at any time, whatever the NIA state — NIA left led previously showing A, B, C, D, E, or F — and does not impact NIA normal operations in any way.

After entering a special key function called special access key function and entering one of the specific key functions, the display of the requested information will be done cyclically on the two LEDs, data byte after data byte. These bytes are encoded and conversion tables are provided further on. In addition, this display may be performed with two speeds for the display: High speed display to have a look, and low speed display to allow the operator to take notes.
Should any other specific key function be requested, or should return to normal display be desired, the corresponding key function may be used at any time.

At each IML time (or whenever internal tests routines are performed) the Log Area is cleared and the internal log function is automatically ready to work without operator intervention. In the same way, for problem determination, a special key function called the special erase key function, is provided to reinitialize the Log Area any time after entering the special access key function.

Note:
When entering a LOG SUBFUNCTION, if a wrong digit has been keyed, the normal erase key function is always available to erase this wrong digit.
When entering a log subfunction not allowed, after keying the special access key, the display will be 1 on the left LED and F on the right LED. After keying ENTER, key the log subfunction again.

1. Type of Possible Events to be recorded in the Log Area:

   The events which may be recorded, are classified below by 'X25 type level':

   - Type 1: X25 level 1 (hardware link between NIA and PPSN)
   - Type 2: X25 level 2 (lap level between NIA and PPSN)
   - Type 3: X25 level 3 (PLP level between NIA and PPSN)

The following events may be recorded according to this classification:

- X25 level 1:
  - DSR OFF
  - CTS OFF
  - DCD OFF
- X25 level 2:

– SABM	| sent by the	DISC	| events sent
– DISC	| PPSN	REJ	| by the NIA–F
– REJ	| to the	CMDR	| to the PPSN
– CMDR	| NIA–F	RNR	|

  - BAD FCS | set by the NIA–F on frames
  - TIMEOUT | received from the PPSN
- X25 level 3:
  - RESTART | coming either
  - RESET | from the
  - CLEAR | NIA–F or the PPSN

2. Log Area Key Functions:

   It is assumed that the NIA is displaying A, B, C, D, E, or F on its left led

whatever the display is on the right led (normal operations).

- The special access key function (1+ENTER):
  The NIA being in normal operations, you may gain access to the display functions (called specific keys functions) by entering the special access key function at the keyboard: (1+ENTER).
  After entering this special key function, the NIA is displaying 1 on its left LED and its right LED is blank.
  When in this state, the NIA is waiting for the operator to enter any specific key function, the special erase key function, or the special end-of-display key function.

- The special erase key function (E+4+ENTER):
  This function may be run at any time after entering the the special access key function (and/or any specific key function).

  The EVENT LOG function being automatically initialized at every power-on time or during internal test routines, you may also re-initialize it by keying the special erase key function: (E+4+ENTER).

  When the LOG AREA is cleared, the two LEDs display 0. Then, the EVENT LOG function begins to log again the events which may occur and is waiting for a specific key function or the special end of display function.

- The special end of display key function (A+ENTER):
  This function is available after having entered the special access key function and/or any special or specific functions.
  This function is provided to return to the normal display mode and cancel the special access key function and by the way any other specific display function.

- Specific key functions (quantitative display functions):
  These specific key functions are available after performing the special access key function.
  Four functions correspond to counters for each type of event (level1, level2, level3) and to a counter for all these levels.
  The recording is done cyclically and the display of this recording is done on the two LEDs (00 to FF, that is, 000 to 255):
  See the conversion table.
  The required counter is displayed until a new command is requested: This new command may be another specific key function (qualitative or quantitative) , the special erase key function, or the special end of display key function.
  Should a new event occur while a quantitative display function is running, the corresponding counters would be updated but not the current display. These quantitative display functions are:

  - E+0+ENTER : number of all type 1, 2, or 3 events
  - E+1+ENTER : number of all type 1 events
  - E+2+ENTER : number of all type 2 events
  - E+3+ENTER : number of all type 3 events

Note that these counters (modulus 256) correspond to all events which have been recorded from the last power-on action (or running of internal test routines) or the last special erase key function.

The table below shows the conversion from hexadecimal to decimal numbers:

HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC
00	000	34	052	68	104	9C	156	D0	208
01	001	35	053	69	105	9D	157	D1	209
02	002	36	054	6A	106	9E	158	D2	210
03	003	37	055	6B	107	9F	159	D3	211
04	004	38	056	6C	108	A0	160	D4	212
05	005	39	057	6D	109	A1	161	D5	213
06	006	3A	058	6E	110	A2	162	D6	214
07	007	3B	059	6F	111	A3	163	D7	215
08	008	3C	060	70	112	A4	164	D8	216
09	009	3D	061	71	113	A5	165	D9	217
0A	010	3E	062	72	114	A6	166	DA	218
0B	011	3F	063	73	115	A7	167	DB	219
0C	012	40	064	74	116	A8	168	DC	220
0D	013	41	065	75	117	A9	169	DD	221
0E	014	42	066	76	118	AA	170	DE	222
0F	015	43	067	77	119	AB	171	DF	223
10	016	44	068	78	120	AC	172	E0	224
11	017	45	069	79	121	AD	173	E1	225
12	018	46	070	7A	122	AE	174	E2	226
13	019	47	071	7B	123	AF	175	E3	227
14	020	48	072	7C	124	B0	176	E4	228
15	021	49	073	7D	125	B1	177	E5	229
16	022	4A	074	7E	126	B2	178	E6	230
17	023	4B	075	7F	127	B3	179	E7	231
18	024	4C	076	80	128	B4	180	E8	232
19	025	4D	077	81	129	B5	181	E9	233
1A	026	4E	078	82	130	B6	182	EA	234
1B	027	4F	079	83	131	B7	183	EB	235
1C	028	50	080	84	132	B8	184	EC	236
1D	029	51	081	85	133	B9	185	ED	237
1E	030	52	082	86	134	BA	186	EE	238
1F	031	53	083	87	135	BB	187	EF	239
20	032	54	084	88	136	BC	188	E0	240
21	033	55	085	89	137	BD	189	E1	241
22	034	56	086	8A	138	BE	190	E2	242
23	035	57	087	8B	139	BF	191	F3	243
24	036	58	088	8C	140	C0	192	F4	244
25	037	59	089	8D	141	C1	193	F5	245
26	038	5A	090	8E	142	C2	194	F6	246
27	039	5B	091	8F	143	C3	195	F7	247
28	040	5C	092	90	144	C4	196	F8	248
29	041	5D	093	91	145	C5	197	F9	249
2A	042	5E	094	92	146	C6	198	FA	250
2B	043	5F	095	93	147	C7	199	FB	251
2C	044	60	096	94	148	C8	200	FC	252
2D	045	61	097	95	149	C9	201	FD	253
2E	046	62	098	96	150	CA	202	FE	254
2F	047	63	099	97	151	CB	203	FF	255
30	048	64	100	98	152	CC	204		
31	049	65	101	99	153	CD	205		
32	050	66	102	9A	154	CE	206		
33	051	67	103	9B	155	CF	207		

- Specific Key Function (Qualitative Display Functions): These specific key functions are available after performing the special access key function. Ten qualitative display functions correspond to the display of the last events recorded. The number of events which may be logged is from 00 to 64 (the recording is done cyclically by the NIA). Each event is encoded in three bytes. Using one of the qualitative display functions will show for each event a display on four bytes (type of event (T), cause byte if any (C), diagnostic byte if any (D)), plus one byte of blanks to separate one event from another):

Note that if there is no cause (C) or diagnostic byte (D) for level 1 or 2 events, they will be replaced by 00. The decoding is done below.

The display (and the recording) is done cyclically and will run until a new command is requested. This new command may be another specific key function (qualitative or quantitative), the special erase key function or the special end of display key function. Furthermore, the display is done at low speed: At any time during this display you may obtain a high speed display by pushing the ENTER key. Pushing the ENTER key again will slow the display back down. This operation may be performed as many times as you want.

It is important to note that every new event which would occur while a qualitative function is running, will be automatically added to the Log Area and to the display. The different qualitative function are:

- 0+1+ENTER : Display the last 8 events recorded
- 0+2+ENTER : Display the last 16 events recorded
- 0+3+ENTER : Display the last 24 events recorded
- 0+4+ENTER : Display the last 32 events recorded
- 0+5+ENTER : Display the last 40 events recorded
- 0+6+ENTER : Display the last 48 events recorded
- 0+7+ENTER : Display the last 56 events recorded
- 0+8+ENTER : Display the last 64 events recorded (display of the whole Log Area)
- E+5+ENTER : Display all the type 2 events recorded
- E+6+ENTER : Display all the type 3 events recorded

Note that when keying the last three functions, the display corresponds to the events contained at this very moment in the log area: Should more than 64 events occur since the last power-on action (running of internal test routines), or since the last special erase key function was performed, the number of events displayed might be different from the number displayed by the quantitative functions (in this case, the number displayed corresponds to all events which have occured since the last power-on action, or since the running of internal test routines, orsince the last special erase key function was performed).

The decoding of the display during one of these function is indicated below:

levels	description of the event	T	C	D	explanations
X25 level 1	DSR off	11	00	00	Note that the integration for every level 1 event is about 6 seconds.
	CTS off	12	00	00	
	DSR and CTS off	13	00	00	
	DCD off	14	00	00	
	DCD and DSR off	15	00	00	
	DCD and CTS off	16	00	00	
	DSR and DCD and CTS off	17	00	00	
X25 level 2 send by PPSN	SABM	21	00	00	
	DISC	22	00	00	
	FRMR	23	CC	DD	.for meaning of CC,DD see Note 1
	REJ	24	00	00	
X25 level 2 set or send by NIA	TIMEOUT	28	00	xx	.xx is the no. of retries
	REJ	29	00	00	
	RNR	2A	00	00	
	FRMR	2B	CC	DD	.for meaning of CC,DD see Note 1
	DISC	2C	00	00	.during data exhange except keyboard D+ENTER function
	DISC	2D	00	00	.in no response to SABM retries except keyboard D+ENTER function
	BAD FCS	2E	00	00	.set by NIA on received frames
X25 level 3 send by PPSN or remote side	RESTART	30	cause	diag.	.except initial restart
	RESET on VC=0 or 4	34	cause	diag.	see Note 2
	RESET on VC=1	35	cause	diag.	
	RESET on VC=2	36	cause	diag.	
	RESET on VC=3	37	cause	diag.	
	CLEAR on VC=0	38	cause	diag.	
	CLEAR on VC=1	39	cause	diag.	
X25 level 3 send by NIA	RESTART	40	00	diag.	see Note 2
	RESET on VC=0 or 4	44	00	diag.	
	RESET on VC=1	45	00	diag.	
	RESET on VC=2	46	00	diag.	
	RESET on VC=3	47	00	diag.	
	CLEAR on VC=0	48	00	diag.	
	CLEAR on VC=1	49	00	diag.	

Note 1: For FRMR, the cause byte refers to bits 1, 2, 3, 4, 5, 6, 7, 8, and the diagnostic byte refers to bits 17, 18, 19, 20, 21, 22, 23, 24 of the X25 CCITT Recommendation (Geneva, 1980) FRMR description (table 4/X25). For information, the cause byte (CC) refers to the rejected frame control field and the more frequently encountered diagnostics (DD) will be:

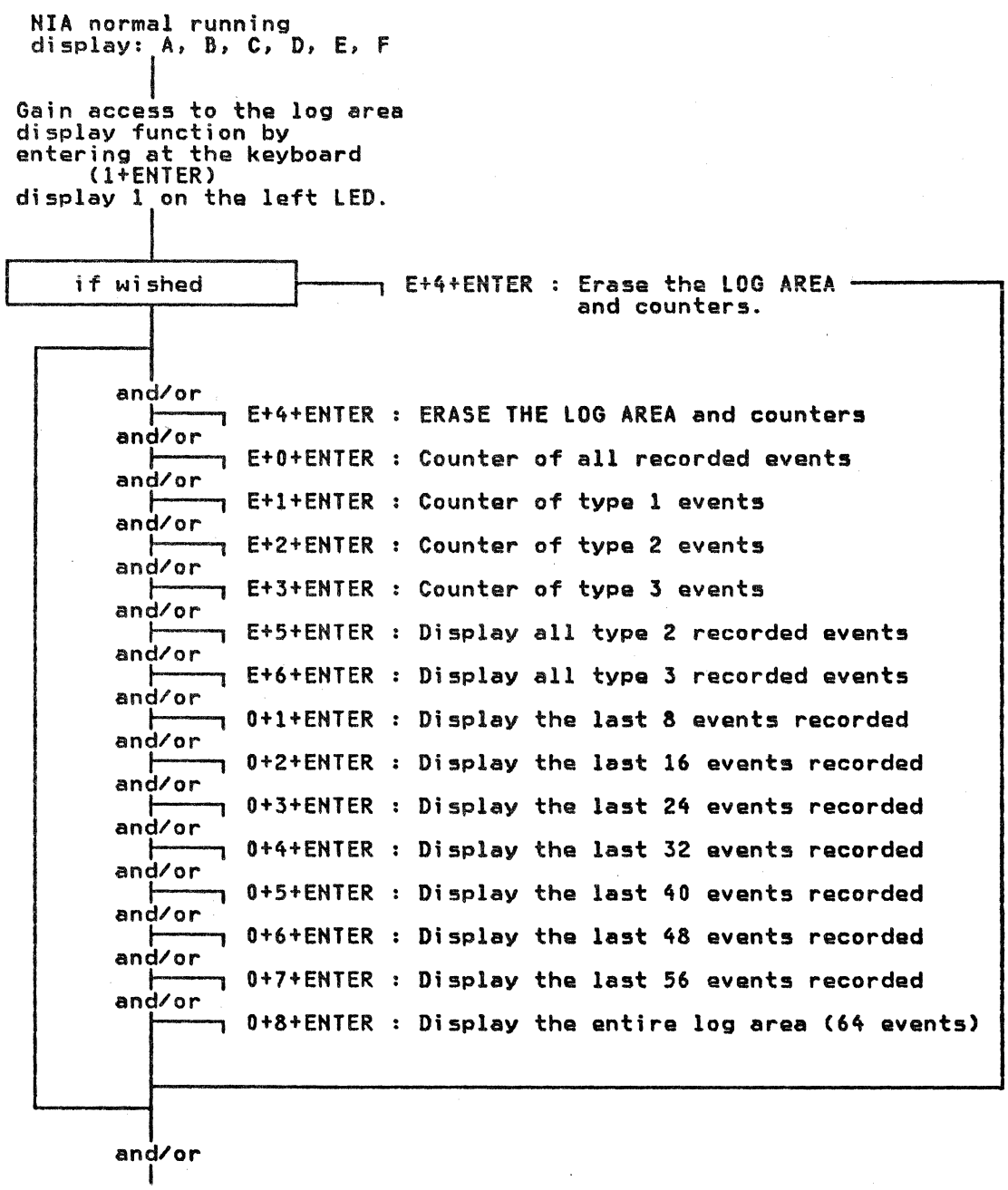
- 01 = The control field was invalid.
- 03 = The control field was invalid because the frame contained an information field which is not allowed with this command.
- 04 = The information field received exceeded the maximum established capacity of the NIA or PPSN reporting the rejection condition.
- 08 = The N(R) was invalid.

Note 2: For RESTART, RESET, and CLEAR:

1. If the RESTART, RESET, or CLEAR has been sent by the frontal NIA (event type 40 to 49) the cause byte of the display (00) is the one sent over the PPSN. Note that this byte is generally displayed as (FF) during normal problem determination display. For diagnostic meaning, refer to the "Application Program (Normal Running)" Section of this manual.

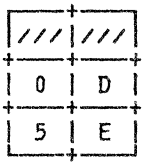
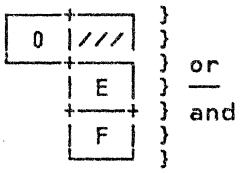
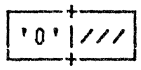
2. For events number 34 to 39, the cause byte is 00 if the RESET or CLEAR has been sent by the IBM remote side, for instance using a remote NIA. Refer to the Product Description Manual, GA11-8642). Should the cause byte be different from 00, refer to the diagnostics delivered by the network itself.

3. Key function summary for event log function:



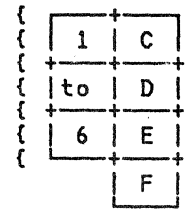
Exit from the LOG ACCESS PROCEDURE by performing the special end-of-display key function (A+ENTER). The NIA will now display its current state at this very moment (A, B, C, D, E, or F on its left LED).

INITIAL MACHINE LOADING ANALYSIS (IML)

(PROBLEM)	RECOVERY
Power ON	
(1) Power ON indicator does not light	• Check that the power plug is plugged in the wall outlet
(2) Check indicator is ON (lit)	• Reset the power switch OFF Wait 5 seconds Retry power ON 3 times If unsuccessful, go to 20.
(3) LED displays 	• Wait for 2 minutes and turn power OFF • Check if a cassette is correctly mounted in the reader (check that the label is on the visible side) and power ON • Power OFF and try the second cassette if the reader seems to be OK. Power ON (if OK with this cassette, contact the IBM CE for a new spare cassette). • If in 5E, check for PTT modem connection. Power OFF and power ON to retry. If unsuccessful, go to 20.
(4) LED displays 	• Check as in 3 above • Check that the cassette is used on the correct side. • Power OFF: Replace the cassette by the second one. Power ON. If unsuccessful, go to 20.
(5) LED displays  ' and no IML after 3 mn	• Power OFF/ON with the second cassette. • Check that the soundhead of the cassette reader is clean. If unsuccessful, go to 20.
(6) Any other abnormal display not described here:	• Retry with the second cassette If unsuccessful, go to 20.

CE ROUTINES (AFTER IML)

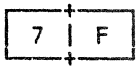
(7) LED displays



or

- Retry from IML
- If 5F or 5E check PTT modem connection and power ON to retry.
- If modem is not operating, call the PTT
  If modem is OK, go to 20.

(8) LED displays

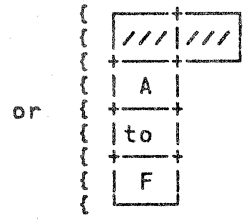


- Check connection at the back of the 5973-L02

If unsuccessful, go to 20.

APPLICATION PROGRAM (NORMAL RUNNING)

(9) Check indicator is ON (lit) and LED display is:



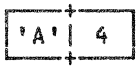
- Retry from IML (Power OFF, Power ON)

If unsuccessful, go to 20.

(10) LED displays

- Check that the PTT modem is power ON, check for DSR ON (107) if this display is available. Check that the PTT modem has its switch in the "Normal" position for transmission (see the PTT Modem documentation)
- Check cable connections
- Use WRAP test "9" (PD AIDS 2)
  - if WRAP test is OK, call the PTT for line checking
  - If not, go to 20.

(11) LED displays



- Use WRAP test "9" as in 19. The answer to SARM or SABM is not received.

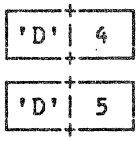
(12) LED displays

- Call the PTT after several retries. The SARM is not received in double exchange.

(13) LED displays

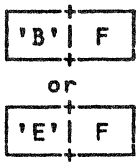
- Check that the host/CA is power ON and enabled See the DTE Interface section of this manual: Data terminal ready (CD/108.2)
- Check cable connections If unsuccessful, go to 20.

(14) LED displays



- The answer to the X25 DISC is not received. Check the PTT modem and call the PTT.
- Key A + Enter to restart the complete data exchange from the connection to the network (normal running).

(15) LED displays



- You have keyed a wrong function. To correct this situation, key the right function requested by the left LED.

- In switched mode, CLEAR, RESTART, RESET sent or received.

- In permanent mode: 1. RESET sent or received on one or several virtual circuits and no more station contacted. 2. RESTART sent or received.

- In permanent mode: RESET on one or several circuits with at least one remote station still connected

When CLEAR or RESET has been sent by the remote NIA (00 value in cause yy) or by the network, see "Problem Determination AID 3".

When the CLEAR, RESTART or RESET has been sent by the NIA (FF value in CAUSE yy), the diagnostic display (zz) has the following meaning:

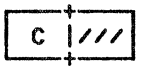
02	Indicates that the DTR is OFF or was OFF (microcut for instance). If the host/CA's DTR is always OFF, enable it. When the DTR goes ON, the diagnostic will stay until the contact between the host and the cluster is made. See the "DTE Interface" section of this manual: Data Terminal Ready (CD/108.2).
03	Loop or memory parity error in the NIA. Disconnect and retry. Inform the IBM CE at the earliest opportunity.
06	Frame sent with wrong VC number: . VC number 0 in SNBU mode on PPSN allowing lower VC number 0. . VC number 1 in SNBU mode on PPSN allowing lower VC number 1. . VC number 1 in permanent mode on PPSN allowing lower VC number 0. . VC number 2 in permanent mode on PPSN allowing lower VC number 1.
07	SDLC procedure error
17	Spare
08	PLP header invalid
18	Unknown format
09	PLP local procedure error Received P(R) invalid
19	PLP local procedure error Received P(S) invalid
0A	PLP local procedure error received message in error with PLP status
0B	Sequence lost in info exchange PLP (received P(S) is valid but not in the expected sequence)).
0C	LLC mode not OK in PLP call (type of IBM protocol used).
6C	LLC sequence lost
1C to 5C	LLC response or data received at the wrong time or unknown
7C	LLC test response received at the wrong time

- Disconnect and retry call if any (switched).

Note: The data exchange is cancelled and must be started again.

MANUAL "CLEAR" (SWITCHED MODE ONLY)

C + Enter (16) — LED displays



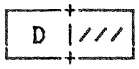
More than 1 minute

- Retry C + ENTER 3 times

If unsuccessful, disconnect and retry call if necessary.

MANUAL "DISCONNECT"

D + ENTER (17) +— LED displays



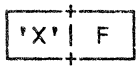
more than 30 seconds

- Retry D + Enter 5 times

If unsuccessful, Key A + ENTER
If still unsuccessful, go to 20.

AT KEYBOARD ENTRY

from A to F +ENTER (18) +— LED displays

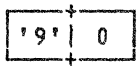


- Entered value is not the expected one. X was the expected value.
- Retry with x value or disconnect

If unsuccessful, key A + ENTER

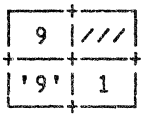
If unsuccessful, go to 20.

Modem WRAP test +ENTER (19) +— LED displays



- Line between PTT Modem and 5973-L02 defective.
- Check that the PTT modem is ON, DSR (107), DCD (109), CTS (106) lit. If DSR, DCD, not lit contact the PTT. If DSR, DCD lit but CTS not lit, check if RTS (105) is lit. If yes, contact the PTT. If not, continue.
- Check cable connections
- Retry WRAP test

If unsuccessful, call the IBM CE



- Check the PPT modem RD (104), CTS (106) lit If RD is not lit, contact the PTT If CTS not lit, check if RTS (105) is lit. If yes contact the PTT. If not, continue.
- Check cable connections
- Retry WRAP test

If unsuccessful, call the IBM CE

Note: The correct result must be A (flasing or not) on the left LED.

WRAP test "9" must be performed with the modem's local loop position ON. In the case of a wrong manipulation, re-initialize the 5973-L02 by performing POWER OFF, POWER ON.

WRAP test "9" and the WRAP test of the host are exclusive. They cannot run simultaneously.

(20) +

Retry the complete problem determination from loading (IML). If unsuccessful again, call the IBM CE if not under the PTT's responsibility.

LINE MODEM INTERFACE

The modem interface is under the control of the X25 adapter card. It monitors the communications line for:

- Serialization of data on the line
- Deserialization of data from the line
- Zero bit insertion/deletion
- Flag character decoding
- Block check character accumulation and insertion for transmit operations
- Block check character checking in receive operations
- Abort and idle sequence decoding
- Line status control
- Adjustable timeout.

It provides eight registers with direct access from the processor to buffer the miscellaneous statuses of the line attachment control code.

A local loop facility is provided to test the adapter. It is used in CE routines.

FRAME CONTROL SEQUENCES

Flag

The flag is the following sequence: 01111110.

Abort

The adapter interprets a binary 0 followed by a sequence of seven binary ones (01111111) as an abort, and sets a bit for the processor.

Idle

The adapter recognizes an idle sequence when sixteen consecutive ones have been received from the line.

BCC (Block Check Character)

The transmitter performs a division of the binary value of the transmission to be checked, using the following generator polynomial:

$$X^{16} + X^{12} + X^{5} + 1$$

Integer quotient digits are ignored and the transmitter sends the complement of the resulting remainder value as the FCS field.

NETWORK INTERFACE

The IBM 5973-L02 provides an EIA Recommended Standard 232C and CCITT Recommendation V.24 type interface for attachment to the network.

The following list shows the interface lines used by the IBM 5973-L03.

Pin Number	EIA/CCIT Circuit	Line Description
2	BA/103	Transmitted data
3	BB/104	Received data
4	CA/105	Request to send
5	CB/106	Clear to send
6	CC/107	Data set Ready
7	AB/102	Signal ground
8	CF/109	Received line signal detector
10	--/--	Signal ground
15	DB/114	Transmitter signal element timing
17	DD/115	Receiver signal element timing
20	CD/108.2	Data terminal ready
25	--/142	Test (can be inhibited by strapping)

Transmitted Data (BA/103)

This circuit transfers data from the IBM 5973-L02 to the network modem for transmission. The IBM 5973-L02 holds circuit 103 in the Mark condition when no signals are to be transmitted or when any of the following circuits are in the OFF condition:

- Request to send (CA/105)
- Clear to send (CB/106)
- Data set ready (CC/107)
- Data terminal ready (CD/108.2).

Received Data (BB/104)

The network modem generates signals on this circuit in response to data signals received from the network channel.

Request to Send (CA/105)

The 5973-L02 generates signals on this circuit to condition the network modem for data transmission.

Clear to Send (CB/106)

The network modem must send signals on this circuit to the IBM 5973-L02, indicating whether the network modem is ready to transmit data.

Data Set Ready (CC/107)

The network modem generates signals on this circuit to indicate its status.

Signal Ground (AB/102)

This conductor establishes the common ground reference for all interface lines.

Receive Line Signal Detector (CF/109)

The network modem generates signals on this circuit. The ON condition of this circuit is present when the network modem is receiving a signal that meets its suitability criteria.

Transmitter Signal Element Timing (DB/114)

Signals on this circuit are used to provide the IBM 5973-L02 with signal element timing information. The IBM 5973-L02 changes the transmitted data signals simultaneously with the OFF to ON transitions of this circuit.

The transmitter's signal element timing pulses must have an accuracy of ± 0.01%. This timing signal must be a square wave with a 50% ± 10% duty cycle.

Transmitter signal element timing pulses must be continuous whenever circuit CC/107 (data set ready) is ON.

Receiver Signal Element Timing (DD/115)

Signals on this circuit are used to provide the IBM 5973-L02 with received signal element timing information. The transition from ON to OFF must indicate the center of each signal element on BB/104 circuit (received data).

Data Terminal Ready (CD/108.2)

The IBM 5973-L02 generates signals on this circuit. The IBM 5973-L02 presents an ON condition on this circuit at power ON if the data set ready circuit is active and the test circuits are inactive.

The ON condition is still present even if the data set ready goes to the OFF condition.

Test

The network modem generates signals on this circuit to indicate a test in process. It is in an ON condition when there is:

- Either a TEST command on the PTT junction (automatic or manual),
- Or a manual WRAP command on the network modem (see function "9").

5973-L02 LINE DTE INTERFACE

The DTE Interface is under the control of the SDLC adapter card. It monitors the DTE Interface for:

- Serializing of data to the DTE
- Deserializing of data from the DTE
- Zero bit insertion/deletion
- Flag character decoding
- Block check character accumulation and insertion for transmit operations to the DTE
- Block check character checking in receive operations from the DTE
- Abort and idle sequence decoding
- Line status control
- Adjustable timeout.

It provides eight registers with direct access by the processor to buffer the miscellaneous statuses of the DTE attachment control code.

A local loop facility is provided to test the adapter. It is used in CE routines.

FRAME CONTROL SEQUENCES

Flag

The flag sequence is: 011111110.

Abort

The adapter interprets a binary 0 followed by a sequence of seven binary ones (01111111) as an abort, and sets a bit for the processor.

Idle

The adapter recognizes an idle sequence when sixteen consecutive binary ones have been received from the DTE attachment.

BCC (Block Check Character)

The transmitter performs a division of the binary value of the transmission to be detected, using the following generator polynomial:

$$X^{16} + X^{12} + X^{5} + 1.$$

Integer quotient digits are ignored and the transmitter sends the complement of the resulting remainder value as the FCS field.

DTE INTERFACE

The following list shows the interface lines used by the IBM 5973-L02:

Pin Number	EIA/CCIT Circuit	Line Description
2	BA/103	Transmitted data
3	BB/104	Received data
4	CA/105	Request to send
5	CB/106	Clear to send
6	CC/107	Data set ready
7	AB/102	Signal ground
8	CF/109	Received line signal detector
15	DB/114	Transmitter signal element timing
17	DD/115	Receiver signal element timing
18	CX/--	Wrap (can be inhibited by strapping)
20	CD/108.2	Data terminal ready

LINE DESCRIPTION

Transmitted Data (BA/103)

This circuit transfers data from the DTE (Data Terminal Equipment) to the IBM 5973-L02. The DTE holds circuit 103 in the mark condition when no signals are to be transmitted or when any of the following circuits are in the OFF condition:

- Request to send CA/105
- Clear to send (CB/106)
- Data terminal ready (CD/108.2).

Received Data (BB/104)

The 5973-L02 generates signals on this circuit in response to data signals received from the network modem.

Request to Send (CA/105)

The DTE generates signals on this circuit to condition the 5973-L02 for data transmission.

Clear to Send (CB/106)

The IBM 5973-L02 must generate signals on this circuit to the DTE, indicating whether it is ready to accept data. The ON condition is present when the 5973-L02 detects an ON condition on circuit 105, if the virtual circuit has been established with the PTT network.

Data Set Ready (CC/107)

To indicate its status, the 5973-L02 generates signals on this circuit. It is in the ON condition after successful initialization and when the network modem is ready.

Signal Ground (AB/102)

This conductor establishes the common ground reference for all interface lines.

Receive Line Signal Detector (CF/109)

The 5973-L02 generates signals on this circuit. The ON condition is present when the 5973-L02 detects an OFF condition on request to send (CA/105) on the cluster side.

Transmitter Signal Element Timing (DB/114)

Signals on this circuit provide the DTE with signal element timing information. The DTE changes the transmitted data signals simultaneously with OFF to ON transitions of this circuit.

The transmitter signal element timing pulses must have an accuracy of ± 0.01%. This timing signal is a continuous square wave form with a 50% ± 10% duty cycle.

Transmitter signal element timing pulses are continuous whenever circuit CC/107 (data set ready) is ON.

Receiver Signal Element Timing (DD/115)

Signals on this circuit are used to provide the DTE with received signal element timing information. The transition from ON to OFF indicates the center of each signal element on circuit BB/104 (received data).

Wrap (CX)

The DTE provides signals on this circuit. An active level sets the IBM 5973-L02 to local test. The IBM 5973-L02 answers by setting signals on circuits 106/107/109 after receving a signal on circuit 105. Timings are continuously provided on circuits 114/115.

Data Terminal Ready (CD/108.2)

The DTE generates signals on this circuit to allow the IBM 5973-L02 to establish the virtual circuit with the PTT network. When the DTR is OFF, the 5973-L02 displays different sorts of diagnostics on the LEDs according to wether a CLEAR (switched mode) or a RESET (permanent mode) may or may not be performed.

1. If the X25 connection through the network is established when the DTR goes OFF, a CLEAR (switched mode), or a RESET (permanent mode) may be performed with the LEDs displaying 'B'E or 'E'E. Pushing the ENTER key will show a CLEAR or a RESET with the diagnostic 02.

   In switched mode, this corresponds to the case where at least the call has been made (NIA left LED previously in 'E' or 'F').

In permanent mode, this corresponds to the case where at least the link setup has been performed (NIA left LED previously in 'E' or 'F').

2. If the X25 connection through the network is not yet established, the diagnostic displayed by the LEDs may be A0, D1 (during disconnection), A1 (before the link setup), B1 (before the X25 call in switched mode), or E1 (in permanent mode).

   In switched mode, if the DTR drops when the NIA has performed the link setup, the NIA still displays B: In this case, the operator will be informed when performing the call over the network by 'B'E, with diagnostic 02 when pressing the ENTER key.

PHYSICAL PLANNING 5973-L02

1. **Dimensions**

	Width	Depth	Height
In centimeters:	2.5	41	24.5

2. **Service Clearances:**

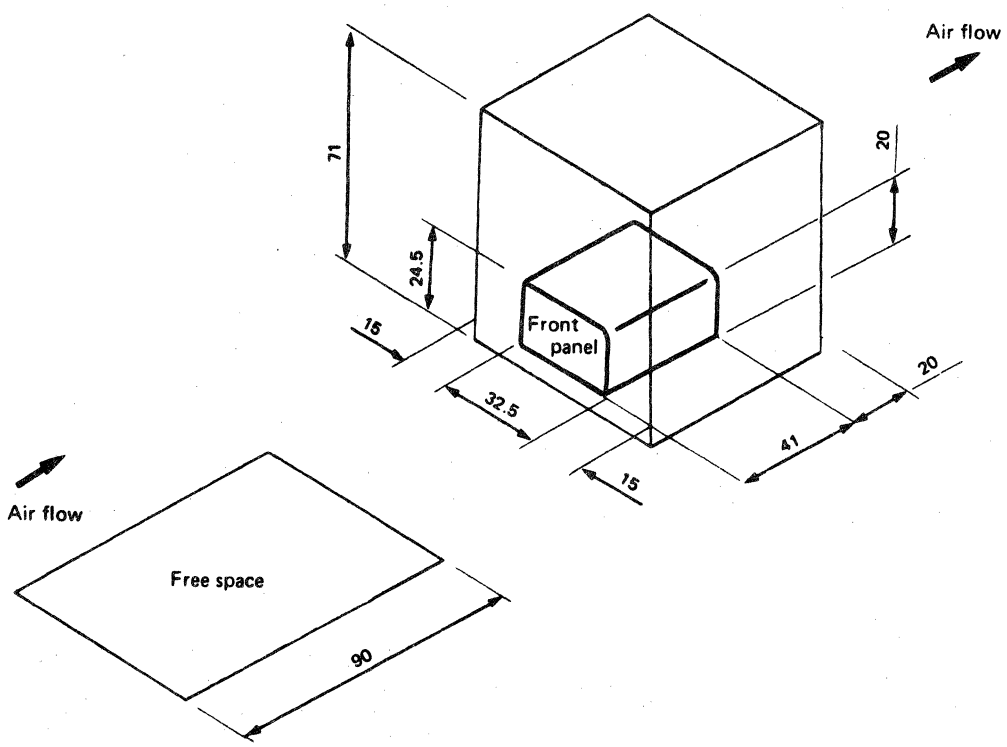


Figure 7. IBM 5973-L02 Measurements and Service Clearances

3. Weight: 11 Kilograms

4. Heat Output:

   BTU/hour 320

   Kcal/hour 80

5. Air flow: 1.7 m^3/mn (60 Ft^3/mn)

6. Environmental Requirements

   a. Temperature:

      10 to 40.6 Celsius (50 to 105 F)

   b. Relative Humidity:

      8 to 80%

   c. Maximum wet bulb:

      26.7 Celsius (80 F)

7. Power Requirements

   a. 100, 110, 112.5, 115, 123.5 or
      200, 208, 220, 230, 235 volts a.c.

   b. Voltage Tolerance: ± 10%

   c. Phase: Single

   d. Frequency range: 49 to 61 Herzs

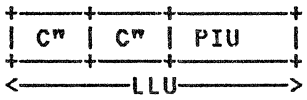
   e. Power Consumption: 200 VA at the rated voltages.

5973-L02 LOGICAL LINK CONTROL DESCRIPTION

The LLC is the lowest end-to-end user procedure.

THE LLC PROCEDURE

The LLC assumes the exchange of Logical Link Units (LLUs) between the host and the cluster. It provides for both virtual circuit status control, and control of the information transfer's integrity, using N(S). Error recoveries are not performed. This means that in the case of a level 2 LLC, should a incorrect N(S) occur, the virtual circuit is reset. For a permanent virtual circuit, a CLEAR packet is initialized.



The C field (two bytes) corresponds to the C" field shown.

It is a full duplex point-to-point procedure working in asynchronous response mode. It operates with primary/secondary relationships.

Primary = 3705-II or 3705-M80 with X25NPSI or NIA-F

Secondary = 5973-L02 (NIA-R)

This LLC uses the two-byte Physical Services Header (PSH) as C"s, to convey in an X25 packet the CONTACT and DISCONTACT responses of the cluster, received by the SDLC layer of the NIA-R after translation in accordance with the following table:

SDLC		LLC/PSH	
XID	——>	PSXID	——>
XID	<——	PSXID	<——
SNRM	——>	PSCONTACT	——>
UA (NSA)	<——	PSCONTACT	<——
DISC	——>	PSDISC	——>
UA (NSA)	<——	PSDISC	<——
SNRM	——>	PSCONTACT	——>
DM (ROL)	<——	PSDISC	<——
TEST	——>	PSTEST	——>
TEST	<——	PSTEST	<——
RQD	<——	PSDISC	<——
DISC	——>	PSDISC	——>
UA (NSA)	<——		

An end-to-end sequence control is also performed by using a single module 256 sequence number in the PSH used to convey a PIU or part of a PIU in an X25 packet.

If the PIU is too large to be sent in a single packet, the PSH segmenting indicator is used.

Note that the PSH segmenting indicator is used for information only. This means that the length of data in both the XID (answer) and TEST (both ways) must be limitied to the packet length used by the PPSN minus two bytes (PSH). For example, with a packet length of 128, the length of data for the XID answer is limited to 126 bytes.

PSH FORMAT

The PSH is always composed of two bytes in the NIA:

PSH TYPE FID-FOX LLC	BYTE 1 0 1 2 3 4 5 6 7	BYTE 2 0 1 2 3 4 5 6 7	DATA FOLLOWS ?
PSDISC	1 1 1 1 0 0 0 1	0 0 0 0 0 0 1 0	NO
PSXID	1 1 1 1 0 0 0 1	0 0 0 0 0 1 0 0	YES if answer (limited)
PSTEST	1 1 1 1 0 0 0 1	0 0 0 0 0 1 1 0	YES both ways (limited - See Note 2)
PSCONTACT	1 1 1 10 0 0 1	0 0 0 0 1 0 0 0	NO (See Note 2)
LAST OR ONLY SEGMENT INFO	1 1 1 1 0 0 1 0	<————> Seg. Numb.	YES
1st OR MID SEGMENT INFO	1 1 1 1 0 1 1 0	<————> Seg. Numb.	YES

Bit 6 of byte 1 ——>Sequence number is present

Bit 5 of byte 1: Segmenting indicator bit

Note 1: PSFRMR (coded X'0A') is not used by the NIA. This case is reported at PLP level in a CLEAR or RESET command.

Note 2: The SDLC cluster address is carried behind the two LLC bytes in PSTEST and PSCONTACT, going from the remote NIA to the host side.

SEGMENTING A PIU

The PIU received from the host/CA can contain up to 269 characters (the RU being limited to 256 bytes in NIA-F).

Because the subscription on the X25 network may use packet lengths inferior to 269 bytes, The NIA-F must separate the data into several packets.

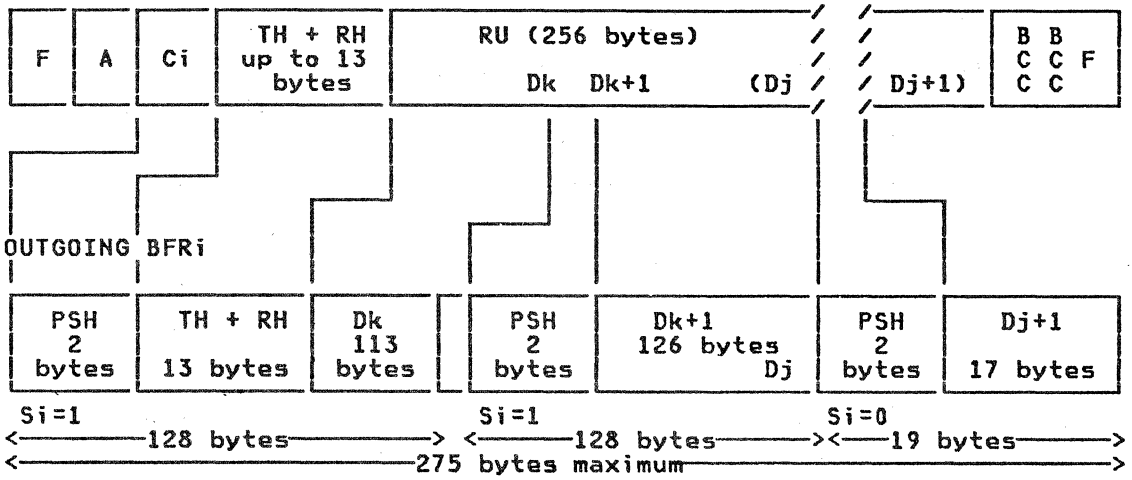
This operation known as segmenting, is executed directly in the outgoing buffer when the characters are received from the SDLC line. The BNF layer updates a counter when each character is received and, when the count is equal to the length of an X25 packet, a new 2-byte PSH is incorporated to the buffer before the next received character is stored.

If this next character does not exist, it means that the received PIU had the correct length to be sent through the network. The PSH that was created is then overwritten when the next PIU is received.

If this character does exist, segmenting occurs and the BNF layer returns to the PSH label of the created segment to incorporate the SI (segmenting indicator) bit in bit 5 of the first byte. The BNF layer ensures that the pointers are in the correct positions to permit the overwriting of the created X25 packets, should the frame be incorrect at the end of the received PIU.

Segmenting Example (With TH Format FID1)

RU = 256
Packet length = 128
TH + RH = 13



DESEGMENTING PACKETS TO RECOMBINE A PIU

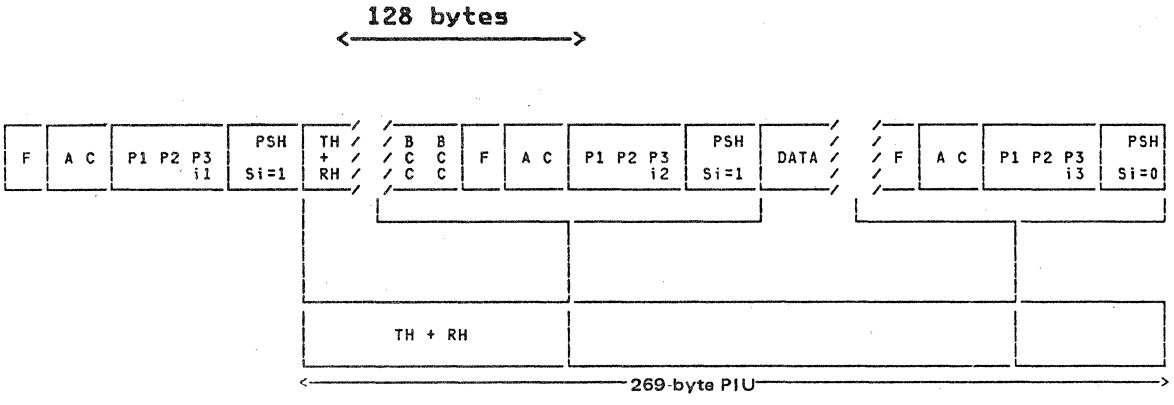
The packets received from the X25 line contain a 2-byte PSH at the beginning of the data string. If bit 5 of the first byte of the PSH is set to 1, the received packet contains only a part of the PIU sent by the remote cluster.

The BNF layer recombines the PIU in the incoming buffer directly, by keeping the first string of data in the buffer (no update of the XMIT pointer) and by eliminating the 2-byte PSH and before storing the characters of the next packet. When no more data is needed to make up the PIU (bit 5 of the first byte of the PSH set to 0 in a received packet), the BNF updates the XMIT pointer to allow transmitting the completed PIU to the host/CA.

The BNF layer performs the necessary recoveries is there is an incorrect frame in an X25 frame conveying the packets, to allow overwriting correctly the erroneous data in the buffer.

Example of Desegmenting (With TH Format FID1)

RU = 256
TH + RH = 13
Packet length = 128



Note: These functions are performed on the cluster side by NIA-R in the same manner as is done on the host side by NIA-F.

HOW THE SDLC IS CONTROLLED BY THE LLC

When the LLC receives a PS CONTACT command, it orders the SDLC to issue an SNRM command to the cluster. When it receives the NSA response, the SDLC transmit it to the LLC and puts the 5973-L02 in the F displayed status.

The SDLC conditions its polling by means of this F status.

The LLC data received when the 5973-L02 is not in the F status is discarded. It is not transmitted to the cluster. When the SDLC receives a DM response, it sends an SNRM only if the 5973-L02 is in the F status. If the 5973-L02 is not in the F status, the SDLC ignores the DM response.

When the LLC receives a PSDISC command, it orders the SDLC to send DISC to the cluster. When the UA response is received, the SDLC transmits it to the LLC and puts the 5973-L02 in the F displayed status. Then, the polling operation is stopped.

SDLC REPORT TO THE PLP

When the SDLC sends a command without obtaining a response, it enters a timeout recovery procedure and re-issues the command that was not answered five times with about a 4-second interval between each retransmission. If there is still no answer afetr the fifth retransmission of the command, the SDLC orders the PLP to send a RESET or a CLEAR REQUEST to the network (switched or permanent VC).

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IBM 5973-L02 Network Interface Adapter
Specify Code 7042
Product Description Manual

This Technical Newsletter provides replacement pages for the subject publication. The replacement pages are only valid to customers using the PN2 microcode (July 82 EC). Regular (PN1 - current EC) customers should continue to use the dash 2 level of the current base publication.

These replacement pages remain in effect for any subsequent releases/levels, unless specifically altered. Pages to be inserted and/or removed are:

i, ii
1, 2
2.1 (added)
7, 8
11–16
16.1–16.6 (added)
19, 20
20.1 (added)
27, 28

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Summary of Amendments

Technical changes to the text.

Note: *Please file this cover letter at the back of the manual to provide a record of changes.*

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IBM 5973-L02 Network Interface Adapter
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Pages to be inserted and/or removed are:

i, ii
1-6
29-Back Cover

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