ALARM UNIT (ALM:X0314)

FUNCTIONAL DESCRIPTION

1. GENERAL

1.01   This section is a cover sheet for the NEC America, Inc., Alarm Unit
(ALM:X0314) Functional Description. This section is reproduced with
permission of NEC America, Inc., and is equivalent to NEC practice NECA
365-407-402, Issue 1.

1.02   Whenever this section is reissued the reason(s) for reissue will be listed in
this paragraph.

1.03   This section provides a general description of the Alarm Unit (ALM:X0314-).

1.04   If corrections are required in the attached document, use Form-3973 as
described in Section 000-010-015.

1.05   If equipment design and/or manufacturing problems should occur, refer to
Section SW 010-522-906 for procedures on filing an Engineering complaint.

2. ORDERING PROCEDURE

2.01   The Alarm Unit (ALM:X0314) may be ordered via the Southwestern Inventory
Management System (SWIMS).

2.02   To order additional copies of this practice, use NECA 365-407-813SW as the
section number.

3. REPAIR/RETURN

3.01   Malfunctioning units may be returned to NEC America, Inc., for repair.

Attachment: NEC America, Inc.
Alarm Unit (ALM:X0314)
Functional Description

NEC

ALARM UNIT (ALM : X0314)

FUNCTIONAL DESCRIPTION

NEC America, Inc.
Transmission Division

♦ ALARM UNIT (ALM:X0314)♦
FUNCTIONAL DESCRIPTION

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ILLUSTRATIONS

TABLE

1. GENERAL

1.01 This practice provides a general description of Alarm unit (ALM; X0314-) and contains the following information.

- Description
- Functional operation
- Controls and indicators
- Strapping selection

1.02 Whenever this practice is reissued, the reason for reissue will be listed in this paragraph.

2. DESCRIPTION

2.01 This unit consists of three epoxy-glass printed wire board (PWB); main assembly, sub-1 assembly and sub-2 assembly and associated circuit components. Printed circuit wiring is etched on both sides of the PWB. On the left side surface of the board (viewed from front), the components are located. Flat jumper cable with connectors are used for connection between these PWBs.

2.02 LEDs and switches for controlling and indicating the operational status are located on the front edge of sub-1 and sub-2 assembly board.

2.03 This unit is mounted in E8980A shelf of the FD-2240A with back board connectors J3 (main assembly) and J4 (sub assembly). This unit inputs and outputs are terminated at the connector on the rear of main and sub-2 boards.

2.04 The unit designation, unit code, manufactured date and serial number are printed on the right side surface of the main board connector.

2.05 The lower front edge of main and sub-2 assembly boards are fitted with ejectors to facilitate insertion and removal of the boards from the shelf. A CLEI and bar code label is placed on the surface of main PWB ejector. See Figure 4-1.

2.06 ◆Five◆ groups are provided with the ALM unit. Table 2-1 lists these ALM unit groups.

◆Table 2-1◆

ALM Unit Group

| No.	Group and Unit Code	Power Voltage	Remarks
1	X0314A	-48 V	Parallel SV alarm
2	X0314A1	-48 V	Parallel SV alarm ◆New version of Grp:0A00
3	X0314B	-24 V	
4	◆ X0314AA	-48 V	Serial SV alarm
5	X0314AB	-24 V	

3. FUNCTION OPERATION

3.01 The Alarm (ALM) unit is a microprocessor controlled alarm system. It
monitors the alarm status of all units. When a failure occurs, the ALM
unit analyzers the resulting alarms and display an alphanumeric alarm message.
The displayed message indicates the type of failure, and the unit which should
be replaced to correct the failure. ALM unit specifies two types, one is to
close office and SV alarm relays when a failure occurs, and another is to close
office relays and serially send and receive alarm information according to TBOS
protocol when a failure occurs. Figures 3-1 and 3-2 show diagrams of two types
of ALM unit.

3.02 ALM unit functions are implemented through an 8 bit microprocessor ROM and
RAM. Bidirectional data buses are utilized to read alarm data signals
from the FD-2240A's various alarm detection circuits and to send data to
circuitry that in turn generates the alphanumeric displays appearing on the
front of the shelf or to circuitry that transfers data to the far-end station.
CPU output data signals from other ports go to the various on-board decoding
circuits which generate control signals necessary for reading data, light LED
indicators and energize alarm relays. Also, CPU for Grp. X0314AA/AB sends out
serial alarm data.

A. Alarm Signal Polling

3.03 The CPU sends polling addresses to a decoder (DEC) circuit which generates
strobe signals. Most of the strobe signals go to the outer units, where
they enable the alarm output circuits. The remaining strobe signals go to a
selection gate (SEL GATE) circuit. The SEL GATE circuit selects other data
signals for application to the data bus. These data signals include the
following:

(1) PWR unit failure alarm signals

(2) Fuse alarm signal

(3) Unit insertion status signals

(4) Remote loopback (RLB) detection signals

(5) Alarm cutoff (ACO), maintenance (MAINT) and scroll (SCRL) signals
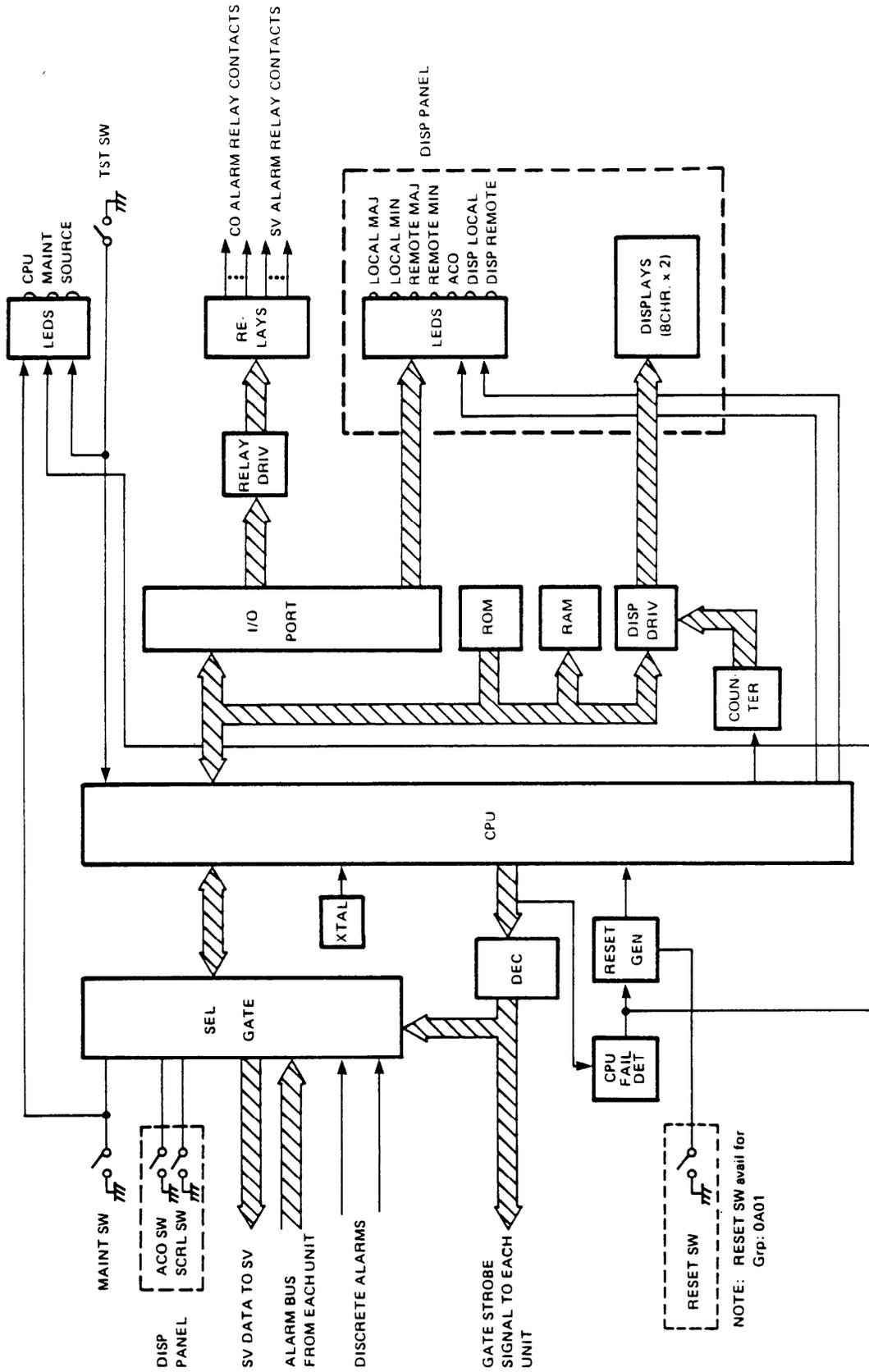
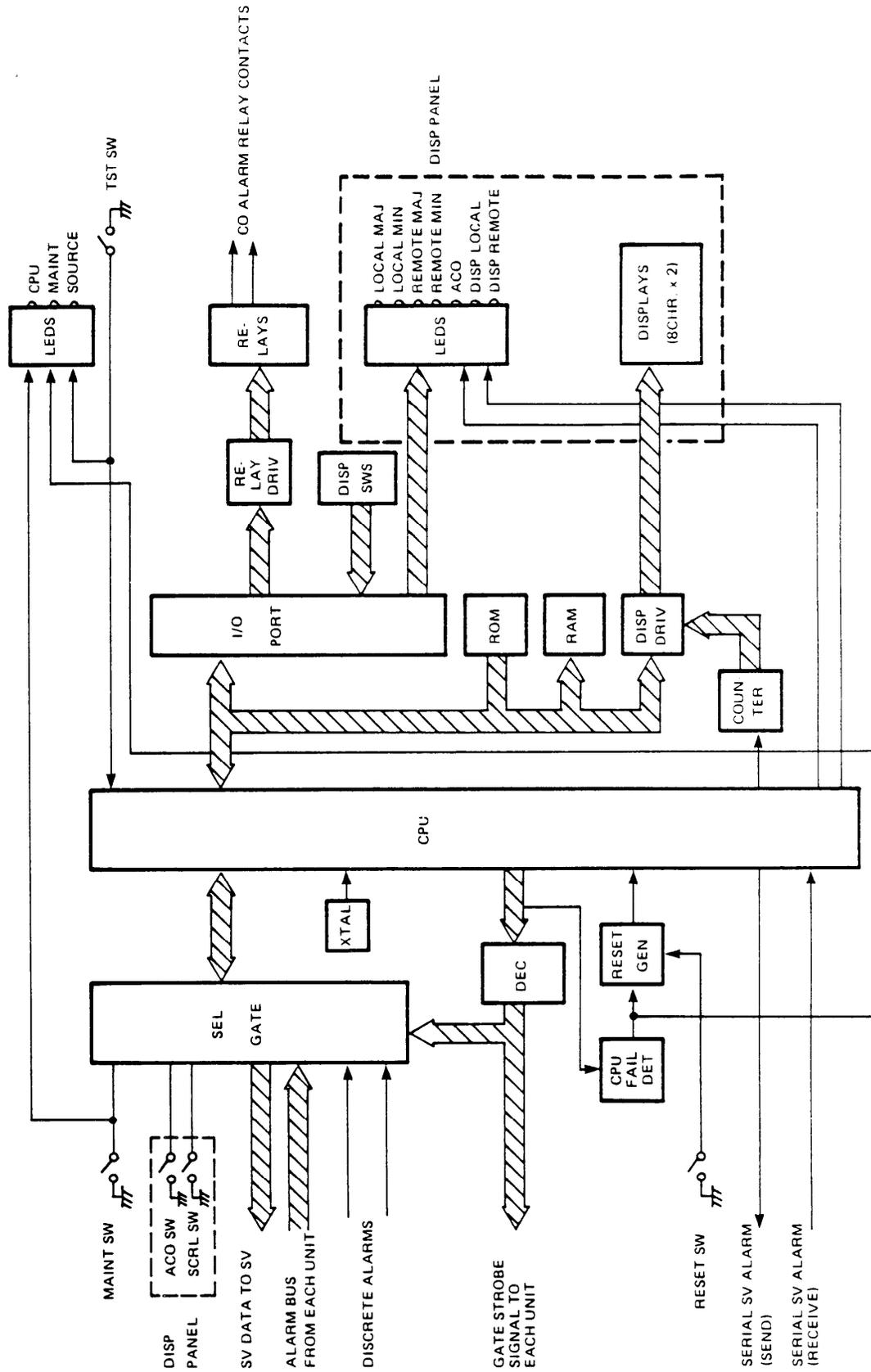♦ Figure 3-1   Block Diagram of ALM Unit (Grp: 0A00, 0A01 and 0B00) ♦

♦ Figure 3-2 Block Diagram of ALM Unit (Grp: AA00 and AB00) ♦

B. Alarm Function

3.04 The CPU reads data from the data bus and determines if a failure has occurred. If a failure is detected, the CPU analyzes the received alarm data, first to determine the type of failure, and then to determine the locations of the faulty circuit. The CPU then sends data to a display driver (DRIV) circuit which in turn generates the appropriate display. Failures occurred at the local station are indicated on the LOCAL DISP and those at remote station are on the REMOTE DISP. When the CPU detects more than one failure condition for the same station, the highest priority (most critical) failure is indicated and other failures, if required, can be viewed by depressing SCRL SW on the DISP panel.

3.05 The CPU also sends failure data to an I/O port circuit, along a clock signal. The I/O port circuit receives the eight bits data at a time from the CPU and shifts the data to its output side. Some outputs go to a relay driver (RELAY DRIV) circuit. RELAY DRIV outputs signals set the central office (CO) and supervisory (SV) alarm relays (Grp:0A00, 0A01; parallel interface version) or CO alarm relays only (Grp:AA00; serial interface version).

3.06 In the serial interface version, SV alarm is sent out as serial data in replay to the request from supervisory equipment. This serial data transmission is based on TBOS protocol and one display is assigned for local alarms and, when the high speed side of the FD-2240A is optical, one display is assigned for remote alarms. These display numbers are set by the DISP SW operation. Figure 3-3 shows the location of DISP SW.
And when the high speed side is an optical interface, the local alarm data signals are sent to SV unit through alarm bus and then are sent out to ALM unit of the remote station via optical transmission line.
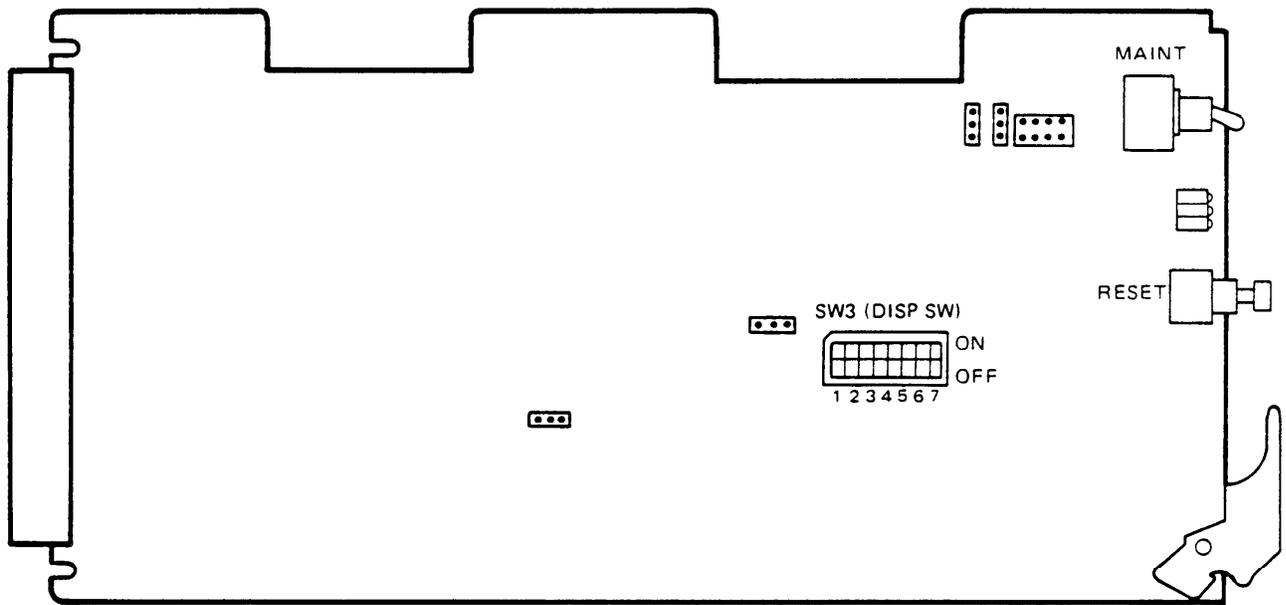
♦ Figure 3-3 DISP SW Location on Sub-2 PWB of ALM Unit Grp, AA00, AB00 ♦

3.07 Alarm indications start and stop as follows:

(1) Alphanumeric displays and LED indicators on the display panel indicate when failure detection occurs and go out when failure condition is cleared. On LOCAL or REMOTE DISP, such failure condition is displayed and when an alarm is Major alarm, the LED flickers.

(2) Visual alarm relays close when failure detection occurs and open when failure condition is cleared.

(3) Audible alarm relays close 2.5, 5, 10 or 20 seconds* after failure detection and open when failure condition is cleared.

(4) Supervisory alarm relays (except PWR MAJ and ALM CCT) close 2.5, 5, 10 or 20 seconds* after failure detection and open when failure condition is cleared, unless this happens before they have been closed for 2.5, 5, 10 or 20 seconds*. These relays remain closed for at least 2.5, 5, 10 or 20 seconds*. (Grp:0A00, 0A01,♦0B00♦)

*NOTE: The above delay times are selectable by timer strapping terminal.

(5) PWR MAJ and ALM CCT relay contacts close when failure detection occurs and open when failure condition is cleared.

(6) Serial SV data are periodically scanned by the supervisory equipment and alarm information is sent out when the character including its item is scanned.

(7) Audible alarm relays and visual alarm relays close for the alarms occurred at the far end station when SC3 strap on the Sub-2 PWB is set to ON.

3.08 When the CPU detects ACO activation signal (ACO SW closes when failure condition exists), it disables the audible alarm relays and visual alarm relays, if on-board strap terminal SC1 on the Sub-2 PWB is strapped to ON. The ACO indicator LED lights and remains as long as the alarm condition exists. If the CPU detects an additional failure, or operation of the RESET SW, it resets the ACO circuits.

3.09 When TST SW is set to ON, all LEDs on this equipment are lit and
"**NEC***" and "FD-2240A" are displayed on the character displays (lamp
test) if SC2 on the Sub-2 PWB is set to LAMP. If SC2 strap is set to ALM, alarm
test can be done too (Visual alarm relays immediately close and audible alarm
relays close after the delay time preset by TIMER. And when TST SW is turned to
OFF, both relays will be open.)

3.10 Table 3-1 lists CO and SV alarm items for ALM unit (Grp:0A00/0A01/♦0B00♦,
for parallel interface).

3.11 Tables 3-2 and 3-3 list alarm items for serial alarm character bits of ALM
unit (Grp:AA00/♦AB00♦, for serial interface).

Table 3-1

Relay Contact Alarm Output Items

ALM	No.	Output Alarm	Failure
CO ALM	1	MAJ VIS	Visual alarm at service affecting
	2	MAJ AUD	Audible alarm at service affecting
	3	MIN VIS	Visual alarm at nonservice affecting
	4	MIN AUD	Audible alarm at nonservice affecting
SV ALM	5	SYSTEM 1 FAIL	Alarm occurred in system 1
	6	SYSTEM 2 FAIL	Alarm occurred in system 2
	7	SYSTEM 3 FAIL	Alarm occurred in system 3
	8	SYSTEM 4 FAIL	Alarm occurred in system 4
	9	LOSS OF ONE LS IN	Loss of only one DS1 input signal
	10	LOSS OF MORE THAN ONE LS IN	Loss of more than one DS1 input signals
	11	RMT ALM	Detection of remote alarm signal
	12	LOSS OF HS	Loss of high speed input signal
	13	MAJ ALM	Service affecting failure in equipment (except PWR MAJ)
	14	MIN ALM	Nonservice affecting failure in equipment
	15	PWR MAJ	Both of PWR unit for DC(-) power and PWR unit for AC power down
	16	PWR MIN	One PWR unit down
	17	MAINT	Condition of MAINT switch ON
	18	AIS RCV	Detection of Alarm Indication Signal in DS2 input signal
	19	ALM CCT FAIL	Alarm occurred in ALM unit circuit

Table 3-2

Scan Display for Local Station Assignment

Char.	Scan Point (Alarm/Status)							
	1	2	3	4	5	6	7	8
000	SYS 1 MUX (A)	SYS 1 HS OUT (A)	SYS 1 HS IN (A)	SYS 1 D MUX (A)	SYS 1 MAJ ERR (A)	SYS 1 LD BIAS (A)	SYS 1,2 CTRL (A)	PWR MAJ (A)
	9	10	11	12	13	14	15	16
001	SYS 2 MUX (A)	SYS 2 HS OUT (A)	SYS 2 HS IN (A)	SYS 2 D MUX (A)	SYS 2 MAJ ERR (A)	SYS 2 LD BIAS (A)	FUSE CD(2) (A)	(U)
	17	18	19	20	21	22	23	24
010	SYS 3 MUX (A)	SYS 3 HS OUT (A)	SYS 3 HS IN (A)	SYS 3 D MUX (A)	SYS 3 MAJ ERR (A)	SYS 3 LD BIAS (A)	SYS 3,4 CTRL (A)	PWR MIN (A)
	25	26	27	28	29	30	31	32
011	SYS 4 MUX (A)	SYS 4 HS OUT (A)	SYS 4 HS IN (A)	SYS 4 D MUX (A)	SYS 4 MAJ ERR (A)	SYS 4 LD BIAS (A)	SV (A)	(U)
	33	34	35	36	37	38	39	40
100	SYS 1 ON LINE (S)	SYS 1 LS CH 1 IN (S)	SYS 1 LS CH 2 IN (S)	SYS 1 LS CH 3 IN (S)	SYS 1 LS CH 4 IN (S)	SYS 1 AIS RCV (S)	SYS 1 RMT ALM (S)	RLB (S)
	41	42	43	44	45	46	47	48
101	SYS 2 ON LINE (S)	SYS 2 LS CH 1 IN (S)	SYS 2 LS CH 2 IN (S)	SYS 2 LS CH 3 IN (S)	SYS 2 LS CH 4 IN (S)	SYS 2 AIS RCV (S)	SYS 2 RMT ALM (S)	MAN SW (S)
	49	50	51	52	53	54	55	56
110	SYS 3 ON LINE (S)	SYS 3 LS CH 1 IN (S)	SYS 3 LS CH 2 IN (S)	SYS 3 LS CH 3 IN (S)	SYS 3 LS CH 4 IN (S)	SYS 3 AIS RCV (S)	SYS 3 RMT ALM (S)	ACO (S)
	57	58	59	60	61	62	63	64
111	SYS 4 ON LINE (S)	SYS 4 LS CH 1 IN (S)	SYS 4 LS CH 2 IN (S)	SYS 4 LS CH 3 IN (S)	SYS 4 LS CH 4 IN (S)	SYS 4 AIS RCV (S)	SYS 4 RMT ALM (S)	(X)

(A) : Alarm   (S) : Status   (U) : Unassigned   (X) : Reserved

NOTE 1: Bit 64th is assigned for administrative function.

2: This Display assignment conforms to STANDARD ATTRIBUTE ASSIGNMENT L128.

Table 3-3

Scan Display for Remote Station Assignment

Char.	Scan Point (Alarm/Status)							
	1	2	3	4	5	6	7	8
000	SYS 1 CTRL (A)	SYS 1 MUX (A)	SYS 1 OPT OUT (A)	SYS 1 OPT IN (A)	SYS 1 DMUX (A)	SYS 1 MAJ ERR (A)	SYS 1 PWR MIN (A)	SYS 1 OFF LINE MON (A)
	9	10	11	12	13	14	15	16
001	SYS 2 CTRL (A)	SYS 2 MUX (A)	SYS 2 OPT OUT (A)	SYS 2 OPT IN (A)	SYS 2 DMUX (A)	SYS 2 MAJ ERR (A)	SYS 2 PWR MIN (A)	SYS 2 OFF LINE MON (A)
	17	18	19	20	21	22	23	24
010	SYS 3 CTRL (A)	SYS 3 MUX (A)	SYS 3 OPT OUT (A)	SYS 3 OPT IN (A)	SYS 3 DMUX (A)	SYS 3 MAJ ERR (A)	SYS 3 PWR MIN (A)	SYS 3 OFF LINE MON (A)
	25	26	27	28	29	30	31	32
011	SYS 4 CTRL (A)	SYS 4 MUX (A)	SYS 4 OPT OUT (A)	SYS 4 OPT IN (A)	SYS 4 DMUX (A)	SYS 4 MAJ ERR (A)	SYS 4 PWR MIN (A)	SYS 4 OFF LINE MON (A)
	33	34	35	36	37	38	39	40
100	SYS 1 MIN ERR (A)	SYS 1 LD BIAS (A)	SYS 1 SV (A)	SYS 1 ALM CCT (A)	SYS 2 MIN ERR (A)	SYS 2 LD BIAS (A)	SYS 2 SV (A)	SYS 2 ALM CCT (A)
	41	42	43	44	45	46	47	48
101	SYS 3 MIN ERR (A)	SYS 3 LD BIAS (A)	SYS 3 SV (A)	SYS 3 ALM CCT (A)	SYS 4 MIN ERR (A)	SYS 4 LD BIAS (A)	SYS 4 SV (A)	SYS 4 ALM CCT (A)
	49	50	51	52	53	54	55	56
110	SYS 1 ON LINE (S)	SYS 1 CH IN (S)	(U)	(U)	SYS 2 ON LINE (S)	SYS 2 CH IN (S)	(U)	(U)
	57	58	59	60	61	62	63	64
111	SYS 3 ON LINE (S)	SYS 3 CH IN (S)	(U)	(U)	SYS 4 ON LINE (S)	SYS 4 CH IN (S)	(U)	(U)

(A) : Alarm   (S) : Status   (U) : Unassigned   (X) : Reserved

NOTE 1: Bit 64th is assigned for administrative function.

2: This Display assignment conforms to STANDARD ATTRIBUTE ASSIGNMENT L128.

C. Setting of DISP Switch

3.12 When the equipment configuration is O-LTM, for assignment of local station
and remote station, two elements of DISP SW on the ALM unit (Grp:AA00, for
serial interface) are used and when in MUX configuration, one element is used
for setting local station.

O-LTM Configuration

3.13 Two DISP SW Nos. are assigned for local station and remote station when
the equipment is in O-LTM configuration. When two numbers out of eight
numbers (0 - 7) are set to ON, the smaller one is for local station and larger
one is for remote station. See Figure 3-4.


```
DISP    No.1 : Local station
DISP    No.5 : Remote station
```
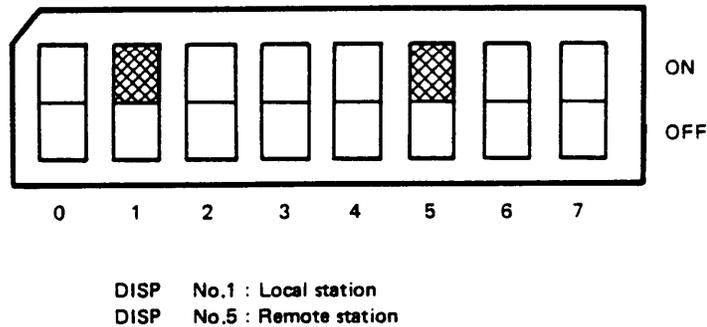
NOTE: When only one is set, this means setting for local station. And when more than
        two are set, the smallest No. is for local station and the next number is for
        remote station and other numbers will be ignored.

Figure 3-4 Example of DISP SW Setting for Local and Remote Station

MUX Configuration

3.13 Setting of DISP SW No. in MUX configuration enables only for local
station.
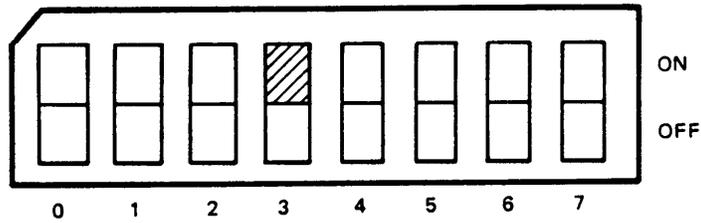
DISP No.3 : Local station

NOTE: When more than one numbers are set, only the smallest number
is valid and rest are ignored.

Figure 3-5   Example of DISP SW Setting for Local Station
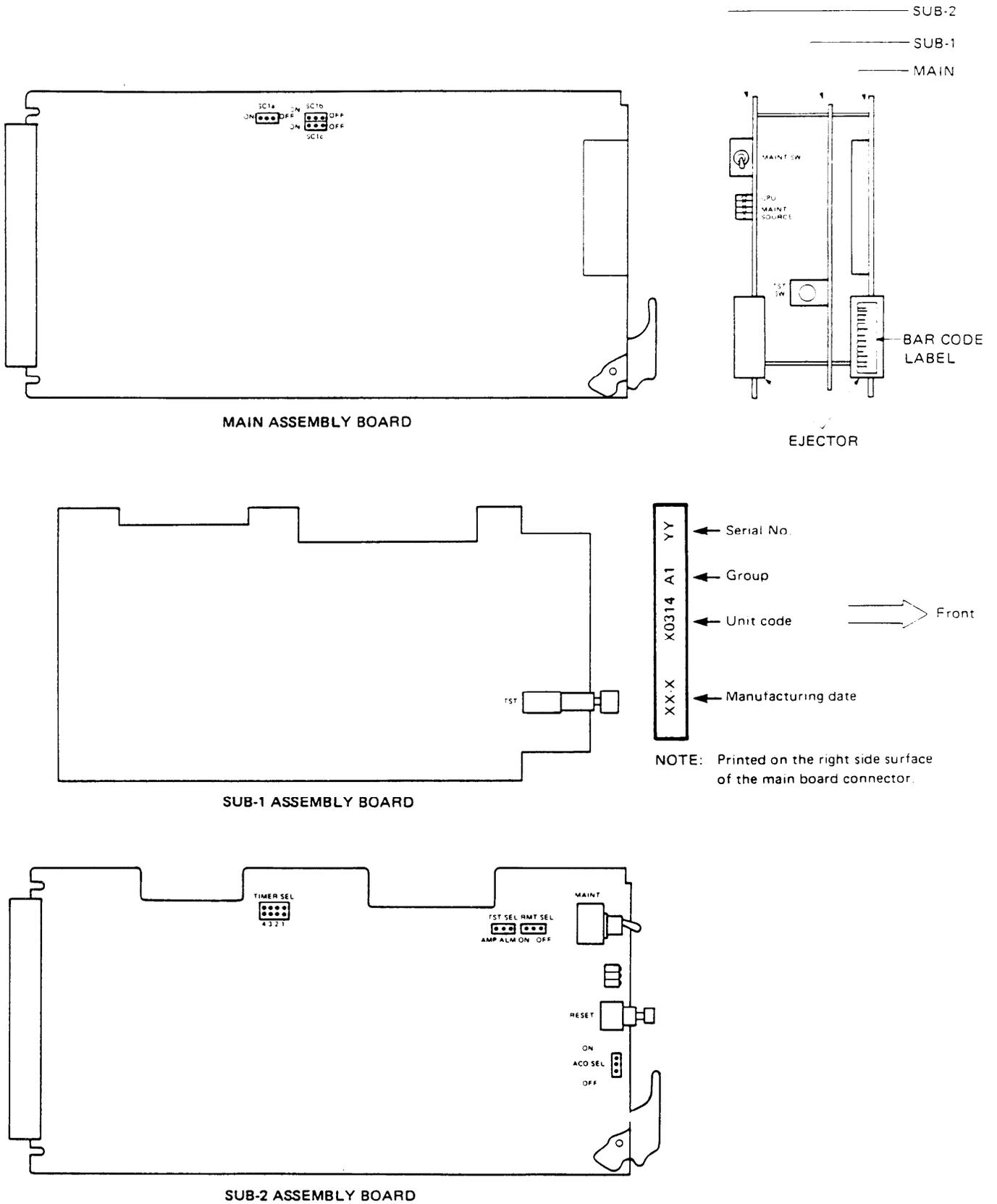
4. CONTROLS AND INDICATORS

4.01 Figures 4-1 through 4-3 show controls and LED indicators of three groups
      of the ALM unit respectively. Table 4-1 lists functions of them. For
physical location of controls and indicators, refer to Figures 4-1 through 4-3.

4.02 RESET switch is located on the ALM unit (Grp:0A01, AA00,♦0B00 and AB00♦),
      and not mounted on the unit (Grp:0A00).   Functions of controls and
indicators are common for all groups.

MAIN ASSEMBLY BOARD

SUB-1 ASSEMBLY BOARD

SUB-2 ASSEMBLY BOARD
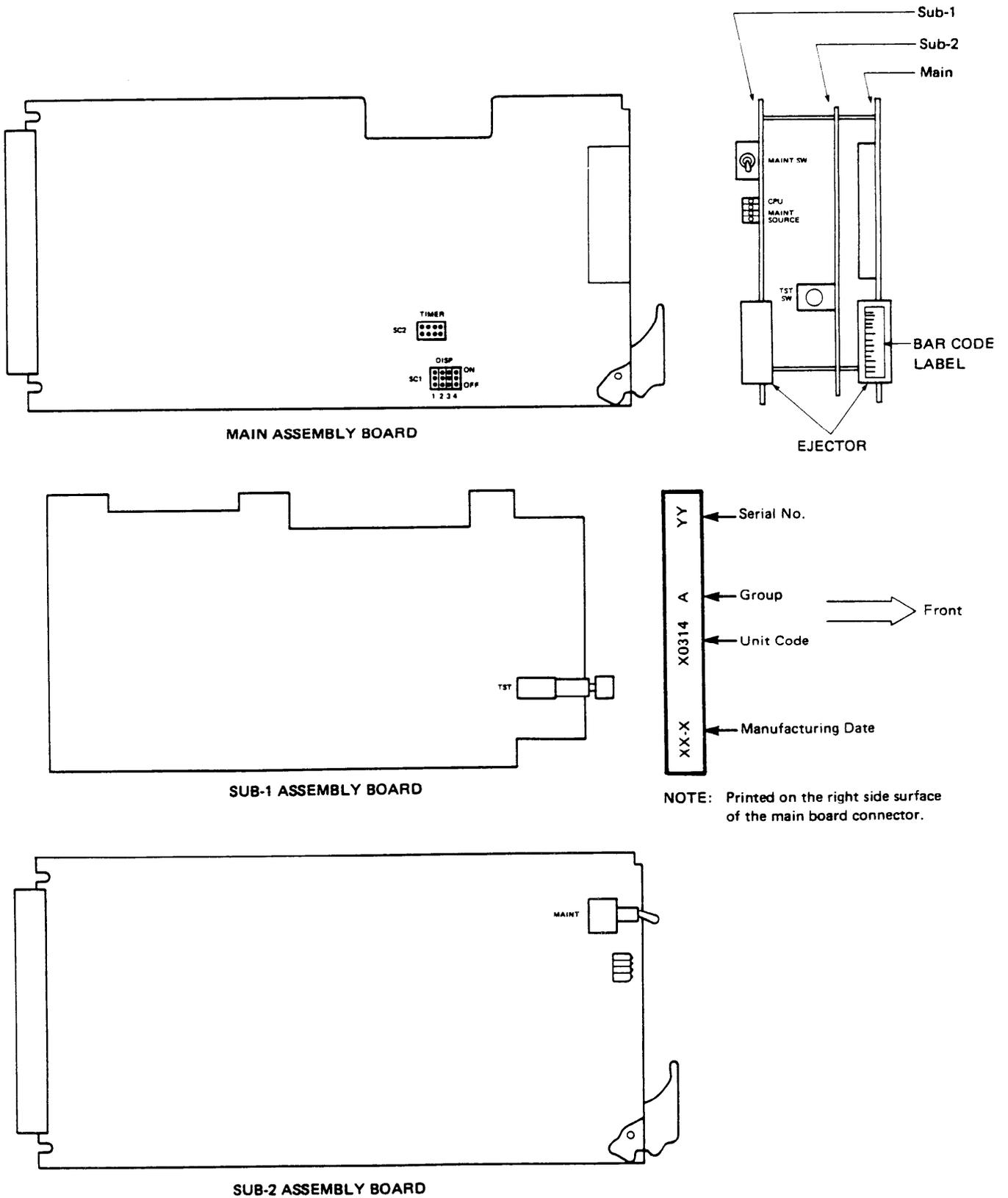
NOTE: Printed on the right side surface
of the main board connector.

Figure 4-1   ALM Unit (Grp: 0A00) Control and Indicators

MAIN ASSEMBLY BOARD

EJECTOR

── SUB-2
── SUB-1
── MAIN

BAR CODE
LABEL

SUB-1 ASSEMBLY BOARD

Serial No.

Group

Unit code

Manufacturing date

NOTE: Printed on the right side surface
of the main board connector.

SUB-2 ASSEMBLY BOARD

◆ Figure 4-2   ALM Unit (Grp: 0A01, 0B00) Control and Indicators ◆

MAIN ASSEMBLY BOARD

SUB-1 ASSEMBLY BOARD

SUB-2 ASSEMBLY BOARD

NOTE: Printed on the right side surface of the main board connector.
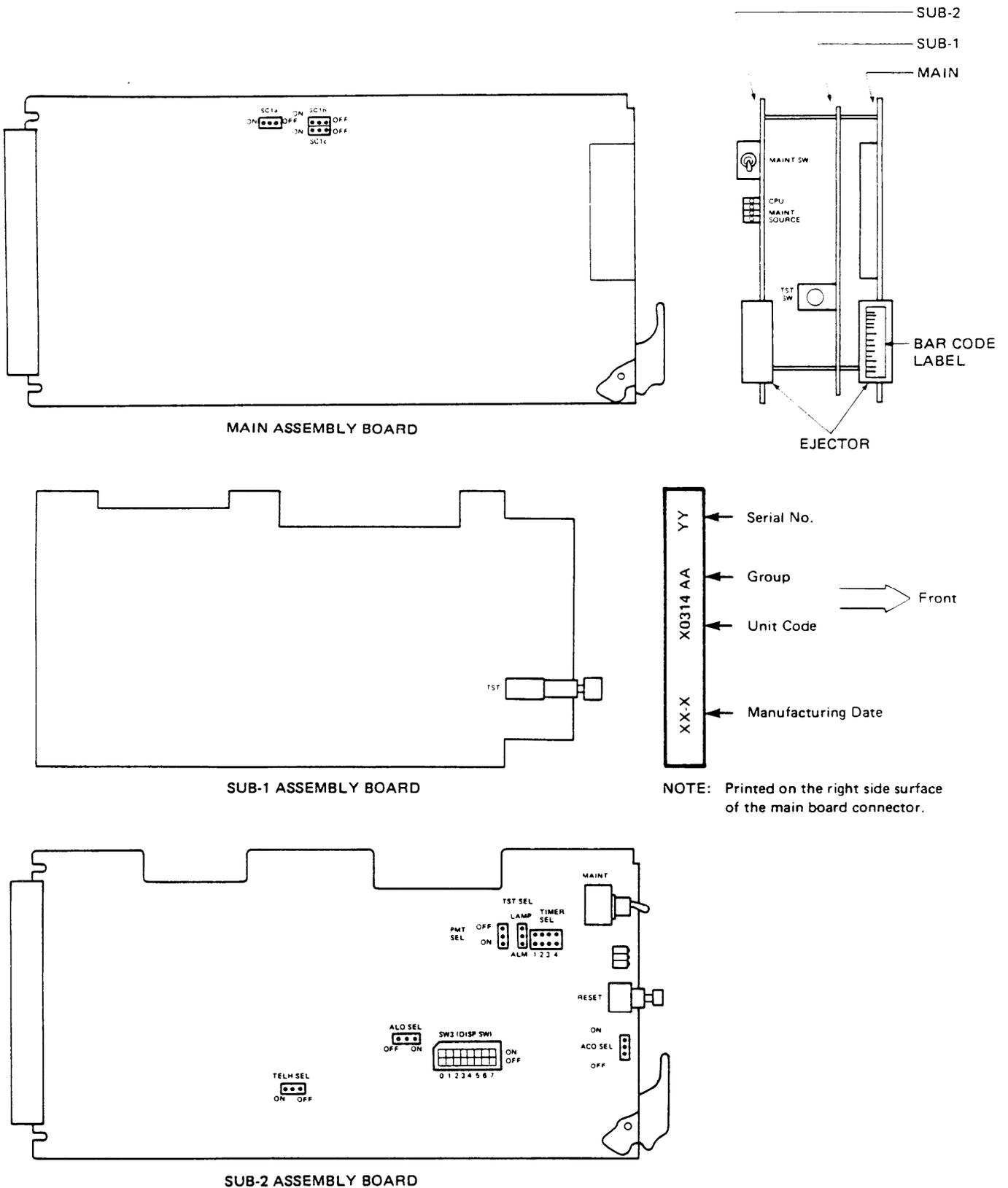
♦ Figure 4-3 ALM Unit (Grp: AA00, AB00) Control and Indicator ♦

Table 4-1

ALM Unit Controls and Indicators

Feature	Type	Control/Indicator	Function
Alarm	Red LED	CPU	Lights when CPU on the ALM unit is faulty.
Status	Red LED	MAINT	Lights when MAINT switch is ON.
	Green LED	SOURCE	Lights when -48 Vdc is supplied to this unit.
Test	Pushbutton switch	TST	LEDs on the units are lit when this switch is depressed.
Operation	Two position toggle switch	MAINT	For manual switching RESET SW operation or remote loopback, this switch set to ON. During maintenance work, this switch is kept ON.
	Pushbutton switch	RESET	When this switch is pushed, temporary release of alarm condition is enabled. And to turn off still lighting LED even if alarm condition is resorted, this switch is despressed.

5. STRAPPING SELECTION

5.01 As shown in Figures 4-1 through 4-3, there are strapping locations on the ALM units. Selection of strapping positions are described in NEC practice NECA 365-407-203.