User's Manual

YEW SERIES 80

Model SPLR ✳ B(Style B) Programmable Computing Unit

Notices

■ Regarding This User's Manual

(1) This manual should be passed on the end user. Keep at least one extra copy of the manual in a safe place.

(2) Read this manual carefully and fully understand how to operate this product before you start operation.

(3) This manual is intended to describe the functions of this product. Yokogawa Electric Corporation (hereinafter simply referred to as Yokogawa) does not guarantee that the functions will suit a particular purpose of the user.

(4) Under absolutely no circumstances may the contents of this manual in part or in whole be transcribed or copied without permission.

(5) The contents of this manual are subject to change without prior notice.

(6) Every effort has been made to ensure accuracy in the preparation of this manual. Should any error or omissions come to your attention however, please contact your nearest Yokogawa representative or our sales office.

■ Regarding Protection, Safety, and Prohibition against Unauthorized Modification

(1) In order to protect the product and the system controlled by it against damage and ensure its safe use, make certain that all of the instructions and precautions relating to safety contained in this manual are strictly adhered to. Yokogawa does not guarantee safety if products are not handled according to these instructions.

(2) Be sure to use the spare parts approved by Yokogawa when replacing parts or consumables.

(3) Modification of the product is strictly prohibited.

(4) Reverse engineering such as the disassembly or decompilation of software is strictly prohibited.

(5) No portion of the software supplied by Yokogawa may be transferred, exchanged, leased or sublet for use by any third party without the prior permission of Yokogawa.

■ Force Majeure

(1) Yokogawa does not make any warranties regarding the product except those mentioned in the WARRANTY that is provided separately.

(2) Yokogawa assumes no liability to any party for any loss or damage, direct or indirect, caused by the user or any unpredictable defect of the product.

CONTENTS

1. INTRODUCTION.

1-1. Inspection.

This instrument was thoroughly tested at the factory before shipment. However, when you receive this instrument:
1) Inspect for visual damage.
2) Confirm that the model and suffix codes shown on the shipping documents, and also on the nameplate at the front of the instrument are the same as on your order sheet.
3) Confirm that all accessories (see section 2-4) are present.

If you have any questions about this instrument, please contact either your nearest Yokogawa Sales & Service Office or Yokogawa Electric Corporation, Tokyo, Japan.

1-2. Comments Concerning This Instruction Manual.

This instruction manual describes handling, operation and simple maintenance procedures for the SPLR Programmable Computing Unit.

To use the SPLR, it is necessary to write a program in the ROM (Read Only Memory) while referring to the instrument worksheets (See Figure 1-2).

For instructions on how to complete these sheets, refer to the relevant instruction manual.

Step 1. Complete the program using the instrumentation flow sheet.

Reference materials:
(1) Functions and applications for SPLR programable computing unit
      — Technical Information   TI 1B4C2-01E
(2) SPLR worksheet   WS 1B4C2-01
(3) SPLR data sheet   WS 1B4C2-02E
(4) SPLR program sheet   WS 1B4C2-03

COMPUTING UNIT
MODEL	SPLR
SUFFIX	-100✶B

SUPPLY INPUT: 80-138VAC 47-63Hz /20-130VDC 310mA AT 20VDC

NO.

YOKOGAWA ◆ Made in Korea
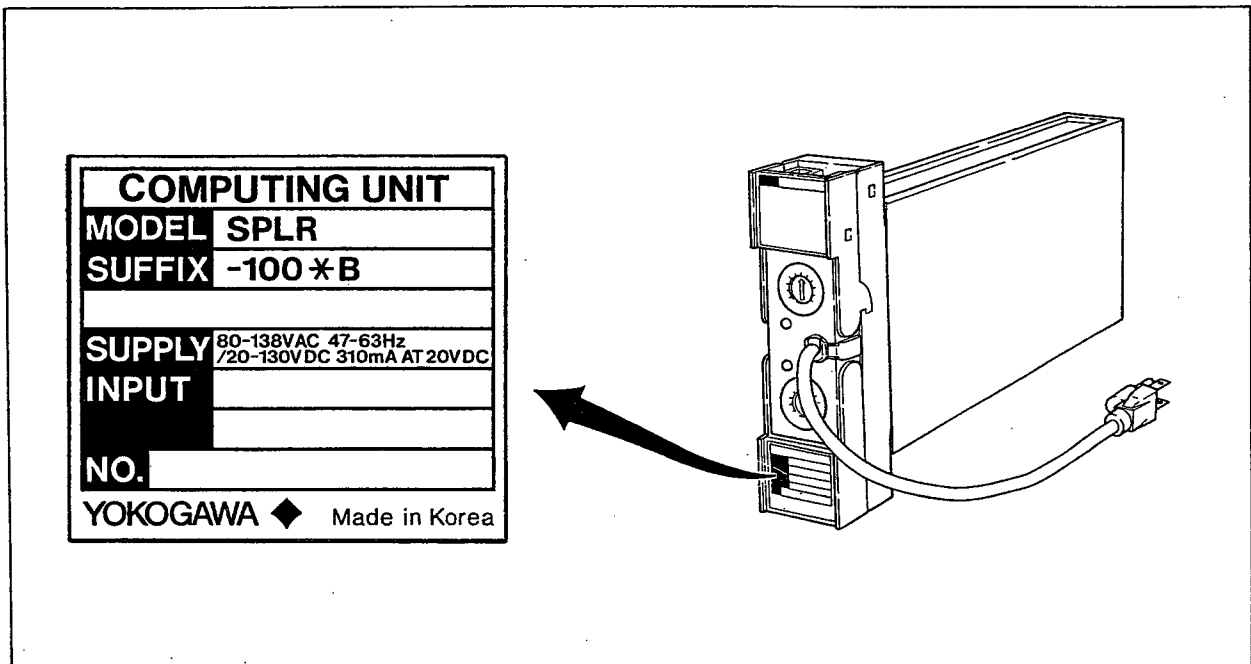
Figure 1-1. Nameplate.
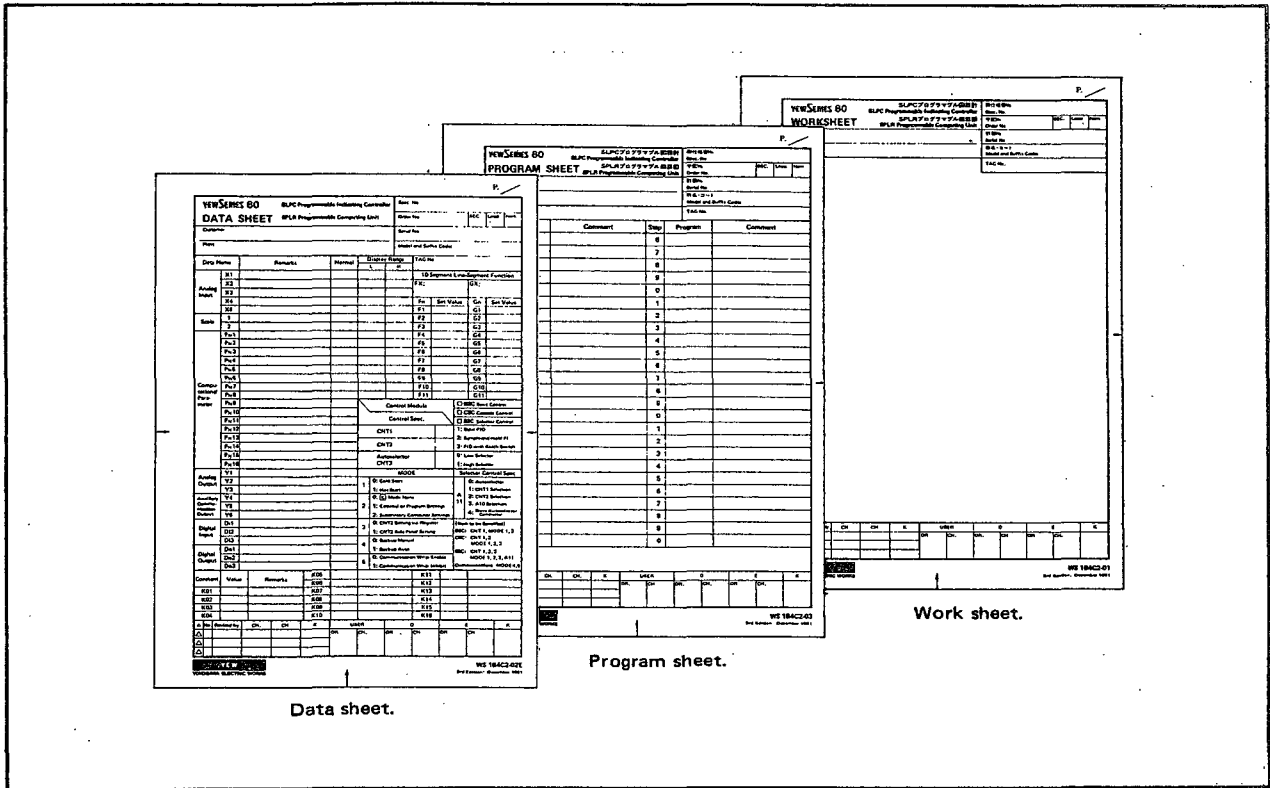
Figure 1-2.   Sheets to be Used in Step 1.

Step 2.   Store the program in ROM (Read Only Memory)

References:
(1) SPRG Programmer Instruction Manual
     IM 1B4W1-01E
(2) Functions and applications for SPLR Program-
     mable Computing Unit
     TI 1B4C2-01E

Step 3.   Install the ROM in SPLR prior to operation.

Step 3 is covered in this section 6-2-2 of this manual.
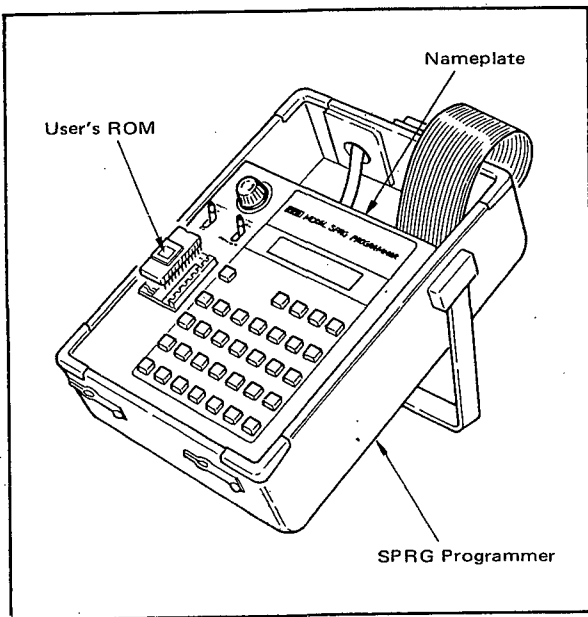
Figure 1-3.   User's ROM and SPRG programmer.
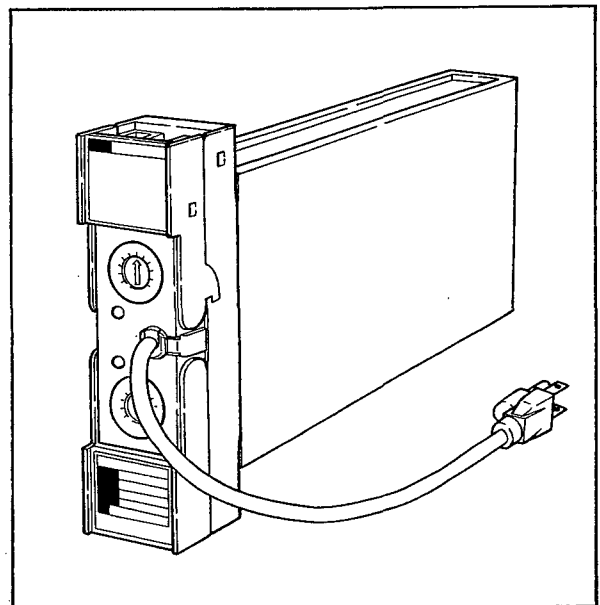
Figure 1-4.   SPLR Programmable Computing Unit.

2. GENERAL.

SPLR Programmable Computing Unit is a high-performance computing unit with analog signal computational functions and logical functions. The analog signal computational functions perform a variety of operations such as addition, subtraction, multiplication, division, square root, selector, limiter, line-segment function, dead time computation and moving average computation. The logical function provides digital input/output, logical operations and conditional jump commands.

SPLR computes a complex compensation and compound computation in combination with signal computational functions and logical functions. Programs can be written to ROM with the same ease as a simple calculator operation by using an optional SPRG programmer.

Figure 2-1 shows an external view of the SPLR programmable computing unit.

Three I/O signal levels are selectable by signal range setting switch.

2-1.   Standard Specifications.

Input/Output Signals

Analog input signals: 1 to 5 V, 0 to 5 V or 0 to 10 V DC; 4 points*.

Analog output signals: 1 to 5 V, 0 to 5 V or 0 to 10 V DC; 2 points.

Status input signals: Contact or voltage level; 1 point*.

Status output signal: Transistor contact; 1 point.
  *When status input signals are used, analog input signals are available at three points (switch selectable).

Fail output signal: Transistor contact; 1 point.

Computational parameters/coefficients: 2 (set by potentiometer in range 0 to 100%).

Constants: 19 (for computations), plus 22 for 10-segment line-segment functions.

Temporary registers: 4.

Computational period: 0.2 second.
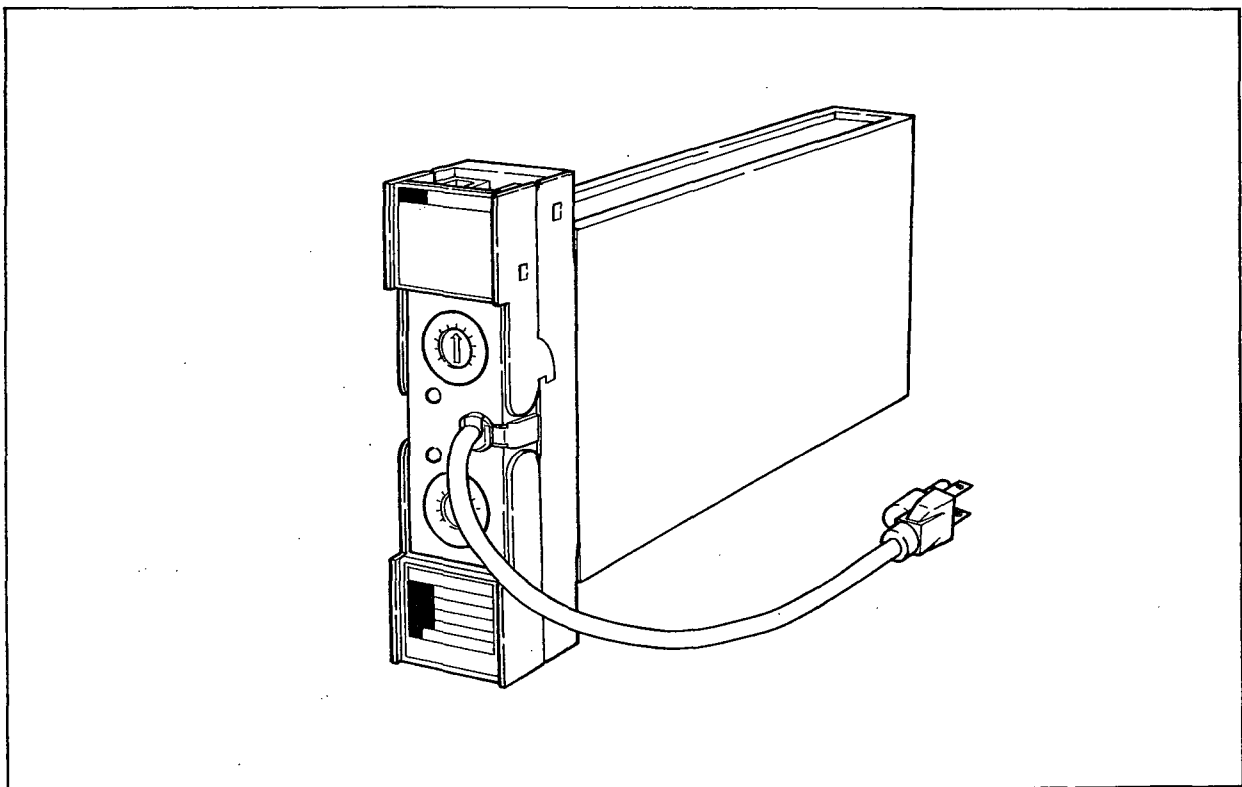
Figure 2-1. External View.

No. of program steps: 99.

Programming: Programs are developed in a dedicated programming language connecting the SPLR to an SPRG Programmer.

Mounting and Wiring

Mounting: Rack mounting.

Wiring:

> Signal wiring to/from the field: ISO M4 size (4 mm) screws on terminal block.

> Power and Ground Wiring:

> 100 V version: JIS C 8303 two-pin plug with earthing contact. (IEC A5-15, UL498).

> 220 V version: CEE 7 VII (CENELEC standard) plug.

> Cable Length: 300 mm.

External dimensions: 130 (H) x 48 (W) x 300 (D depth behind panel) (mm).

Weight: 2.0 kg.

Normal Operating Conditions

Ambient temperature: 0 to 50°C.

Ambient humidity: 5 to 90% relative humidity (non-condensing).

Power Supply: Two versions, for "100 V" (standard) or "220 V" (option /A2ER). Both versions may use AC or DC, without change to the instrument:

Version	100 V	220 V
DC (polarity reversible)	20 to 130 V	120 to 340 V
AC (47 to 63 Hz)	80 to 138 V	138 to 264 V

Computational Functions

Function	Function name
General functions	Addition, subtraction, multiplication, division, magnitude (absolute value), square root, high selector, low selector, high limiter, low limiter.
Functions with device addresses	10-segment transfer function (break points user-definable), high limit alarm, low limit alarm, first order lag, first order lead, dead time, velocity and moving average computations, velocity limiters, timers, pulse rate output.
Logical functions	AND, OR, NOT CMP (compare greater than or equal), branching, conditional branching, signal switching.

2-2. Model and Suffix Codes.

Model	Suffix Codes		Description
SPLR	. . . .		Programmable Computing Unit
	-100		Always 100
Style Code	*B		Style B
Option Codes		/NPR	Unprogrammed
		/UPR	With user's program
		/A2ER	220 V power supply
		/NHR	Without case

2-3. Optional Specification.

/NPR: Computing unit supplied unprogrammed.

/UPR: Computing unit supplied with user program.

/A2ER: For "220 V version" power supply.

/NHR: No case, plug-in instrument only. See GS 1B4F2-E to order case separately.

2-4. Accessory.

Fuse (1 A): 1 piece.

Note: The fuse (S9510VK) is the dedicated fuse, Do not use it for other products.

3. INSTALLATION.

For the installation procedure and wiring cautions, refer to instruction manual IM 1B4F2-01E "Installation of Rack-Mounted Instruments".

3-1. Wiring.

(1) The terminal block (4 mm screw terminal) can be seen when the terminal cover is opened as shown in Figure 3-2.
(2) For wiring to each terminal, refer to Table 3-1.
(3) After completing the wiring, always replace the terminal cover.
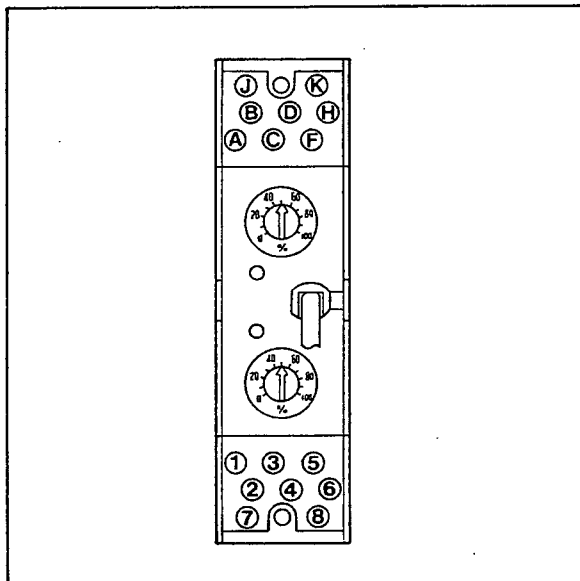
Figure 3-1.   Terminal Layout.
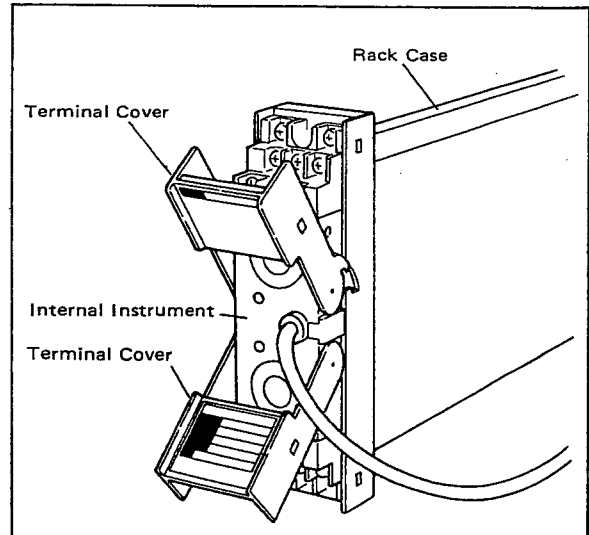
Figure 3-2.   Internal Instrument and Terminal Cover.

Table 3-1.   Terminal Connection.

Terminal Designation	Description	Terminal Designation	Description
1	+ Analog	A	+ Analog
2	– input 1	B	– output 1
3	+ Analog	C	+ Contact
4	– input 3	D	– output
5	+ Analog	F	+ Analog
6	– input 2	H	– output 2
7	+ Analog input 4 (*1)	J	+ Fail
8	– Contact input (*2)	K	–

Note: *1: Four analog inputs.
        *2: Three analog and one digital input.

3-2. Wiring Precautions.

(1) Furnish all cable ends with solderless crimp-on type lugs for terminal connections.

(2) Use the input contacts within the ratings. Avoid using high resistance leadwires in order to avoid an excessive voltage drops in the conductor. Insure that the input signal is connected with the correct polarity. For the input contact specifications, refer to the general specifications at the end of this manual.

(3) Fail output and digital output are by transistor switch contacts (isolated type). When connecting to the external unit, observe the following procedures (See Figure 3-3):

● Carefully observe the correct contact polarities.

● If a contact is connected to an inductive load such as a relay, use a spark quench diode or CR circuit in parallel with the load.

● Since AC load cannot be opened or closed directly, install a relay to drive the AC load.

● Do not connect any load exceeding the contact rating (maximum 30V DC, 200mA).

● An analog or digital signal is fed to terminals 7 and 8 via the selector switch. Use care when completing this signal wiring.
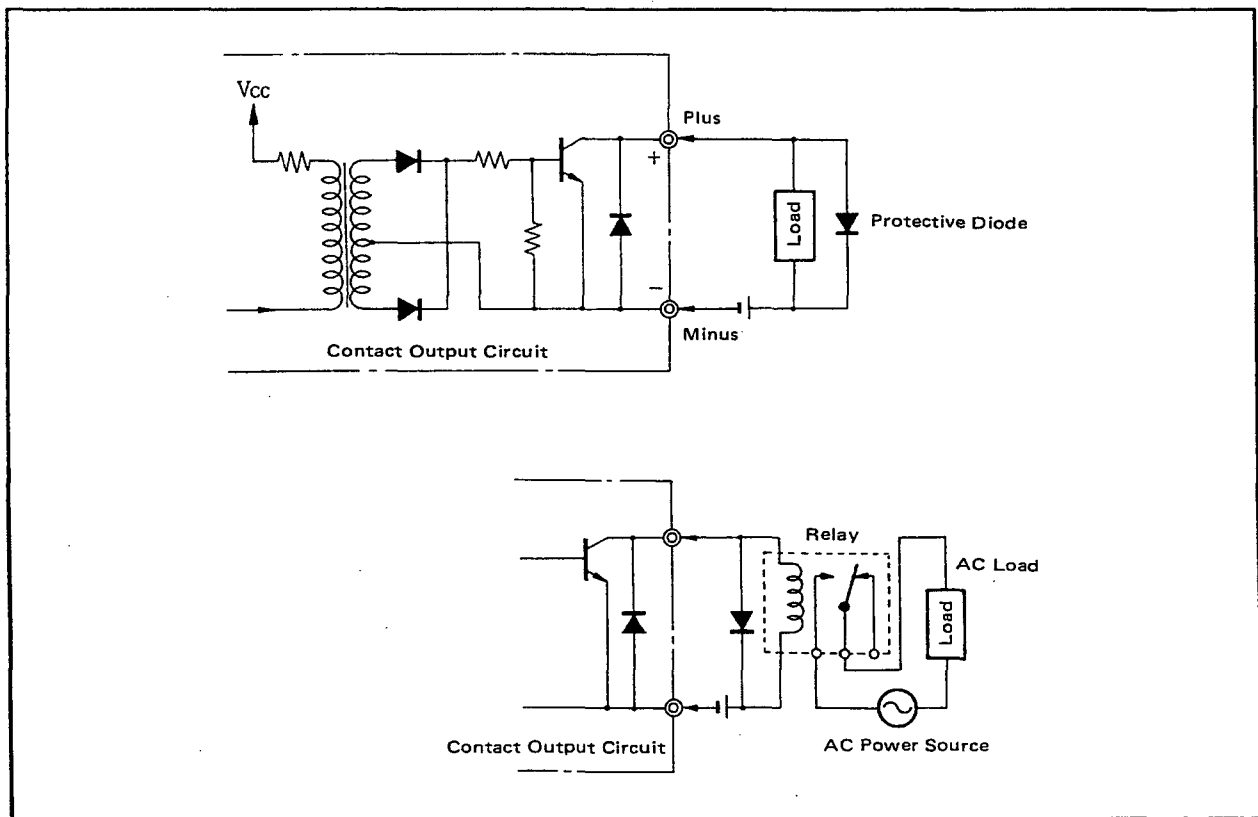
Figure 3-3. Connecting the Contact Output.

4. PRINCIPLES OF OPERATION.

4-1. Principles of Computational Functions.

4-1-1. Computation.

The operating principles of SPLR are based on the three basic operations: input, computation and output. Figure 4-1 shows a program example for a two input adder. Figure 4-2 shows the register operations for this program. All computations are performed in common computation register S. The signal is sent to register S with LOAD command LD. Register S is a register stack consisting of S_1 thru S_5. The data is pushed down into S_2 from S_1 each time an input LD command occurs.

The FUNCTION command is used for arithmetic operations. FUNCTION perform 28 different computation functions; commands are represented by mnemonic codes such as +, ÷, and HSL. The computation is performed by using the data from register S. The result of the operation is output to top register S_1 in stack register S and the other data in register S also pops up.

The STORE command ST is used to send the result of the computation to the output register (described later). The register contents remain unchanged even when the ST command is executed.
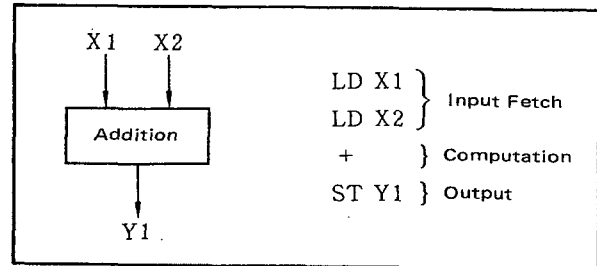
Figure 4-1. 2-Input Arithmetic Unit and Program.
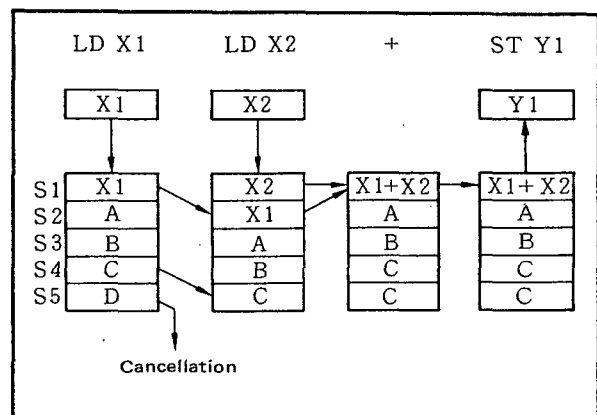
Figure 4-2. Computational Function and Program Flow.
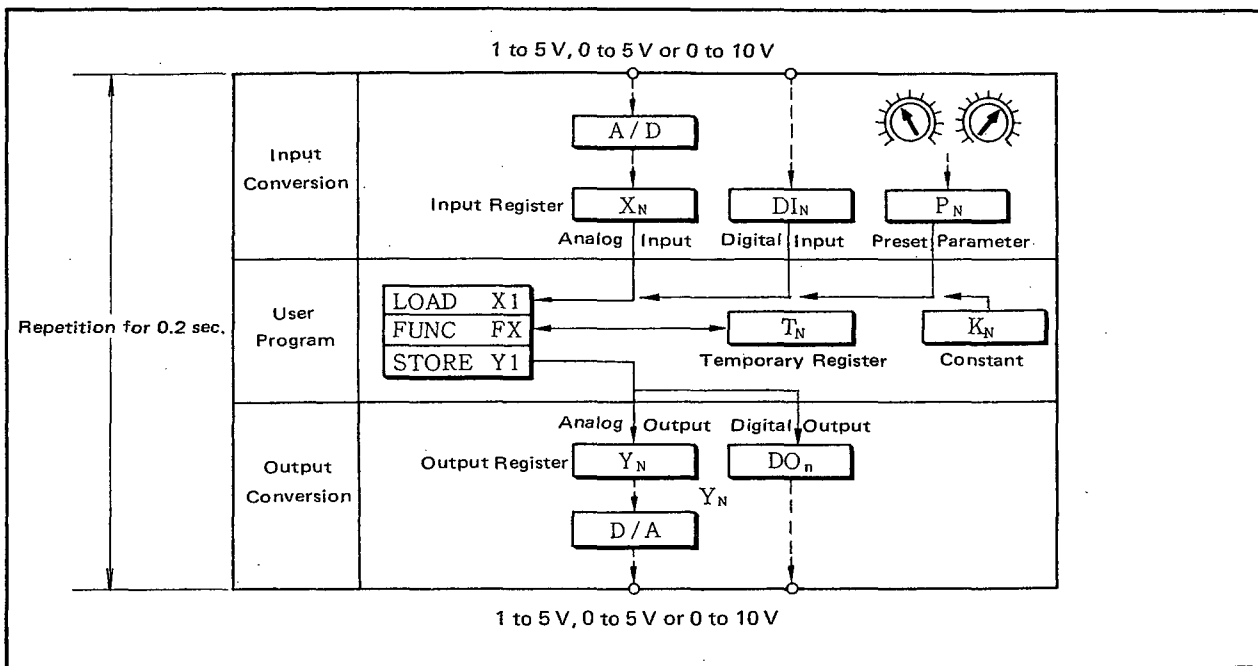
Figure 4-3. Comfiguration of Registers.

4-1-2. Input/output register configuration.

Figure 4-3 shows the configuration of the SPLR registers. Inputs such as analog input, digital input and preset parameters to entry registers X_N, DI_N and P_N are sent prior to the execution of the user program.

For the user program, necessary input signals and parameters are fetched to the registers from the appropriate registers by an LD command. The computation result is dumped into output registers Y_N, DO_n by a ST command. Subsequently, the contents of output registers Y_N, DO_n are output from SPLR as analog or digital output.

The above process constitutes the complete computational cycle which is repeated every 0.2 second.

4-2. Circuit Description.

Figure 4-4 shows a block diagram of the SPLR circuit.

4-2-1. Analog input circuit.

The respective input signals pass the corresponding differential buffer amplifiers (A1, A2, A3 and A4) and are applied to the input multiplexer. The buffer amplifier provides voltage Eis to detect input signal below 0 %.

4-2-2. Analog/digital conversion circuit.

The analog input signal and the parameters which are being fed to the input circuit are each selected in turn by the multiplexer, converted to digital values in an A/D converter circuit consisting of a comparator, CPU and D/A (Digital/Analog conversion circuit), and stored in RAM memory. RAM data is protected for about 2 seconds during a power failure by the charge on a capacitor.

4-2-3. Digital input circuit.

The digital input signal from the input port is isolated by a transformer in the input circuit and stored in RAM via the data bus.

4-2-4. Computational circuitry.

Once all necessary input data items have been fetched, the microprocessor (CPU) executes the processing according to the program stored in the user ROM.

The operational result is output through the D/A conversion circuit or the output port.

Watch Dog Timer WDT monitors the actions in the CPU. When an abnormal condition occurs, the FAIL indicator lights and a fail contact output is issued.

4-2-5. Analog output circuit.

The analog input signal from the D/A converter is fed to the voltage output circuit through the output multiplexer.

A bias voltage Eos is applied so that voltages below 0 % can be output.

4-2-6. Digital output circuit.

The signal from the output port is isolated by the transformer, and output to external devices as an open collector contact signal.
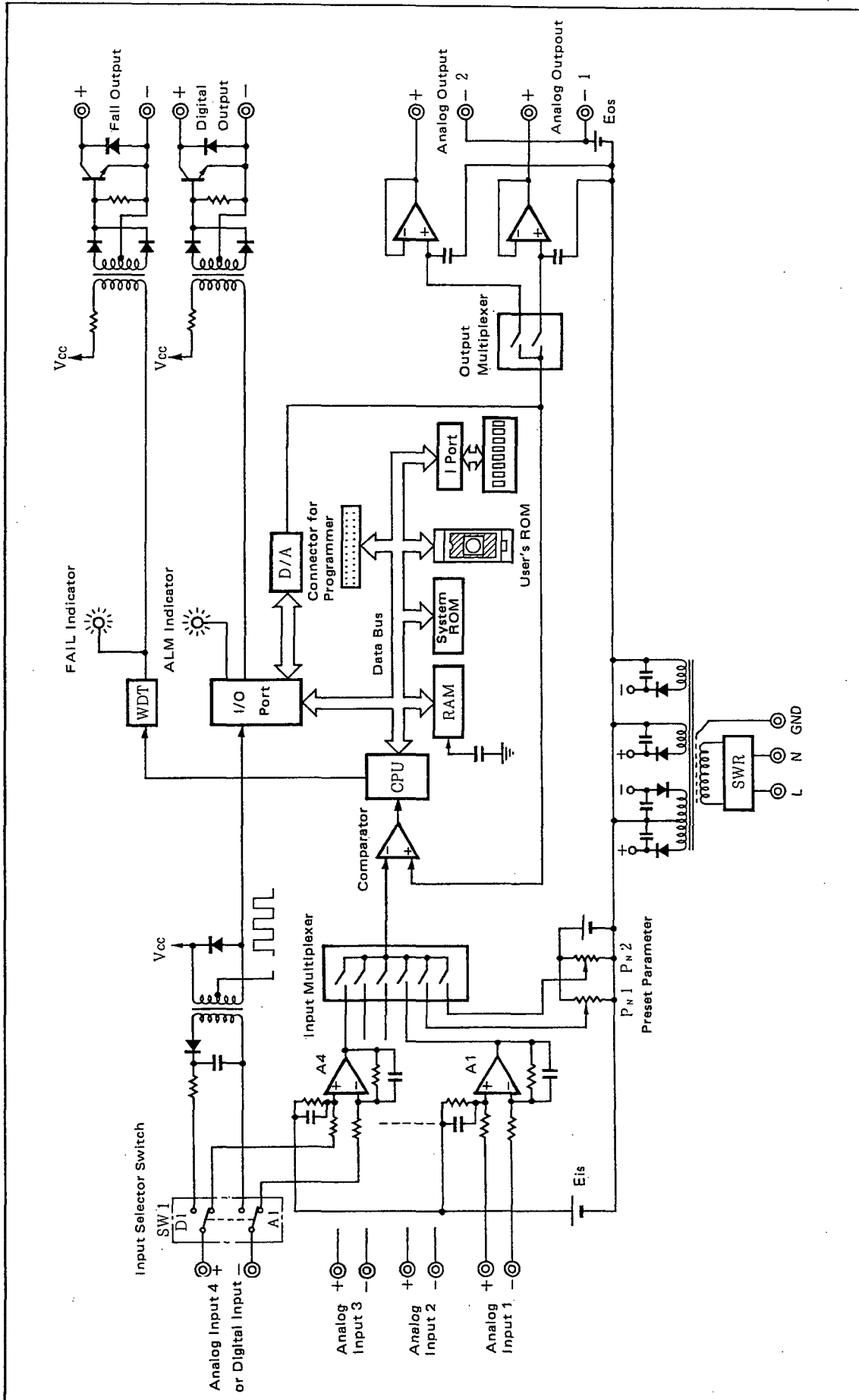
Figure 4-4.   SPLR Block Diagram.

5. OPERATION.

This chapter describes the precedures for making simple settings as well as the checks to be made upon completing the wiring. This should be done before the unit is entered into normal operation.

5-1. Components.
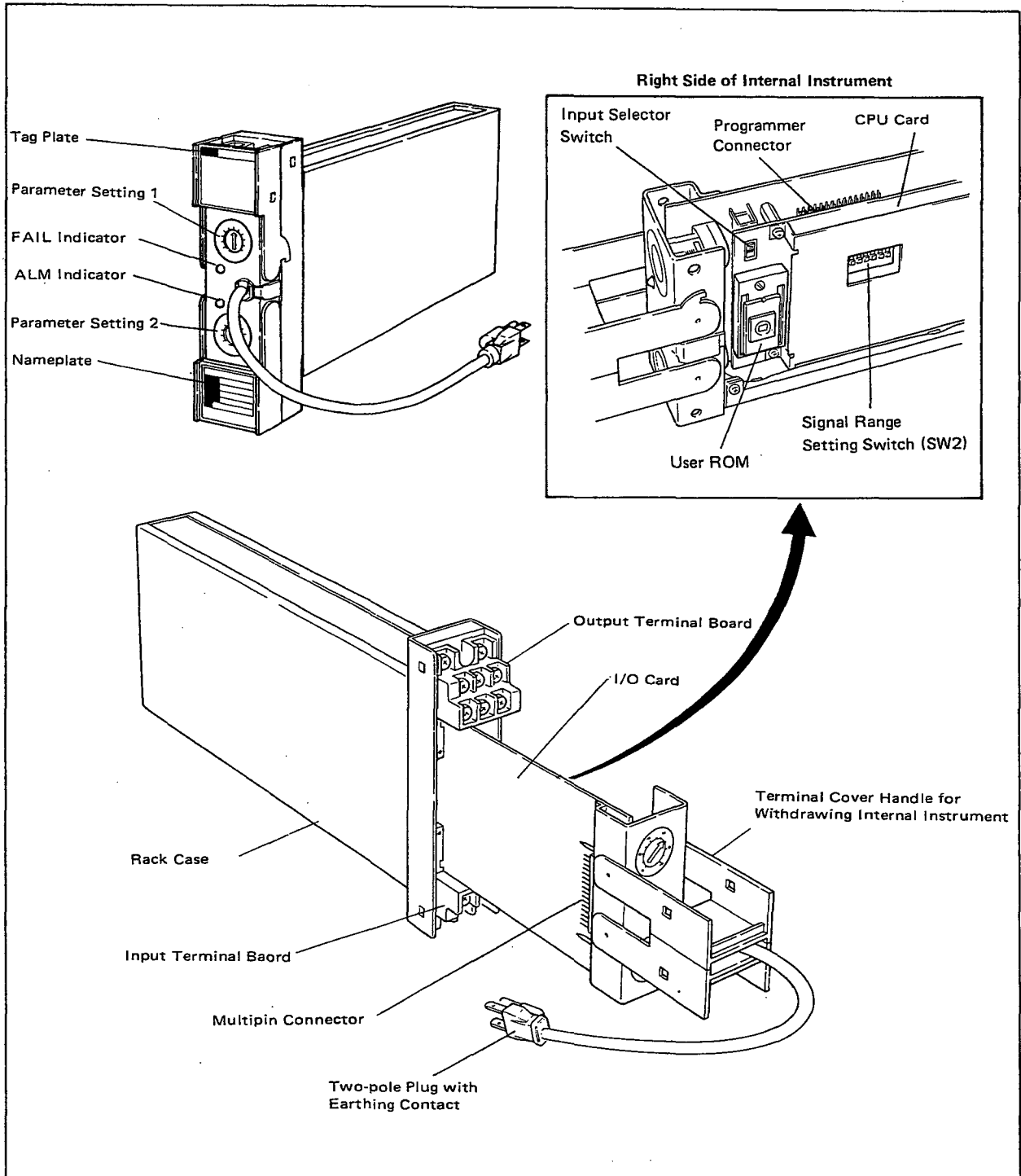
Figure 5-1.   Components.

5-2. Checks and Setting Prior to Operation.

Before starting normal operation, check and confirm the following settings with the power plug disconnected.

(1) Pull out the internal instrument from the rack case, and check that the specified fuse is installed in the fuseholder at the rear of the internal instrument.

(2) Check that the user ROM is installed on the right side of the internal instrument.

(3) Check that the desired input signal is selected by input selector switch SW1 on the right side of the internal instrument. This switch selects either a digital or an analog signals for input to terminals 7 and 8.

Switch position	Input signal
D1	Digital input
A1	Analog input 4

(4) The I/O signal levels are set to 1 to 5 V at the factory before shipment. If other signal levels are to be set, use a tweezers to set the signal range setting swith SW2 (see Figure 5-2) as listed in Table 5-1.

Switches No.1 and 2 are used for input signal setting, and No.3 and 4 are used for output signal setting.

Switches No.5 through 8 are not used, however, confirm that these switches are set to OFF position.

Table 5-1.

	Input/Output Range	SW2 Setting	Description
INPUT	1 to 5 V	ON / OFF	1 : OFF 2 : OFF
	0 to 5 V	ON / OFF	1 : OFF 2 : ON
	0 to 10 V	ON / OFF	1 : ON 2 : OFF
OUTPUT	1 to 5 V	ON / OFF	3 : OFF 4 : OFF
	0 to 5 V	ON / OFF	3 : OFF 4 : ON
	0 to 10 V	ON / OFF	3 : ON 4 : OFF

(5) Set parameter dials 1 and 2 at the front of the internal instrument to the desired values.

(6) Check that the wires are properly connected to the terminal board.

(7) Replace the internal instrument into the rack case. Replace the terminal cover on the terminal board.

(8) Connect the power plug to the outlet and begin the operation.

5-3. Self-Diagnosis and Alarm Checks.

This unit displays an internal abnormality on either the FAIL or ALM indicator lamps on the front panel of the unit. Thus, an illuminated FAIL or ALM indicator should receive prompt attention and any necessary countermeasures taken.
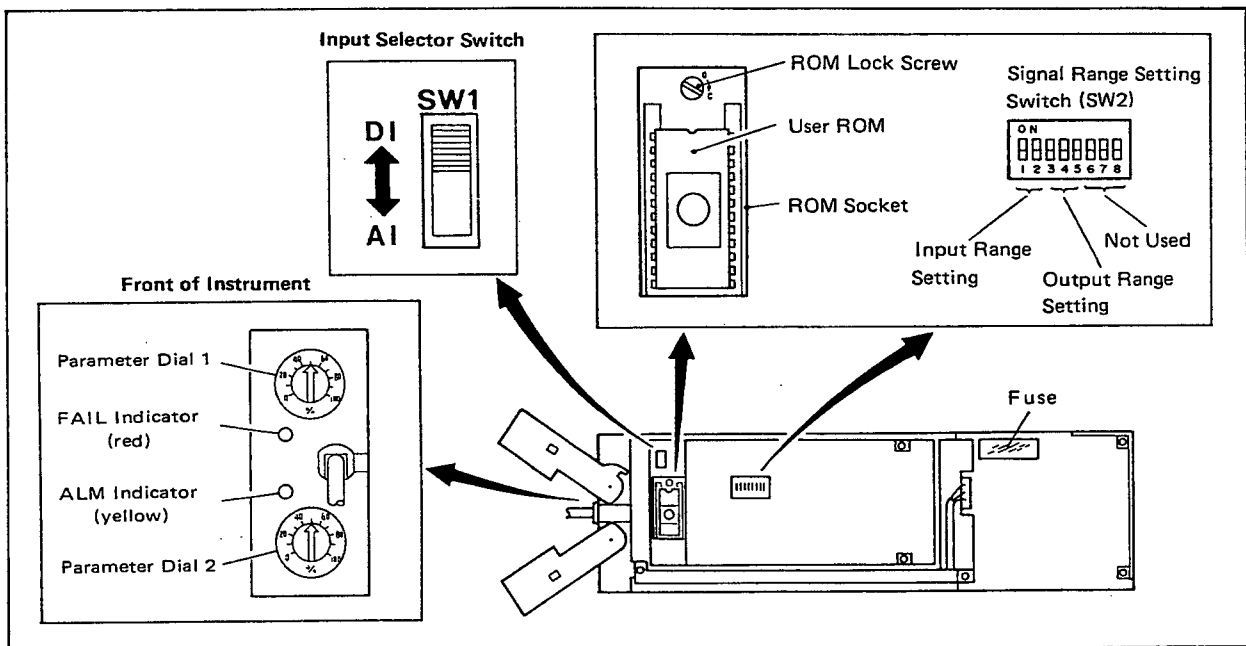
Figure 5-2. Check Points and Setting Prior to Operation.

IM 1B4L3-01E

5-3-1. FAIL indicator.

The FAIL indicator lights for any of the errors shown in Table 5-2. When the FAIL indicator lamp lights, the operation stops, the output signal is unpredictable and the fail contact opens. Thus, when the FAIL indicator lights, pull the internal instrument out from the housing, check for the cause of the failure and restore the unit to its normal operating condition.

Table 5-2.

FAIL indicator lights when:
A/D or D/A converter fails
User ROM fails or is not installed
Microprocessor fails

Note that extremely strong electrical noise can cause the FAIL indicator to light and stop the operation of this unit.

When this situation occurs, disconnect the power plug or switch off the power, and then restore the power to restart this instrument (FAIL indicator goes out when the operation restarts).

5-3-2. ALM indicator.

The ALM indicator lights when any of the errors shown in Table 5-3 occur. The computation continues but the input signal and the computation data are limited by the limit value.

When the ALM indicator lights, check the input and output signals with a voltmeter and take any necessary actions to remove the cause of the trouble.

(The ALM indicator and the program alarm functions are not connected.)

Table 5-3.

ALM indicator lights when:
Input signal limits —6.3% to 106.3% are exceeded.
Computation overrange limits —800% to 800% are exceeded.

5-3-3. Error indication.

The causes of the error described in 5-3-1 and 5-3-2 can be displayed numerically by the SPRG programmer.

(1) Remove the SPLR (or use an extension board to keep the unit on-line), and connect the SPRG programmer by referring to the procedure described in 3-2-2 of SPRG programmer instruction manual IM 1B4W1-01E (see Figure 6-1).

(2) After turning on the power switch, set the programmer to the program mode, and press program transfer key ⎡XFR⎤ . When the FAIL indicator lights, check that the user program (contents of User's ROM) is normal using ⎡△⎤ ⎡▽⎤ key. If the keys ⎡XFR⎤ , ⎡△⎤ and ⎡▽⎤ do not operate normally, this is an indication that the microprocessor may have failed.

(3) Now, set the programmer to the test-run mode. The cause of the failure can now be indicated numerically by pressing flag register key ⎡FL⎤ ⎡n⎤ . When the ALM indicator lights (outside input signal or computation limits), examine the program flag while checking a known input signal with the program.

Table 5-4 shows the relationship between cause of the failure and the display on the programmer.

Table 5-4. Indication of Failure by SPRG Programmer.

Indicator lamp	Operation of programmer (Note)	Indication	Diagnosis
FAIL	⎡XFR⎤	Abnormal	Microprocessor failed
	⎡△⎤ ⎡▽⎤	Program step	User's ROM (One-by-one program check)
	⎡FL⎤ ⎡1⎤	0	Normal
		1	A/D or D/A conversion abnormality
ALM	⎡FL⎤ ⎡3⎤	0	Normal
		1	Overrange of operation
	⎡FL⎤ ⎡4⎤	0	Normal
		1	Input signal is out-of-limit

Note: Use program mode for ⎡XFR⎤ and ⎡△⎤ ⎡▽⎤ and test run mode for ⎡FL⎤ ⎡m⎤ .

5-4. Power-Fail Restart Function.

When recovering following a power failure, the operation continues with the data read after restart.

However, for time-dependent functions such as the first order lag, first order lead and dead time, the method used to restart the computation after a power failure may vary depending on the power failure duration, since the computation involves old data.

Figure 5-3 shows some typical examples of time-dependent functions following power failures.

Table 5-5.

Power failure duration / Computation	less than 2 sec.	2 sec. or more
First order lag, first order lead, dead time, velocity computation, moving average, velocity limiter, timer, high and low limit alarms	Computation starts with the values read just prior to the power failure.	Computation starts after old data is initialized.
Temporary register TN	Stores the data just prior to the power failure.	Reset to 0.0.
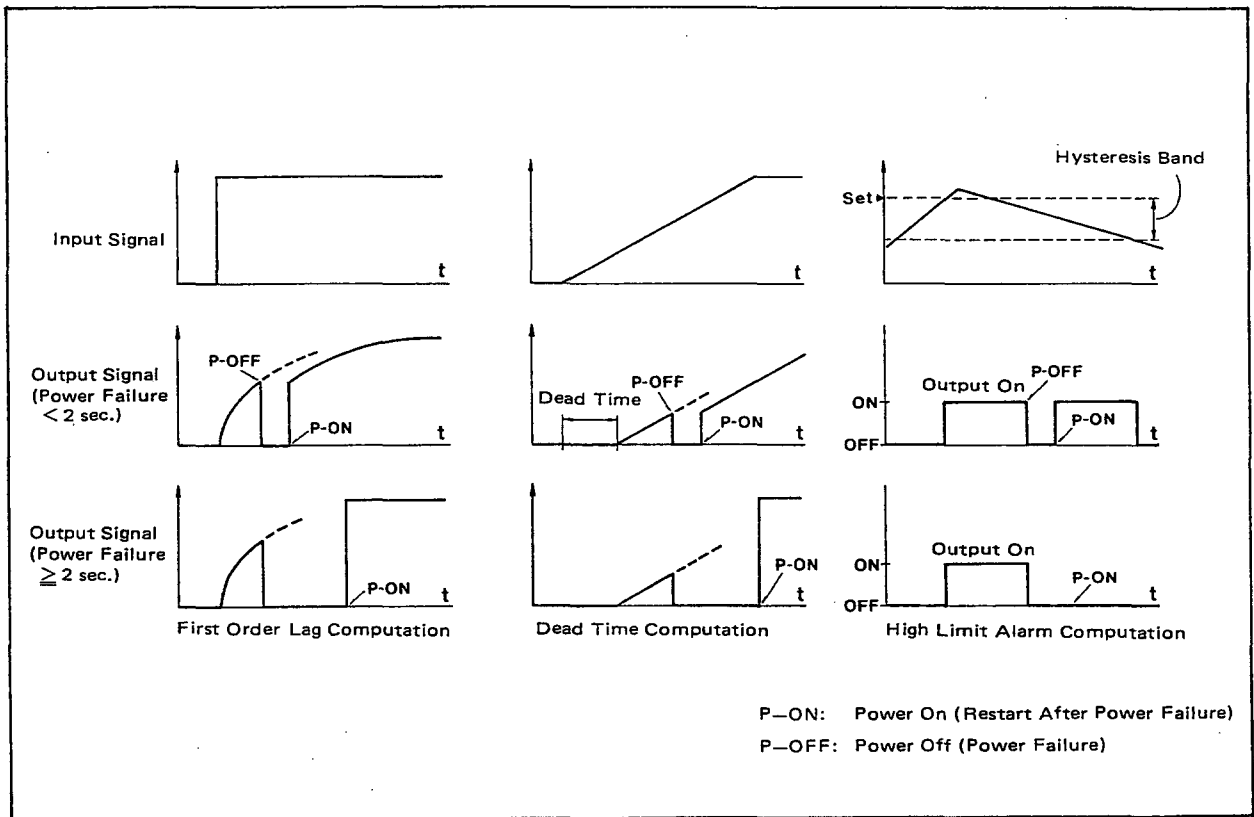
Figure 5-3. Time-Dependent Functions Following Power Failure

6. MAINTENANCE.

This section describes the procedures relatively simple input/output signal checks and parts replacement.

6-1. Input/Output Signal Checks.

This section describes the procedures for checking the input/output signals with an SPRG programmer, voltmeter and voltage standard.

6-1-1. Test equipment.
DC Voltage/Current Standard:
Model 2554 or equivalent 1
Voltmeter: Type 2502 or equivalent 1
SPRG programmer 1
Resister (about 10 kΩ). 1

6-1-2. Connecting the SPRG programmer and preparing the test program.
(1) Connect the SPRG programmer to the SPLR according to the procedure described in 3-2-2 of SPRG instruction manual IM 1B4W1-01E (see Figure 6-1).
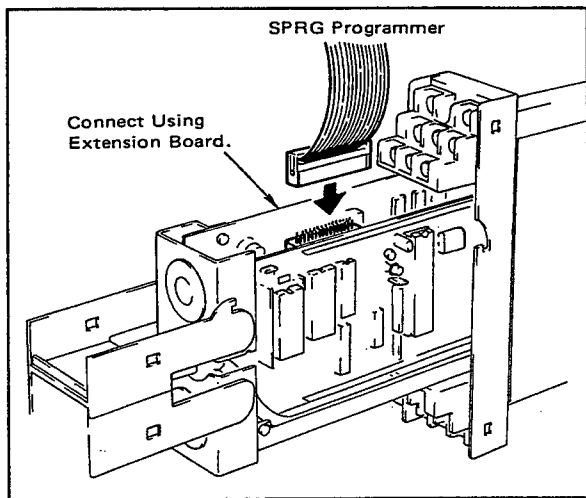
Figure 6-1. Connecting the Programmer.

(2) After turning the power ON, use the program mode to prepare the program for testing.

Table 6-1. Test Program.

Step	Program	Comment
01	LD K01	Read and check constants
02	ST Y1	Store K01 in output 1
03	ST Y2	Store K01 in output 2
04	LD Di 1	Read digital input 1
05	ST Do 1	Store Di 1 in digital output 1
06	END	End

(3) Transfer SPRG to the test run mode.

6-1-3. Input signal checks.
(1) Set input selector switch SW1 on the right side of the SPLR internal instrument to "AI".
(2) Connect the voltage/current standard to input terminal 1+, 2—, and call X1 using SPRG programmer. The input signal and the values indicated in SPRG programmer satisfy the relationship shown in Table 6-2.

Table 6-2. Input Voltage and Programmer Indicator Readings.

Input Voltage (V)			Programmer Readings
1.000	0.000	0.000	0.000 ± 0.002
2.000	1.250	2.500	0.250 ± 0.002
3.000	2.500	5.000	0.500 ± 0.002
4.000	3.750	7.500	0.750 ± 0.002
5.000	5.000	10.000	1.000 ± 0.002
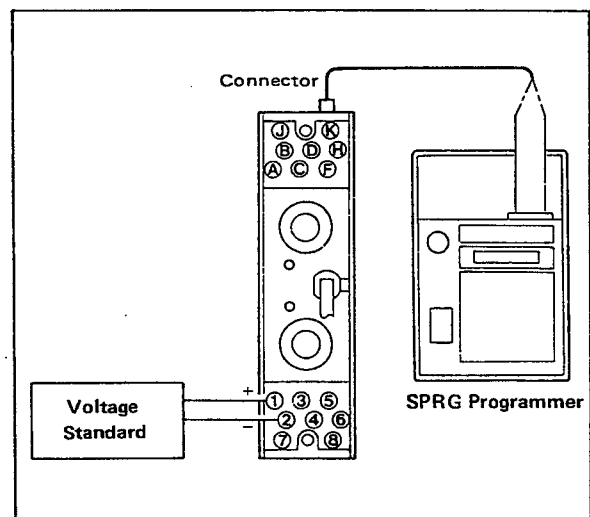
Figure 6-2. Input Signal Check.

(3) Then, connect the voltage/current standard to input terminal X2, and check the signal by calling the X2 with the programmer. Also check input terminals X3 and X4 (refer to Table 3-1 for the terminal numbers) in a similar manner. The input voltage and the indicated values must conform to those listed in Table 6-2.

6-1-4. Digital input/output signal checks.

Set input selector switch SW1 to DI, and connect the voltage/currents standard, resister and voltmeter to digital output terminals. C, D as illustrated in Figure 6-3. Then, check that the selecror switch can be actuated by opening and shorting digital output terminals 7, 8. The reading at the programmer and the digital output voltage should vary as shown in Table 6-3.

Table 6-3. Digital Input/Output Signal.

Input terminal 7+, 8—	Programmer reading D11 and D01	Output terminal C(+), D(—)
Open	0	4.8V min.
Shorted	1	0.2V max.
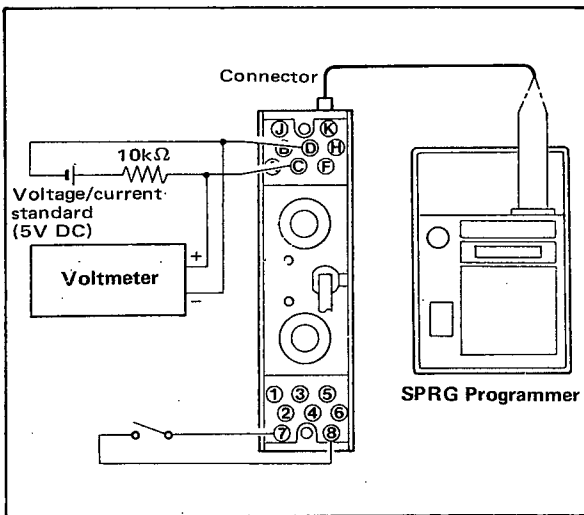
Figure 6-3. Digital Input/Output Signal Checks.

6-1-5. Output signal checks.
(1) Connect the voltmeter to output terminal Y1 (terminals A+, B—), and set the check data by calling K01 using the SPRG programmer*. The set values and the output signals should satisfy the relationship shown in Table 6-4.

* For the setting method, refer to subsection 5-12-3 of SPRG programmer instruction manual IM 1B4W1-01E.

(2) Then, connect the voltmeter to Y2 (terminals F+, H—), and check in a manner similar to (1). Data setting K01 and the corresponding output voltage must satisfy those listed in Table 6-4.

Table 6-4. Data Setting and Output Voltage.

Data Setting (K01)	Output Voltage (V)		
	1 to 5 V Output	0 to 5 V Output	0 to 10 V Output
0.000	1.000 ± 0.012	0.000 ± 0.015	0.000 ± 0.030
0.250	2.000 ± 0.012	1.250 ± 0.015	2.500 ± 0.030
0.500	3.000 ± 0.012	2.500 ± 0.015	5.000 ± 0.030
0.750	4.000 ± 0.012	3.750 ± 0.015	7.500 ± 0.030
1.000	5.000 ± 0.012	5.000 ± 0.015	10.000 ± 0.030

6-1-6. Parameter checks.

Set adjustments PN1 and PN2 on the SPLR panel to the 0%, 25%, 50%, 75% and 100% positions and call the parameters using the SPRG programmer. Check that the indicated value is within ±5% of the set value.

6-1-7. Test results.

If, during the checks described in subsections 6-1-3 through 6-1-6, signals are found that are not in conformity with the specifications, precise adjustments will be required. In this event, contact our service department.

6-2. Parts Replacement.

6-2-1. Replacing the fuse.

When the fuse blows, first investigate the cause, and then replace the fuse according to the following procedure. If the fuse or fuseholder itself is the cause, check the inside of the fuse holder for any contamination that might be causing poor contact (see Figure 6-2).

Recommended replacement interval : Abaut 3 years.
(1) To remove the fuse holder cap, turn the cap counterclockwise in the direction of the arrow indicated on the cap.
(2) Before installing a new fuse, check the fuse rating. Replace the cap securely.
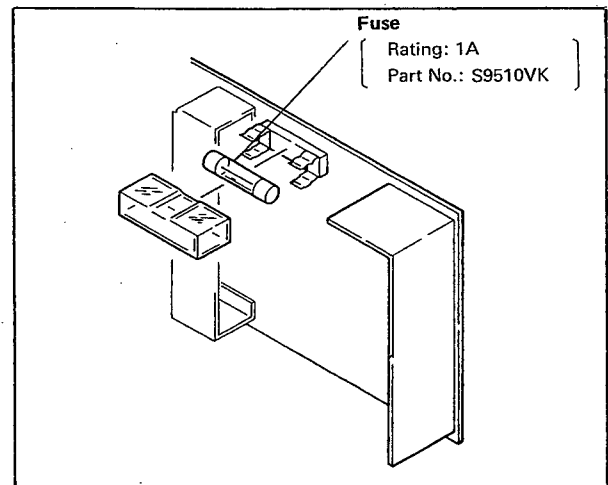
Figure 6-4. Fuse Replacement.

Note: Use the dedicated fuse (S9510VK). Do not use a fuse for other products.

6-2-2. Replacing the user ROM

~~~~~~

CAUTION

~~~~~~

Do not remove or install the user ROM while power is being supplied to the instrument. This will cause the computing unit to enter the FAIL mode, and may damage the ROM.

To change the user ROM to change the program, proceed as follows:
(1) Removing the user ROM.
   a) Turn the power supply OFF to the internal instrument.
   b) Pull out the internal instrument, and locate the user ROM installed on the right side of the internal instrument.
   c) Using a small flat blade screwdriver, turn the ROM lok screw (fixing ROM socket) counterclockwise 1/4 turn.
   d) Holding the ROM with one hand, lift it out carefully so as not to damage the ROM pins. The ROM can be easily removed in this manner (see Figure 6-5).
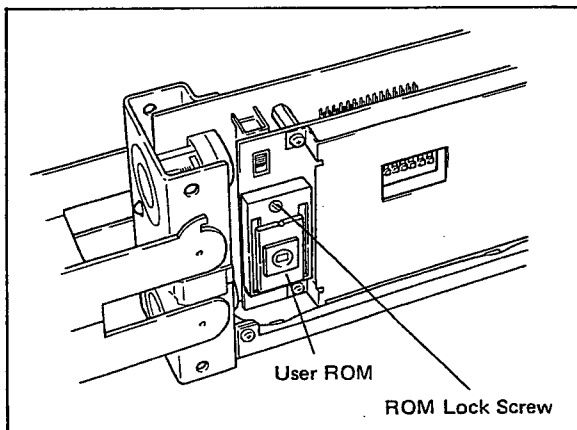
Figure 6-5. Installing and Removing the User ROM.

(2) Installating the user ROM.
   a) The ROM should be installed so the notched edge faces upward.
   b) Always check for correct corespondence between the pins and the socket.
      When a 24-pin ROM (part No,G9003LT) is installed onto the unit, mount it in the low area of the socket (so the upper two pinholes on both the right and left lines of socket become idle).

c) To install, slowly insert manually.
d) Using a small flat blade screwdriver, turn the ROM lock screw fully clockwise (approx. 1/4 turn) until it stops.

~~~~~~

Cautions for handing the user ROM

~~~~~~

The user's ROM is the PROM type generally called the MOS (metal Oxide Semiconductor). This type of IC can be destroyed by a charge of static electricity, so adequate care must be taken when handling the user ROM. Also note that the stored program may be destroyed if the sealed area of the ROM is subjected to ultraviolet rays.
Thus, when handling the user ROM, the following cautions should be observed:
● **Protecting the ROM for static electricity**
When transporting or storing the user ROM, always use a conductive mat. Do not let the ROM contact garments or equipment which may charge the ROM with static electricity. Do not handle the ROM while wearing gloves made of synthetic materials.
● **Protecting the ROM from ultraviolet rays**
Never remove the light shield for any purposes other than to erase the data. When installing a new PROM in this instrument, always cover it with the specified seal.
● **Preventing ROM pin deformation**
When a pin is deformed, bend it back carefully so as not to break it or damage the base seal.
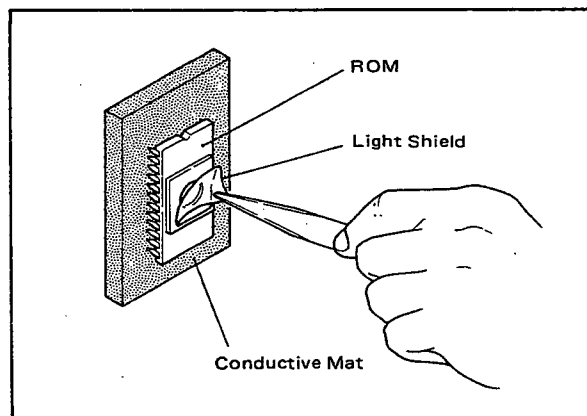
Figure 6-6. ROM Seal.

6-2-3. Replacing the Power Supply Unit.
   Degradation of the Al electrolytic capacitor in the Power Supply Unit depends on working temperature conditions.
Recommended replacement interval: 5 to 10 years.
   Replace the power supply unit as instructed in Section 7-2.

7. TROUBLESHOOTING.

If a problem occurs in the Model SPLR Programmable Computing Unit, identify the problem and resolve it according to the troubleshooting flowcharts shown in Section 7-1. Troubleshooting is facilitated by using the extention cable contained in the SSKD service kit.

If the problem is difficult to find, consult your local Yokogawa service station.

7-1. Troubleshooting Flowcharts.

[1] Problem identification

[2] Totally inoperative

```
                    │
                    ▼
          ┌──────────────────────┐
          │ Check connection     │
          │ between instrument   │
          │ module and rack case │
          └──────────────────────┘
                    │
                    ▼
                  ╱─────────╲              YES
               ╱  Is fuse normal? ╲─────────────────┐
               ╲                 ╱                   │
                  ╲─────────╱                        │
                    │                                │
                  NO (blown)                         │
                    │                                │
                    ▼                                ▼
          ┌──────────────┐              ┌──────────────────┐
          │ Replace fuse │              │ Replace rack case│
          └──────────────┘              └──────────────────┘
                    │                            │
  Fuse blows again ┤- - - - -                   │- - - -  ( If still inoperative, reinstall
                    │         │                  │         ( original rack case
                    └─────────┼──────────────────┘
                              ▼
                    ┌──────────────────────┐
                    │ Replace power supply │
                    │ unit                 │
                    └──────────────────────┘
                              │
  If still abnormal, reinstall┤- - - - - -
  original power unit         │
                              ▼
                    ┌──────────────────────┐
                    │ Replace CPU card     │
                    └──────────────────────┘
                              │
  If still abnormal, reinstall┤- - - - - - -
  original CPU card           │
                              ▼
                    ┌──────────────────────┐
                    │ Faulty I/O card; replace │
                    └──────────────────────┘
```

[3] FAIL lamp ON

```
                              │
                              ▼
                  ┌───────────────────────┐
                  │   Check installation  │
                  │     of user ROM       │
                  └───────────────────────┘
                              │
                              ▼
                        ╱───────────╲          ((Overvoltage)
                      ╱  Is input     ╲─────────────────────┐
                      ╲ signal normal? ╱   NO               │
                        ╲───────────╱                       │
                              │ YES                          ▼
                              ▼                    ┌──────────────────┐
(For example, service  ┌───────────────┐          │  Turn power off for │
   kit check ROM)      │ Replace user  │          │  at least 2 seconds,│
                       │     ROM       │          │   then recheck      │
                       └───────────────┘          └──────────────────┘
                              │
                              ▼
                        ╱───────────╲      YES
                      ╱ Is FAIL lamp   ╲──────────────────────┐
                      ╲ OFF and fail    ╱                      │
                       ╲output closed? ╱                       ▼
                        ╲───────────╱                ┌──────────────────┐
                              │ NO                   │ User ROM abnormal │
                              ▼                      └──────────────────┘
                  ┌───────────────────────┐
                  │  Connect Programmer   │
                  │   (program mode)      │
                  └───────────────────────┘
                              │
            NO                ▼
      ┌────────────────╱───────────╲
      │               ╱ Is "PROGRAM" ╲
      │               ╲  displayed?   ╱
      │                ╲───────────╱
      │                     │ YES
      │                     ▼
      │               ╱───────────╲   Executable
      │             ╱ Change to test ╲────────────┐
      │             ╲  run mode.      ╱            │
      │              ╲───────────╱                 ▼
      │                 │ Not                ╱───────────╲    YES
      │                 │ executable        ╱  Is FL1=1   ╲────────┐
      │                 │                   ╲ in test run  ╱        │
      │                 │                    ╲  mode?      ╱         │
      │                 │                     ╲─────────╱           │
      │                 │                        │ NO (normal)       │
      ▼                 ▼                        ▼                   ▼
┌───────────────┐  ┌──────────────────┐  ┌──────────────────┐
│ Replace CPU   │  │ Turn power off for │  │  Replace I/O card │
│    card       │  │ at least 2 seconds,│  └──────────────────┘
└───────────────┘  │   then recheck     │
                   └──────────────────┘
                   (Malfunction caused by
                    noises is suspectable.)
```

[4] ALARM lamp ON

```
                                    │
                                    ▼
                        ┌───────────────────────┐
                        │ Check connection      │
                        │ between instrument    │
                        │ module and rack case  │
                        └───────────────────────┘
                                    │
                                    ▼
                            ╱───────────────╲          NO
                           ╱  Is ALM lamp ON? ╲──────────────────────┐
                            ╲───────────────╱                        │
                                    │                                │
                                   YES                               │
                                    ▼                                ▼
  ┌──────────────────┐  YES  ╱───────────╲        NO       ╱───────────╲
  │ Input signal     │◄──────╱  FL4 = 1   ╲       ┌────────╱  FL4 = 0    ╲
  │ abnormal         │        ╲───────────╱       │         ╲───────────╱
  └──────────────────┘             │              │              │
                                   NO             │             YES
                                    ▼             │              ▼
  ┌──────────────────┐  YES  ╱───────────╲        │   NO   ╱───────────╲
  │ Arithmetic range │◄──────╱  FL3 = 1   ╲◄──────────────╱  FL3 = 0    ╲
  │ overflow         │        ╲───────────╱               ╲───────────╱
  └──────────────────┘             │                           │
                                   NO                         YES
                                    ▼                           ▼
                        ┌───────────────────┐        ┌───────────────────┐
                        │  Replace CPU card │        │ Normal operation  │
                        └───────────────────┘        └───────────────────┘
                                    │
     If still abnormal, reinstall }─┼─ ─ ─ ─
     original CPU card              │
                                    ▼
                        ┌───────────────────┐
                        │  Replace I/O card │
                        └───────────────────┘
```

[5] Analog I/O signal abnormal

```
                              │
                              ▼
                  ┌───────────────────────┐
                  ╱ Is only No. 4 analog   ╲        YES
                  ╲   input abnormal?      ╱ ──────────────┐
                  └───────────────────────┘                │
                              │ NO                          │
                              ▼                             │
┌──────────────┐  YES ┌───────────────────────┐            │
│ Set correctly │◄──── ╱     Incorrect         ╲           │
└──────────────┘      ╲  Input Range Setting   ╱           │
                      └───────────────────────┘            │
                              │ NO                          ▼
                              ▼                   ┌──────────────────┐
                  ┌───────────────────┐           │                  │
                  │ Check connection  │           │ Set SW1 properly │
                  │ between instrument│           │                  │
                  │ module and rack   │           └──────────────────┘
                  │ case              │                     │
                  └───────────────────┘                     │
                              │◄─────────────────────────────  ─ ─ ─{ If still abnormal
                              ▼
                  ┌───────────────────────┐       NO
                  ╱  Signal value abnormal ╲ ──────────────┐
                  └───────────────────────┘                │
 (Check errors, variations,   │ YES                        │
 etc. with Programmer         ▼                            ▼
 display and voltmeter.)  ┌──────────────┐        ┌──────────────────┐
                          │ Replace CPU  │        │ Recheck problem  │
                          │ card         │        └──────────────────┘
                          └──────────────┘
  If still abnormal, reinstall  ┤ ─ ─ ─
  original CPU card             │
                                ▼
                          ┌──────────────────┐
                          │ Faulty I/O card; │
                          │ replace          │
                          └──────────────────┘
```

[6] Digital I/O signal abnormal

```
                              │
                              ▼
                         ◇─────────◇            YES
                        ╱  Di1      ╲─────────────────┐
                        ╲ remains at 0╱               │
                         ◇─────────◇                  │
                              │                        │
                              │ NO                     │
                              ▼                        ▼
                    ┌──────────────────┐      ┌──────────────────┐
                    │ Check connection │      │                  │
                    │ between instrument│     │  Set SW1 properly │
                    │ module and rack  │      │                  │
                    └──────────────────┘      └──────────────────┘
                              │                        │
                              │◄───────────────────────┘
   If still abnormal ┤─ ─ ─ ┤
                              │
                              ▼
                    ┌──────────────────┐
                    │ Faulty I/O card; replace │
                    └──────────────────┘
```

[7] Computational parameter abnormal

```
                              │
                              ▼
                         ◇─────────────◇         NO
                        ╱ Computational  ╲───────────────┐
                        ╲ parameter abnormal╱            │
                         ◇─────────────◇                 │
   (Check errors, variations,  │                          │
     etc. by Programmer)       │ YES                      │
                              ▼                           ▼
                    ┌──────────────────┐        ┌──────────────────┐
                    │  Replace I/O card │        │  Recheck problem  │
                    └──────────────────┘        └──────────────────┘
```
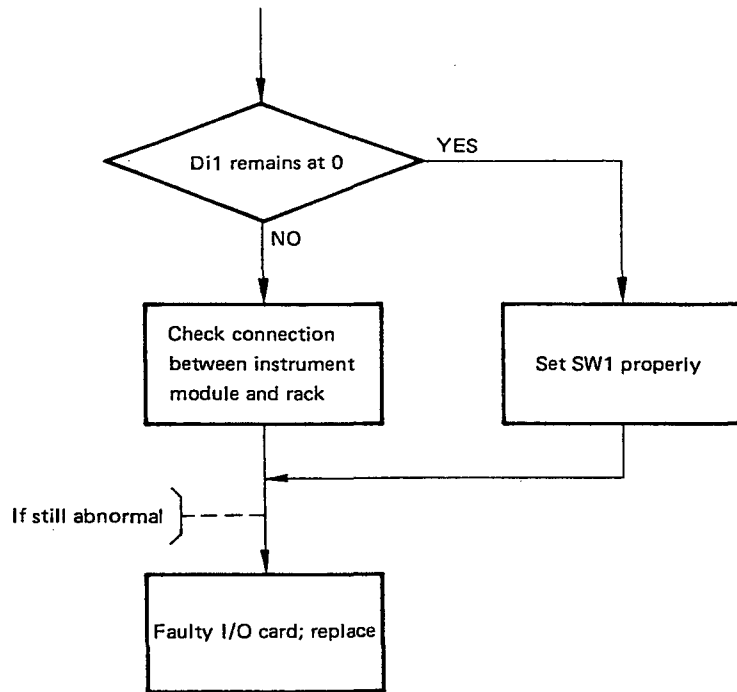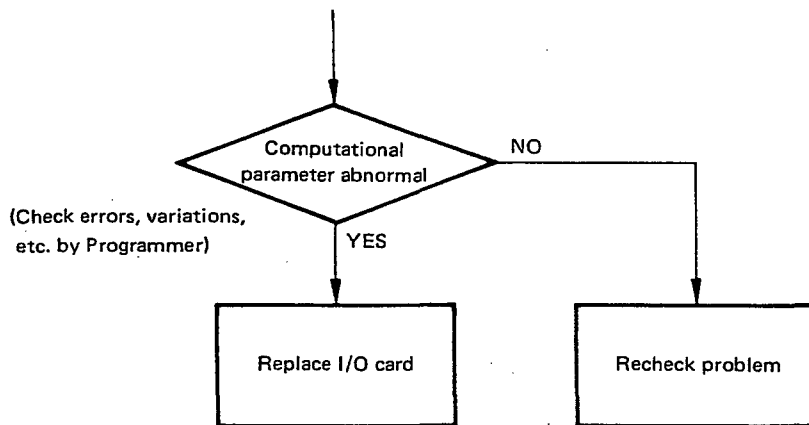
7-2. Parts Replacement.

Follow the procedures in this section to replace faulty units.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

CAUTION

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Limit the scope of overhaul to the minimum required. Have the YEW service station service parts not covered in this section.

7-2-1. Replacing procedure.
See Figure 7-1.
(1) Replacing power supply unit.
(2) Replacing CPU card.
(3) Replacing I/O card.

7-2-2. Replacing power supply card.
(i) Remove connector ① .
(ii) Remove two screws ② .
(iii) Remove the power supply unit backward.

7-2-3. Replacing CPU card.
(i) Detach cover A by removing three screws ③ .
(ii) Remove the CPU card carefully, observing its connector to the I/O card.

7-2-4. Replacing I/O card.
(i) Slide the power cable by removing two screws ④ .
(ii) Detach the front plate by removing two screws ⑤ .
(iii) Release the bracket by removing two screws ⑥ .
(iv) Detach cover B (with insulating film) by removing four screws ⑦ , and separate the I/O card.
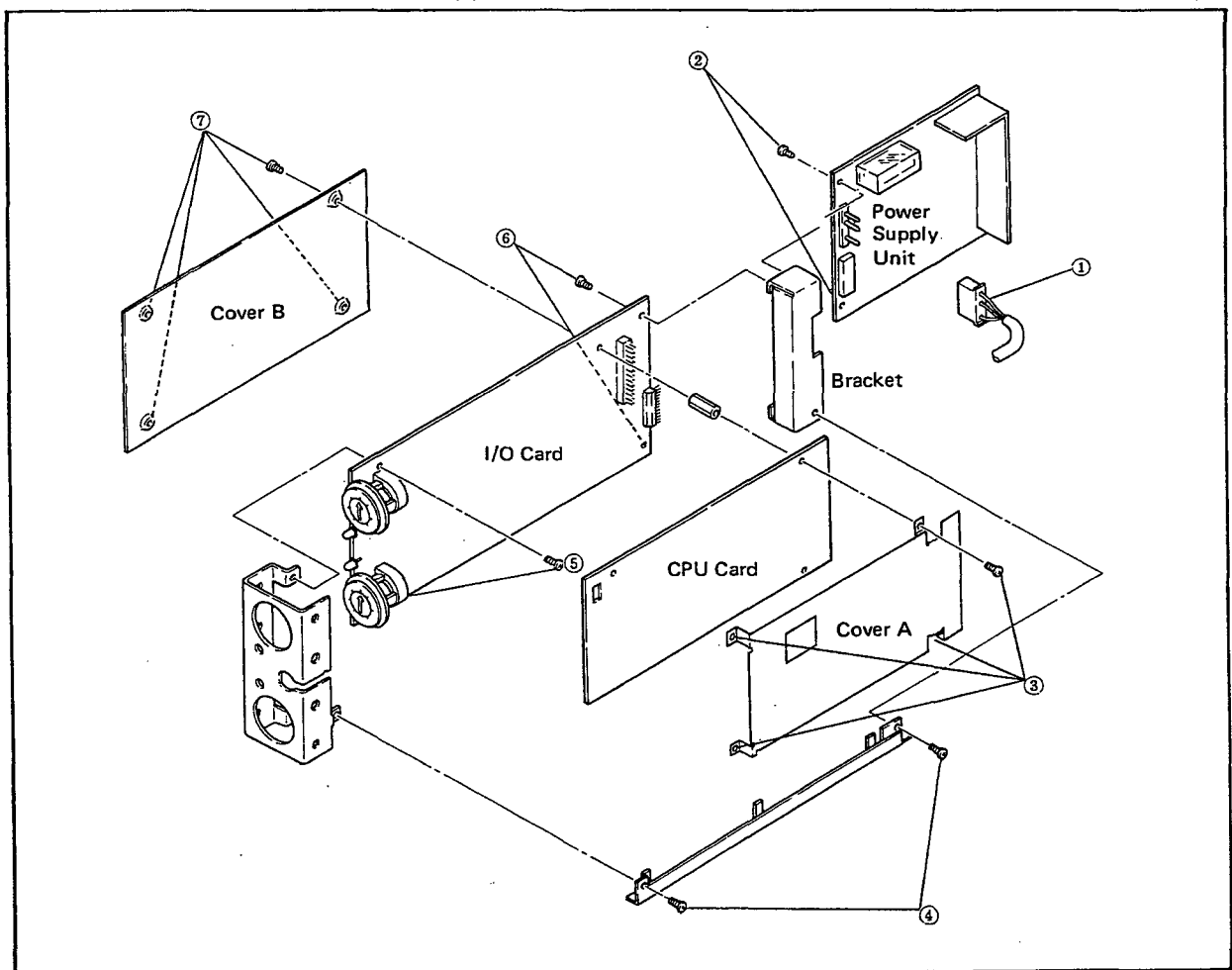
Figure 7-1. Model SPLR Programmable Computing Unit Disassembly Drawing.

2
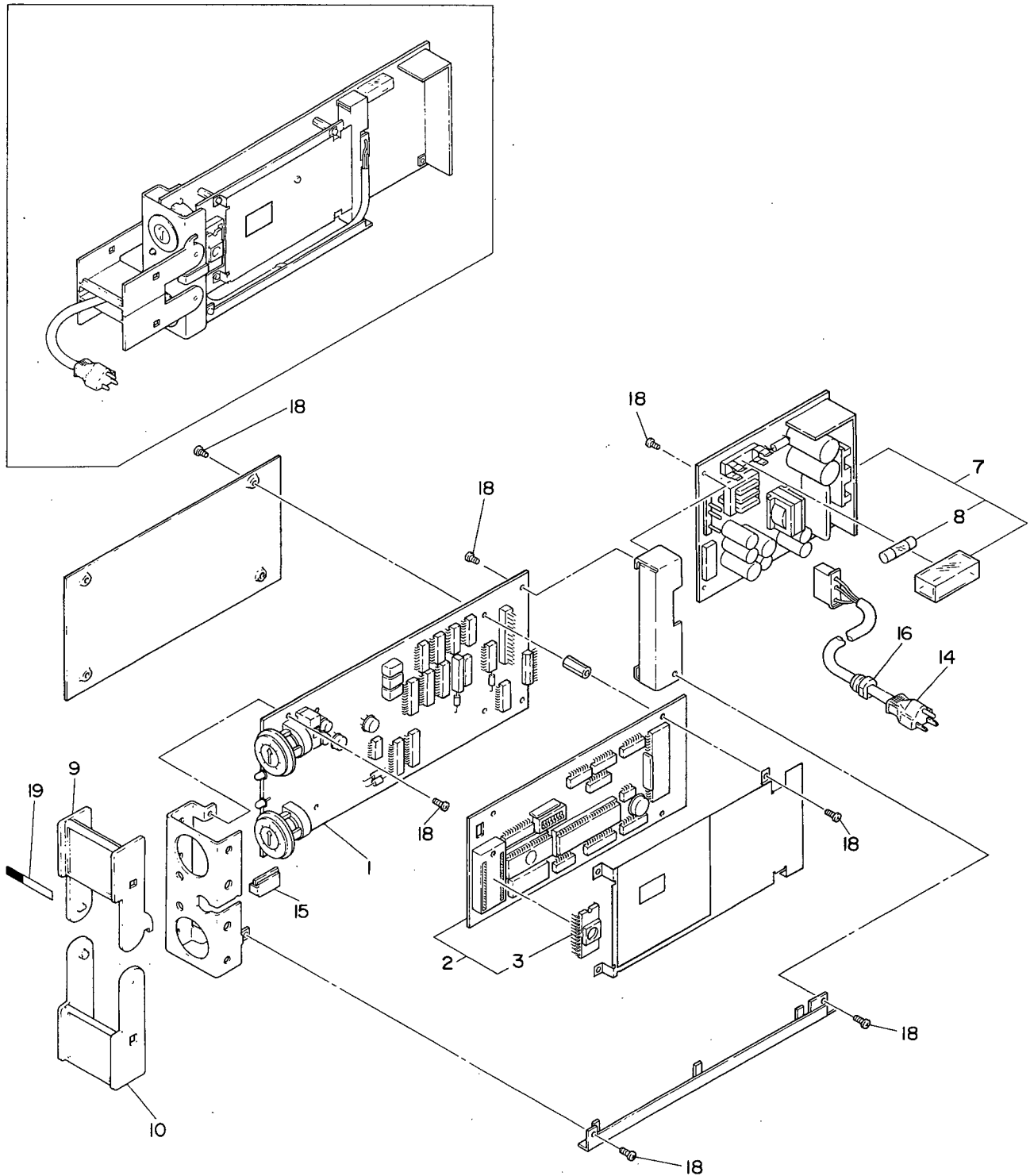
Item	Part No.	Qty	Description
1	E9715FC	1	I/O Card
2	E9715FD	1	CPU Card
3	A1123LQ	1	EPROM (U6)
7	E9715YA	1	Power Supply Unit (for 100V Version)
	E9715YR	1	Power Supply Unit (for 220V Version)
8	S9510VK	1	Fuse — 1A
9	E9713CK	1	Cover
10	E9713CA	1	Cover
14	E9713EG	1	Cable Assembly (for 100V Version)
	E9713FS	1	Cable Assembly (for 220V Version)
15	E9713CE	1	Cover
16	S9079PB	1	Bushing
18	Y9306JB	16	Pan H. Screw, M3 x 6
19	Y9422NP	1	Tag No. Label (blank)

Instruction Manual

/TB
Power Supply Terminal
Connections for Rack-mounted
Instruments(Option)

ʏɛwЅᴇʀɪᴇЅ 80

1. GENERAL.

If you specify the terminal board to which the power source is directly connected (suffix code /TB), the external wiring to the terminal board is necessary; therefore, drawing out of the inner chassis requires previous turning off of the power source and disconnection of the wiring from the terminal board.

2. APPLICABLE INSTRUMENTS.

Model	Description
STED	Emf- and RTS-to-Voltage Converter
SKYD	Alarm Unit
SALD	Emf- and RTS-Input Alarm Unit
SPLR	Programmable Computing Unit
SIND	Integrator
SISD	Isolator
SDBT	Power Distributor
SDBS	Power Distributor
SDBU-21	Power Distributor

3. EXTERNAL VIEW AND NAMES OF COMPONENTS.
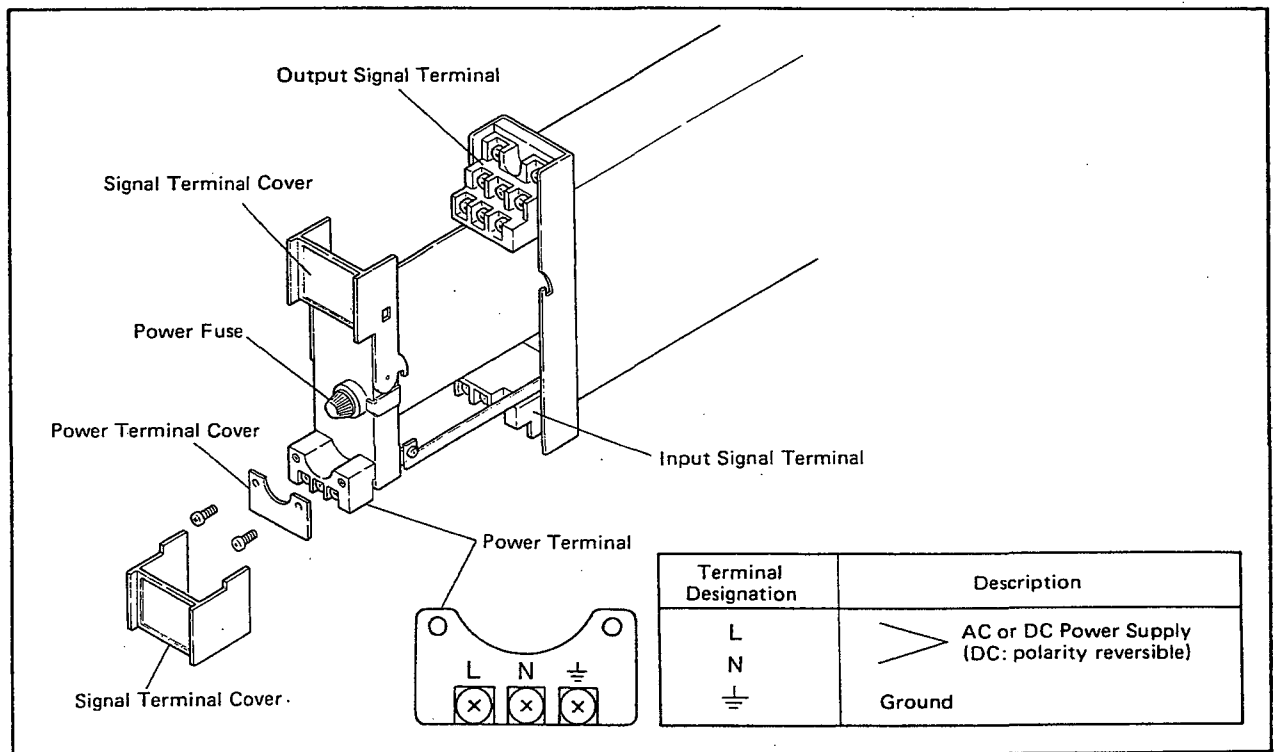
4. POWER SUPPLY AND GROUND WIRING.

(1) All cable ends must be furnished with crimp-on type solderless lugs (for 4 mm screw).
(2) Examples of applicable cables.
Cross-sectional area of the cable conductor: $2.0\,mm^2$.*
Applicable cable:
600 V vinyle insulated cable (IV), conforming to JIS C3307.
Vinyle sheathed cables for electric appliances (KIV), conforming to JIS C3316.
Note *: Power supply cables should be determined from the instrument power consumption — they must have conductors with cross-sectional area of at least $1.25\,mm^2$.
(3) Wirings to power supply and ground terminals should be made after completion of signal terminal wirings. (To facilitate connecting input signal, pull the internal instrument module approximately half way out of the housing. Do not remove the power terminal block.)
(4) After completing the power supply and ground wiring, mount the power terminal cover.

Terminal Designation	Description
L	AC or DC Power Supply (DC: polarity reversible)
N	
⏚	Ground

Customer Maintenance Parts List

/TB
Power Supply Terminals
For Rack-Mounted Instruments
(Option)

YEWSERIES 80
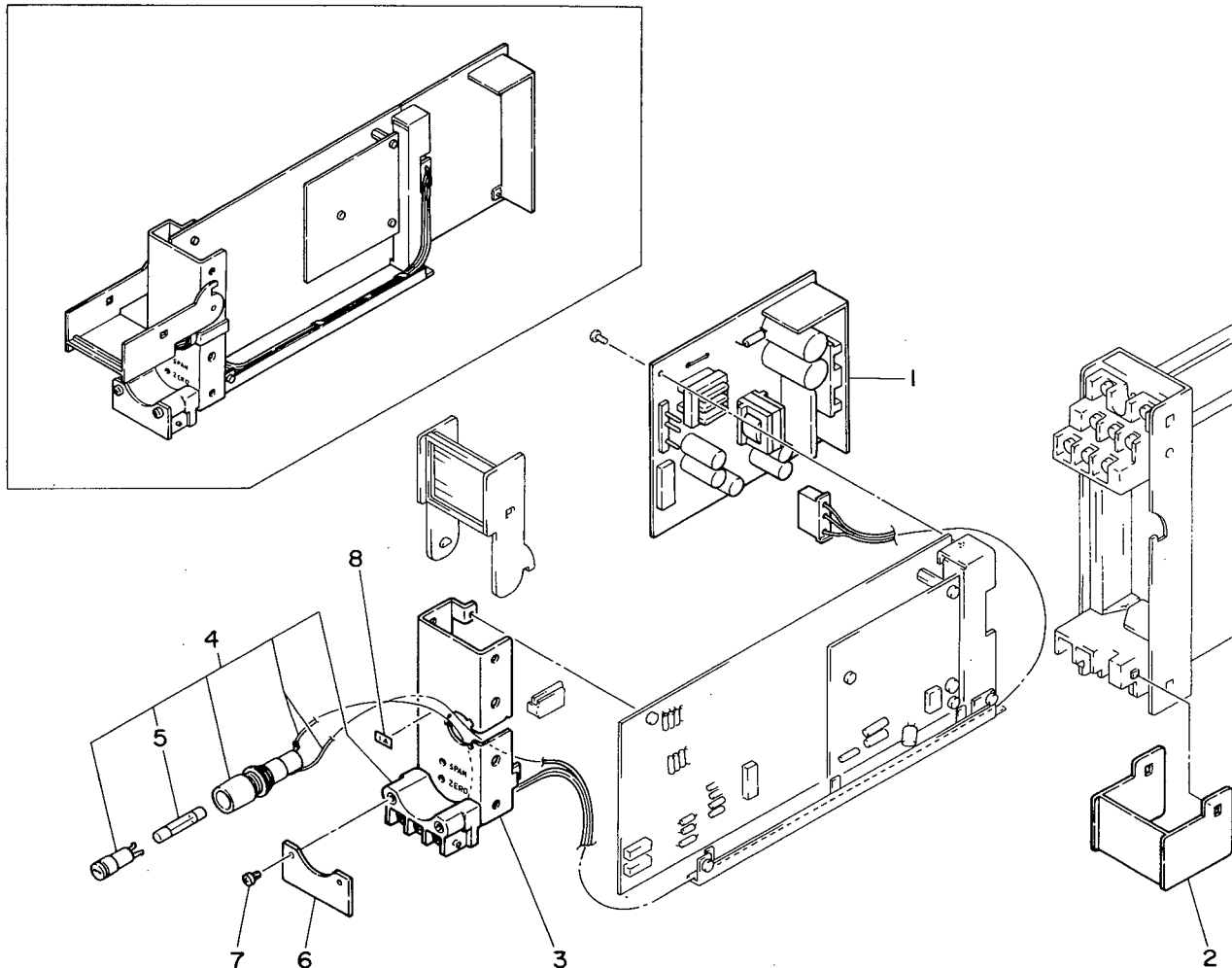
Item	Part No.	Qty	Description
1	—	1	Power Supply Unit (see Table 1)
2	E9713CJ	1	Cover
3	—	1	Bracket (see Table 2)
4	E9713ET	1	Terminal Assembly
5	S9510VK	1	Fuse (1 A)
6	E9713CV	1	Cover
7	Y9306JB	2	Pan H. Screw, M3 x 6
8	G9325EM	1	Label (1 A)

Table 1. Power Supply Unit Part Number.

Applicable Instruments	Power Supply Unit Part No.	
Model	1.00 V Version	220 V Version
SPLR, SIND	E9715YH	W9092JM
STED, SKYD, SALD SISD, SDBT	E9715YJ	W9092JN
SDBS	E9715YK	W9092JP
SDBU-21	E9715YK	—
SPCM	E9715YL	W9092SK

Table 2. Bracket Part Number.

Applicable Instruments	Bracket Part No.
Model	
STED	E9713DS
SKYD, SPLR	E9713DN
SKYD-100	E9713DP
SALD	E9713DT
SDBT, SIND, SISD SDBU-21	E9713DL
SDBS	E9713DR
SPCM	E9714KB

YOKOGAWA ◆

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