User's
Manual

YEWSERIES BCS

Model SBSD
(Style E)
Batch Set Station

IM 1B4E1-02E

YOKOGAWA ◆
Yokogawa Electric Corporation

IM 1B4E1-02E
6th Edition

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.

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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 visible damage.
2) Confirm that the model and suffix codes shown on the shipping documents, and also on the nameplate on the instrument side panel, are the same as on your order sheet.
3) Confirm that all accessories (see section 2-2) 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. Scope of this Manual and Associated Manuals.

This instruction manual covers handling, operating and simple maintenance procedures for the SBSD*E Batch Set Station.

You should first read the following manuals, in order to fully understand the functions of the SBSD*E Batch Set Station. You will then be able to fill out the data label on the side panel of the batch set station.

Please refer to the following manuals:

① TI 1B4E1-01E
"YewSeries BCS (style E) Batch-Blending Control System Functions and Data Setting".

② WS 1B4E1-02E
"SBSD*E Data Sheet".

2. GENERAL.

The SBSD*E Batch Set Station is used with the SLCC*E Blending Controller when a high-resolution in-line blending batch loader is required. In this application, it generates a demand pulse signal for the blending controller.

It can also be used for on/off control in batch loader applications using batch status output.

The Batch Set Station functions include:

- Scaling, addition or subtraction of flow signals, instantaneous flow display, repeater for a flow signal.
- Analog inputs and outputs, and compensation computation functions.
- Flow program set unit, batch sequences. Sequencer switches are on the front panel.
- Various totalizer functions. Totalizer parameters are easy to set, and totalizer totals may be viewed.
- Communications functions — the instrument is easy to design into a system, it can communicate with a central operator station or supervisory computer.
- Self-diagnostic functions.

Figure 2-1-1 shows the front view of SBSD*E.

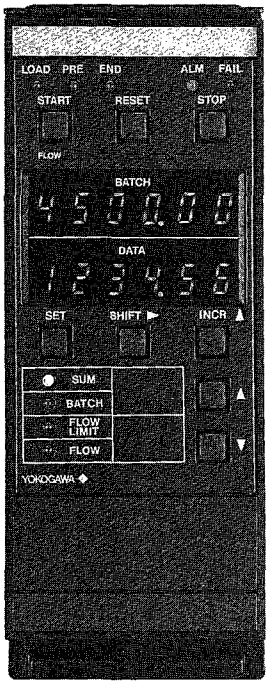


Figure 2-1-1. Front View of SBSD*E.

2-1. Standard Specifications.

Input Signals

Process Variable Pulse Input Signal: 0 to 6 kHz, zero elevation not possible, minimum pulse width 50 μs. Pulse input from two-wire/three-wire transmitter, or voltage transition/contact signal.

Input From Transmitter: SBSD contains distributor, voltage is switch-selectable – distributor supplies 12 V/24 V ±10%, current up to 50 mA. For two-wire transmitter, load resistance is switch selectable – 200 Ω, 510 Ω or 1 kΩ.

Voltage (Transition) Pulse:

Voltage LOW Level (E_L): –1 V to +8 V DC.

Voltage HIGH Level (E_H): 3 V to 24 V DC.

Amplitude of Pulse Signal ($E_H - E_L$): At least 3 V.

Input Resistance: At least 10 kΩ.

Contact Pulse: Relay/switch contact or transistor switch.

Contact ON: Source resistance up to 200 Ω.

Contact OFF: Source resistance at least 100 kΩ.

Contact Rating: At least 30 V DC, 30 mA.

Filter for Contact Pulse Input: Switch-selectable, time constant 10 ms.

Auxiliary Pulse Input Signal (Added to/Subtracted from Process Variable), and Status Inputs: Auxiliary pulse input is 0 to 1 kHz, zero elevation not possible, minimum pulse width 350 μs. Status input minimum pulse width 220 ms. Voltage (level) or contact signals.

Voltage (Level) Input:

Voltage LOW Level (E_L): –1 V to +1 V DC (status ON).

Voltage HIGH Level (E_H): 4.5 V to 25 V DC (status OFF).

Contact Input: Relay/switch contact or transistor switch.

Contact (Status) ON: Source resistance up to 200 Ω.

Contact (Status) OFF: Source resistance at least 100 kΩ.

Contact Rating: At least 5 V DC, 20 mA.

Analog Input Signals (Process Variable or Auxiliary Flow and Compensation Signals) (SBSD-201 and -301 only): 1 to 5 V DC, input resistance 1 MΩ.

Analog Input Conversion Accuracy: ±0.2% of span.

RTD Input Signal (for Temperature Compensation) (SBSD-301 only): JIS or DIN specification Pt 100 Ω 3-wire RTD, lead wire resistance up to 10 Ω/wire.

Temperature Compensation Accuracy: ±0.2% of span.

Burnout Function: Provided; scaleout time up to 60s.

Output Signals

Pulse Output Signal (Flow Repeater or Demand Pulse Signal): Transistor contact signal, rating 30 V DC, 200 mA.

Frequency: 0 to 1 kHz; **Duty Cycle** 50% (for conecting to YewSeries BCS Instrument), or **Fixed Pulse Width** – selectable (one of 0.5, 1, 20, 33, 50 or 100 ms) – for electromechanical counter.

Status Output Signals (for flow signal input abnormal (missing/leakage), pre-batch and batch end alarms, reset, and fail signals – five points): Transistor contact signals, rating 30 V DC, 200 mA.

Analog Output Signal (Flow Repeater Signal) (SBSD-201 and -301 only): 1 to 5 V DC, load resistance at least 2 kΩ.

Analog Ouptut Conversion Accuracy: ±0.3% of span.

Isolation

Contact (pulse/status) I/O signals are isolated from internal circuitry; analog signals are not. Pulse I/O signals are isolated from each other; status inputs, status outputs and analog I/O signals use separate common negative lines. Power supply is isolated from internal circuitry.

Input Processing Functions

Process variable and auxiliary flow inputs may be either voltage or pulse signals, compensation input may be either a voltage or RTD signal.

Auxiliary Flow Signal Processing (SBSD-201, -301 only): Auxiliary flow signal can be added to or subtracted from process variable signal. Range of analog output (to display and repeater) is adjustable.

Voltage Flow Signal Processing: Span setting (4-digit fixed point number) corresponding to input signal range of 1 to 5 V DC; low-input cutoff (for inputs under 1% of span) and square root function selectable.

Input Filter (for Process Variable Pulse Input or Auxiliary Pulse Input): First order lag filter, time constant adjustable 0 to 9999s.

Totalizer Scale Factors: Scaler for pulse signal input (constant K number of pulses for every flow unit totalized). Totalizer scale factor for analog signal input. K (K_1, K_2) are 5-digit fixed point numbers, of maximum value 32767.

Compensation Computation (SBSD-201 and -301 only): Can compensate the process variable and auxiliary flow signals for liquid density changes with temperature.

SBSD has the following 4 ASTM compensation.

- Old ASTM No. D1250 (edit in 1952)
- New ASTM No. D1250 (edit in 1980) for crude oils, fuels & solvents and lubricating oils.

Other types of compensation are also possible (see below).

Temperature Compensation:

Temperature unit is selectable (°C or °F).

Input Signal: Platinum RTD JIS '89 JPt 100 or JIS '89 Pt 100 (DIN Pt 100) or 1 to 5 V DC.

Temperature Range: For platinum RTD; −50 to +250°C.

For a 1 to 5 V DC signal; Arbitrary.

Computation Format: ASTM equation or general quadratic equation.

ASTM Equation: $V_0 = V[(1 + \alpha) \cdot f(\rho, t)]$

where $f(\rho,t) = VCF$

$$VCF = \frac{V_{15}}{V_t} = \frac{\rho_t}{\rho_{15}}$$

$$= exp\ [-\alpha\gamma\Delta t(1.0 + 0.8\alpha\gamma\Delta t)]$$

where VCF : Volume conversion coefficient (at 15°C)

V_{15} : Volume (m^3) at 15°C

V_t : Volume (m^3) at arbitrary temperature (t°C)

ρ_t : Density (t°C) (kg/m^3)

ρ_{15} : Density (15°C) (kg/m^3)

$\alpha\gamma$: Thermal expansion coefficient at 15°C (°C^{-1})

Δt : Temperature difference [Δt=t–15] (°C)

General Quadratic Equation:

$$V_0 = V[\ (1 + \alpha)\ \{\ 1 + \beta(t - t_0) \times 10^{-2} + \gamma(t - t_0)^2 \times 10^{-6}\ \}\ ]$$

V_0: Volumetric Flow at reference temperature t_0.

V : Volumetric flow (process variable flow signal) at temperature t.

t_0 : Reference temperature (°C).

t : Flow sensor temperature (°C).

α : Flow transmitter compensation coefficient, (–99.99 to 99.99).

β : First order compensation coefficient, (–99.99 to 99.99).

γ : Second order compensation coefficient, (–99.99 to 99.99).

General Compensation Computations (SBSD-201 only):

Computation Format:

$$V_o = V\ [\ (C_{max} - C_{min})\ C + C_{min}\ ]$$

C_{max} ; Maximum compensation coefficient (0 to 9999)

C_{min} ; Minimum compensation coefficient (0 to 9999)

C; Compensation coefficient, C ranges from 0 to 1 – its value corresponds to the compensation input signal; a voltage in the range 1 to 5 V DC.

Flow Signal Repeater or Demand Pulse Output Function

Outputs pulse* and analog** signals corresponding to the process variable input (the instrument can also add or subtract an auxiliary flow signal input – in this case, the span of analog output (to display and repeater) is adjustable). Can output a demand pulse signal which corresponds to current set point in flow program.

* Applies only to "simple batch set station" mode.

** SBSD-201 and -301 only.

Pulse Output: Output pulse rate may be scaled by a factor K'. K' (K_3, K_4, K_5, K_6) are 5-digit fixed point numbers, of maximum value 32767.

Pulse Output ON Time: Selectable – one of 0.5, 1, 20, 33, 50 or 100 ms – or duty cycle of 50% (for YewSeries BCS Instruments: up to ten may be connected in parallel with output).

Analog Output (Flow Signal Repeater Signal): 1 to 5 V DC.

Totalizer Functions

Five totalizers are built in – three 6-digit batch totalizers and two 8-digit (cumulative) totalizers:

- Batch flow totalizer (process variable only).
- Batch flow totalizer (process variable, with compensation computation).
- Batch flow totalizer (process variable, with auxiliary flow signal added to or subtracted from it, and compensation computation).
- Cumulative flow totalizer (process variable, with auxiliary flow signal added to or subtracted from it).
- Cumulative flow totalizer (process varible, with auxiliary flow signal added to or subtracted from it, and compensation computation).

Batch totalizer is reset after end of each batch by reset input signal or front panel reset pushbutton. Cumulative flow totalizer may be reset manually by entering other data for totalizer value.

Data Display and Data Setting Functions

Data Display:

Upper display is batch loader setting, 6 digits.

Lower display is selectable data, 6 digits.

Selectable data (displayed in lower display) may be major data item or auxiliary data item:

Major Data Item: Displayed data type is indicated by lamp next to data item label on front panel. Value of batch flow totalizer (for process variable with auxiliary flow signal added to or subtracted from it, and compensation computation), batch loader set value, instantaneous flow high limit and instantaneous flow may be displayed.

Auxiliary Data Item: Displayed data type is indicated by code displayed in upper display. Auxiliary data indludes the other four totalizer values, pre-batch alarm setting, program set parameters and control parameters. A table of data that may be displayed is on the instrument side panel.

Instantaneous Flow Display: 5-segment bar graph.

Data Setting:

Displayed Data Selection: Selected by push buttons. One switch (on side panel) changes from major data display to auxiliary data display.

Data Setting: Uses push button switches. Data setting may be inhibited (disabled) by an inhibit/enable switch on the side panel.

SBSD Modes

The SBSD Batch Set Station offers the following modes:

- Constant flow manual unit, with ramp-up/ramp-down functions.
- Simple batch set station (batch program resembles that shown below, but setpoint changes abruptly rather than ramping up/down to/from flow high limit setting).
- Batch master station (batch program shown in figure).

For all three modes, the program is started by a status input or by operating the START switch.

Emergency Stop/Restart (see figure): Using stop/start status inputs. Ramp change in output between high and low flow limits, step change in output between low flow limit and zero.

Master Pacing Input: Changes (ON/OFF or OFF/ON) cause the output to ramp between high and low flow limits. Useful when SBSD is used as a blending master or used in a blending batch loader system (the SBSD can provide a demand pulse signal to a slave controller such as the SLCC Blending Controller). Master pacing is not provided in "simple batch set station" mode.

Batch Functions

Batch Status:

Batch status	Status input/ output	Lamp lit LOAD, PRE, END	Status output		
			Pre-batch	Batch end	Reset
Start	Pushbutton or status input	Load lit	OFF to ON*	OFF to ON	—
Pre-batch	Pre-batch-end alarm output	PRE lit	ON to OFF	ON	—
Batch end	Batch end output	END lit LOAD off	OFF	ON to OFF	—
Reset	Pushbutton or status input	PRE, END off. LOAD** flashing	OFF	OFF	ON (momentary)
Stop	Pushbutton or status input	LOAD** PRE, END flashing	OFF	ON to OFF***	—

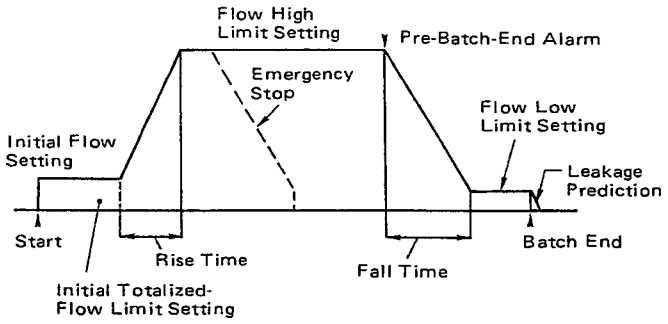
* Contact closes when the initial flow limit (see diagram below) is reached.

** LOAD lamp flashes when STOP status input is turned OFF (STOP condition) or RESET status input is turned ON.

*** Contact opens after program ramps flow set point down to zero.

Batch Computation Period: 0.04 seconds.

Setpoint Program:



Alarm Functions

Detects loss of flow process variable input signal between the time flow should have reached high limit setting and pre-batch-end. ALM lamp lights, alarm output contact opens. This function is not provided in "simple batch set station" mode.

Leakage Detection: Detects leakage flow between batch end and reset. ALM lamp lights, alarm output contact opens.

Communication Functions

The SBSD can communicate (via LCS card in field control station/unit) with a central YEWPACK, μXL/CENTUM CRT-display operator station and supervisory computer. Maximum length of (SCCD) cable to LCS card is 100 m (328 ft).

Data Transmitted: Instantaneous flow, batch flow totalizer value (process variable, with auxiliary flow signal added to or subtracted from it, and compensation computation), batch loader setting, initial flow setting, initial totalized-flow limit setting, high flow limit setting, demand signal output, instrument mode, batch sequence status, alarm status, compensation coefficients, status of "C/A" switch on side panel.

Data with Remote Setting: Batch loader setting, batch flow totalizer value (process variable, with auxiliary flow signal added to or subtracted from it, and compensation computation), initial flow setting, initial totalized-flow limit setting, high flow limit setting, batch sequence status, compensation coefficients. Remote setting (from YEWPACK, μXL/CENTUM operator station or supervisory computer) can be disabled.

Simulation Functions

In simulation mode, flow signal is internally generated, and batch and totalizer functions may be checked.

Mounting:

Flush panel mounting. Instruments are in housings, and may be mounted individually or side-by-side.

Rear of instrument may be up to 75° below front.

Wiring:
Signal Wiring to/from the Field: ISO M4 size (4 mm) screws on termianl 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 7VII (CENELEC standard) plug.
Cable Length: 30 cm (11.8 in)
Front Panel Finish: Dark Green (Munsell 2.5GY 3/1).
Bezel: Aluminium diecast, black baked-enamel finish.
Housing: Open front.
Housing Dimensions: 182.5 (H) x 87 (W) x 480 ((D): depth behind panel surface) (mm)(7.2x3.4x18.9 in).
Weight:
Instrument Body: 3.1 kg (6.8 lb) (excluding housing).
Housing: 2 kg (4.4 lb) (excluding mounting kit).

Normal Operating Conditions
Ambient Temperature: 0 to 50°C.(32 to 122°F)
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

2-2. Model and Suffix Codes.

Model	Suffix Codes	Style	Option Codes	Description
SBSD	. . . . .	. . . .	. . . . .	Batch Set Station with Communication Functions
Compensation Input, Analog I/O	-1 . . .	. . . .	. . . . .	No compensation input, no analog I/O
	-2 . . .	. . . .	. . . . .	1 to 5V DC Compensation input; Pt 100Ω RTD also analog I/O
	-3 . . .	. . . .	. . . . .	
	01 .	. . . .	. . . . .	Always 01
Style Code		*E	. . . . .	Style E
Option			/DL	With data labels attached
Common Options			/A2ER	220V power supply(1)
			/PA	JIS '89 JPt 100 (2)
			/PD	JIS '89 Pt 100 (DIN Pt 100)(2)
			/MTS	With mounting kit
			/SCF-G□M	Bezel color change
			/HNS	Without housing
			/NPE	Nameplate engraving

(1) Specify /A2/HNS to order without housing.
(2) Specify only compensation input RTD.

2-3. Options.

/DL: With data set as per data sheet, and corresponding data label attached.
/A2ER: For "220 V version" power supply.
/PA: Compensation input JIS '89 JPt 100.
/PD: Compensation input JIS '89 Pt 100 (DIN Pt 100).
/MTS: Supplied with kit for individual mounting. For mounting in groups, see GS 1B4F1-E.
/SCF-G□M: Mounting kit bezel color change from standard color (black). Choose color from set of optional colors (see GS 22D1F1-E). Specify color code in space □.
/NHS: No housing, pulg-in instrument module only. See GS 1B4F1-E to order housing separately.
/NPE: Letters engraved on front panel nameplate.

2-4. Accessories.

1 A fuse, quantity one. Part No.: S9510VK
Engineering units labels, one set. Part No.: E9712DL
Blank label, one set. (for user filling) Part No.: E9712DS
Note: The fuse (S9510VK) is the dedicated fuse, Do not use it for other products.

3. INSTALLATION.

For general information regarding installation of this instrument, refer to the instruction manual "Installation of Panel-Mounting Instruments" (IM 1B4F1-01E).

3-1. Wiring.

The terminal board is located on the rear of the housing. Remove the cover of the terminal board, and connect external signal wires to the (M4 size) screw terminals. After wiring, be sure to replace the cover. (See Figures 3-1-1 and 3-1-2.)

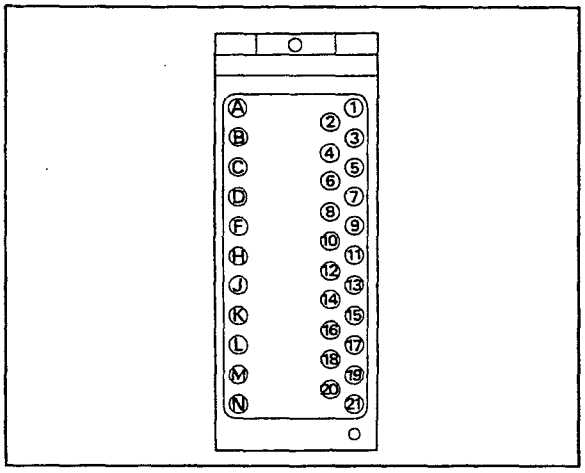


Figure 3-1-1. Terminal Layout.

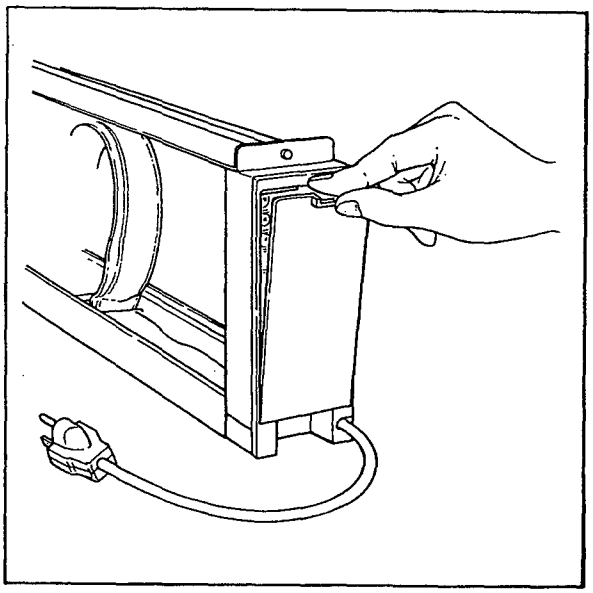


Figure 3-1-2. Terminal Cover.

Tables 3-1-1, 3-1-2 and 3-1-3 show the terminal designations and signals to be connected (these differ according to the model and suffix codes).

■ **Terminal Wiring**

Table 3-1-1. SBSD-101∗E.

Terminal Designation	Description	Terminal Designation	Description
1	Process variable input, pulse signal *1	17	+ Communications *2
2		18	−
3		19	+ Auxiliary pulse flow signal input
4		20	−
5		21	− Fail output (− terminal)
6		A	
7		B	
8		C	+ Demand pulse or flow signal repeater (pulse output)
9	+ Master pacing input	D	−
10	+ Start input	F	+ Reset output (+ terminal)
11	+ Reset input	H	
12	+ Stop input	J	
13	− Common	K	
14	+ Pre-batch output	L	+ Alarm output
15	+ Batch end output	M	−
16	− Common (& reset output, − terminal)	N	+ Fail output (+ terminal)

Note 1: Change wire connection according to the type of transmitter used. (See Sections 5-1-2 and 5-3-2).

Terminal Designation	Contact or Voltage Level Pulse*	2-wire Type Power Supply**	3-wire Type Power Supply**
1	+ Transmitter	− Transmitter	Sig. Transmitter
2	−	+	−
3			+

* Voltage level pulse: external distributor.

** 12V/24V distributor for transmitter built into SBSD.

Note 2: Use shielded twisted-pair cable (SCCD see GS 34B6T1-01E).

Table 3-1-2. SBSD-201∗E.

Terminal Designation	Description	Terminal Designation	Description
1		17	+ / – Communications *2
2	Process variable input, pulse signal *1	18	
3		19	+ / – Auxiliary pulse flow signal input
4	+	20	
5	Compensation input, 1 to 5 V DC	21	– Fail output (– terminal)
6	–	A	
7	+	B	
8	– Process variable input, or auxiliary flow input, 1 to 5 V DC	C	+ / – Demand pulse or flow signal repeater (pulse output)
9	+ Master pacing input	D	
10	+ Start input	F	+ Reset output (+ terminal)
11	+ Reset input	H	
12	+ Stop input	J	+ / – Flow signal repeater (1 to 5 V output)
13	– Common	K	
14	+ Pre-batch output	L	+ / – Alarm output
15	+ Batch end output	M	
16	– Common (& reset output, – terminal)	N	+ Fail output (+ terminal)

Notes 1 and 2: Refer to previous page.

Table 3-1-3. SBSD-301∗E.

Terminal Designation	Description	Terminal Designation	Description
1		17	+ / – Communications *2
2	Process variable input, pulse signal *1	18	
3		19	+ / – Auxiliary pulse flow signal input
4	B	20	
5	B – RTD input	21	– Fail output (– terminal)
6	A	A	
7	+	B	
8	– Process variable input, or auxiliary flow input, 1 to 5 V DC	C	+ / – Demand pulse or flow signal repeater (pulse output)
9	+ Master pacing input	D	
10	+ Start input	F	+ Reset output (+ terminal)
11	+ Reset input	H	
12	+ Stop input	J	+ / – Flow signal repeater (1 to 5 V output)
13	– Common	K	
14	+ Pre-batch output	L	+ / – Alarm output
15	+ Batch end output	M	
16	– Common (& reset output, – terminal)	N	+ Fail output (+ terminal)

Notes 1 and 2: Refer to previous page.

3-1-1. Wiring Precautions.

(1) Be sure to terminate all cable connections in solderless crimp-on lugs.

(2) Each status and voltage input must be as per SBSD specifications. Note the limits on conductor resistance, voltage drop in conductors, and voltage (high/low) levels.

(3) The fail and digital outputs are transistor contact signals (isolated from power supply and other internal circuitry). When connecting external devices, pay attention to the following: (See Figure 3-1-3.)

- Observe correct polarity of status output terminals.
- Most status outputs share a common negative terminal.
- When connecting a relay or other such inductive device, connect a surge absorber (protective diode – Figure 3-1-3, CR circuit, etc.) in parallel with the load.
- Note that status outputs cannot be connected directly to an AC circuit. Use a relay to switch an AC circuit.
- Do not connect any load which exceeds the contact rating. (Max. 30V DC, 200 mA).

(4) Use shielded twisted-pair SCCD cable for communication lines (terminals 17, 18).

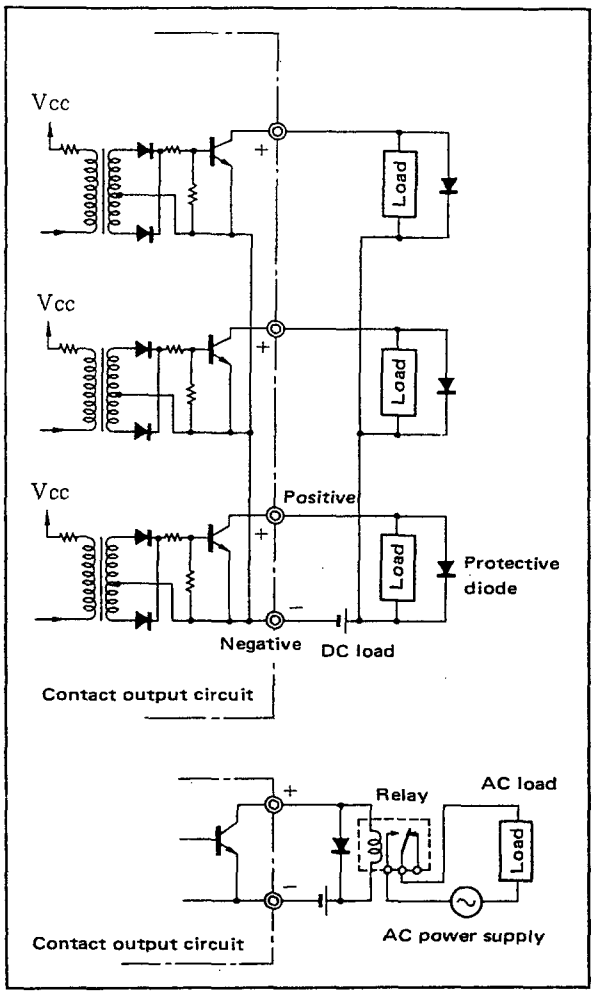
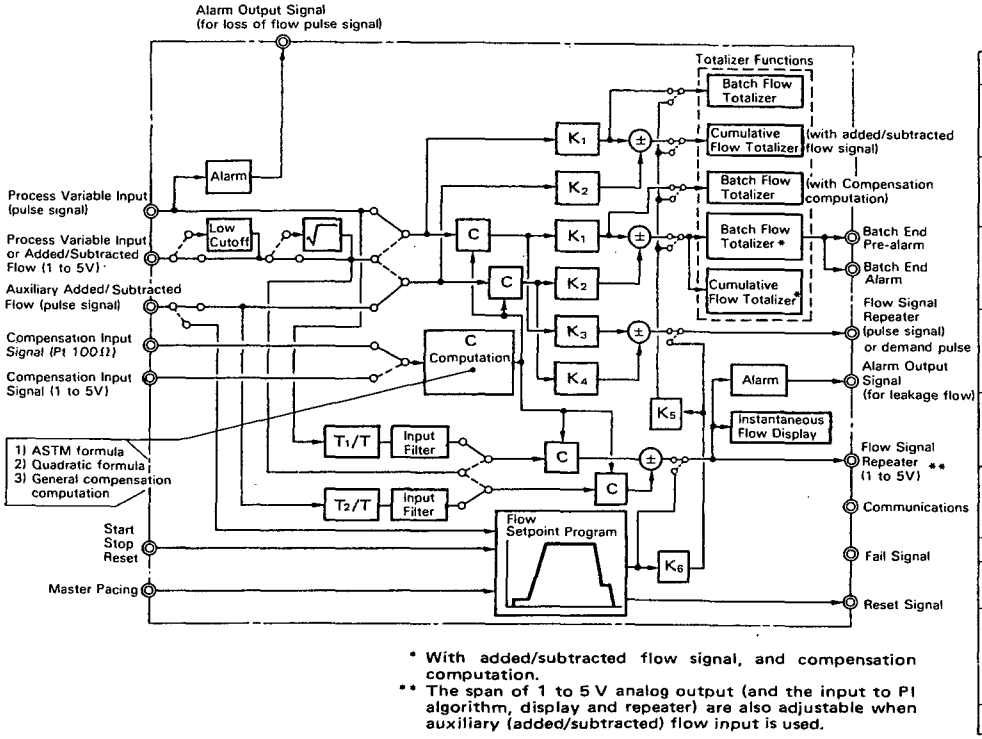


Figure 3-1-3. Connection of Contact Outputs.

4. PRINCIPLES OF OPERATION.

This chapter outlines some major features of the SBSD*E Batch Set Station that are used daily in operating system. For further details, refer to TI 1B4A3-01E "YewSeries BCS Batch-Blending Control System".

Refer to the SBSD*E functional block diagram in Figure 4-1-1.



* With added/subtracted flow signal, and compensation computation.
** The span of 1 to 5 V analog output (and the input to PI algorithm, display and repeater) are also adjustable when auxiliary (added/subtracted) flow input is used.

	Pulse input	1 to 5V input
K_1	$\frac{1}{\text{K factor for flow process variable}}$	$\frac{\text{Flow process variable span} \times \text{Totalizer scale factor}}{\text{h or min}}$
K_2	$\frac{1}{\text{K factor for added/subtracted flow}}$	$\frac{\text{Added/subtracted flow span} \times \text{Totalizer scale factor}}{\text{h or min}}$
K_3	$\frac{\text{Repeater pulse K factor}}{\text{Flow process variable K factor}}$	$\frac{\text{Flow process variable span} \times \text{Totalizer scale factor} \times \text{Repeater pulse K factor}}{\text{h or min}}$
K_4	$\frac{\text{Repeater pulse K factor}}{\text{K factor for added/subtracted flow}}$	$\frac{\text{Added/subtracted flow span} \times \text{Totalizer scale factor} \times \text{Repeater pulse K factor}}{\text{h or min}}$
T_1	$\frac{\text{Flow process variable span} \times \text{Totalizer scale factor} \times \text{K factor for flow process variable}}{\text{h or min}}$	
T_2	$\frac{\text{Added/subtracted flow span} \times \text{Totalizer scale factor} \times \text{K factor for added/subtracted flow}}{\text{h or min}}$	
T	Period of input pulse	
K_5	$\frac{1}{\text{K factor for demand pulse}}$	
K_6	$\frac{(\text{Flow process variable span} + \text{Added/subtracted flow span}) \times \text{Totalizer scale factor} \times \text{K factor for demand pulse}}{\text{h or min}}$	
C	Compensation computation	

Figure 4-1-1. SBSD Functional Block Diagram.

4-1. Totalizer Functions.

Totalizers are essential in Batch-Blending Control. The SBSD*E permits the following five totalized values to be displayed. (See Figure 4-1-1.)

(1) Batch flow totalizer value
Totalized value of uncompensated flow process variable signal.

(2) Batch flow totalizer value (with compensation computation)
Totalized value of compensated flow process variable signal.

(3) Batch flow totalizer value (with added/subtracted flow signal and compensation computation)
Totalized value for flow process variable after addition/subtraction of auxiliary input and compensation.

(4) Cumulative flow totalizer value (with added/subtracted flow signal)
Cumulative totalizer value for uncompensated flow process variable after addition/subtraction of auxiliary input.

(5) Cumulative flow totalizer value (with added/subtracted flow signal and compensation computation)
Cumulative totalizer value for flow process variable after addition/subtraction of flow signal and compensation computation.

The totalized values are classified into two types; batch totalizer values are reset after each batch, and cumulative totalizer values are not reset. The batch totalizer values are 6-digits long, and the cumulative totalizer values are 8-digits long and are displayed using the upper and lower sections of the display.

Of these five totalizer values, the batch flow totalizer value (with added/subtracted flow signal input, and compensation computation) is used as main data for batch processing, and is displayed as SUM on the front panel. The other four totalizer values are treated as auxiliary data.

4-2. Batch Functions.

Refer to 5.4.1 "Starting up".

4-3. Alarm Functions.

Alarm functions that are peculiar to SBSD*E are detection of missing pulse input and detection of leakage.

Figure 4-3-1 shows the relationship between the alarm functions and batch sequence.

(1) Detection of loss of pulse input.
If — between the time flow should have reached high limit setting and pre-batch-end — the process variable flow input signal level remains below 1% of span, the input signal is considered to be missing: the ALM lamp lights and the alarm output contact opens.

(2) Detection of leakage.
The leakage during the period between batch end and resetting is measured. If the leakage equals or exceeds a preset value (auxiliary data setting), the ALM lamp lights and the alarm output contact opens.
"Reset" resets the detected leakage value, but leakage detection continues until "start".

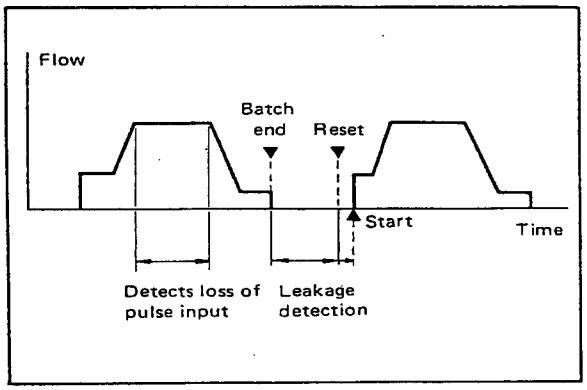


Figure 4-3-1.

5. OPERATION.

5-1. Front- and Side-Panel Features.

5-1-1. Front Panel.

Figure 5-1-1. shows the front panel of the SBSD*E Batch Set Station.

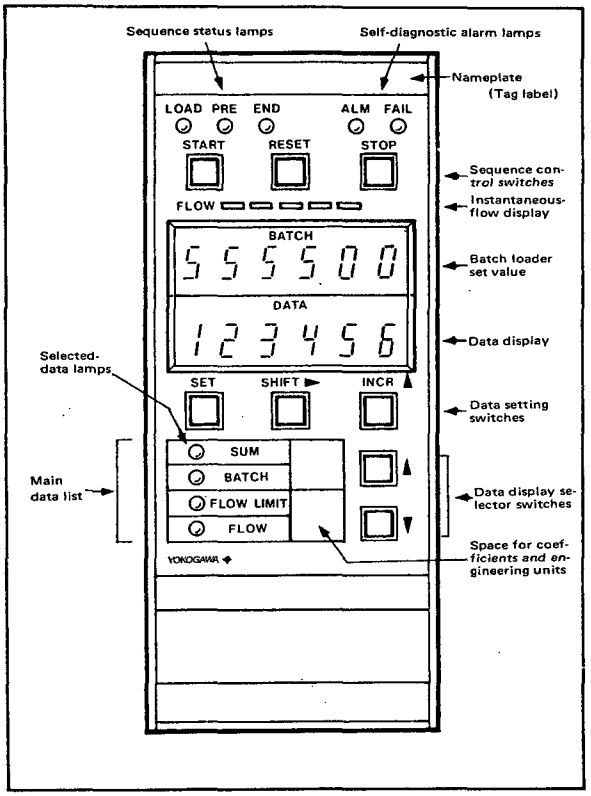


Figure 5-1-1. Front Panel.

(1) Sequence status lamps (LOAD, PRE, END).
Display the status of the batch sequence.

(2) Self-diagnostic alarm lamps.
FAIL lamp (red): Lights if the controller fails.
ALM lamp (yellow): Lights to indicate alarm status.
This lamp flashes if the data memory backup battery is not installed, or when its voltage is low.

(3) Sequence control switches.
These switches are used to start, reset and stop the batch sequence. The batch sequence can be controlled by these switches or by contact inputs.

(4) Instantaneous-flow display.
The instantaneous flow is displayed on a bar graph consisting of five LEDs.

(5) Data display.
The data display is divided into two sections, upper and lower, each of which displays six digits.
Frequently-used "main data" (data items — such as set value and process variable value — shown in the main data list on the front panel), and "auxiliary data" (data items — such as computational constants and control constants — shown on the side panel data label) are displayed on this data display according to the setting of the main data/auxiliary data selector switch (FRONT P./SIDE P.) located on the side panel. (See item (6) of 5-1-2.)
During ordinary operation, set this selector switch to FRONT P. (main data). With this setting, the upper section of the display contains the batch set value, and the lower section of the display contains one of the main data items as selected by the data display selector switches [▲] [▼]. A selected-data lamp lights to indicate which data item is selected. (See Figure 5-1-2.)
To display auxiliary data items, set the FRONT P./SIDE P. selector switch to SIDE P. (auxiliary data). With this setting, the upper section of the display contains an auxiliary data item no., and the lower section contains the corresponding data. The desired item can be selected using the data display selector switches [▲][▼]. (See Figure 5-1-3.)
The lower data display section can be used for displaying data, and also for setting computational constants and other values.

(6) Data setting switches ([SET], [SHIFT▶], [INCR▲]).
These switches are used for setting data.

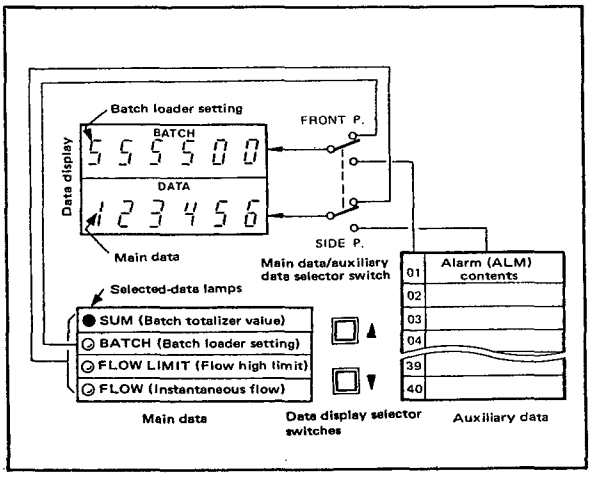


Figure 5-1-2. Functions of Data Display. (Main data display shown.)

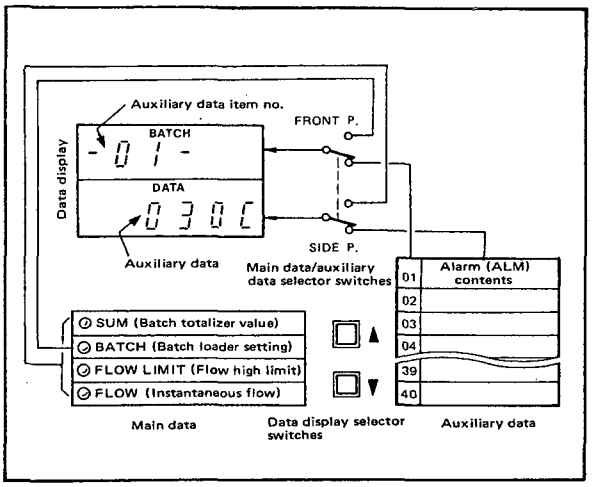


Figure 5-1-3. Functions of Data Display. (Auxiliary data display shown.)

(7) Data display selector switches ([▲],[▼]).
Used to select data to be displayed in the data display.

(8) Main data list.
Contains the most-often-used data. A desired data item can be selected using the data display selector switches.
Main data:
SUM..... Batch totalizer value
BATCH..... Batch set value
FLOW LIMIT..... Flow high limit
FLOW..... Instantaneous flow

(9) Selected-data lamps.
One of these lamps lights to indicate the main data item selected by the data display selector switches.

(10) Space for displaying coefficients and engineering units.
The "coefficients/engineering-units label" provided as an accessory is attached here.

5-1-2. Instrument Side Panel.

Figure 5-1-4 shows details of the SBSD∗E side panel.

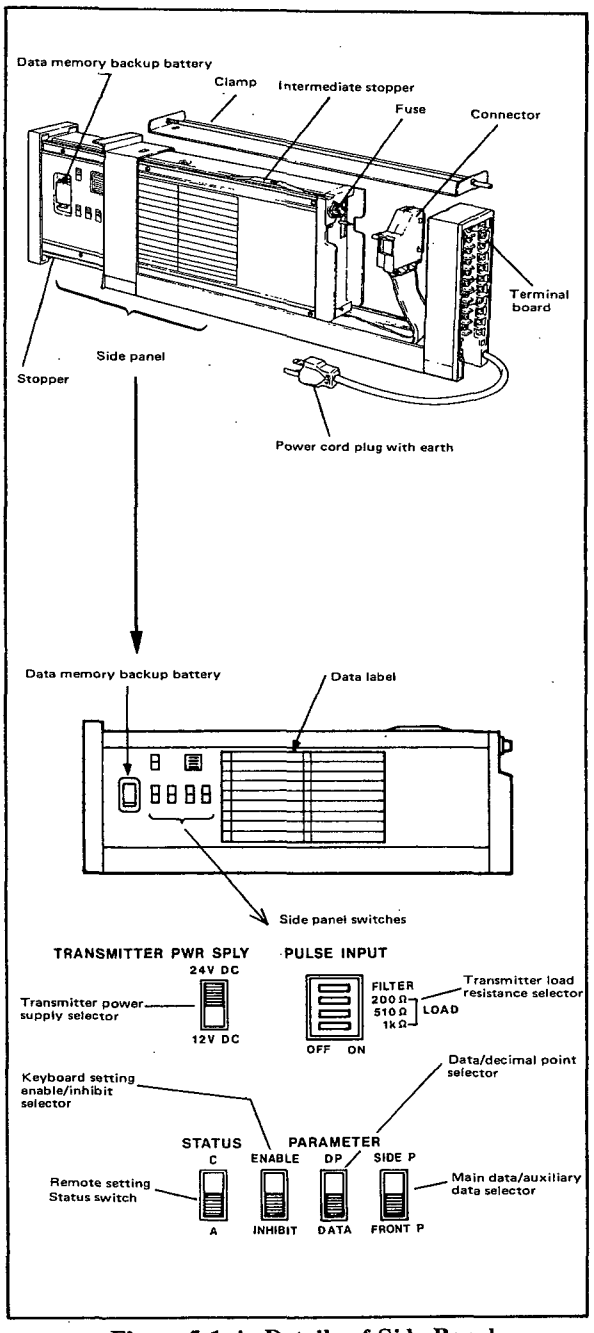


Figure 5-1-4. Details of Side Panel.

(1) Transmitter power supply selector switch (TRANSMITTER PWR SPLY).
For pulse type process variable input signals (two-wire distributor type or three-wire distributor type, see Table 3-1-1, note *1) 12 or 24V DC is supplied from the SBSD*E unit.

(2) Transmitter load resistance selector switches (PULSE INPUT).
When a two-wire pulse transmitter is used with SBSD*E internal power supply distributor (see (1) above), the load resistance (200Ω, 510Ω or 1 kΩ) is selected by these switches. One of these switches turns the input filter On or Off.

(3) C-A selector switch (STATUS).
This switch causes "C" or "A" instrument status to be transmitted to a remote supervisory system, which should sense the status and enable or inhibit remote setting. For details of communications functions, refer to YEWPACK/μXL Field Control Unit Functions TI 34B6G1-01E, TI 34A6B21-01E).
C: Status flag to enable setting by supervisory system.
A: Status flag to inhibit setting by supervisory system.

(4) Data setting enable/inhibit switch (ENABLE/INHIBIT).
This switch is used to enable or inhibit data setting by the front panel switches.
ENABLE: Data setting is allowed.
INHIBIT: Data setting is not allowed.

(5) Data/decimal point selector switch (D.P./DATA).
This switch is used for setting the decimal point position of the set data. With this switch set to DP, the decimal point can be set using the front panel switches (SHIFT, SET).

(6) Main data/auxiliary data selector switch (FRONT P./SIDE P.)
This switch designates the data to be displayed on the front panel data display as either main data or auxiliary data.
FRONT P.: Main data is displayed
SIDE P.: Auxiliary data is displayed

(7) Data label.
The data label lists auxiliary data such as K factors and other computational constants and function-specifying data.
Write data values in the data field.
Table 5-1-1 shows the data label, and Table 5-1-2 shows details of the auxiliary data function specification items (item Nos. 21, 22 and 23).
For further details of the data label, refer to TI 1B4A3-01E "YewSeries BCS Batch-Blending Control System" and TI 1B4E1-01E "YewSeries BCS (style E) Batch-Blending Control System Functions and Data Setting".

Table 5-1-1. SBSD Data Label.

SBSD*E Batch Set Station		TAG No.					
01	Alarm (ALM) code			11	Flow low limit setting		
02	Batch flow totalizer value (uncompensated)			12	Flow rise time		S
03	Batch flow totalizer value (compensated)			13	Flow fall time		
04	Cumulative totalizer value (uncompensated) *			14			
05	Cumulative totalizer value (compensated) *			15			
06	Initial totalized flow limit			16	Measured temperature/ compensation coefficient input		
07	Prebatch set value			17	Measured pulse input filter		S
08	Predicted leakage value			18	Added/subtracted pulse input filter		
09	Leakage detection set value			19			
10	Initial flow setting			20			
21	Function specification (1)			31	Analog display/flow signal repeater span *		
22	Function specification (2)			32	Compensation reference temperature		
23	Function specification (3)			33	Manual set temperature/ Manual compensation coefficient		
24				34	Maximum value of measured temperature/ Maximum value of compensation coefficient		
25	Flow process variable span			35	Minimum value of measured temperature/ Minimum value of compensation coefficient		
26	Added/subtracted flow span			36	Compensation factor		
27	K factor for flow process variable			37	Flow transmitter error compensation coefficient α		
28	K factor for added/subtracted flow			38	First order compensation coefficient β density or specific gravity μ		
29	K factor for demand/repeater pulse			39	Second order compensation coefficient γ		
30	Totalizer scale factor			40			

Table 5-1-2. Function Specification Details.

Note: Fill in the blanks of 21. Function specification (1) and 22. Function specification (2) and 23. Function specification (3) as follows:

Function specification (1) A B C D E F

A Operation mode
- 0: Simple batch set station
- 1: Batch master (with flow input)
- 2: Batch master (without flow input)
- 3: Blending master (with flow input)
- 4: Blending master (without flow input)

B *Flow signal repeater pulse width*
- 0: Duty cycle 50% (For connection to YS-BCS instrument)
- 1: 0.5 ms
- 2: 1 ms
- 3: 20 ms
- 4: 33 ms
- 5: 50 ms
- 6: 100 ms

C Communications write and Keyboard setting *enable/inhibit selector*
- 0: Enable/whole data
- 1: Inhibit/whole data
- 2: Enable/main data SUM aux. data No. 2 to 6, after No. 21
- 3: Inhibit/main data SUM aux. data No. 2 to 6, after No. 21

D Instantaneous power fail restart mode
- 0: COLD
- 1: HOT

E External stop input, master pacing input inhibit/enable

	External stop input	Master pacing input
0:	Inhibit	
1:	Enable	Inhibit
2:	Inhibit	Enable
3:	Enable	

F START/RESET/STOP switch
- 0: Inhibit
- 1: Enable

FUNCTION specification (2) G H I J K L

G Time unit of flow
- 0: */h
- 1: */min.
- 2: */day

H Flow signal/Simulation specification
- 0: Pulse flow signal
- 1: Analog flow signal
- 2: Simulation - D/O inhibit
- 3: Simulation - D/O enable

I Added/subtracted flow signal
- 0: None
- 1: Provided, pulse, added
- 2: Provided, pulse, subtracted
- 3: Provided, analog, added
- 4: Provided, analog, subtracted

J Analog input processing

	Loc cutoff	Square root extraction
0	1% or less	Not provided
1	0% or less	Not provided
2	1% or less	Provided
3	0% or less	Provided

K Resetting of stored totalizer and demand/repeater pulse values:
- 0: All values reset.
- 1: Demand/repeater & non-displayed totalizer digits preserved.
- 2: Like 1, but least-significant totalizer display digit also preserved.
- 3: Like 1, but two least-significant totalizer display degits also preserved.

L

	Compensation computation provided for:	Process variable input	Added/ subtracted input
0:	.....	Not provided	
1:	.....	Provided	Not provided
2:	.....	Not provided	Provided
3:	...	Provided	

Function specification (3) M N O – Q –

M Compensation computation
- 0: ASTM method
- 1: General quadratic formula
- 2: General compensation

N Temperature/compensation coefficient data
- 0: Process variable
- 1: Manual set point

O Temperature unit
- 0: °C
- 1: °F

Q Selection of ASTM compensation equation (Effective when M=0 in function specification(3))
- 0: Old ASTM (ASTM-52)
- 1: New ASTM (ASTM-80, ISO 91/1) Crude oil
- 2: New ASTM (ASTM-80, ISO 91/1) Fuel oil
- 3: New ASTM (API, ISO) Lubricating oil

5-2. Preparation of Data Label.

Before using the SBSD*E Batch Set Station, the required values of auxiliary data items — such as function specifying data, K factors and other computational constants — must be decided and input, and these values should also be written on the data label (see note).

When preparing the data label, refer to TI 1B4E1-01E "YewSeries BCS (style E) Batch-Blending Control System Functions and Data Setting".

and TI 1B4A3-01E "YewSeries Batch-Blending Control System".

NOTE

If option/DL is specified at order time, the factory will write data values on the data label before shipping the batch set station.

5-3. Preparation for Operation.

Perform preparation with the batch set station installed in the panel, or removed and placed on a work table.

(Suppose that the instrument module is in the housing).

Removing the instrument module from the housing:

① Push up the stopper, located below the front panel of the instrument module, to remove it. When it is drawn out halfway, the instrument module is stopped by an intermediate stopper. (Figure 5-3-1).

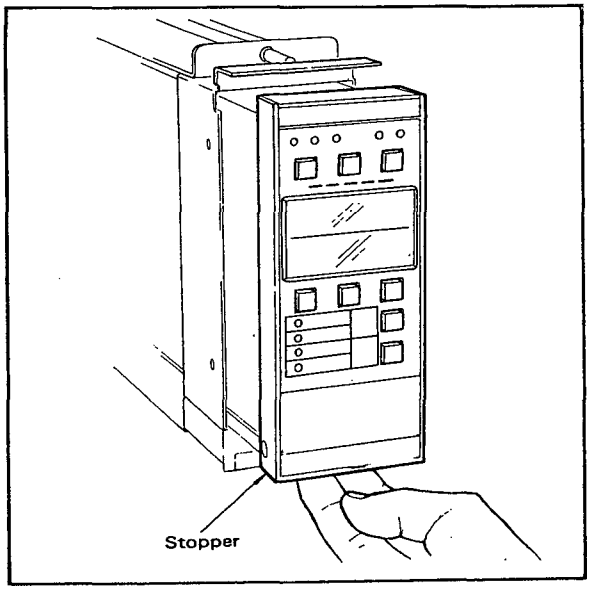


Figure 5-3-1. Removing Instrument Module.

② To remove the instrument module from the housing, push down on the intermediate stopper while pulling the instrument out of the housing as shown in Figure 5-3-2.

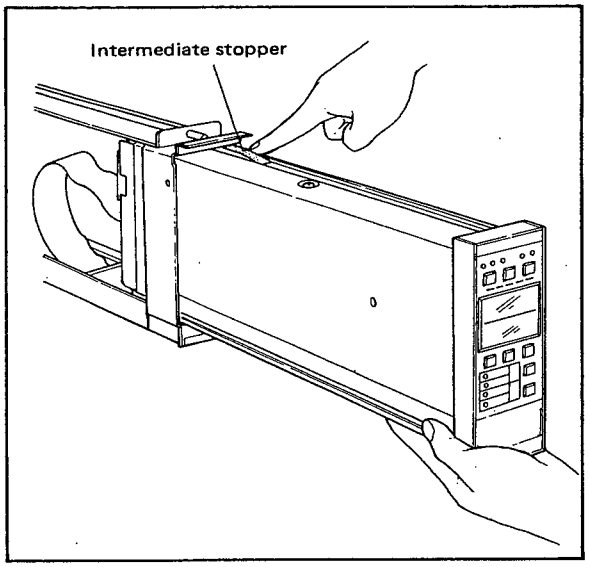


Figure 5-3-2. Removing Instrument Module.

③ Detach the connector from the instrument module. The instrument module is now separated from the housing. (Figure 5-3-3).

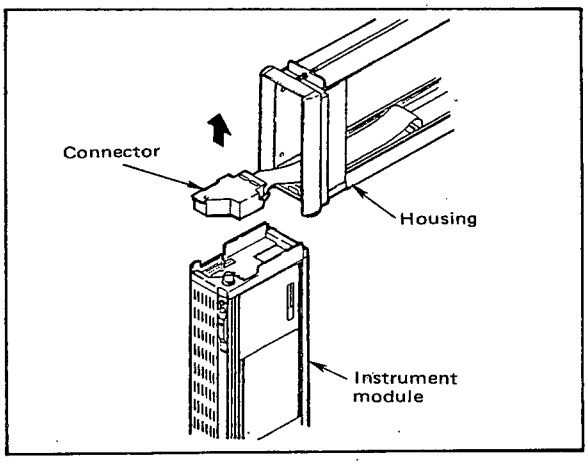


Figure 5-3-3. Detaching the Connector.

5-3-1. Check Special Parts are Installed.

Check to see that the fuse and data memory backup battery are installed. If not, refer to Chapter 6 "Maintenance" for installation procedure.

5-3-2. Setting Side Panel Switches.

(1) Transmitter power supply selector switch (TRANSMITTER PWR SPLY).
For pulse type process variable input signals (two-wire distributor type or three-wire distributor type, see Table 3-1-1, note *1) a distributor in the SBSD unit supplies 12 or 24V DC. The switch setting is irrelevant for two-wire voltage level or contact pulse inputs (left side of Table 3-1-1, note *1).

(2) Transmitter load resistance selector switch (PULSE INPUT).

- When using a two-wire pulse transmitter with the distributor in the SBSD*E unit, the switch corresponding to the desired load resistance should be turned ON. When using any other type of transmitter, be sure to turn all of the resistance switches OFF.
- If input filtering is needed, turn the FILTER switch ON. Further, when the repeater pulse from YEWSERIES BCS instrument is applied as the input signal, be sure to turn the input filter switch OFF.

NOTE

Select an appropriate time-constant from zero (0) to 9999 seconds and set it into the auxiliary data item 17 and 18 "Pulse Input Filter", when the displayed value of instantaneous flow (or analog flow repeater signal) wavers owing to the irregularity of input pulse signal.

As for setting operation to instrument, refer to Chapter 5-3-4 (Setting Auxiliary Data).

(3) Communications write-inhibit switch ("STATUS C/A selector switch").
Set this switch as desired.

(4) Data setting enable/inhibit switch (ENABLE/INHIBIT)
Set this switch to INHIBIT during normal operation.

(5) Data/decimal point selector switch (D.P./DATA).
Set this switch to DATA during normal operation, or to D.P. when setting decimal point.

(6) Main data/auxiliary data selector switch (FRONT P./SIDE P.)
Set this switch to FRONT P. (main data) during normal operation, or to SIDE P. when setting auxiliary data.

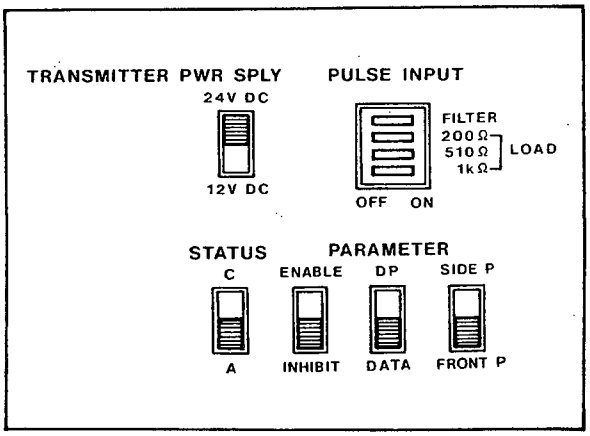


Figure 5-3-4. Side Panel Switches.

5-3-3. Setting Main Data.

The following main data must be set before commencing operation.

Batch set value (BATCH)

Flow high limit set value (FLOW LIMIT)

(1) Setting the data.

Turn on the power, set the main data/auxiliary data selector switch on the side panel to FRONT P. (main data) position, set the data/decimal point selector switch to DATA, then select the data item to be set and display it on the lower section of the display using the data display selector switches [▲][▼]. Next, perform the following operations.

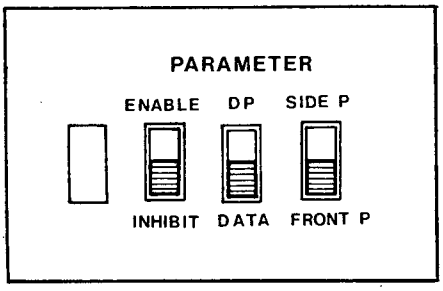


Figure 5-3-5.

[Example of display and setting (Setting batch set value)]

Switch operation	Display (lower)	Description
		The initial value of the batch set value or an already set value is indicated.
SHIFT ▶	(Note)	The most significant digit that may be set flashes.
INCR ▲	5	Set the desired data. If setting is not needed, go to the next step.
SHIFT ▶	5	The next most significant digit flashes.
INCR ▲	52	Set the desired data. If setting is not needed, go to the next step.
INCR ▲	52000	Repeat the above setting operation to the least significant digit.
SET	52000	The whole data thus set flashes.
SET	52000	Data setting is completed.

Note: The shaded portion ▒ indicates flashing of data display.

(2) Setting the decimal point.

The batch set value decimal point position is automatically set to coincide with the decimal point position of the cumulatively totalized value of auxiliary data item 04. Similarly, the decimal point position of the flow high limit set value is automatically set to coincide with the process variable flow span – auxiliary data item 25.

Accordingly, the decimal point position need not be set when setting the main data.

5-3-4. Setting Auxiliary Data.

As described below, the auxiliary data values must be set to correspond with the data on the data label prepared in section 5-2:

NOTE

If this controller has been ordered with data label (option /DL), the data has already been set at the factory according to the data label prepared by YOKOGAWA.

Before starting operation, be sure to check that each data item has been set correctly (to correspond with the label).

If any error is found, correct the data setting as explained below.

NOTE

Auxiliary data should be set in the sequence items 21 thru 40, items 04 thru 18.

(1) Setting the decimal point.

Set the main data/auxiliary data selector switch on the side panel to SIDE P. (auxiliary data) position, set the data/decimal point selector switch to the DP position, then set the data setting enable/inhibit switch to ENABLE. Using the data display selector switches [▲][▼], select the data whose decimal point is to be set, and display it on the lower section of the display. Next perform the following operations:

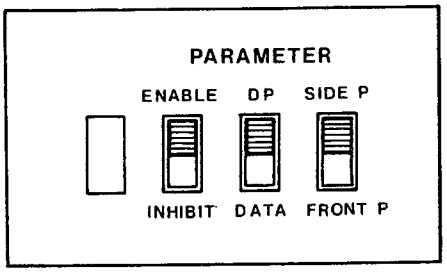


Figure 5-3-6.

[Decimal point position setting example]

Switch operation	Display (lower)	Description
		The initial value is displayed.
SHIFT▶	(Note 1)	The decimal point of the initial value flashes.
SHIFT▶		When the SHIFT switch is held depressed, the decimal point position changes digit by digit and the decimal point position flashes. When the decimal point reaches the desired position, release the switch.
SET	(Note 2)	The entire display flashes.
SET		Decimal point setting completed.

Note 1: The * mark indicates a flashing decimal point.
Note 2: The shaded portion ▒ indicates flashing digit.

(2) Setting data.

Set the main data/auxiliary data selector switch to SIDE P. (auxiliary data), set the data/decimal point selector switch to DATA, and set the data setting enable/inhibit switch to ENABLE. Then select the data item to be set and display it on the lower display section using the data display selector switches [▲][▼]. Next set the data. The data is set in the same way as for main data. Refer to the main data setting example of par. 5-3-3.

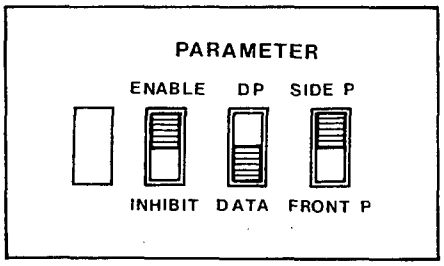


Figure 5-3-7.

After completing data setting, set the data setting enable/inhibit switch to INHIBIT so as to prevent accidental (erroneous) setting.

Unused Auxiliary Data

The data display selector switches skip the auxiliary data that is not being used according to the function specification.

5-3-5. Simulation.

After setting the main and auxiliary data, check the operation of the batch set function using the simulation function of SBSD. (Refer to TI 1B4A3-01E.)

Set auxiliary data item 22 [function specification (2)] H Process variable flow signal/simulation specification to simulation mode, and check the operation (refer to 5-4-1 "Start-up procedure" and Table 5-3-1 below).

In simulation mode, contact outputs (D/O) can be inhibited if so specified. (Refer to Table 5-3-1.)

Table 5-3-1. Auxiliary Data Simulation Specifying Item.

22. Function specification (2)

G	H	I	J	K	L

H Process variable flow signal/simulation specification
0: Pulse flow signal
1: Analog flow signal
2: Simulation D/O inhibit
3: Simulation D/O enable

5-3-6. Other Preparations.

Attach coefficient/units label.

Choose suitable coefficient and engineering units labels from those supplied with the batch set station, and stick them in the appropriate place on the front panel. (See Figure 5-3-8.)

If a suitable label is missing, use a blank label and write the necessary coefficient or units on it.

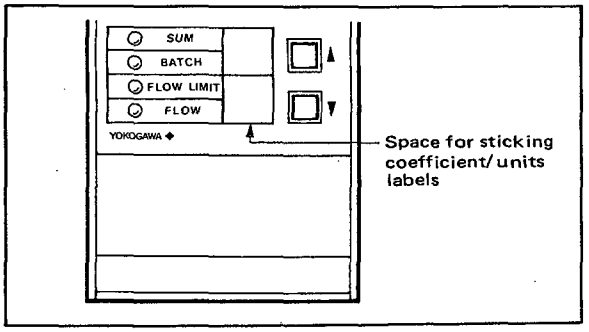


Figure 5-3-8.

5-4. Operation.

After setting main data and auxiliary data, start up the batch set station as described below. Note that the operations required to start pumps and other devices are not described in this manual.

5-4-1. Operating Batch Master Station. (See Figure 5-4-2.)

The start-up procedure when using this instrument as the batch master station in a blending batch loader is described below.

① Turn on the power to the instrument.

② Turn ON the reset signal (front panel RESET switch or status input).
The batch totalizer value will be reset. If the stop status input is ON, the instrument is ready to start.

Note that the instrument cannot be restarted immediately after normal batch end without first resetting it. An interlock function of this instrument disables the reset signal during a batch sequence.

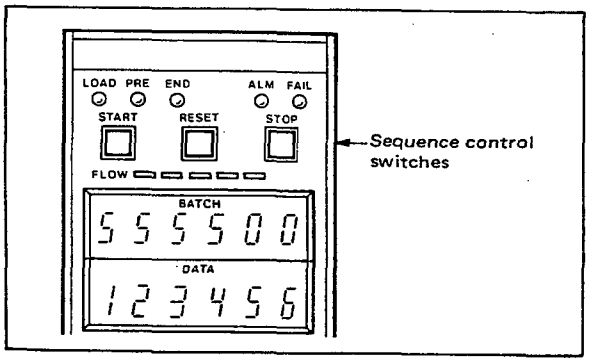
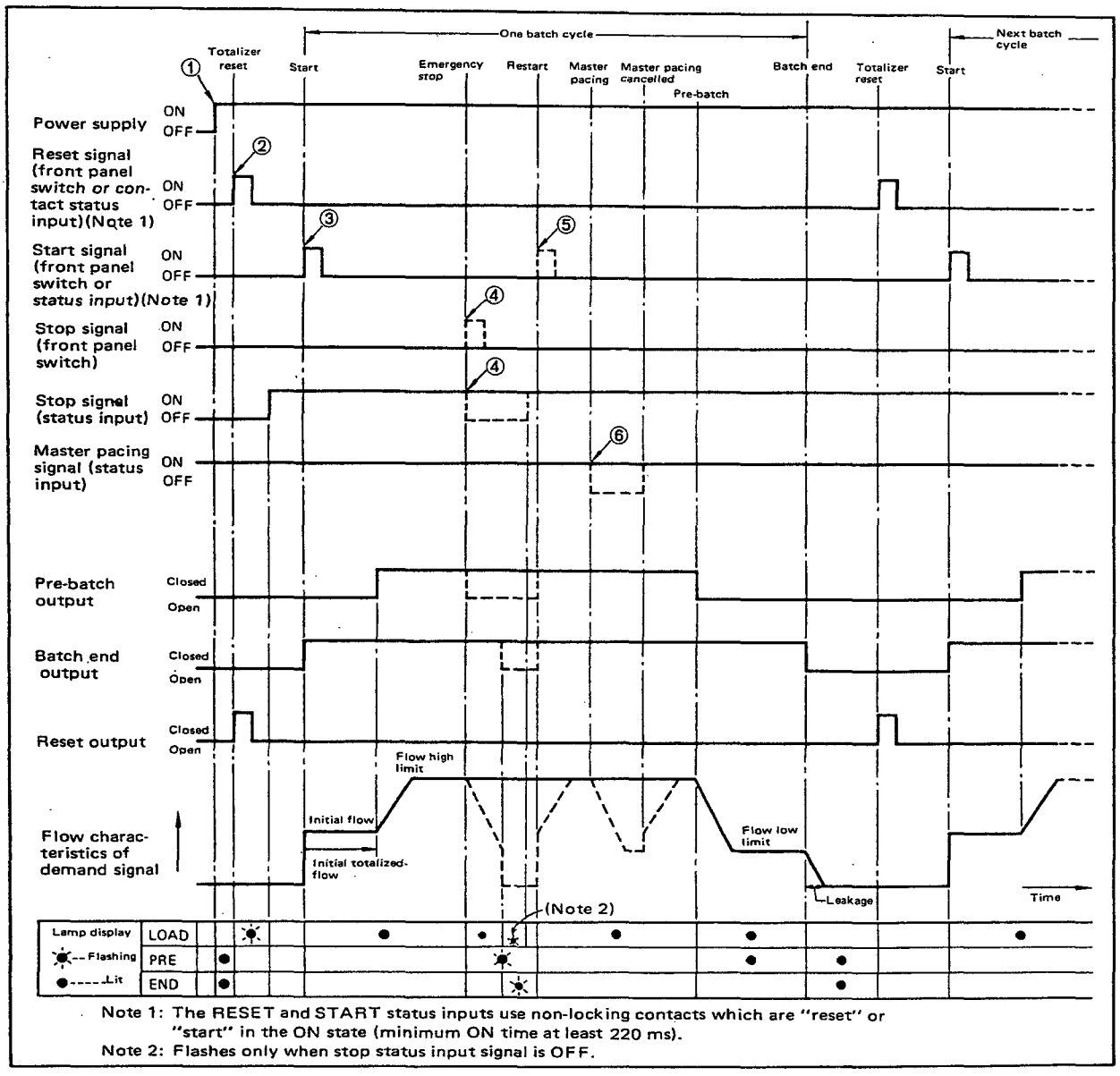


Figure 5-4-1.



Note 1: The RESET and START status inputs use non-locking contacts which are "reset" or "start" in the ON state (minimum ON time at least 220 ms).
Note 2: Flashes only when stop status input signal is OFF.

Figure 5-4-2. Batch Sequence and Flow Characteristics.

③ Turn the start signal (front panel START switch or status input) ON.
This controller operates automatically according to the batch sequence, and stops automatically when the totalized flow reaches the batch loader set value. Figure 5-4-2 shows the change in the demand signal during the batch cycle, begin with step ② above.

④ To stop operation in the middle of a batch cycle, press the front panel stop switch, or turn the stop status input OFF. The flow ramps down to the flow low limit in a preset time, and then goes to zero.

⑤ To resume operation after stopping in the middle of a batch cycle, turn ON the start signal without resetting. The remaining quantity is then loaded, so that the totalized flow coincides with the batch loader set value. To restart the batch cycle, begin with step ④ above.

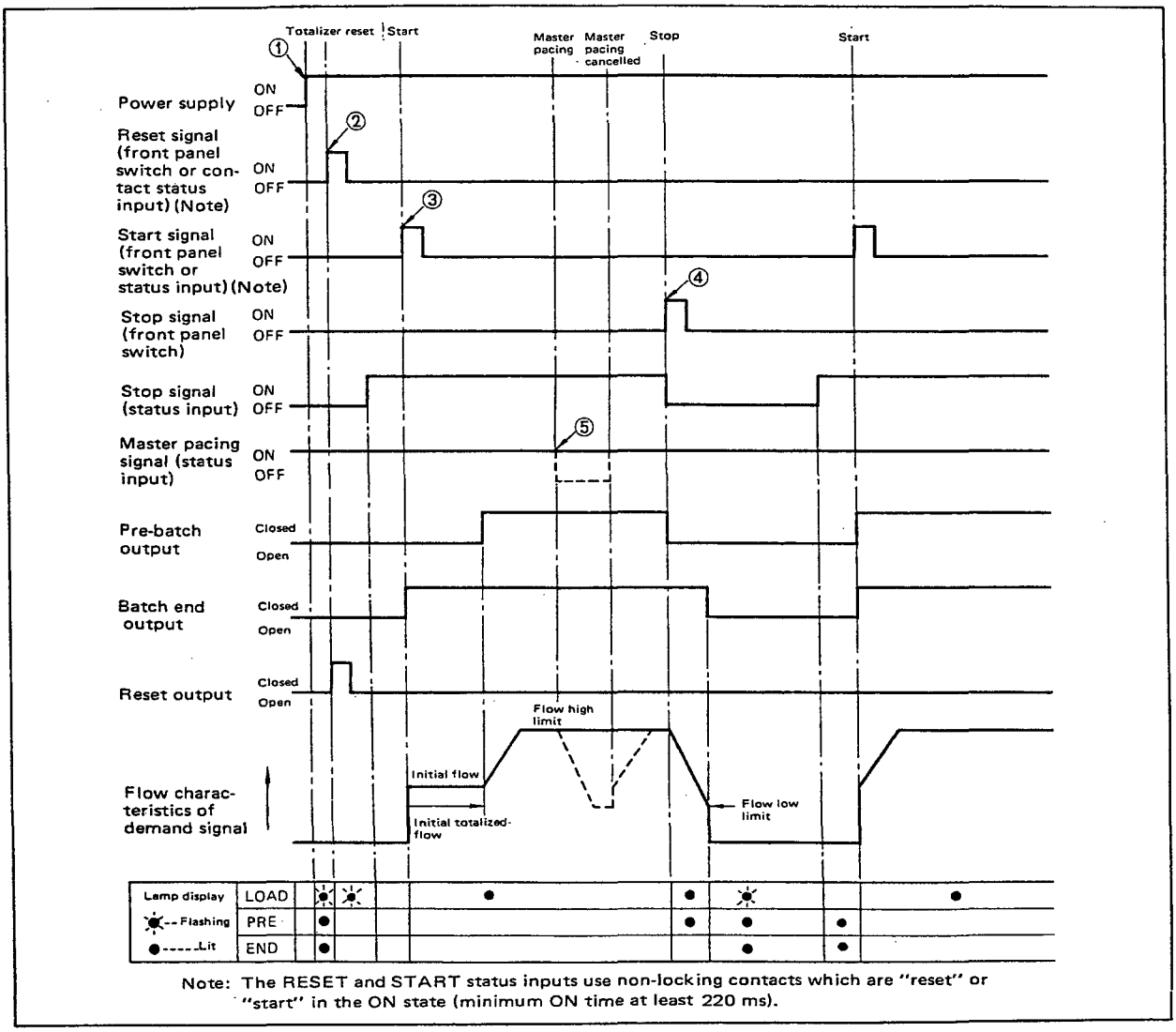
⑥ If the master pacing status input is turned OFF during operation at the flow high limit, the flow ramps down to the flow low limit in a preset time. If the master pacing status input is then turned ON, the flow ramps up to the flow high limit in a preset time.

5-4-2. Operating Blending Master Station. (See Figure 5-4-3).

The start-up procedure when using this station as a blending master station is described below.

① Turn on power to the station.

② Turn the reset signal (front panel RESET switch or status input) ON.
This resets the batch totalizer value. If the stop status input is ON, the instrument is ready to start.



Note: The RESET and START status inputs use non-locking contacts which are "reset" or "start" in the ON state (minimum ON time at least 220 ms).

Figure 5-4-3. Sequence and Flow Characteristics of Blending Master Station.

If resetting is unnecessary, skip step ② and go to step ③.

③ Turn ON the start signal (front panel START switch or status input).
The demand signal increases to the flow high limit according to the sequence. Figure 5-4-3. shows the change in the demand signal during the batch cycle.

④ To stop operation, press the front panel stop switch, or turn OFF the stop status input. The demand signal ramps down to the flow low limit in a preset time, and then goes to zero.

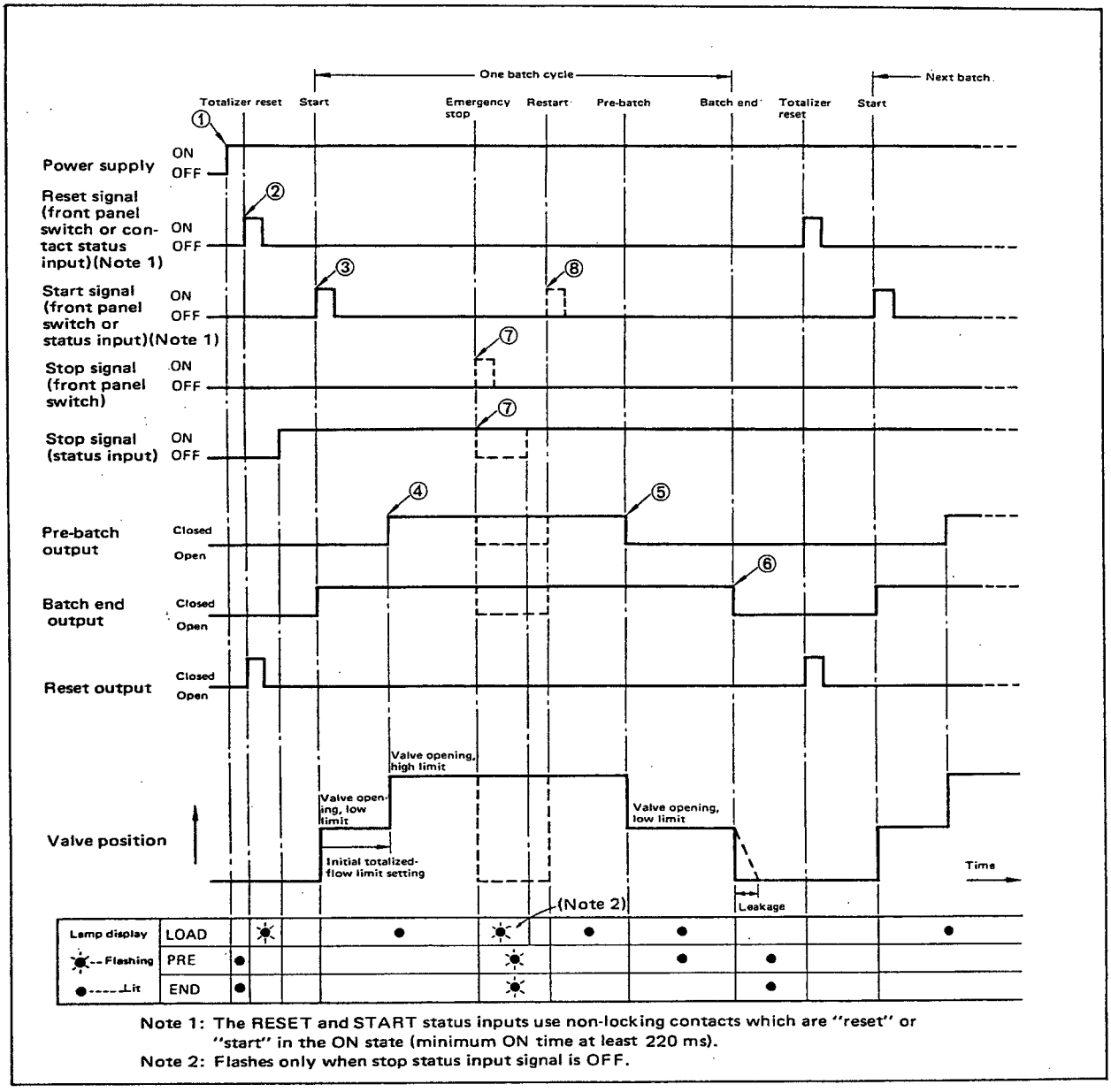
⑤ If the master pacing status input turns OFF while the system is operating at the flow high limit, the demand signal ramps down to the flow low limit in a preset time. If the master pacing status input then turns ON, the demand signal ramps up to the flow high limit in a preset time.

5-4-3. Operating Simple Batch Station. (See Figure 5-4-4.)

The start-up procedure when this instrument is used as a simple batch station is explained below.

① Turn on the power to the instrument.

② Turn the reset signal (front panel RESET switch or status input) ON.
This resets the batch totalizer value. If the stop status input is ON, the instrument is ready to start. The batch set station cannot be restarted unless the station has been reset after normal batch end. An interlock function of the batch set station disables the reset signal during a batch sequence.



Note 1: The RESET and START status inputs use non-locking contacts which are "reset" or "start" in the ON state (minimum ON time at least 220 ms).
Note 2: Flashes only when stop status input signal is OFF.

Figure 5-4-4. Simple Batch Station Sequence and Valve Action.

③ Turn the start signal (front panel START switch or status input) ON.
The batch end output contact closes (low limit of valve opening), and the operation starts.

④ When the totalized flow reaches the initial totalized-flow limit setting, the pre-batch output closes (high limit of valve opening).

⑤ When the totalized flow reaches the pre-batch point (batch set value - pre-batch set value), the pre-batch output opens (low limit of valve opening).

⑥ When the totalized flow reaches the batch loader set value, the batch end output opens (valve fully closed).

⑦ To stop operation in the middle of the batch cycle, press the front panel stop switch, or turn OFF the stop status input. In this case, both the batch end output and pre-batch output open (valve fully closed).

⑧ To resume operation after stopping in the middle of a batch cycle, turn ON the start signal again without resetting. The remaining quantity is then loaded, so that the totalized flow coincides with the batch loader set value. To restart the batch cycle, begin with step ② above.

5-4-4. Reseting Cumulative Totalizer Value.

The cumulative totalizer values contained in auxiliary data items 04 and 05 are not reset by the reset signal. If resetting is needed, set this auxiliary data to zero using the data setting switches. For the setting procedure, refer to 5-3-4 "Setting of auxiliary data".

5-5. Action to be Taken when FAIL or ALM Lamps Light.

Any faults in the batch set station or in the signal connections are indicated by the FAIL or ALM lamps lighting. If either of these lamps lights (or begins flashing), please take appropriate action (as described below) without delay.

5-5-1. Action to be Taken when FAIL Lamp Lights.

When the FAIL lamp lights and the FAIL contact output opens, this indicates that a serious fault has occurred inside the instrument.

(1) Set the main data/auxiliary data selector switch to the auxiliary data position to indicate the alarm (ALM) contents of auxiliary data item 01 on the data display, and check the cause of the fault. (See Figure 5-5-4). Take appropriate action to correct the fault.

(2) If the data display does not function normally, it can be presumed that the microprocessor is not operating.

5-5-2. Action to be Taken when ALM Lamp Lights.

The ALM lamp lights if the high or low limit alarms of the batch set station operate, or when input-output signals are disconnected.

Display the alarm (ALM) contents of auxiliary data item 01 on the data display, and examine the cause of the fault. (See 5-5-4.) Take appropriate action corresponding to the cause of the fault.

5-5-3. Action to be Taken when ALM Lamp Flashes.

The ALM lamp begins flashing if the voltage of the data memory backup battery is low. Replace the battery with a new one. (See Section 6-3 for replacement procedure.)

NOTE

(1) If the ALM lamp begins to flash during normal operation, replace the battery within one month.

(2) The flashing of the ALM lamp has precedence over its continuous lighting. Thus, other alarms cannot be displayed while the lamp is flashing.

5-5-4. Alarm (ALM) Codes, their Meanings and Controls Actions when Abnormal.

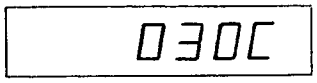
The alarm codes and their meaning are listed below.

Code	Lamp	Meaning	Control actions when abnormal
0000	–	Normal.	–
–	FAIL	Fault in CPU.	FAIL contact : Open
0001	FAIL	Fault in A/D converter.	
0002	FAIL	Fault in D/A converter.	
0004	ALM	Computation range overflow.	Computation using limit value.
0008	ALM	Temperature input/compensation coefficient input signal out of range.	Computation using manual set value/ manual compensation coefficient.
0010 (Note)	ALM	Error in compensation computation.	• Computation is performed with limit value. • Control is continued.
0020	ALM (flashing)	Data memory backup battery not installed, or low battery voltage.	Operates normally unless power failure occurs.
0080	ALM	RAM memory data initialization.	Computation using initial value.
0100	ALM	Process variable input signal out of range or missing pulse input.	Computation using limit value.
0200	ALM	Added/Subtracted input signal out of range.	
0400	ALM	Abnormal leakage detection.	Alarm output contacts opens when leakage or less of pulse input is detected.
0800	ALM	Flow signal out of range (for analog display and flow signal repeater span) after addition/subtraction.	
2000	ALM	Repeater internal data overflow.	
4000	ALM	Data setting range out of range.	

Note: In the computation of basic equation (see page 2-3) of volume conversion coefficient, if $|\alpha_\gamma \Delta t| > 0.5$, "0010" alarm occurs also.
At this time, computation is continued with the value limited at 0.5 or –0.5. This processing is executed to prevent the internal data overflow if improper input or set value is applied.

If two or more faults occur simultaneously, the hexadecimal sum of their code numbers is displayed.

[Example]



030C = 0004 + 0008 + 0100 + 0200 (computation range overflow, temperature input/compensation coefficient input signal out of range, process variable input signal out of range, added/subtracted input signal out of range)

The diagnostic alarm code display reverts to zero and the ALM lamp turns off when the cause of the fault is removed, except for the following items.

Select these items using the data selector switches ▲ ▼ and reset them using the SET key.

Items to be reset by SET pushbutton switch.

- RAM memory data initialization
- Abnormal leakage detection
- Repeater internal data overflow

6. MAINTENANCE.

This chapter explains the indicator adjustment and parts replacement procedures.

6-1. Replacing Nameplate (Tag Label).

Draw out the instrument module a little from its housing, and open the lid located on the top of the front panel. Remove the nameplate, and install a new one. (Figure 6-1-1).

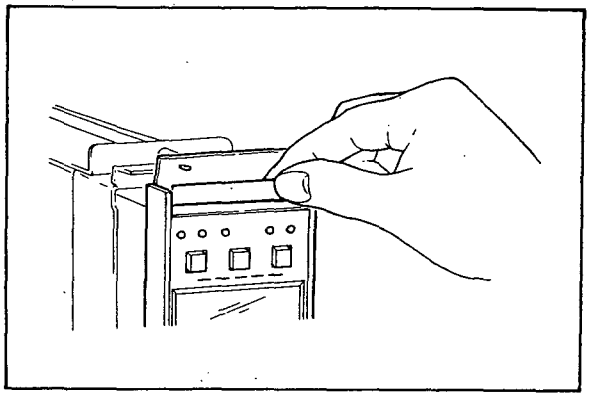


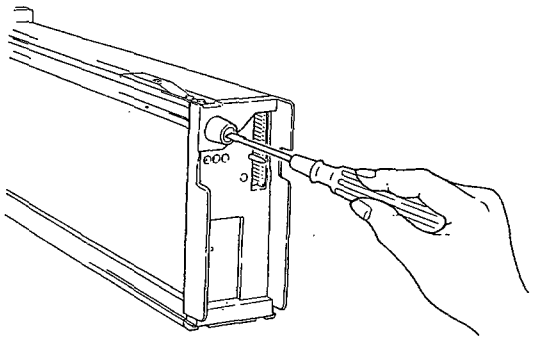
Figure 6-1-1. Replacing Nameplate.

6-2. Replacing Fuse.

If it seems that the fuse may be faulty, check the inside of the fuse holder for contamination or poor contact with fuse.
Recommended replacement interval: About 3 years.

(1) To remove the fuse, unscrew the fuseholder cap (turn it in the direction of the arrow marked on the cap — counterclockwise); the cap and fuse may then be removed.
(2) Install a new fuse of the correct rating. Tighten the cap firmly.

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



Fuse Part No. : S9510VK
Rating : 1A

Figure 6-2-1. Replacing Fuse.

6-3. Replacing Data Memory Backup Battery.

If the ALM lamp on the front panel of the instrument begins flashing, please replace the battery without delay.

NOTE

Leave power applied to the instrument while replacing the battery. If the battery is removed while the power is off, data (parameter) settings may be lost.

(1) Draw out the controller module a little from the housing, and remove the battery cover and battery. (See Figures 6-3-1 and 6-3-2.)
(2) Install a new battery, and fit the battery cover securely.
(3) Make sure that the ALM lamp on the front panel has stopped flashing.

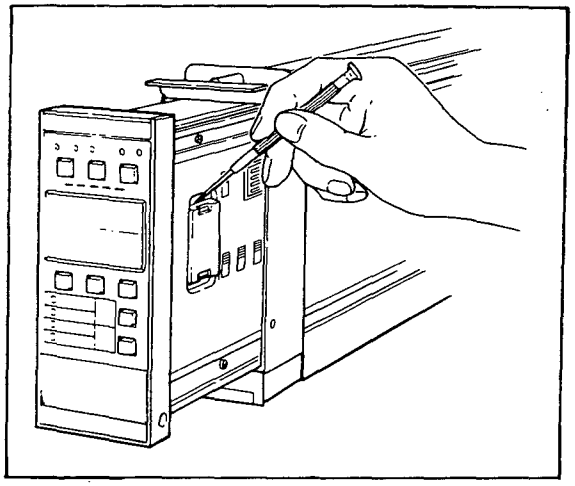


Figure 6-3-1. Removing Battery Cover.

[Precautions for storage and handling of data memory backup batteries]

(1) Storage conditions
Ambient temperature: −10 to 60°.
Ambient humidity: 5 to 95% RH (non-condensing).
Location free from corrosive gases.
(2) Replace the complete battery assembly (battery in plastic plug-in package).
(3) When measuring the battery voltage, be sure to use a high impedance voltmeter. Do not attempt to measure the voltage using a circuit tester or the like.

(4) Cautions in handling batteries
- Do not charge the batteries.
- Do not heat or put into a fire.
- Do not short the positive and negative poles together.
- Do not apply shock, do not attempt to disassemble.

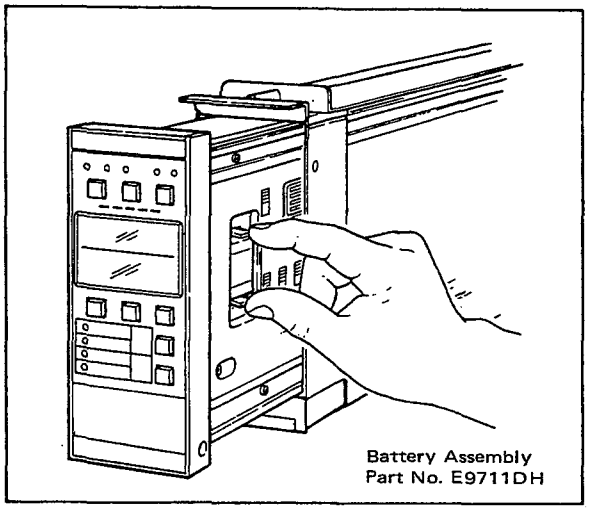


Figure 6-3-2. Removing Battery.

YEWSERIES BCS SBSD*E BATCH SET STATION DATASHEET

Spec. No.				
YOKOGAWA Order No.	SEC.	Loop	Item	
Instrument No.				
Model and Suffix Codes SBSD-				

Customer:

Equipment:

SBSD*E Batch Set Station . TAG No.

01	Alarm (ALM) code			11	Flow low limit setting		
02	Batch flow totalizer value (uncompensated)			12	Flow rise time		S
03	Batch flow totalizer value (compensated)			13	Flow fall time		
04	Cumulative totalizer value (uncompensated) *			14			
05	Cumulative totalizer value (compensated) *			15			
06	Initial totalized flow limit			16	Measured temperature/ compensation coefficient input		
07	Prebatch set value			17	Measured pulse input filter		S
08	Predicted leakage value			18	Added/subtracted pulse input filter		
09	Leakage detection set value			19			
10	Initial flow setting			20			

21	Function specification (1)			31	Analog display/flow signal repeater span *		
22	Function specification (2)			32	Compensation reference temperature		
23	Function specification (3)			33	Manual set temperature/ Manual compensation coefficient		
24				34	Maximum value of measured temperature/ Maximum value of compensation coefficient		
25	Flow process variable span			35	Minimum value of measured temperature/ Minimum value of compensation coefficient		
26	Added/subtracted flow span			36	Compensation factor		
27	K factor for flow process variable			37	Flow transmitter error compensation coefficient α		
28	K factor for added/subtracted flow			38	First order compensation coefficient β/ density or specific gravity ρ		
29	K factor for demand/repeater pulse			39	Second order compensation coefficient γ		
30	Totalizer scale factor			40			

* with added/subtracted flow signal

△	NO.	Revised by	CH.	CH.	K
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USER		D		E		K
DR.	CH.	DR.	CH.	DR.	CH.	

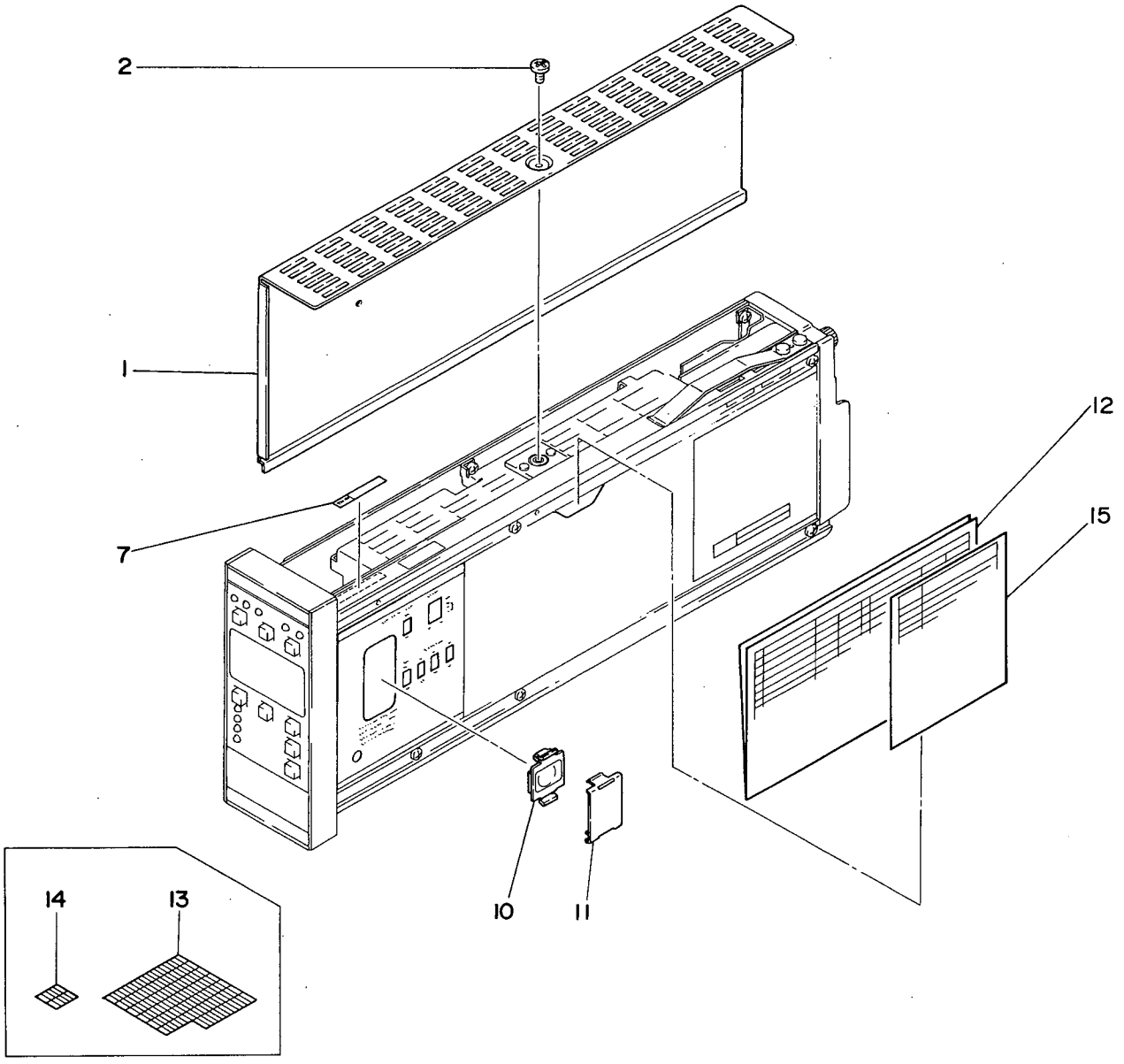
YOKOGAWA

WS 1B4E1-02E
2nd Edition: August, 1987
Printed in Japan (UP)

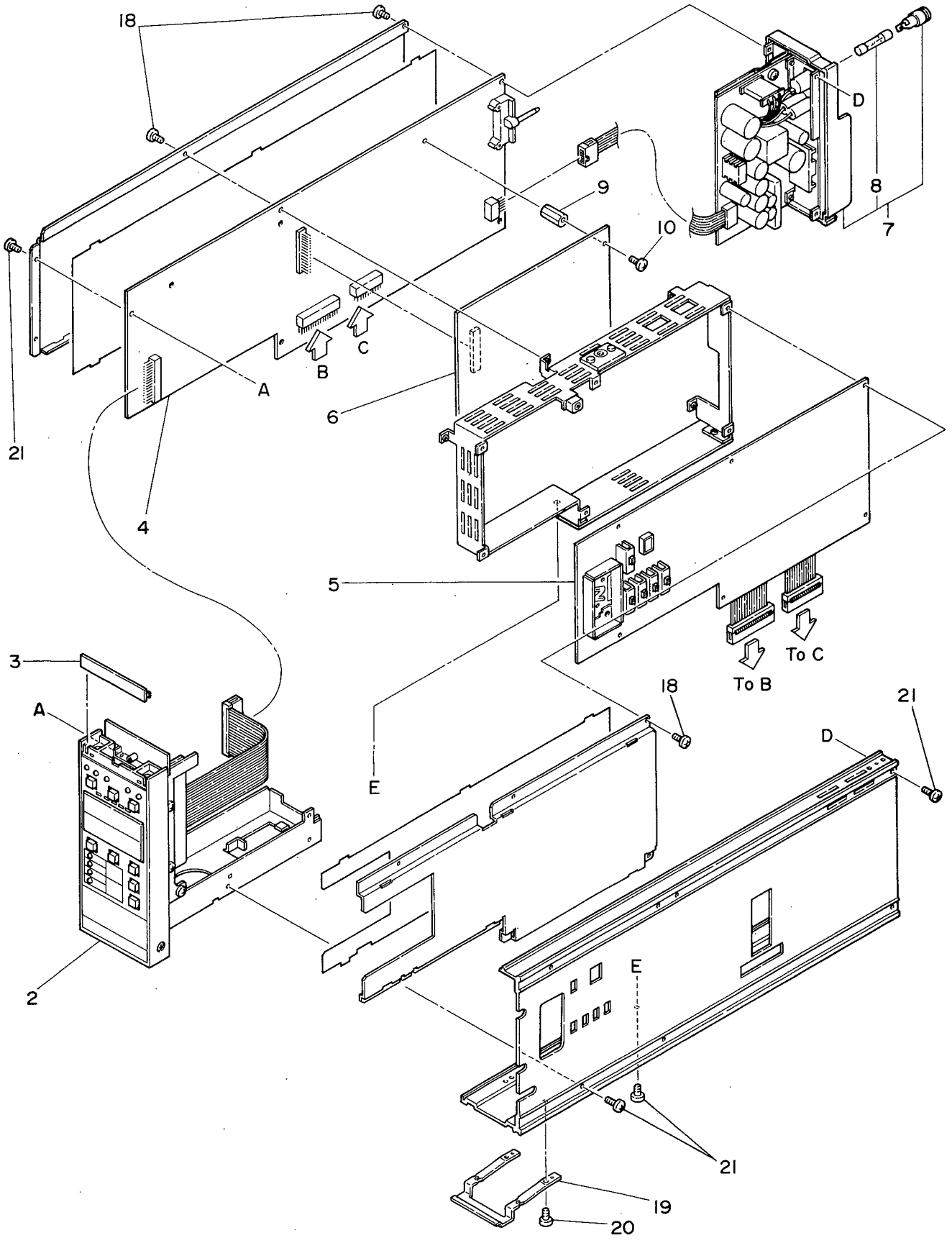
Customer Maintenance Parts List

Model SBSD (Style E)
Batch Set Station

YEWSERIES 80



Item	Part No.	Qty	Description
1	E9711TG	1	Cover
2	Y9405LB	1	B.H. Screw, M4 x 5
7	Y9422NP	1	Tag No. Label (blank)
10	E9711DH	1	Battery Assembly
11	E9711GQ	1	Cover
12	E9714RK	1	Data Label
13	E9712DL	1	Label
14	E9712DS	1	Label (blank)
15	E9714RP	1	Alarm Code Sheet


18
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To C
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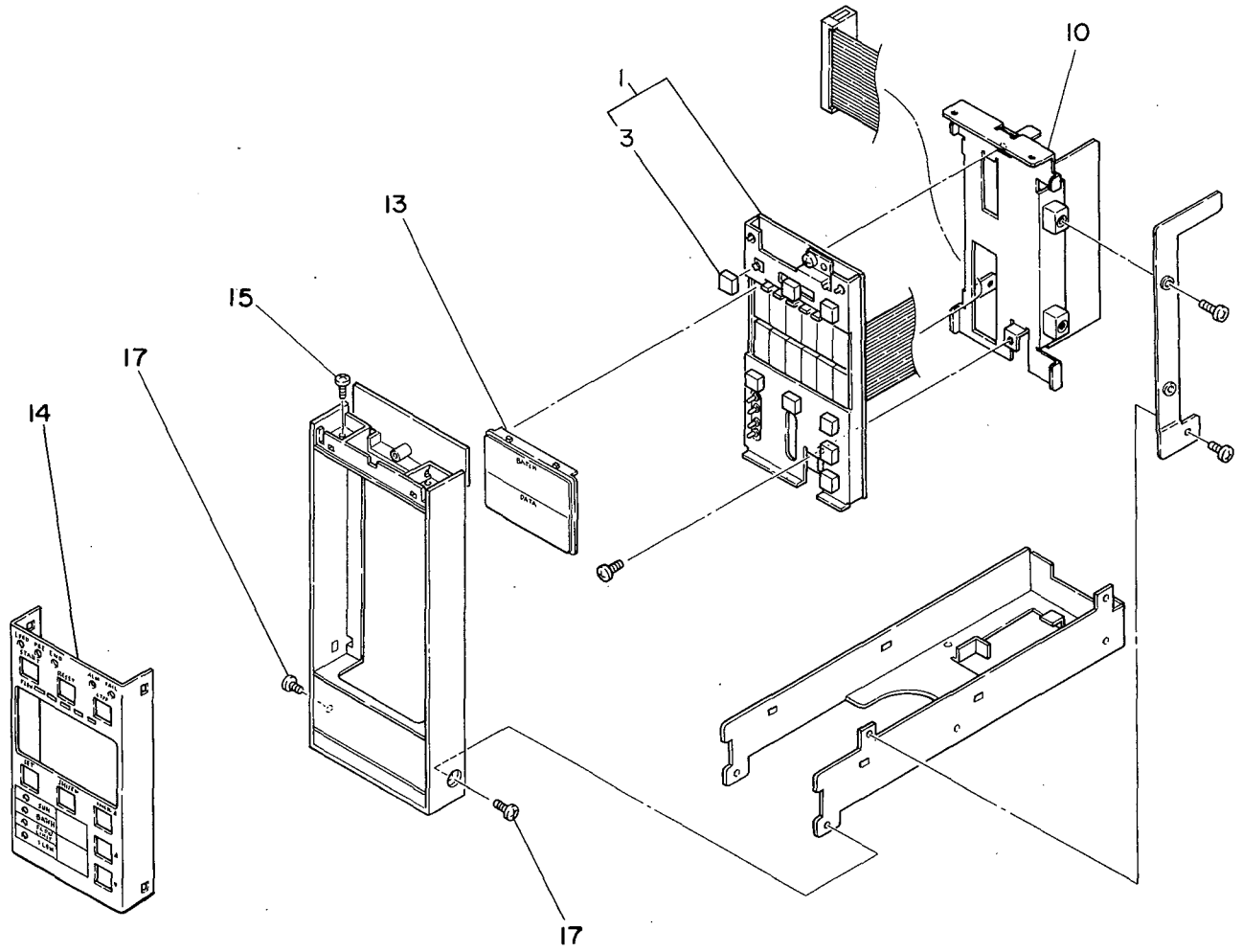
19
20

Item	Part No.	Qty	Description
2	—	1	Display Assembly (see page 4)
3	E9711FG	1	Plate (blank)
—	—	1	Control Assembly (item 4 through 18)
4	E9714TC	1	I/O Card
5	E9714WC	1	CPU Card
6	E9714XA	1	Option Card (for Model SBSD-200*E)
	E9714XB	1	Option Card (for Model SBSD-300*E)
7	E9716YB	1	Power Supply Unit (for 100 V version)
	E9716YS	1	Power Supply Unit (for 220 V version)
8	S9510VK	1	Fuse — "1A"
9	T9008ZB	2	Stud } Expect for Model SBSD-100*E
10	Y9306JB	4	Pan H. Screw, M3 x 6 } Expect for Model SBSD-100*E
18	Y9306JB	12	Pan H. Screw, M3 x 6
19	E9711TD	1	Stopper
20	E9711TE	2	Screw
21	Y9306JB	10	Pan H. Screw, M3 x 6

Display Assembly



Item	Part No.	Qty	Description
—	E9714GD	1	Display Assembly (item 1 through 15)
1	E9714PE	1	Display Card Assembly
3	E9712CC	8	Key Top
13	E9711GF	1	Cover
14	E9711HC	1	Bracket
15	Y9306JB	2	Pan H. Screw, M3 x 6
17	Y9306JB	2	Pan H. Screw, M3 x 6

Instruction Manual

/ HTB
Power Supply Terminal Connections for Panel - mounted Instruments (Option)

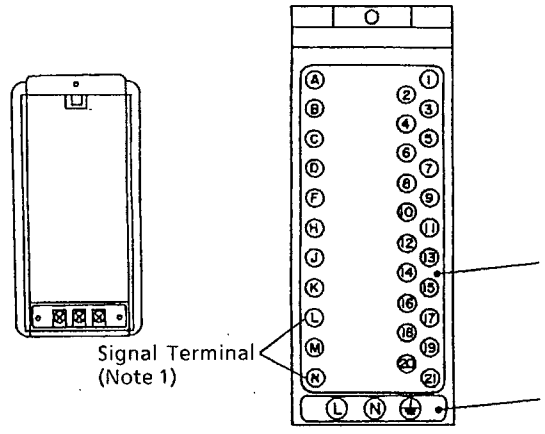
1. GENERAL.

If you specify the terminal board to which the power source is directly connected (suffix code / HTB), the external wiring to the terminal board is necessary.

2. APPLICABLE INSTRUMENTS.

Model	Description
SRVD	Strip Chart Recorder
SIHM	Indicator (With Housing)
SIHF	Bar Graph Indicator (With Alarms)
SIHK	Indicator (With Alarms)
SLCD	Indicating Controller
SLPC	Programmable Indicating Controller
SLMC	Programmable Indicating Controller with Pulse → Width Output
SMLD	Manual Station
SMST	Auto / Manual Station
SMRT	Ratio Set Station
SCMS	Programmable Computing Station
SBSD	Batch Set Station
SLCC	Blending Controller
SLBC	Batch Controller
STLD	Totalizer

3. NAME OF COMPONENTS AND TERMINAL DESIGNATION OF POWER SUPPLY



Terminals Layout

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

(Note 1) Be careful for which Signal Terminals have L, N terminals, too.

4. POWER SUPPLY AND GROUND WIRING.

(1) All cable ends must be furnished with crimp - on type solderless lugs (for 4mm screw).

(2) Examples of applicable cables.

Cross - sectional area of the cable conductor : 2.0mm^2.*

Note * : Power supply cables should be determined from the instrument power consumption - they must have conductors with cross - sectional area of at least 1.25mm^2.

Applicable cable : 600V vinyle insulated cable (IV), conforming to JIS C3307.
Vinyle sheathed cables for electric appliances (KIV), conforming to JIS C3316.

(3) After completing the power supply and ground wiring, mount the power terminal cover.

FD No. 10004 - S

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