REV. DATE	DESCRIPTION
⚠1	
2011. 07. 04	: CHANGE FLOW CHART INSERT NOTE Sheet No. 21, 22, 27, 28, 29, 30

MESSRS

MOTOR CONTROLLER
FOR MARINE
ELECTRIC MOTOR STARTER

■ SMC-505Ⓡ24 / 505HⓇ24 : STAND-BY START
(AUTO-CHANGEOVER)

CE

7 SHEETS WITH COVER

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CONTENTS

1. GENERAL INFORMATION

1.1 GENERAL

- The SMC 500 series motor controllers are high quality products combined with related functions and especially developed to be easily applied to marine system, power plant, steel, chemical plant and any other places where the motors should be controlled. They comply with various international standards, and standardized circuit is adopted. In addition to a basic function, the controller has applicable functions, and control circuit consists of high quality components up to various standards.
- Particularly, the enclosure is made of flame retardant polycarbonate material, and it has the highest electric insulation and strong resistance to shock. And also, it's weight is very light. So, it can be easily applied in any environmental conditions.

1.2 CHARACTERISTIC

- The SMC 500 series improves the reliability of control circuit and correctness of assembling for starter, and saves the design M/h for group start panel. Moreover, the size of a starter can be reduced about 30% compared with starter without SMC 500. Starter with SMC 500 can be superior in quality, and it's design and assembling can be standardized. Also, maintenance can be done easily, promptly, and can be managed systematically.
- As the major point, all models have sequential start (UVR/UVP), alarm signal out and remote control, and SMC-503, 504, 504R models have the prevention against inrush current while changing direction or speed. Especially, SMC-505 model has common circuit (function) to 2 or 3 stand-by, so design and maintenance can be done economically. And it has interlock device and auto-changeover function (by intercommunication function between the running, stand-by and steady motors) for various abnormal conditions. As a result, SMC 505 model can be widely applied to the special function.

⚠ CAUTION

CAUTION

⚠ For safety, read and give attention to "CAUTION" and 'MANUAL". "CAUTION" notice with the left symbol must be observed, otherwise (for your daily habit or behavior) the controller can be seriously damaged and some problem on system can occur.

1.3 ORDERING INFORMATION

Motor control circuits are different from one another in their operation according to their auxiliary machines or systems. The following are applicable models. Please select the applicable model according to the plan of the system and the specification on this operation manual. To apply the extra model of the following regular series, please refer to the "Appendix-Derivation Model for SMC-500".

SMC- 505 [H] (R4)

[H] : With Heater switch and indicator

[X] : Non-Heater control

2. SPECIFICATION FOR CONSTRUCTION AND ENVIRONMENT

2.1 ENCLOSURE

1) Material : PC (Flame retardant) UL94 V-O / TRIREX3025G10 / G/F (Reinforced)
2) Dielectric strength : 31 KV/mm
3) Color : Black (maker standard)

2.2 TEMPERATURE / HUMIDITY FOR OPERATION

1) Ambient temperature : -20°C ~ +55°C
2) Storage temperature : -20°C ~ +85°C
3) Humidity : 45% ~ 85% R.H

2.3 IP GRADE

1) Push button : IP 65 - IEC 525 (Approvals - UL, CSA, CE)
2) Push button with lamp : IP 65 - IEC 525 (Approvals - UL, CSA, CE)
3) Selector switch : IP 65 - IEC 529 (Approvals - UL, CSA, GL, VDE)
4) Mounting bracket : IP 65 with packing

2.4 EXTERNAL CONNECTION T.B

1) Material
   -Insulating Material : PC (Flame retardant) UL94 V-O / TRIREX3025G10 / G/F (Reinforced)
   -Flammability Class : UL-94 V-O
   -Terminal Block/Contact : Brass (Ni- Plating)
2) Wire size (max) : 3.5 mm^2
3) Spacing between terminals : 9.0 mm
4) Connecting screw : M3.5

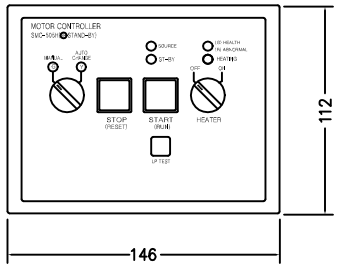
2.5 FRONT NAME PLATE : Embossing color plate

2.6 VIBRATION TEST (LR rule) : 30 Hz, acceleration ; ±0.7 G (±7m/s^2)

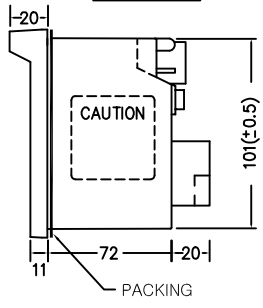
2.7 SHOCK RESISTANCE : 10G

2.8 OUTSIDE FIGURE (See detail : Dwg. No. SB-SMC-500 ; Sheet No.9) : Unit in mm

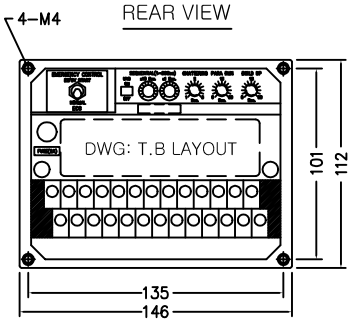
FRONT VIEW



SIDE VIEW



REAR VIEW



3. ELECTRICAL AND MECHANICAL SPECIFICATION

3.1 INPUT POWER SOURCE

1) Voltage rating : AC 22V 50/60HZ
2) Voltage variation : AC 22V ±20%
3) Back-up time for blackout : About 200ms
4) Surge transient : 2kV 50 uVs line/earth ; 1kV 50 uVs line/line (IEC 1000-4-5/1995/)
5) Power consumption : 20VA(max) ---- Control Fuse : 250Vac 2A (miniature glass tube)

3.2 TIMER CHARACTERISTIC

1) Accuracy (Ta=ambient temp')
   : less than ±1% (-10°C<Ta<+45°C)
   : less than ±5% (-10°C <Ta<-20°C , +45°C<Ta<+55°C)
2) Setting method
   : Sequential time - By digital switch
   : Interval, Chattering, Para, Build-up - By V/R
3) Reset time : 0.2 Sec or less

- The timer is provided for all SMC 500 series controllers as follows.
  - Sequential start (UVR) : 1 Sec~99 Sec (Digital control : 1 Sec step, apply to all models)
  - D-start delay : 50 mSec~500 mSec (Apply only to SMC-502Y)
  - Interval
    : 2 Sec~30 Sec (Apply only to SMC-502Y)
    : 0.5 Sec~30 Sec (Apply only to SMC-503, 504R)
    : 0.5 Sec~6 Sec (Apply only to SMC-504, 504R)
  - Chattering : 1 Sec~3 Sec (Apply only to SMC-501A)
  - Parallel Run : 0.5 Sec~30 Sec (Apply only to SMC-505)
  - Pressure Build up : 0.5 Sec~30 Sec

3.3 Rating of push button : 250Vac, 3A (p.f.=0.3), (-25°C<Ta<+55°C) -- UL, CSA, CE
- Life Expectancy : Mechanical life - 2,000,000 cycles
  Electrical life - 100,000 cycles

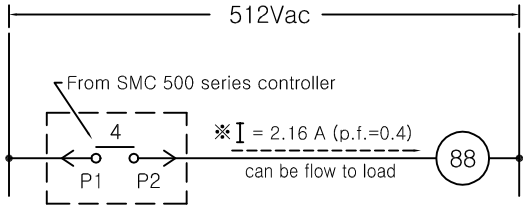
3.4 Rating of sellector switch : 250Vac, 3A (p.f.=0.3), (-25°C<Ta<+55°C) -- UL, CSA, GL, DIN VDE
- Life Expectancy : Mechanical life - 2,000,000 cycles
  Electrical life - 100,000 cycles

3.5 Rating of external T.B for connection : 600V / 15A (-30°C<Ta<+105°C), 1000V / 9A (-30°C<Ta<+105°C)

3.6 Rating of control relay for electromagnetic contactor : ref. contact 4 in F1)-(UL, CSA, VDE, IEC)

- Maximum rating : 512Vac 2.16 A (p.f.=0.4) --- 1000Vrms between open contacts for 1 min.
- Max. switching power : continuity 300W 10A, 2770 VA 51A for 2ms (-55°C<Ta<+70°C)
- Life Expectancy : Mechanical life - 30,000,000 cycles / Electrical life - 100,000 cycles

F1)



※I = 1.6A on 690Vac line
4 : Relay contact for driving electromagnetic contactor
88 : Electromagnetic contactor

3.7 Rating of control relay for signal interface : 250Vac 0.3A (p.f.=0.4)

3.8 Electrical insulation resistance : Above 200Megger ohms between live part and enclosure.

3.9 Dielectric strength : 2.5 kVac, for 1min between relay out terminal or 440V control line (P1~P4) and enclosure

4. CONTROL FUNCTION AND SPECIFICATION OF DISPLAY

4.1 FUNCTION AS TO APPLICABLE MODEL : See "Table 1" below.

1) UVR / UVP : It's a sequential start function, set each time considering the sequential start time of whole system.

UVR: Under Voltage Release (With sequential start function)

UVP: Under Voltage Protection (Without sequential start function)

2) LAMP TEST : All lamps of SMC series can be tested by test button at any cycle of operation.

2) SELF DIAGNOSIS : SMC-505 series includes self diagnostic function specially as follows.

HEALTH : Light up in green (good condition)

ABNORMAL : Flicker in red (bad control condition)

Table 1 : Control function

APPLI-CATION	CONTROLLER MODEL	CONTROL SYSTEM		SCHEMATIC DIAGRAM Dwg No.	SHEET No.	CONTROL SIGNAL OUTPUT (Normal Open) (Dry contact)	ALARM SIGNAL OUTPUT (Normal Close) (Dry contact)
		ADDITIONAL FUNCTION	BASIC FUNCTION				
AUTOMATIC CHANGEOVER	SMC-505R4	- Manual - Automatic changeover - Chattering - Parallel run - Pressure build-up - Stand-by	- Start - Stop - UVR - UVP - Self diagnosis - LP test	SMC-505-REF 505H-REF Flow chart Dwg No. SMC-505-F2-1 ~ SMC-505-F3-5	59 ~ 72	- Stand-by - Parallel run	- Overloaded - CPU fail - Power failure - Stand-by started - LPS - Abnormal stop
	SMC-505HR4 - Heater control					- Stand-by - Parallel run - Heater control	

4.2 DISPLAY AND SWITCHES AS TO APPLICATION MODEL

1) HEALTH / ABNORMAL : Dual color lamp, indicates the state of "HEALTH" or "ABNORMAL".

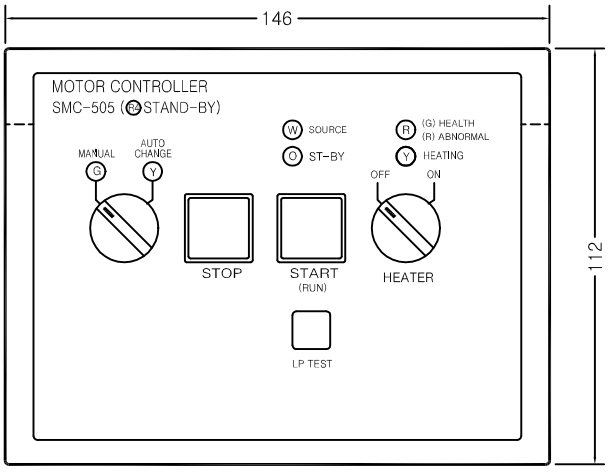
("HEALTH" lamp is lit up in green and "ABNORMAL" lamp is lit up in red)

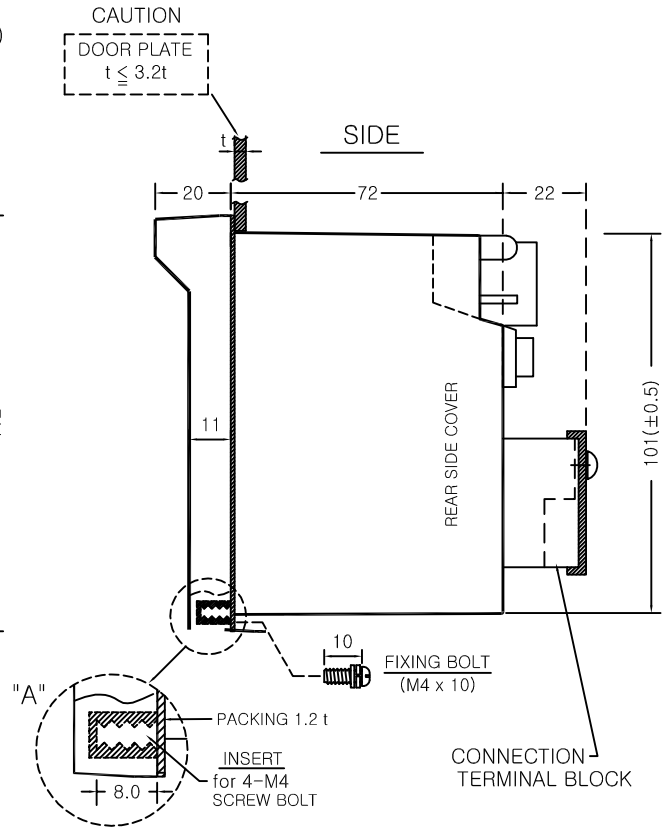
Table 2 : Control switches and display

		CONTROL SWITCHES & NAME					DISPLAY LAMPS & NAME						
APPLI-CATION	CONTROLLER MODEL	START PB (Green)	STOP PB (Red)	SELECTOR SWITCH (Black)		LAMP TEST	SOURCE (White)	RUN (Green)	ABNORMAL (Red)	HEATING (Yellow)	AUTO (Yellow)	MANUAL (Green)	ST-BY (Orange)
				HEATER ON / OFF	AUTO / MANUAL								
AUTOMATIC CHANGE-OVER	SMC-505R4	1 pc	1 pc	—	1 pc	1 pc	1 pc	1 pc	dual 1 pc (R,G)	—	1 pc	1 pc	1 pc
	SMC-505HR4	1 pc	1 pc	1 pc	1 pc	1 pc	1 pc	1 pc	dual 1 pc (R,G)	1 pc	1 pc	1 pc	1 pc

4.3 OUTLINE DIMENSION AND PANEL CUTTING (Unit in m/m)

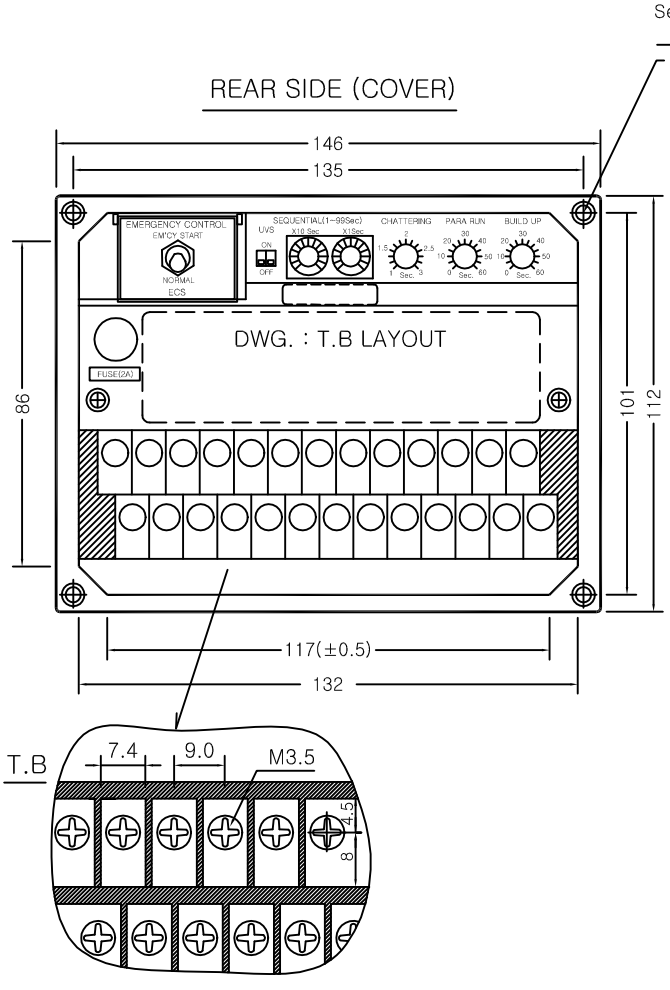
- The size of all models are the same





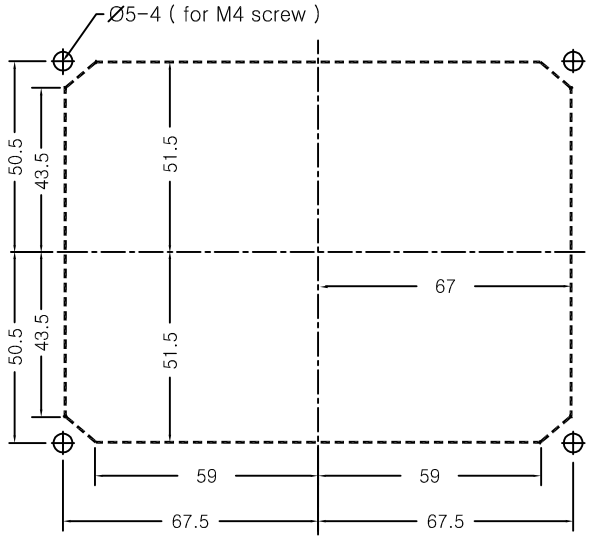
1. Material : PC (Flame retardant)
   TRIREX3025G10
   G/F (Reinforced)
   UL94 V-O

2. Color : Black (Maker Standard)



PANEL CUTTING (all models are the same)

(Clearance between case and panel : 2W - 2H)



SB-SMC-500	Title: SMC-505(R4) OUTLINE DIMENSION & PANEL CUTTING			
	LUXCO CO., LTD.	DWG. No. SB-SMC-500	Edition	Sheet

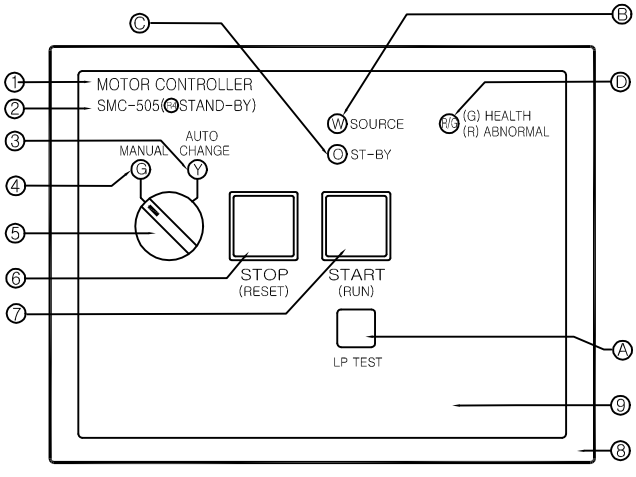
5. SMC-505(R4) : STAND-BY START (AUTO CHANGEOVER)

☐ The SMC-505(R4) model is applied to the automatic changeover system. In this system, 2 or 3 motor starters are monitored and communicate with each other, and in case some trouble occurs to the motor that is running single or parallel, the stand-by motor is started instead of the running motor.

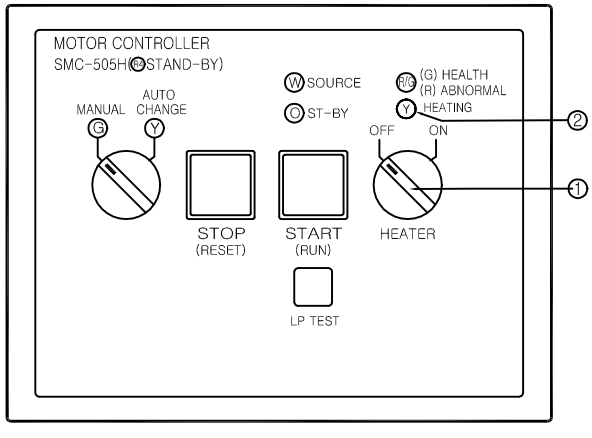
5.1 OUTLINE DESCRIPTION

The following describes the front side control section of the controller attended with auxiliary equipment. Auxiliary equipment means, for example, motor has winding heater or space heater, pressure switch, and the functions relating to motor control are manually or automatically operated.

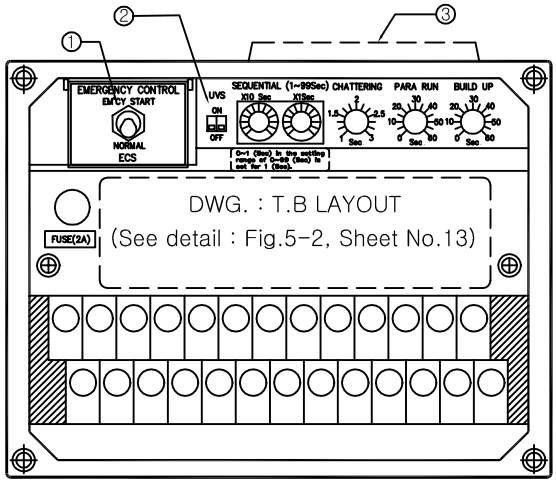
SMC-505(R4) FRONT VIEW



SMC-505H(R4) FRONT VIEW



REAR SIDE(SMC-505(R4), 505H(R4) are the same)



1) SMC-505(R4) MODEL

SYMBOL	NAME	DESCRIPTION
1 :	Name of model	: "MOTOR CONTROLLER"
2 :	Model No.	: SMC-505(R4) or SMC-505H(R4) (STAND-BY)
3 :	Auto change indicator	: LED (light up in Yellow)
4:	Manual indicator	: LED (light up in Green)
5 :	Manual / Auto change switch	: Ø18 Selector switch Black (IP65)
6 :	Stop button	: 18 x 18 Red (IP65)
7 :	Start button-w/lamp	: 18 x 18 Green (IP65)
8 :	Case	: PC (flame retardant)
9 :	Name plate	: Embossing color plate
A :	Test button	: Tact switch
B :	Source indicator	: LED (light up in white)
C :	Stand-by indicator	: LED (light up in orange)
D :	Abnormal indicator	: dual color LED (ref. below)

- HEALTH : light up in green.
- ABNORMAL : light up in red(overloaded, pressure build-up failed).

2) SMC-505H(R4) MODEL

SYMBOL	NAME	DESCRIPTION
1 :	Heater switch	: Ø18 Selector switch Black (IP65)
2 :	Heating indicator	: LED (light up in yellow)

3) REAR SIDE CONTROL

(SMC-505(R4), 505H(R4) are the same)

SYMBOL	NAME	DESCRIPTION
1 :	ECS switch (emergency control)	: Toggle switch for emergency start
2 :	UVR / UVP switch	: Dip switch for sequential start.
3 :	Timer	: See Fig.5-2 (Sheet No. 13)

5. 2 STAND-BY START (AUTO CHANGEOVER)

5.2 Manual operation of 2 STAND-BY

(Refer to DWG No. SMC-505-REF)
(Refer to Flowchart. 2ST-BY-F2-1)

For manual operation of one or both of No.1 and No.2 starters, the "MANUAL-AUTO CHANGE" selector switch on applicable controller should be set to "MANUAL" position.

When the manual mode is selected, the "MANUAL" lamp is lit up in green.

One of the starters doesn't affect the other starter, and operates separately.

> CAUTION
> In manual operation, the motor can not be changed over automatically when some trouble occurs to the running motor. Therefore, manual operation must be changed to "AUTO CHANGE" mode after manual operating.

- The following explanation is an example of a manual control of No.1 starter.

1) MANUAL START AND RUNNING

Press the START push-button switch (3C) on front of the controller or on the remote side.

This energizes the starting relay (4).

And the Electromagnetic Contactor (88) is energized via the contact (P1, P2) of relay (4), and forms self-holding circuit. Thus the motor starts and "RUN" lamp is lit.

2) STOP

Press the STOP push-button switch (3-O) on front of the controller or on the remote side.

This energizes the stopping relay (7) , and de-energizes the starting relay (4).

As a result, the contactor (88) drops out and the motor is stopped.

At the same time the "RUN" lamp is turned off.

3) OVERLOAD

If the motor is overloaded for some cause during running, the over current relay (51) will operate. (refer to Dwg. No. SMC-505-REF)

Operating the contact (51) means "b" contact of (51) makes the contactor (88) dropped out directly and "a" contact of (51) makes the starting relay (4) de-energized immediately.

Thus the contactor (88) is de-energized and clears starting circuit.

As a result, the motor is stopped outputting an abnormal signal and abnormal alarm lamp is lit.

At the same the time the "RUN" lamp is turned off.

4) SEQUENTIAL START

If the blackout (loss of power) occurs while the motor is running, the motor will be stopped in abnormal state. On the recovery of the power, the sequential start timer (T1) starts time counting and, when its time is out, the relay (4) is energized through the keeping relay (4C).

And the contact (88) is energized via the contact (P1, P2) of relay (4), thus the motor restarts automatically. The UVR/UVP selector switch (UVS) is provided on rear side of the controller.

0~1 sec in the sequential timer setting range of 0~99 sec is internally set for 1 sec.

5. 2 STAND-BY START (AUTO CHANGEOVER)

5.3 Automatic operation of 2 STAND-BY

(Refer to DWG No. SMC-505-REF)
(Refer to Flowchart. 2ST-BY-F2-2)

For automatic operation, the "MANUAL-AUTO CHANGE" selector switches on No.1 and No.2 starters should be set to "AUTO CHANGE" position.

When the auto-change mode is selected, the "AUTO CHANGE" lamp is lit up in yellow.

No.1 or No.2 that starts operating first is the lead unit.

CAUTION

In case of checking the pump circulation system, manual mode may be needed.
In manual mode, the motor can not be changed over automatically when some trouble occurs to the running motor. Therefore, manual operation must be changed to "AUTO CHANGE" mode after manual operating.

- The following explanation is an example of the operation when No.1 starter is placed in a lead unit and No.2 starter is placed in a stand-by unit.

1) START AND STAND-BY START

Press the START push-button switch (3C) on the controller or on the remote side of No.1 starter. This energizes the starting relay (4). And electromagnetic contactor (88) is energized via the contact (P1, P2) of relay (4), and forms self-holding circuit.

Thus the motor starts and "RUN" lamp is lit. After No.1 starter operates and the operation is detected by No.2 starter, the orange "ST-BY" lamp of No.2 starter will light up in 1 second and No.2 starter will be placed in a stand-by mode automatically.

Next, No.2 starter will automatically start running as soon as the loss of power, overload or low pressure condition occurs to No.1 motor, and output a stand-by started alarm signal for 5 seconds.

2) STOP

Press the STOP push-button switch (3-O) on front of the controller or on the remote side. This energizes the stopping relay (7) , and de-energizes the starting relay (4).

As a result, the contactor (88) drops out and the motor is stopped.

At the same time the "RUN" lamp is turned off. In case No.1 motor is stopped by manual operating(pressing stop button), No.2 starter is reset automatically from the stand-by mode.

3) OVERLOAD

If the motor is overloaded for some cause during running, the over current relay (51) will operate. Operating the contact (51) means "b" contact of (51) makes the contactor (88) dropped out directly and "a" contact of (51) makes the starting relay (4) de-energized immediately.

Thus the contactor (88) is de-energized and clears starting circuit.

As a result, the motor is stopped and an abnormal signal is output. At the same time the "ABNORMAL" lamp is lit and the "RUN" lamp is turned off.

At this time, No.2 motor is started immediately in a stand-by mode, so running motor is changed over from No.1 to No.2. And No.1 is placed in a stand-by mode automatically when it is recovered from the overload.

5. 2 STAND-BY START (AUTO CHANGEOVER)

4) SEQUENTIAL START

- If the blackout (loss of power) occurs while No.1 motor is running and No.2 motor is placed in a stand-by mode, No.1 motor will stop in abnormal state and No.2 will be reset from the stand-by mode. On the recovery of the power, No.1 motor restarts and No.2 is placed in stand-by mode again.
- But if the power failure or fuse blowout occurs only to No.1, No.2 motor will start instantly and No.1 motor will stop in abnormal state.
  After this, even when the power of No.1 starter is recovered, the sequential timer of No.1 is not operated and No.1 is placed in a stand-by mode because No.2 is running.
- 0~1 sec in the sequential timer setting range of 0~99 sec is internally set for 1 sec.

5) LOW PRESSURE CONDITION

If a drop in pressure on running No.1 motor(pump) is caused by some reason and continues for a chattering time (T2: 1~3sec), No.1 starter will detect the low pressure condition, and No.2 motor will be started and run in parallel with No.1.
The parallel running continues until the parallel run time (T3: 0.5~60sec) is over. And when the time is out, No.1 motor is stopped outputting a parallel run stop signal for 5 seconds and placed in a stand-by mode. If the pressure does not reach to the specified value after parallel running is end, No.1 motor will be stopped outputting an "ABNORMAL STOP" alarm for 5 seconds. And No.2 will be still running outputting a "LOW PRESSURE" alarm and "ABNORMAL" lamp will be lit up.

(NOTE)

In the stand -by state, No.2 motor starts running when any of the following two condition is met.

5.1 Power supply to No.1 starter is shut off(by reason that the MCCB is tripped or off, or a control fuse blows out), or No.1 motor encounters overload (operating of over current relay) and is stopped in abnormal state.

5.2 The pressure on the pump circulation system drops continuously by some reason.

NOTE) If the pressure on the pump circulation system does not reach to the specified value, No.1 starter will never be placed in a stand-by mode.
This prevents continuous alternating operation between No.1 and No.2 pumps.

6) EMERGENCY CONTROL

- If the controller malfunctions , automatic and manual mode can not be operated.
In this case, emergency control can be done by use of ECS (emergency control switch) on rear side of the controller. 'EM'CY START' position means 'RUN' state, and on 'NORMAL' position it's means 'STOP' state.

5. 2 STAND-BY START (AUTO CHANGEOVER)

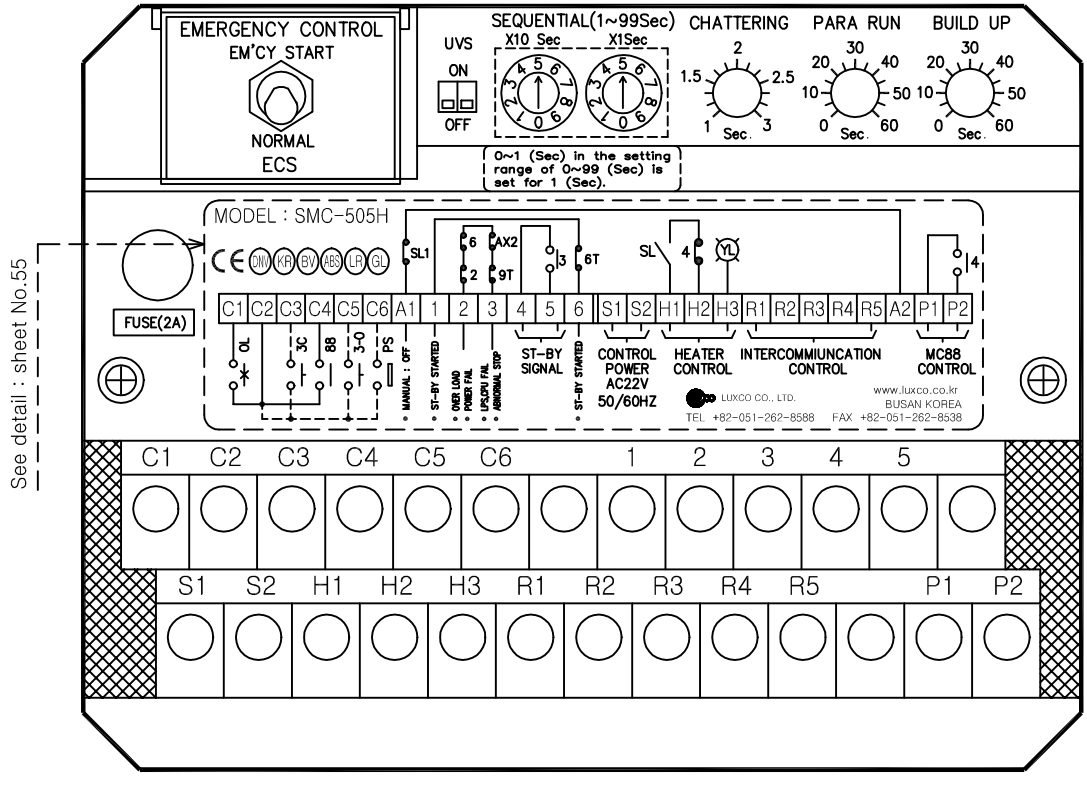
7) HEATER CONTROL

This function is only for SMC-505H. Power for heater circuit is turned on or off (T.B : H1, H2) by selector switch (SL2). And receiving the any kind of contact signal (T.B : H3, C2), "HEATING" lamp is lit while heater is in operation.
But heater can not operate during running because of the interlock with relay (4).
(refer to Dwg. No. SMC-505H-REF)

8) TIMER SETTING AND EMERGENCY CONTROL (Ref. Fig. 5-1 below)

Emergency control switch (ECS), sequential start selector switch (UVS) and four kinds of timers are provided on rear side of all SMC-505 models.
As to emergency control (ECS), if the abnormal indicator(dual color) is flickering (the lamp is lit up steadily in red on overload and pressure recovery failure), it means the controller is having internal manaul and automatic function trouble. At this time, set the ECS switch to "ON" position and operate the motor.
Sequential start switch (UVS) should be set according to the specification of whole system.
Set the sequential timer properly, keeping the time difference between starters that start sequentially.

Fig.5-1 SMC-505HⓇ4 REAR SIDE VIEW



5. T.B, TIMER AND CAUTION PLATE

5.4 T.B LAYOUT & TIMER SETTING METHOD FOR SMC-505, 505H

- See the DWG. on rear side of the controller to see the T.B layout and to set the time.

EMERGENCY CONTROL

If "HEALTH/ABNORMAL" lamp is flickering in red, it means bad control conditions. In that case set the selector switch on the front to "MANUAL" and ECS on the rear to "ON". And operate the motor in emergency control mode. "HEALTH" lamp means good conditions. Dual lamp lit up steadily in red means, overloaded or pressure recovery failure.

CAUTION

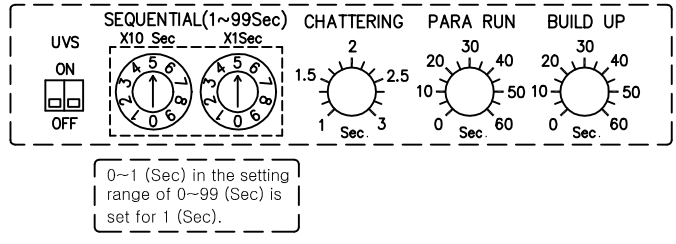
After checking & repair for starter, Reset UVR function by pressing the "STOP" button as power is on. Unexpected problem can occur by unspecified self-starting.

PROHIBITION AGAINST DIELECTRIC WITHSTAND TEST

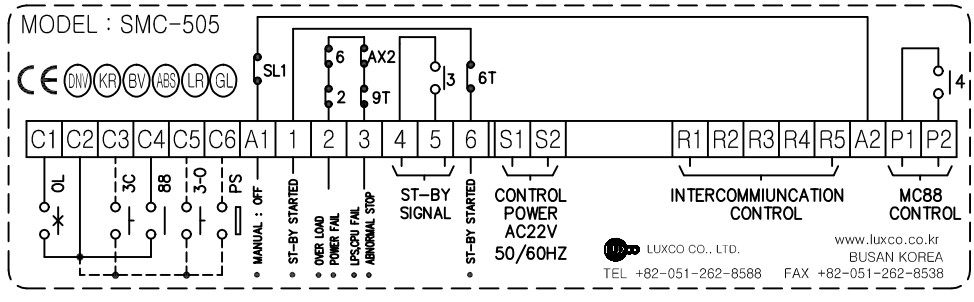
Do not give a dielectric withstand test on the terminals that are not specified on manual. The test can cause damage to inner component.

Fig.5-2

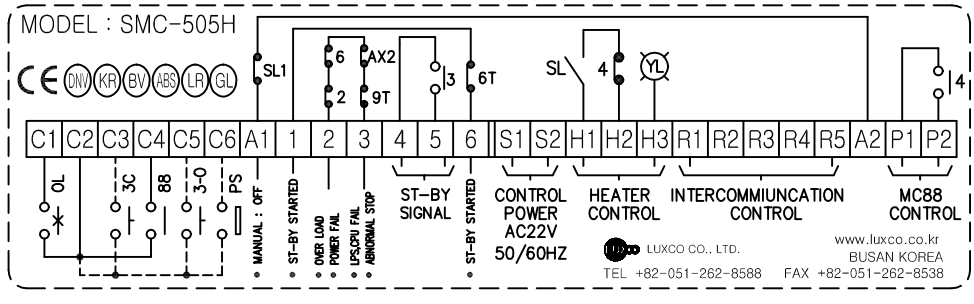
SMC-505, 505H are the same
TIMER LAYOUT



SMC-505
T.B LAYOUT



SMC-505H
T.B LAYOUT



5. 3 STAND-BY START (AUTO CHANGEOVER)

5.5 Manual operation of 3 STAND-BY

(Refer to DWG No. SMC-505-REF)
(Refer to Flowchart. 3ST-BY-F3-1)

For manual operation of one or both of No.1, No.2 and No.3 starters, the "MANUAL-AUTO CHANGE" selector switch on applicable controller should be set to "MANUAL" position.
When the manual mode is selected, the "MANUAL" lamp is lit up in green.
One of the starters doesn't affect the other starters, and operates separately.

CAUTION
In manual operation, the motor can not be changed over automatically when some trouble occurs to the running motor. Therefore, manual operation must be changed to "AUTO CHANGE" mode after manual operating.

- The following explanation is an example of a manual control of No.1 starter.

1) MANUAL START AND RUNNING

Press the START push-button switch (3C) on front of the controller or on the remote side.
This energizes the starting relay (4).
And the Electromagnetic Contactor (88) is energized via the contact (P1, P2) of relay (4), and forms self-holding circuit. Thus the motor starts and "RUN" lamp is lit.

2) STOP

Press the STOP push-button switch (3-O) on front of the controller or on the remote side.
This energizes the stopping relay (7) , and de-energizes the starting relay (4).
As a result, the contactor (88) drops out and the motor is stopped.
At the same time the "RUN" lamp is turned off.

3) OVERLOAD

If the motor is overloaded for some cause during running, the over current relay (51) will operate. (refer to Dwg. No. SMC-505-REF)
Operating the contact (51) means "b" contact of (51) makes the contactor (88) dropped out directly and "a" contact of (51) makes the starting relay (4) de-energized immediately.
Thus the contactor (88) is de-energized and clears starting circuit.
As a result, the motor is stopped outputting an abnormal signal and abnormal alarm lamp is lit.
At the same the time the "RUN" lamp is turned off.

4) SEQUENTIAL START

If the blackout (loss of power) occurs while the motor is running, the motor will be stopped in abnormal state. On the recovery of the power, the sequential start timer (T1) starts time counting and, when its time is out, the relay (4) is energized through the keeping relay (4C).
And the contact (88) is energized via the contact (P1, P2) of relay (4), thus the motor restarts automatically. The UVR/UVP selector switch (UVS) is provided on rear side of the controller.
0~1 sec in the sequential timer setting range of 0~99 sec is internally set for 1 sec.

5.6 Automatic operation of 3 STAND-BY

(Refer to : DWG No. SMC-505-REF)
(Refer to : Flowchart. 3ST-BY-F3-2~5)

For automatic operation, the "MANUAL-AUTO CHANGE" selector switches on No.1, No.2 and No.3 starters should be set to "AUTO CHANGE" position.

When the auto-change mode is selected, the "AUTO CHANGE" lamp is lit up in yellow.

No.1, No.2 or No.3 that starts operating first is the lead unit.

CAUTION

In case of checking the pump circulation system, manual mode may be needed.
In manual mode, the motor can not be changed over automatically when some trouble occurs to the running motor. Therefore, manual operation must be changed to "AUTO CHANGE" mode after manual operating.

- The following explanation is an example of the operation when No.1 starter is placed in a lead unit, No.2 starter is placed in a stand-by unit and No.3 starter is placed in a normal power "ON" state (referred to from now on as "STEADY")

1) START AND STAND-BY START

Press the START push-button switch (3C) on the controller or on the remote side of No.1 starter. This energizes the starting relay (4). And electromagnetic contactor (88) is energized via the contact (P1, P2) of relay (4), and forms self-holding circuit.

Thus the motor starts and "RUN" lamp is lit. After No.1 starter operates and the operation is detected by No.2 starter, the orange "ST-BY" lamp of No.2 starter will light up in 1 second and No.2 starter will be placed in a stand-by mode automatically.

At this time, if No.2 starter is in abnormal state, No.3 starter will be placed in a stand-by mode.

Next, No.2 starter will automatically start running as soon as the loss of power, overload or low pressure condition occurs to No.1 motor, and output a stand-by started alarm signal for 5 seconds. And No.3 starter will be placed in a stand-by mode.

(Refer to flowchart : 3ST-BY-3PS --- sheet No. 24)

2) STOP

(Same operation as the automatic operation of 2 stand-by : sheet No. 10)

3) OVERLOAD

If No.1 motor is overloaded for some cause during running, the over current relay (51) will operate.

Operating the contact (51) means "b" contact of (51) makes the contactor (88) dropped out directly and "a" contact of (51) makes the starting relay (4) de-energized immediately.

Thus the contactor (88) is de-energized and clears starting circuit.

As a result, the motor is stopped and an abnormal signal is output. At the same time the "ABNORMAL" lamp is lit and the "RUN" lamp is turned off.

At this time, No.2 motor is started immediately in a stand-by mode, so running motor is changed over from No.1 to No.2. And No.3 is placed in a stand-by mode automatically.

And No.1 is placed in a steady mode automatically when it is recovered from the overload.

5. 3 STAND-BY START (AUTO CHANGEOVER)

4) SEQUENTIAL START

- If the blackout (loss of power) occurs while No.1 motor is running, No.2 motor is placed in a stand-by mode and No.3 motor is placed in a steady mode, No.1 motor will stop in abnormal state and No.2 will be reset from the stand-by mode.
  On the recovery of the power, No.1 motor restarts and No.2 is placed in stand-by mode again.
- But if the power failure or fuse blowout occurs only to No.1, No.2 motor will start instantly, No.3 will be placed in a stand-by mode and No.1 motor will stop in abnormal state. After this, even when the power of No.1 starter is recovered, the sequential timer of No.1 is not operated and No.1 is placed in a stand-by mode because No.2 is running and No.3 is placed in a stand-by mode.
- 0~1 sec in the sequential timer setting range of 0~99 sec is internally set for 1 sec.

5) LOW PRESSURE CONDITION

If a drop in pressure on running No.1 motor(pump) is caused by some reason and continues for a chattering time (T2: 1~3sec), No.1 starter will detect the low pressure condition, and No.2 motor will be started and run in parallel with No.1.
The parallel running continues until the parallel run time (T3: 0.5~60sec) is over. And when the time is out, No.1 motor is stopped outputting a parallel run stop signal for 5 seconds and placed in a steady mode, and No.3 is placed in a stand-by mode. If the pressure does not reach to the specified value after parallel running is end, No.1 motor will be stopped outputting an "ABNORMAL STOP" alarm for 5 seconds. And No.2 will be still running outputting a "LOW PRESSURE" alarm and "ABNORMAL" lamp will be lit up. But, at this time, No.3 will not be placed in a stand-by mode.

(NOTE)

In the stand -by state, No.2 motor starts running when any of the following two condition is met.

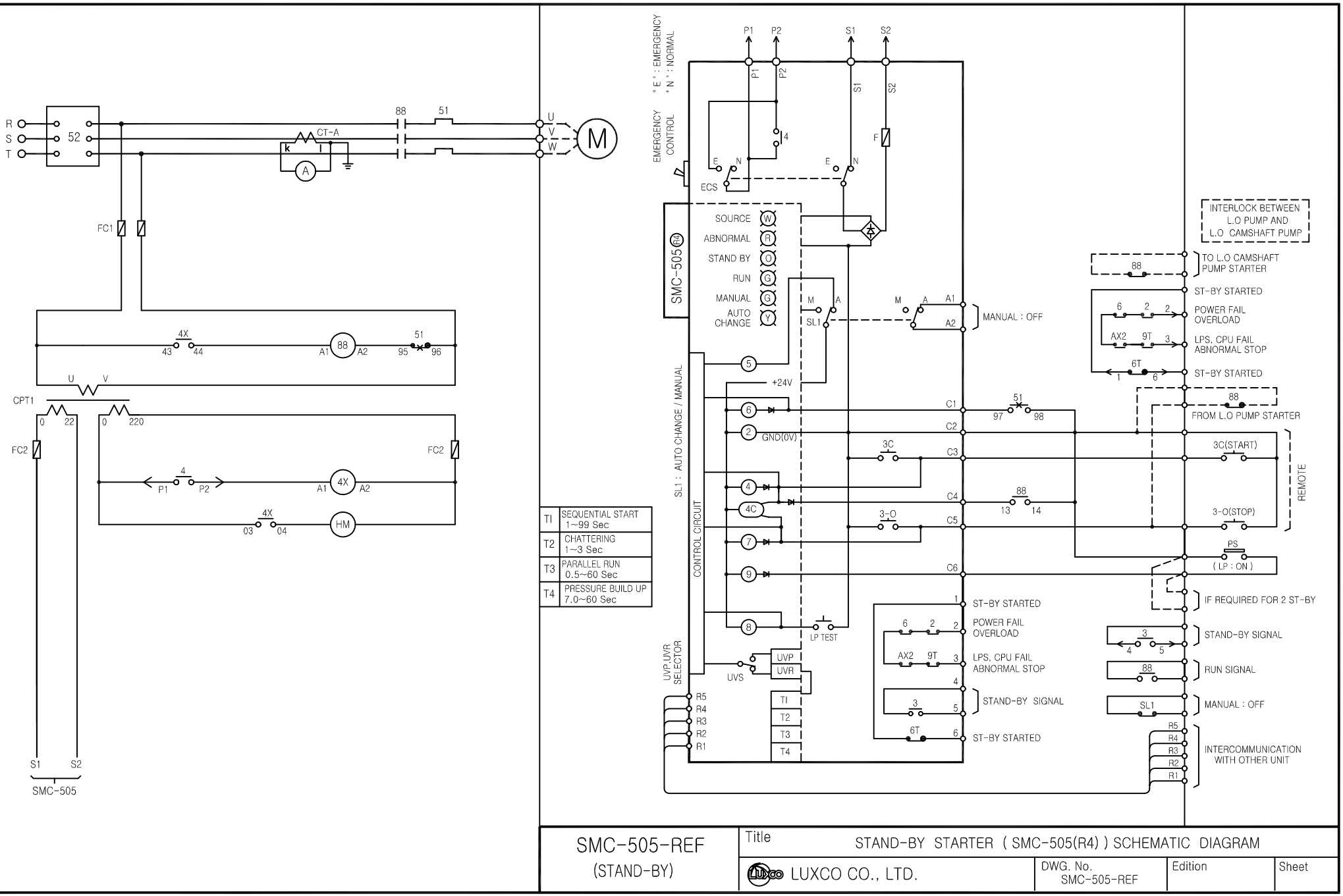
5.1 Power supply to No.1 starter is shut off(by reason that the MCCB is tripped or off, or a control fuse blows out), or No.1 motor encounters overload (operating of over current relay) and is stopped in abnormal state.

5.2 The pressure on the pump circulation system drops continuously by some reason.

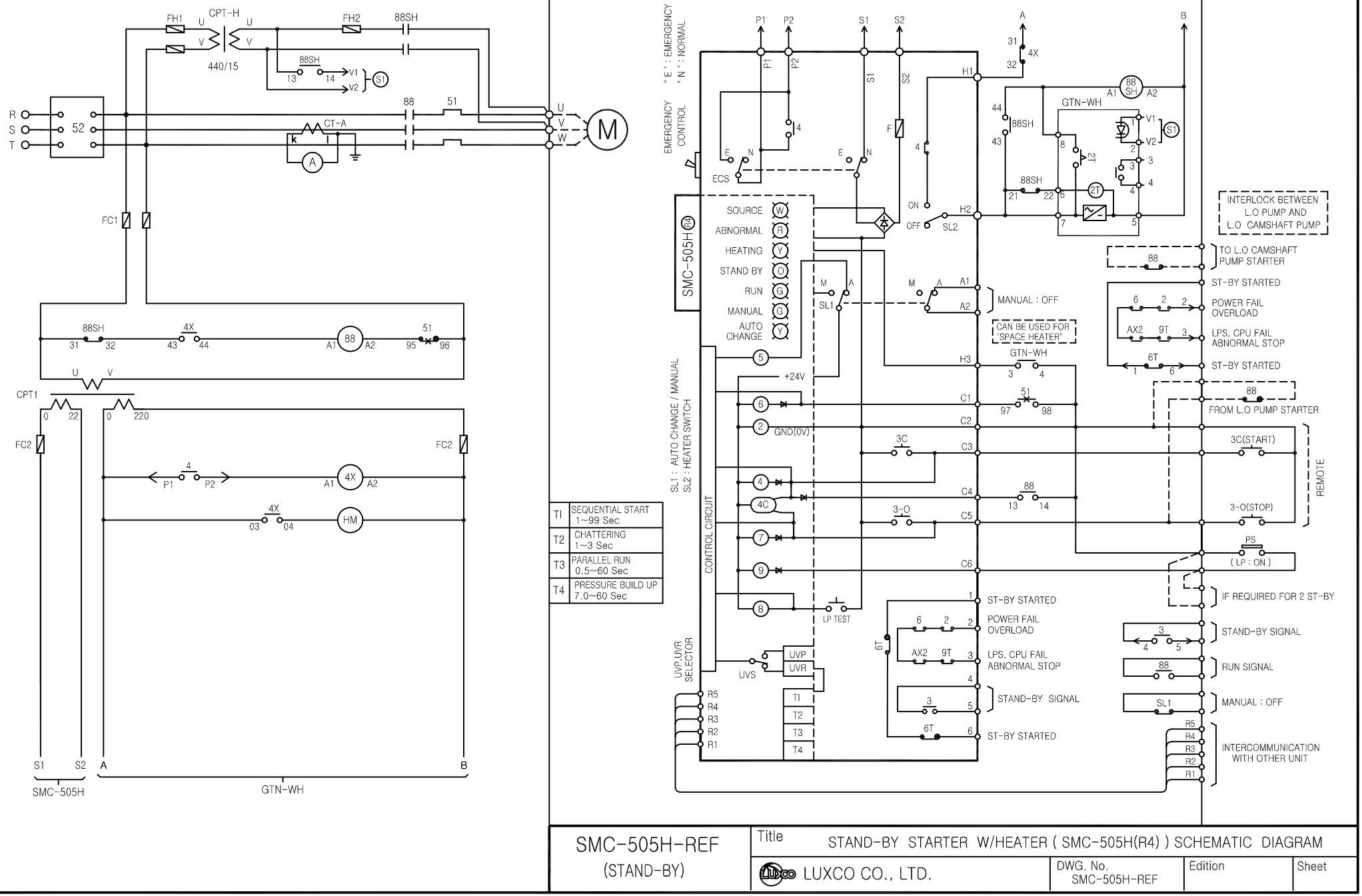
NOTE) If the pressure on the pump circulation system does not reach to the specified value, No.3 starter will never be placed in a stand-by mode.
This prevents continuous alternating operation between No.1, No.2 and No.3 pumps.

6) EMERGENCY CONTROL

- If the controller malfunctions , automatic and manual mode can not be operated.
In this case, emergency control can be done by use of ECS (emergency control switch) on rear side of the controller. 'EM'CY START' position means 'RUN' state, and on 'NORMAL' position it's means 'STOP' state.

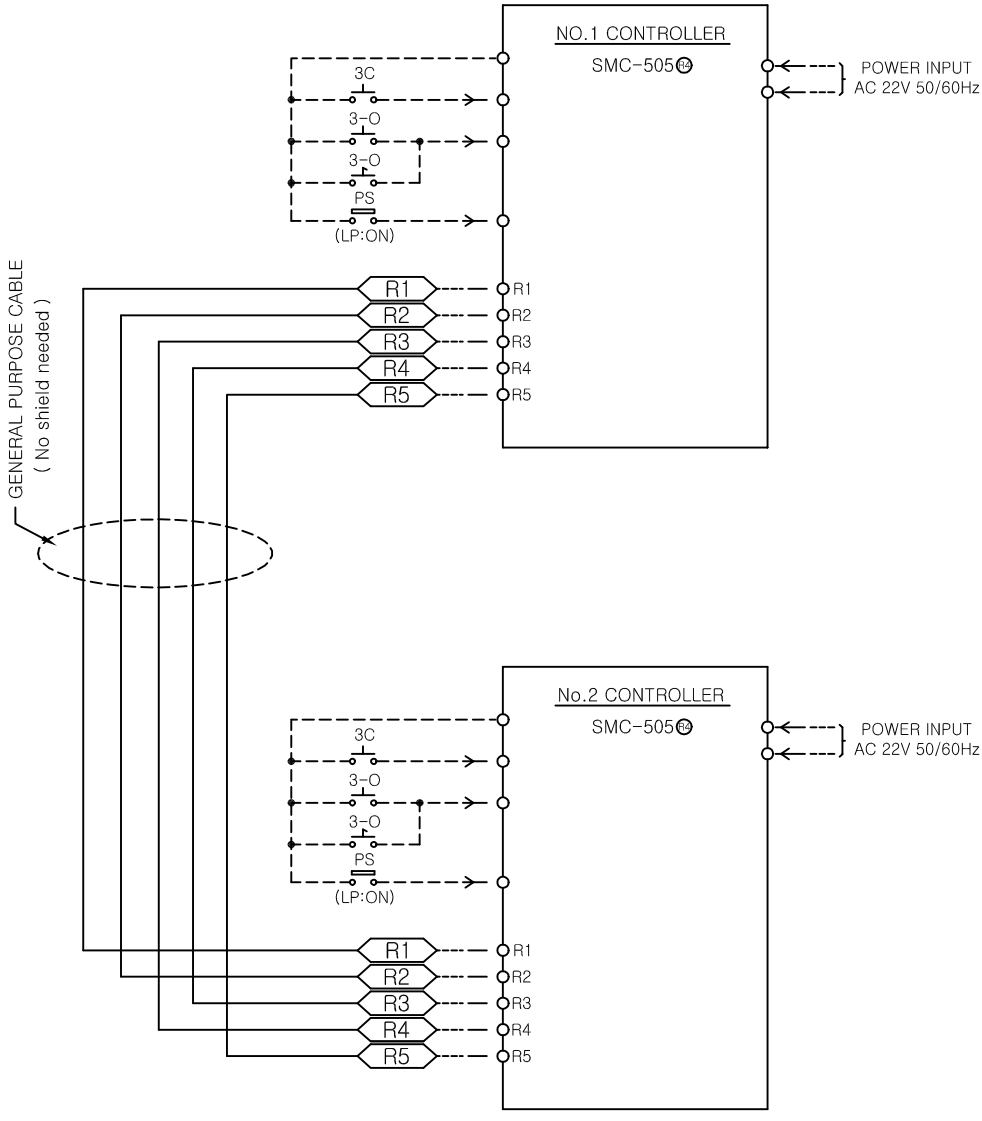


SMC-505-REF (STAND-BY)	Title: STAND-BY STARTER (SMC-505(R4)) SCHEMATIC DIAGRAM
LUXCO CO., LTD.	DWG. No. SMC-505-REF / Edition / Sheet

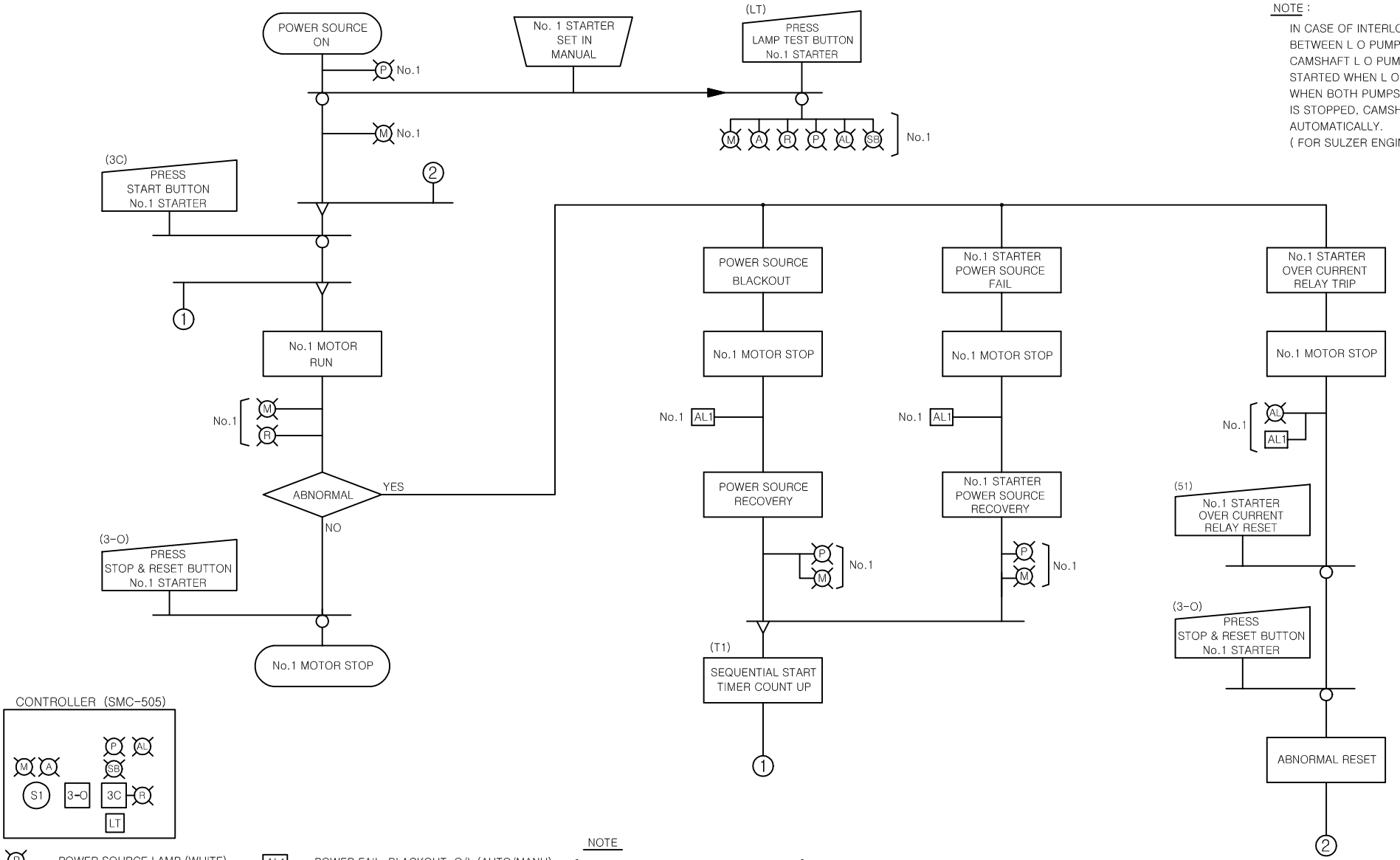


T1	SEQUENTIAL START 1~99 Sec
T2	CHATTERING 1~3 Sec
T3	PARALLEL RUN 0.5~60 Sec
T4	PRESSURE BUILD UP 7.0~60 Sec

SMC-505H-REF (STAND-BY)	Title	STAND-BY STARTER W/HEATER (SMC-505H(R4)) SCHEMATIC DIAGRAM	
	LUXCO CO., LTD.	DWG. No. SMC-505H-REF	Edition / Sheet



SMC-505-2RT	Title	2 STAND-BY CONNECTION DIAGRAM OF R/T		
	LUXCO CO., LTD.	DWG. No. SMC-505-2RT	Edition	Sheet



NOTE :

IN CASE OF INTERLOCK DEVICE TO BE PROVIDED BETWEEN L O PUMP AND CAMSHAFT L O PUMP. CAMSHAFT L O PUMP IS NOT ABLE TO BE STARTED WHEN L O PUMP IS STOPPED. WHEN BOTH PUMPS ARE RUNNING, IF L O PUMP IS STOPPED, CAMSHAFT L O PUMP IS STOPPED AUTOMATICALLY.
(FOR SULZER ENGINE TYPE RTA.)

CONTROLLER (SMC-505)

- P --- POWER SOURCE LAMP (WHITE)
- AL --- DUAL COLOR LAMP FOR ABNORMAL STOP AND CONDITION HEALTH(GREEN) / ABNORMAL(RED)
- SB --- STAND-BY LAMP (ORANGE)
- R --- RUN LAMP (GREEN)
- A --- LAMP FOR AUTO MODE (YELLOW)
- M --- LAMP FOR MANUAL MODE (GREEN)

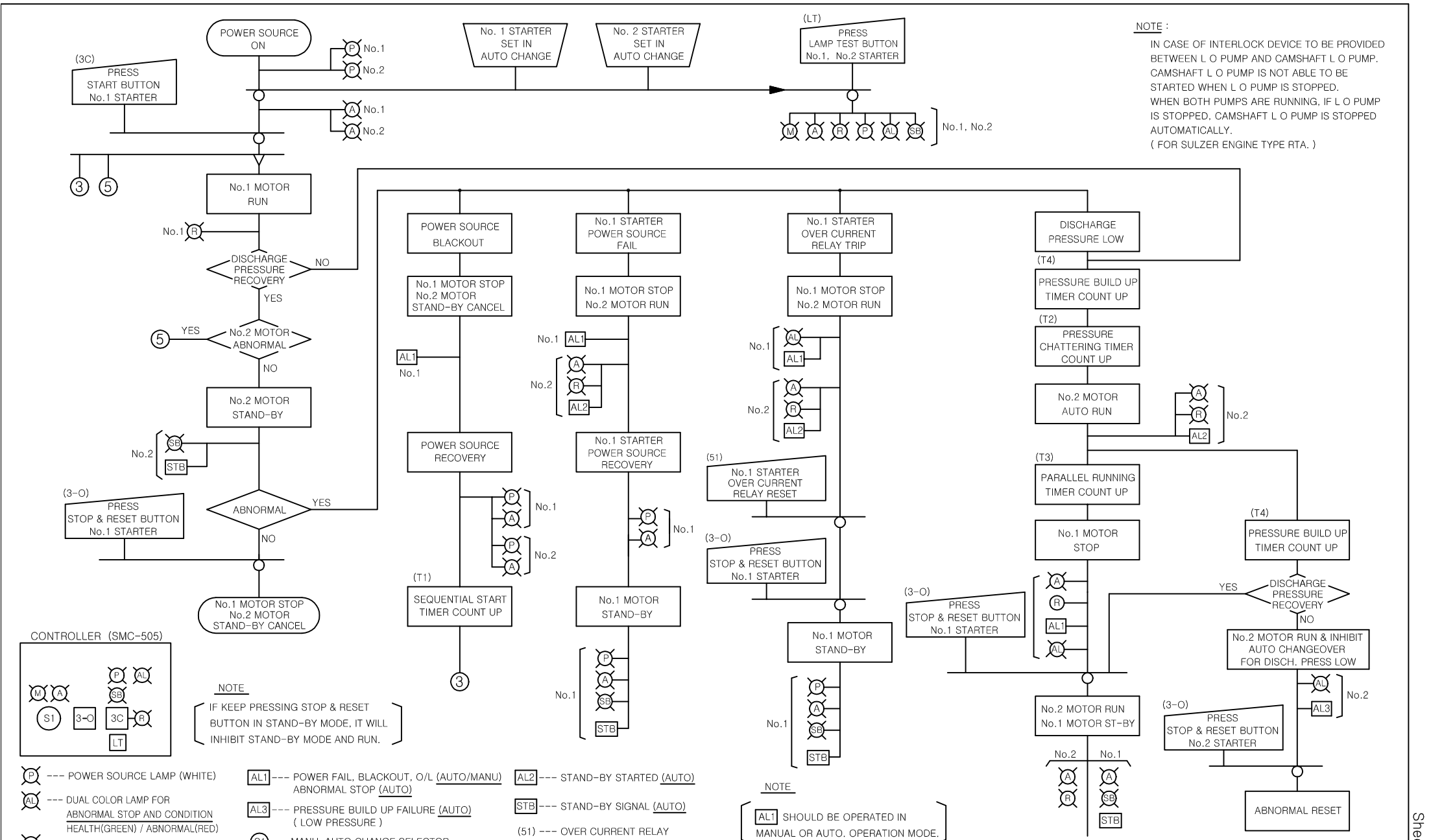
- AL1 --- POWER FAIL, BLACKOUT, O/L (AUTO/MANU) ABNORMAL STOP (AUTO)
- S1 --- MANU-AUTO CHANGE SELECTOR
- (3-O) --- STOP & RESET PUSH BUTTON(RED)
- (3C) --- START PUSH BUTTON (GREEN) WITH LAMP(GREEN)
- (LT) --- LAMP TEST BUTTON

NOTE

[AL1 SHOULD BE OPERATED IN MANUAL OR AUTO. OPERATION MODE.]

- (51) --- OVER CURRENT RELAY
- (T1) --- SEQUENTIAL START (1~99 Sec)
- (T2) --- LPS CHATTERING (1~3 Sec)
- (T3) --- PARALLEL RUN (3~60 Sec)
- (T4) --- PRESSURE BUILD UP (3~60 Sec)

2 ST-BY-F2-1	Title: 2 ST-BY AUTO CHANGEOVER OPERATION FLOWCHART (No.1, 2 MOTOR MANUAL OPERATION)			
UTILIZED SMC-505	LUXCO CO., LTD.	DWG. No. 2 ST-BY-F2-1	Edition	Sheet



P --- POWER SOURCE LAMP (WHITE)

AL --- DUAL COLOR LAMP FOR ABNORMAL STOP AND CONDITION HEALTH(GREEN) / ABNORMAL(RED)

SB --- STAND-BY LAMP (ORANGE)

R --- RUN LAMP (GREEN)

A --- LAMP FOR AUTO MODE (YELLOW)

M --- LAMP FOR MANUAL MODE (GREEN)

AL1 --- POWER FAIL, BLACKOUT, O/L (AUTO/MANU) ABNORMAL STOP (AUTO)

AL3 --- PRESSURE BUILD UP FAILURE (AUTO) (LOW PRESSURE)

(S1) --- MANU-AUTO CHANGE SELECTOR

(3-O) --- STOP & RESET PUSH BUTTON(RED)

(3C) --- START PUSH BUTTON (GREEN) WITH LAMP(GREEN)

(LT) --- LAMP TEST BUTTON

AL2 --- STAND-BY STARTED (AUTO)

STB --- STAND-BY SIGNAL (AUTO)

(51) --- OVER CURRENT RELAY

(T1) --- SEQUENTIAL START (1~99 Sec)

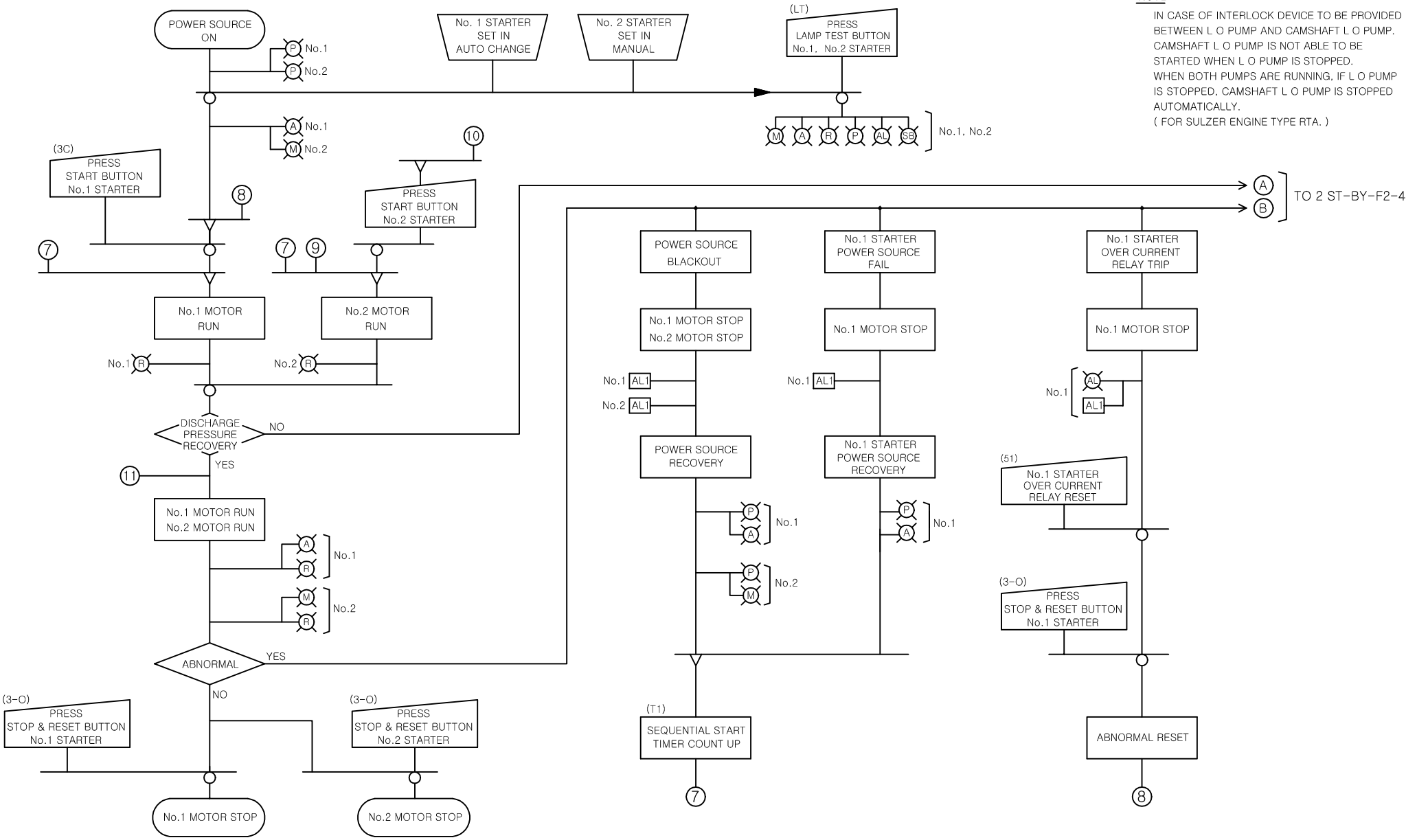
(T2) --- LPS CHATTERING (1~3 Sec)

(T3) --- PARALLEL RUN (3~60 Sec)

(T4) --- PRESSURE BUILD UP (3~60 Sec)

2 ST-BY-F2-2	Title: 2 ST-BY AUTO CHANGEOVER OPERATION FLOWCHART (No.1 MOTOR LEAD AND No.2 MOTOR STAND-BY)			
UTILIZED SMC-505	LUXCO CO., LTD.	DWG. No. 2 ST-BY-F2-2	Edition	Sheet

Sheet No. 21



NOTE
IF KEEP PRESSING STOP & RESET BUTTON IN STAND-BY MODE, IT WILL INHIBIT STAND-BY MODE AND RUN.

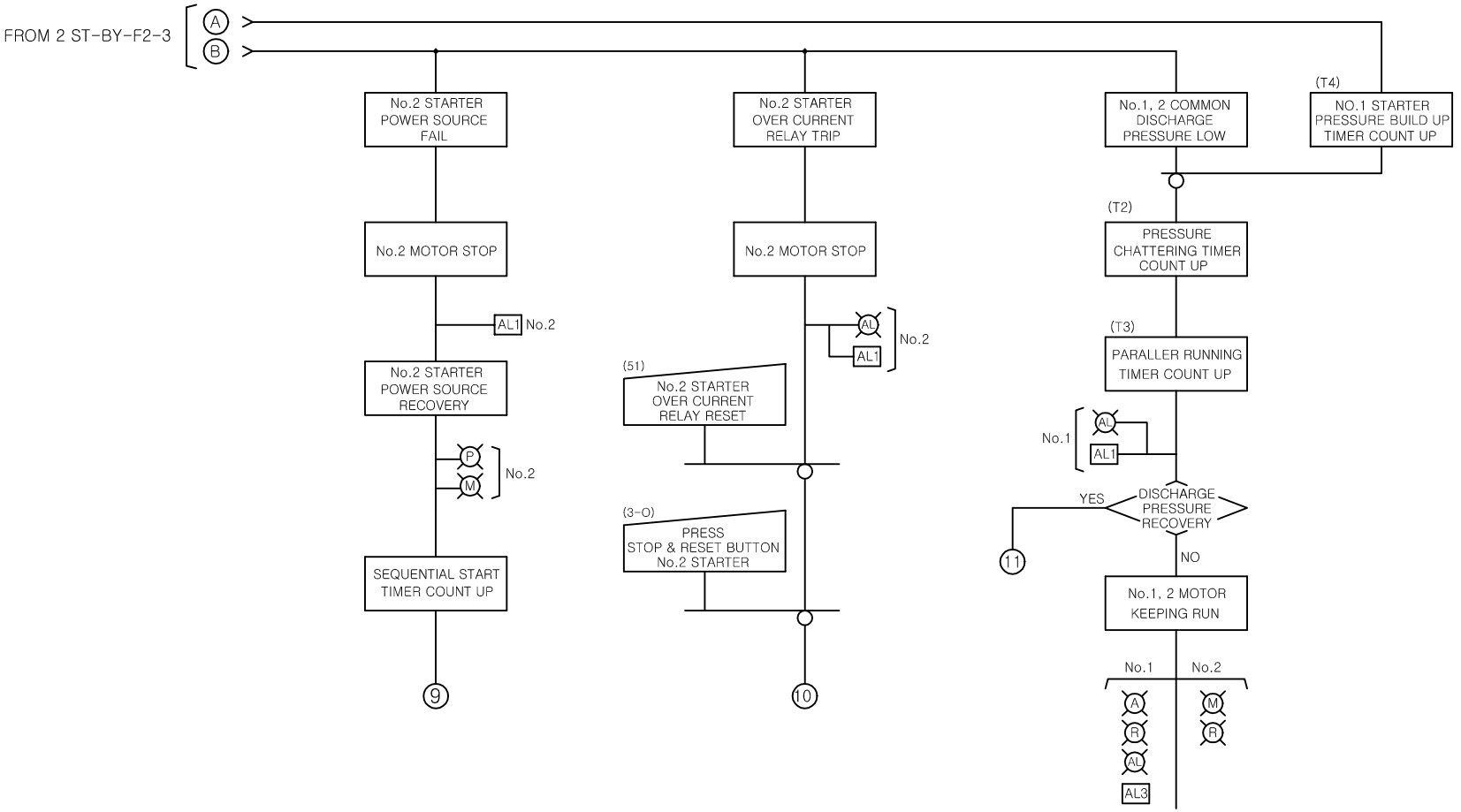
NOTE
AL1 SHOULD BE OPERATED IN MANUAL OR AUTO. OPERATION MODE.

2 ST-BY-F2-3	Title: 2 ST-BY AUTO CHANGEOVER OPERATION FLOWCHART (No.1 MOTOR AUTO. AND No.2 MOTOR MANUAL OPERATION)			
UTILIZED SMC-505	LUXCO CO., LTD.	DWG. No. 2 ST-BY-F2-3	Edition	Sheet

Sheet No. 22

NOTE :

IN CASE OF INTERLOCK DEVICE TO BE PROVIDED BETWEEN L O PUMP AND CAMSHAFT L O PUMP. CAMSHAFT L O PUMP IS NOT ABLE TO BE STARTED WHEN L O PUMP IS STOPPED. WHEN BOTH PUMPS ARE RUNNING, IF L O PUMP IS STOPPED, CAMSHAFT L O PUMP IS STOPPED AUTOMATICALLY.
(FOR SULZER ENGINE TYPE RTA.)



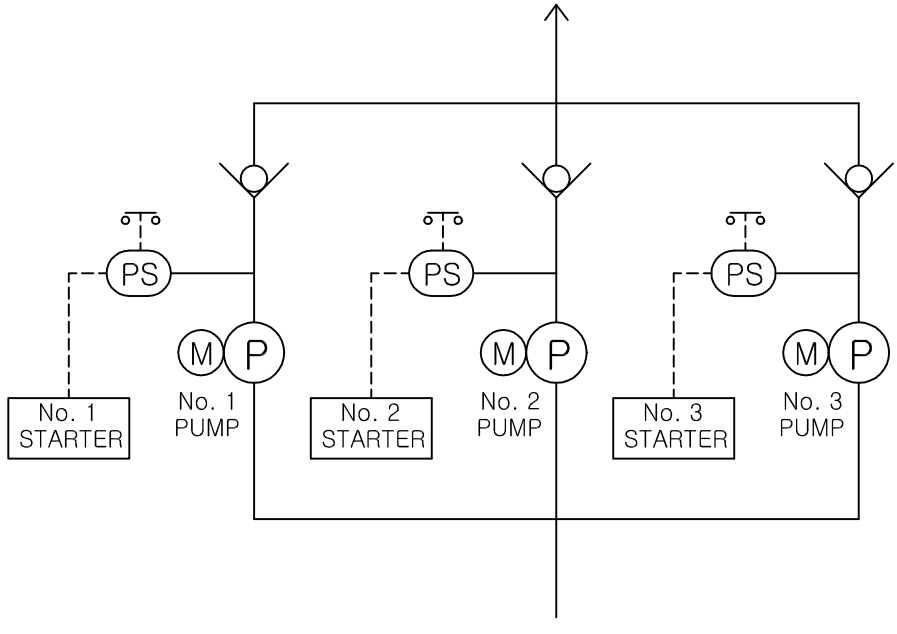
NOTE

AL1 SHOULD BE OPERATED IN MANUAL OR AUTO. OPERATION MODE.

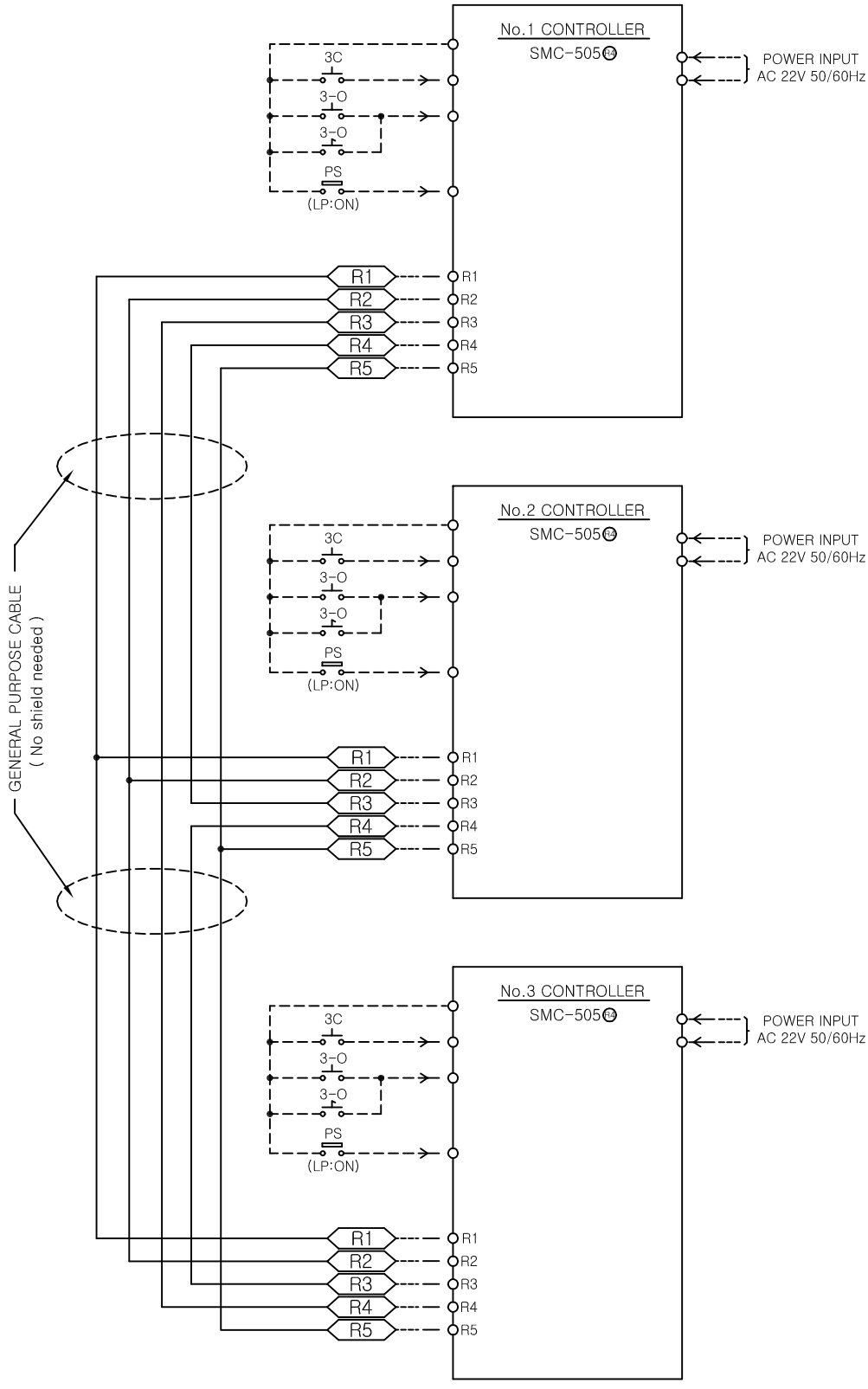
2 ST-BY-F2-4	Title: 2 ST-BY AUTO CHANGEOVER OPERATION FLOWCHART (No.1 MOTOR AUTO. AND No.2 MOTOR MANUAL OPERATION)			
UTILIZED SMC-505	LUXCO CO., LTD.	DWG. No. 2 ST-BY-F2-4	Edition	Sheet

Sheet No. 23

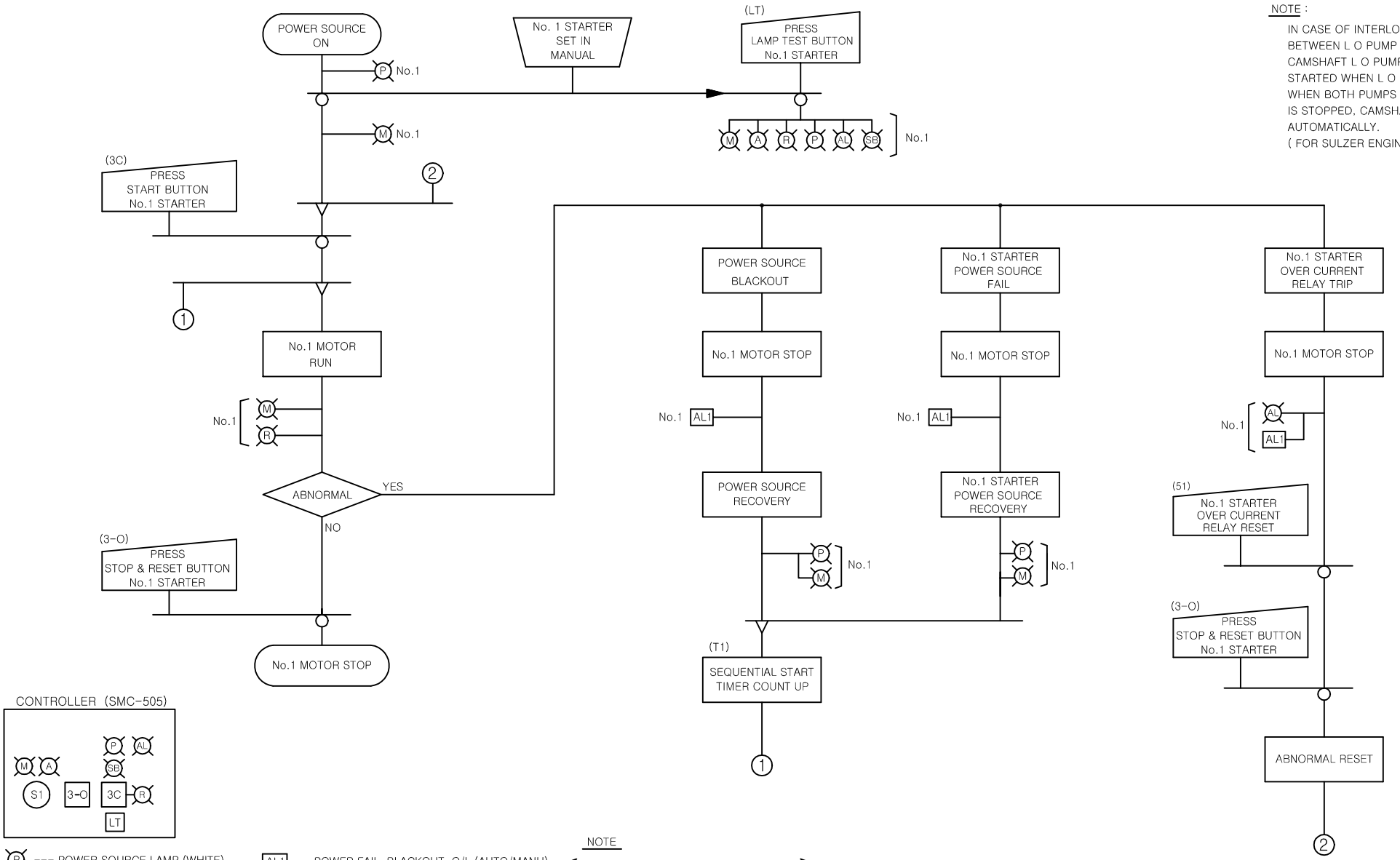
MODE			CONDITION		
No. 1 STARTER	No. 2 STARTER	No. 3 STARTER	No. 1 MOTOR	No. 2 MOTOR	No. 3 MOTOR
AUTO CHANGE	AUTO CHANGE	AUTO CHANGE	RUN	STAND-BY	STEADY
			STEADY	RUN	STAND-BY
			STAND-BY	STEADY	RUN
			RUN	ABNORMAL	STAND-BY
			STAND-BY	RUN	ABNORMAL
			ABNORMAL	STAND-BY	RUN
			RUN	RUN	STAND-BY
			STAND-BY	RUN	RUN
			RUN	STAND-BY	RUN
AUTO CHANGE	AUTO CHANGE	MANUAL OR EMERGENCY CONTROL	RUN	STAND-BY	
			STAND-BY	RUN	
MANUAL OR EMERGENCY CONTROL	AUTO CHANGE	AUTO CHANGE		RUN	STAND-BY
				STAND-BY	RUN
AUTO CHANGE	MANUAL OR EMERGENCY CONTROL	AUTO CHANGE	STAND-BY		RUN
			RUN		STAND-BY



3 ST-BY-3PS	Title	AUTO CHANGEOVER FOR 3 PUMPS SYSTEM FLOWCHART		
	LUXCO CO., LTD.	DWG. No. 3ST-BY-3PS	Edition	Sheet



SMC-505-3RT	Title	3 STAND-BY CONNECTION DIAGRAM OF R/T		
	LUXCO CO., LTD.	DWG. No. SMC-505-3RT	Edition	Sheet



NOTE :

IN CASE OF INTERLOCK DEVICE TO BE PROVIDED BETWEEN L O PUMP AND CAMSHAFT L O PUMP. CAMSHAFT L O PUMP IS NOT ABLE TO BE STARTED WHEN L O PUMP IS STOPPED. WHEN BOTH PUMPS ARE RUNNING, IF L O PUMP IS STOPPED, CAMSHAFT L O PUMP IS STOPPED AUTOMATICALLY. (FOR SULZER ENGINE TYPE RTA.)

CONTROLLER (SMC-505)

- P --- POWER SOURCE LAMP (WHITE)
- AL --- DUAL COLOR LAMP FOR ABNORMAL STOP AND CONDITION HEALTH(GREEN) / ABNORMAL(RED)
- SB --- STAND-BY LAMP (ORANGE)
- R --- RUN LAMP (GREEN)
- A --- LAMP FOR AUTO MODE (YELLOW)
- M --- LAMP FOR MANUAL MODE (GREEN)

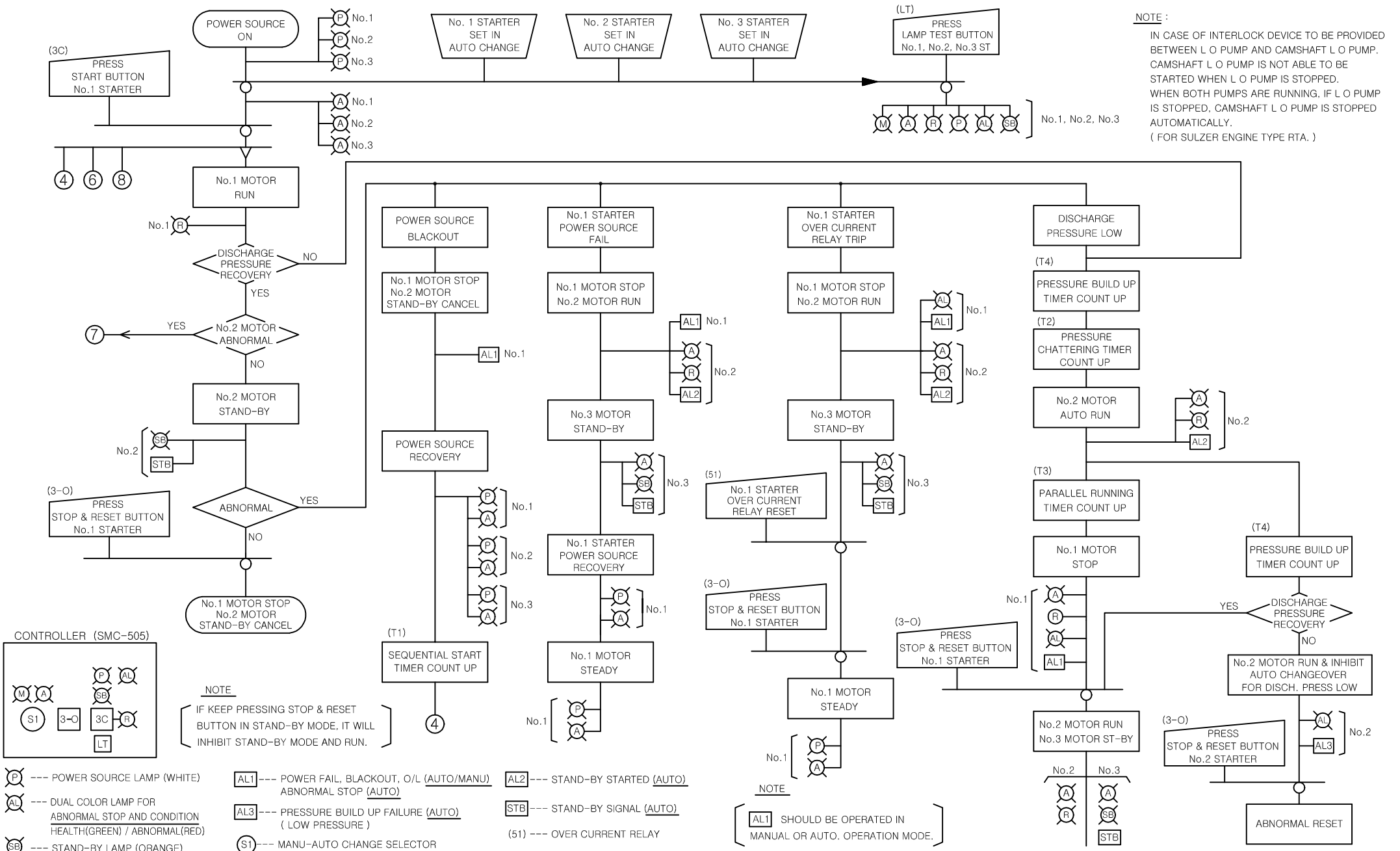
- AL1 --- POWER FAIL, BLACKOUT, O/L (AUTO/MANU) ABNORMAL STOP (AUTO)
- S1 --- MANU-AUTO CHANGE SELECTOR
- (3-O) --- STOP & RESET PUSH BUTTON(RED)
- (3C) --- START PUSH BUTTON (GREEN) WITH LAMP(GREEN)
- (LT) --- LAMP TEST BUTTON

NOTE

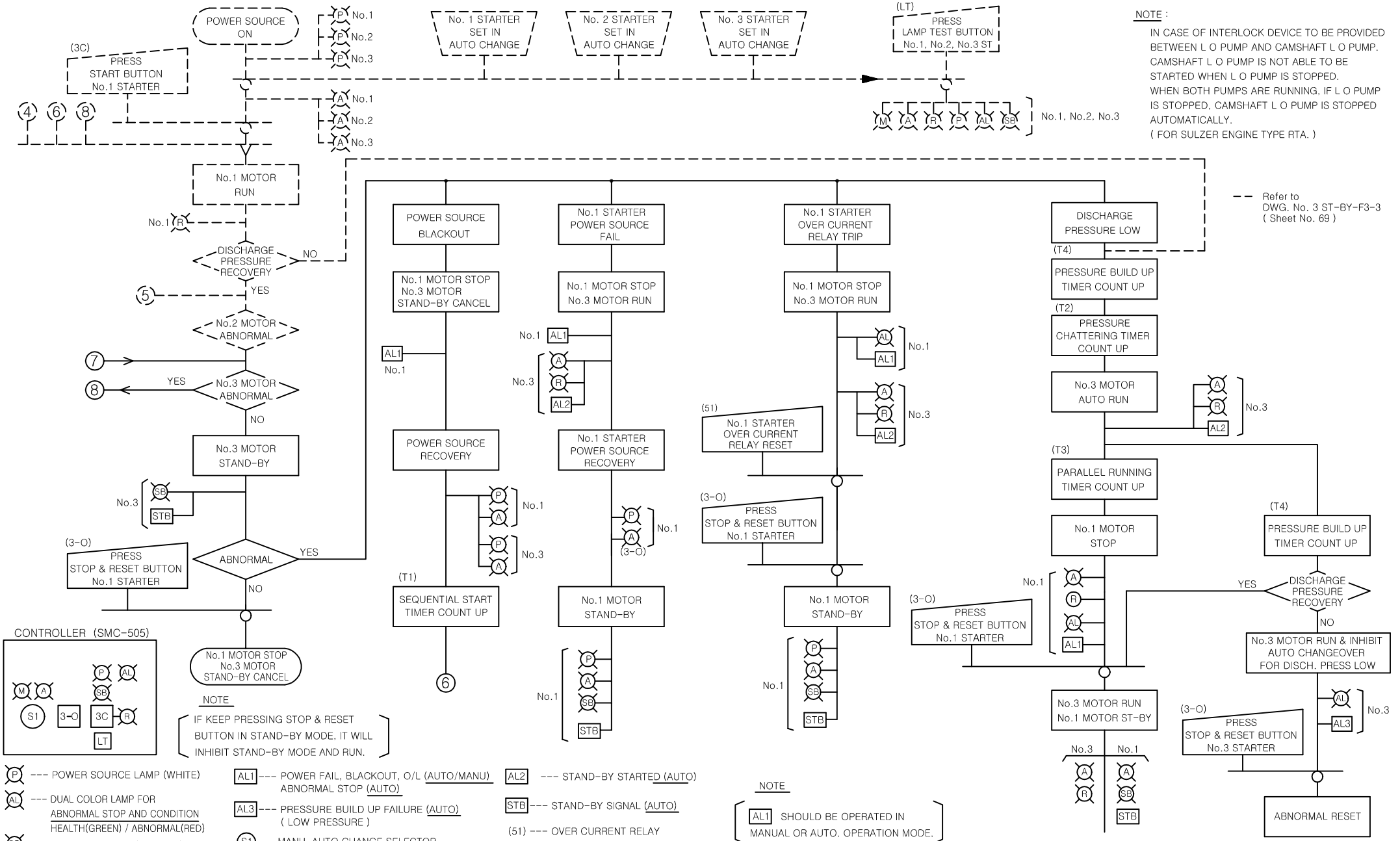
[AL1 SHOULD BE OPERATED IN MANUAL OR AUTO. OPERATION MODE.]

- (51) --- OVER CURRENT RELAY
- (T1) --- SEQUENTIAL START (1~99 Sec)
- (T2) --- LPS CHATTERING (1~3 Sec)
- (T3) --- PARALLEL RUN (3~60 Sec)
- (T4) --- PRESSURE BUILD UP (3~60 Sec)

3 ST-BY-F3-1	Title: 3 ST-BY AUTO CHANGEOVER OPERATION FLOWCHART (No.1, 2, 3 MOTOR MANUAL OPERATION)			
UTILIZED SMC-505	LUXCO CO., LTD.	DWG. No. 3 ST-BY-F3-1	Edition	Sheet

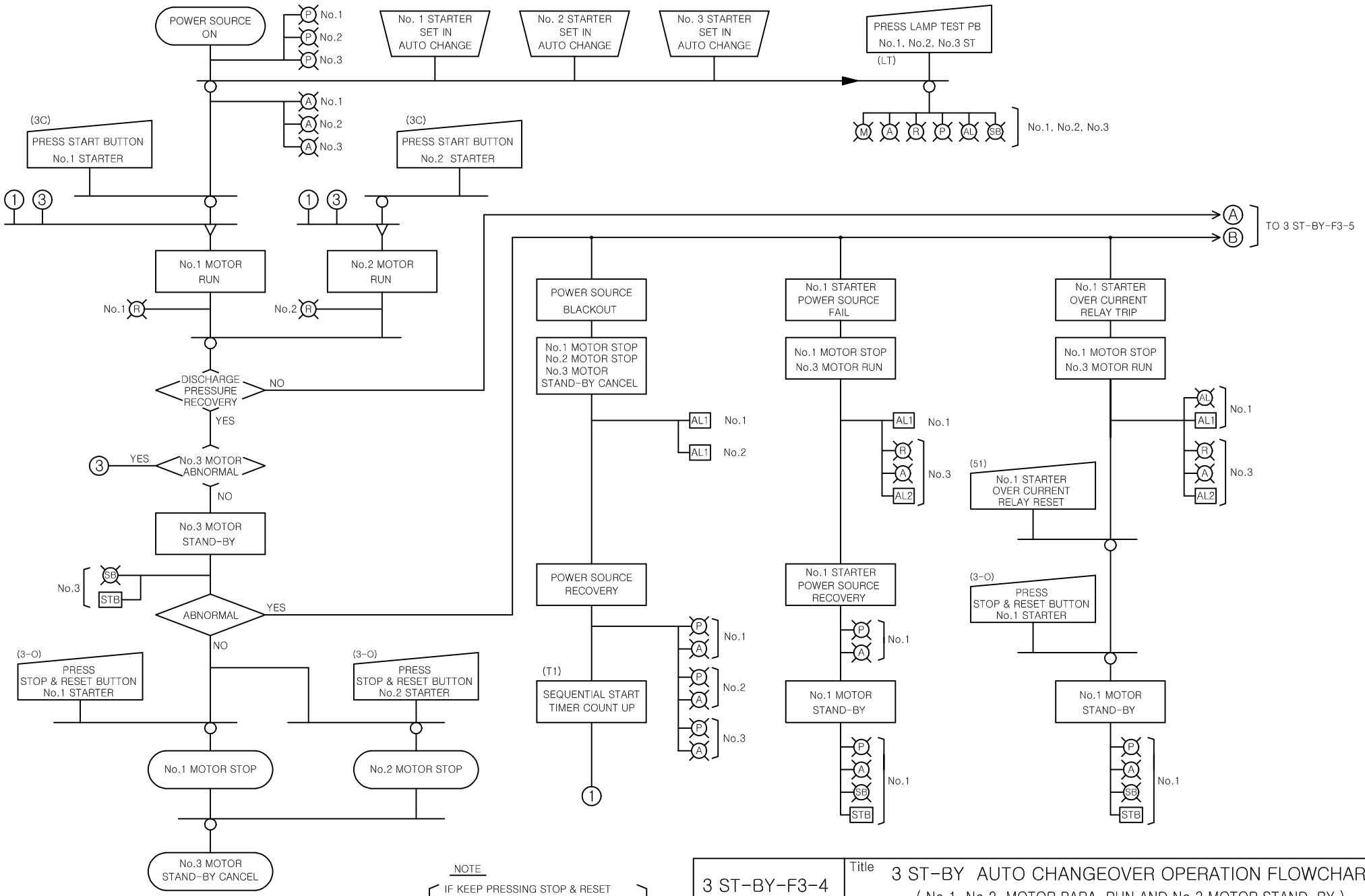


3 ST-BY-F3-2	Title 3 ST-BY AUTO CHANGEOVER OPERATION FLOWCHART (No.1 MOTOR LEAD, No.2 MOTOR STAND-BY AND No.3 MOTOR STEADY)			
UTILIZED SMC-505	LUXCO CO., LTD.	DWG. No. 3 ST-BY-F3-2	Edition	Sheet



- (P) --- POWER SOURCE LAMP (WHITE)
- (AL) --- DUAL COLOR LAMP FOR ABNORMAL STOP AND CONDITION HEALTH(GREEN) / ABNORMAL(RED)
- (SB) --- STAND-BY LAMP (ORANGE)
- (R) --- RUN LAMP (GREEN)
- (A) --- LAMP FOR AUTO MODE (YELLOW)
- (M) --- LAMP FOR MANUAL MODE (GREEN)
- AL1 --- POWER FAIL, BLACKOUT, O/L (AUTO/MANU) ABNORMAL STOP (AUTO)
- AL2 --- STAND-BY STARTED (AUTO)
- AL3 --- PRESSURE BUILD UP FAILURE (AUTO) (LOW PRESSURE)
- STB --- STAND-BY SIGNAL (AUTO)
- (S1) --- MANU-AUTO CHANGE SELECTOR
- (51) --- OVER CURRENT RELAY
- (3-O) --- STOP & RESET PUSH BUTTON(RED)
- (3C) --- START PUSH BUTTON (GREEN) WITH LAMP(GREEN)
- (T1) --- SEQUENTIAL START (1~99 Sec)
- (LT) --- LAMP TEST BUTTON
- (T2) --- LPS CHATTERING (1~3 Sec)
- (T3) --- PARALLEL RUN (3~60 Sec)
- (T4) --- PRESSURE BUILD UP (3~60 Sec)

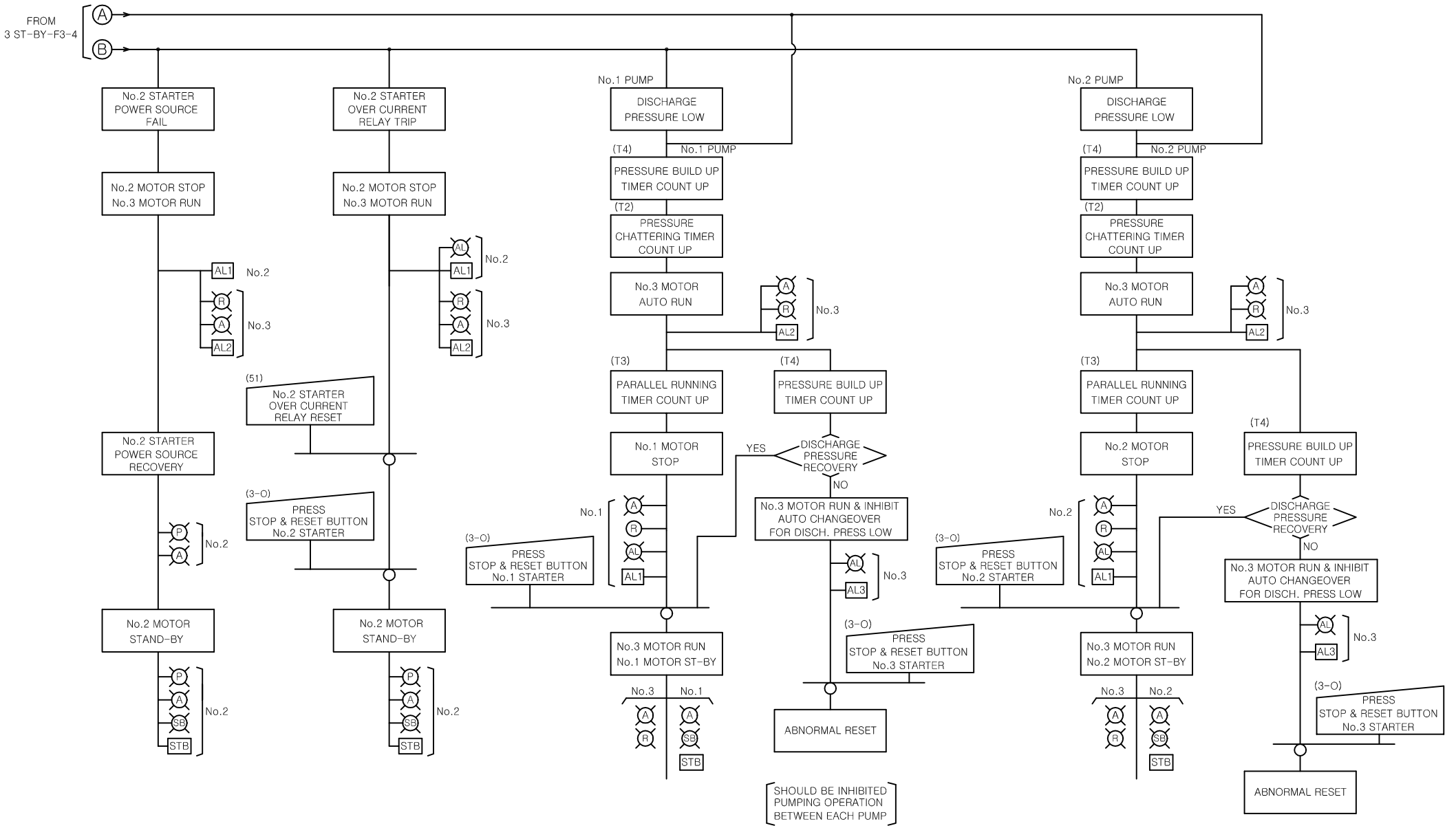
3 ST-BY-F3-3	Title: 3 ST-BY AUTO CHANGEOVER OPERATION FLOWCHART (No.1 MOTOR LEAD, No.2 MOTOR STAND-BY AND No.3 MOTOR STEADY)			
UTILIZED SMC-505	LUXCO CO., LTD.	DWG. No. 3 ST-BY-F3-3	Edition	Sheet



NOTE

IF KEEP PRESSING STOP & RESET BUTTON IN STAND-BY MODE, IT WILL INHIBIT STAND-BY MODE AND RUN.

3 ST-BY-F3-4	Title: 3 ST-BY AUTO CHANGEOVER OPERATION FLOWCHART (No.1, No.2 MOTOR PARA. RUN AND No.3 MOTOR STAND-BY)			
UTILIZED SMC-505	LUXCO CO., LTD.	DWG. No. 3 ST-BY-F3-4	Edition	Sheet



NOTE

IF KEEP PRESSING STOP & RESET BUTTON IN STAND-BY MODE, IT WILL INHIBIT STAND-BY MODE AND RUN.

3 ST-BY-F3-5	Title: 3 ST-BY AUTO CHANGEOVER OPERATION FLOWCHART (No.1, No.2 MOTOR PARA. RUN AND No.3 MOTOR STAND-BY)			
UTILIZED SMC-505	LUXCO CO., LTD.	DWG. No. 3 ST-BY-F3-5	Edition	Sheet

6. TROUBLESHOOTING

6.1 SMC-501 TO 505 TROUBLESHOOTING TABLE : See "Table 3" below.

Table 3 : SMC 501 to 505 Troubleshooting

CONDITION / CHECK	No source lamp lights up	Lamp doesn't lights up on LP Test	No "MANU / AUTO" mode change is made	No motor starts when "START" button is pressed	No motor stops when "STOP" button is pressed	No sequential start	Abnormal motor stop	No stand-by mode is made	No stand-by start (O/L, Power fail, Low pressure)	TROUBLE-SHOOTING
Blackout, fuse blow-out or MCCB tripped	○						○			Check system & replace the fuse, turn MCCB on
Misconnection of T.B and cable	○			○	○		○	○	○	Check and reconnect the T.B and cable
Lamp defective	○	○								Replace with a spare
The STOP (M/S) button is operating				○		○			○	Switch the M/S button (3-O) off
Over current relay (51) is actuated				○		○	○		○	Remove the cause
Contactor (88) defective				○	○	○	○		○	Check contactor (88) and remove the cause
Fuse in controller is blown	○						○			Replace the fuse (250V 2A)
"MANU/AUTO" mode selector switch defective			○							Replace with a spare
MANUAL or EM'CY mode is operationg			○			○		○	○	Set the "AUTO/MANUAL" selector switch to "AUTO" and the "ECS" switch to "OFF"
Button defective				○	○					Replace with a spare
UVP mode is operating						○				Set the "UVS" switch to "ON" (UVR)

7. REPLACEMENT

7.1 For Printed Circuit Board

Remove the rear cover from the controller, and separate the sockets and plugs.
Next, replace the board with reference to the "Table 4", and assemble the boards, sockets, plugs, rear cover into a complete controller.
After this, set the timers. (Ref. timer specification and the existing board)
(See Fig.5-3 below)

Fig. 5-3

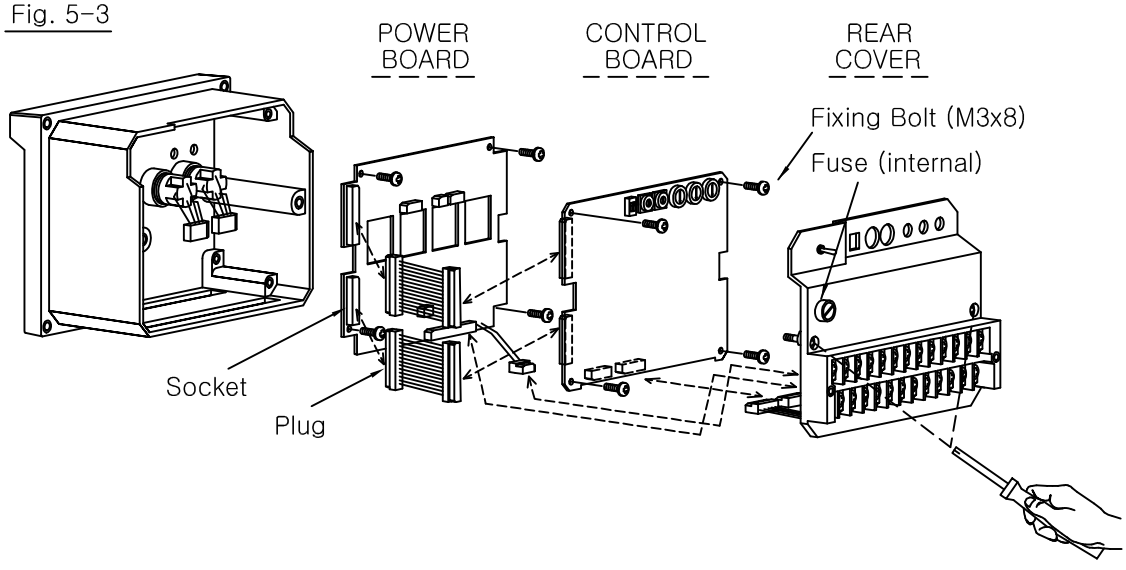
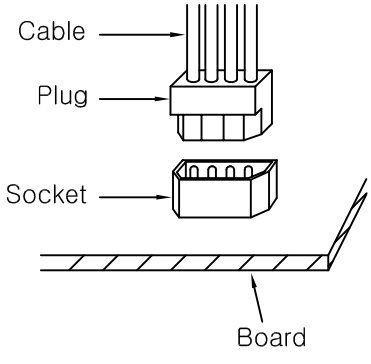


Table 4 : Replaceable Board No.

MODEL	PART NAME	BOARD No. or SPEC.	REMARK
SMC-505Ⓡ4 SMC-505HⓇ4	CONTROL BOARD	SMC505H(R4)-A	for SMC-505Ⓡ4 & SMC-505HⓇ4
	POWER BOARD	SMC505H(R4)-B	for SMC-505Ⓡ4 & SMC-505HⓇ4
	FUSE (internal)	250V 2A, Ø5x20	miniature glass tube type

CAUTION : Connecting and disconnecting connector



1) Directly touch and give force to the socket and plug when removing the connector from board. If the wire is touched and given force for removing, connector may be damaged.
2) Confirm the direction of socket and plug when connecting the plug with socket.
If the plug is connected on the contrary to socket, the connector will be damaged and also the controller will be seriously damaged.

7. REPLACEMENT

7.2 For Push button and Selector switch

Remove the connector and the fixing nut after removing the boards. (Ref. sheet No.74)
And, replace the components from the front side of the controller with reference to the "Table 5".
Next, connect the plug with the socket and assemble the parts into a complete controller.
(See Fig.5-4 below)

Fig. 5-4

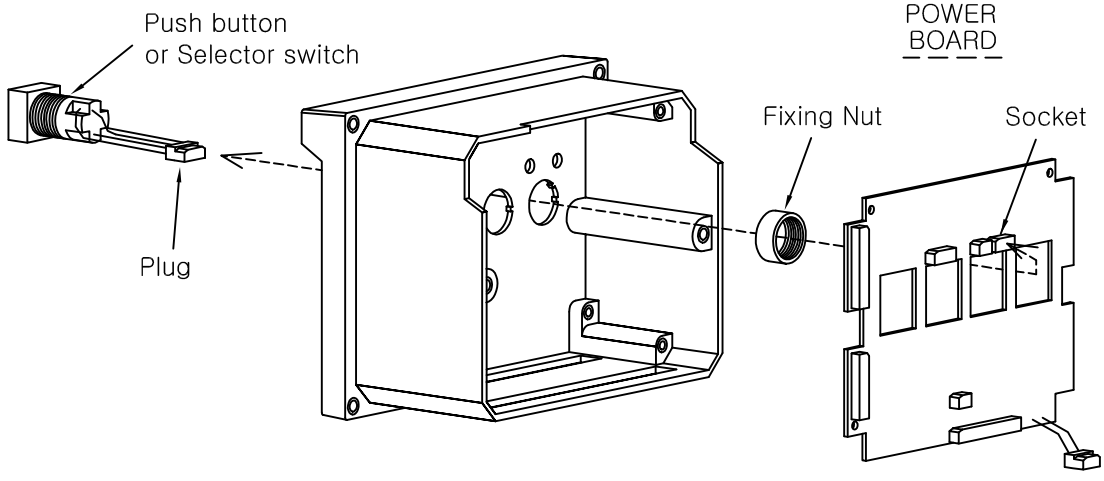
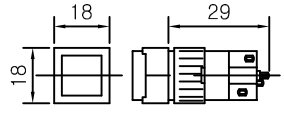
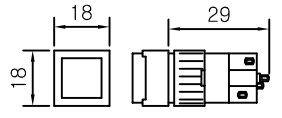
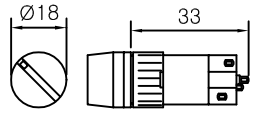
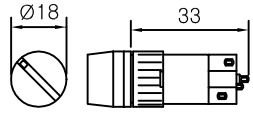
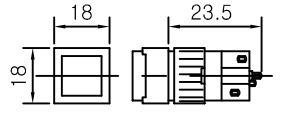


Table 5 : Replaceable Button & Switch

PART NAME	FIGURE (size unit : mm)	SPECIFICATIONS
Push button with LED (for "START") Ref. Maker : "eao" in Switz. / E16-111.55		- Size : 18x18, D=29 - Color : green - Momentary type
Push button (for "STOP") Ref. Maker : "eao" in Switz. / E16-111.52		- Size : 18x18, D=29 - Color : red - Momentary type
Selector switch (for "MANUAL / AUTO") (for "LOCAL / REMOTE") Ref. Maker : "eao" in Switz. / 52-271		- Size : Ø18, D=33
Selector switch (for "HEATER ON / OFF") Ref. Maker : "eao" in Switz. / 52-271		- Size : Ø18, D=33
LED lamp (for "Y-RUN") Ref. Maker : "eao" in Switz. / E16-010.55		- Size : 18x18, D=23.5 - Color : green