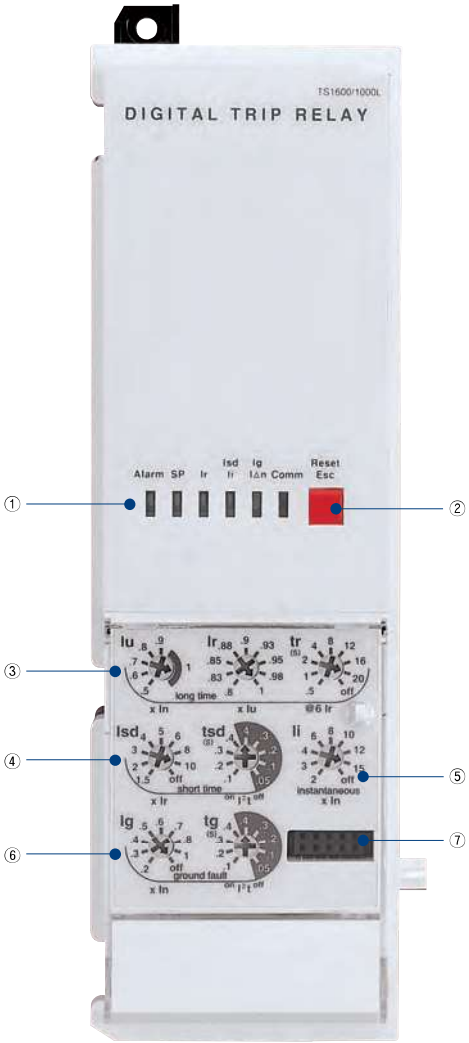
Overview

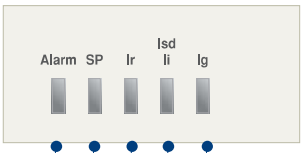
Classification	N type	A type	P type	S type
Externals				
Current protection	• L / S / I / G / Thermal	• L / S / I / G / Thermal • ZSI(Protective coordination)	• L / S / I / G / Thermal(Continuous) • ZSI(Protective coordination)	• L / S / I / G / Thermal(Continuous) • ZSI(Protective coordination)
Other protection	-	• Earth leakage (Option)	• Earth leakage(Option) • Over/Under voltage • Over/Under frequency • Unbalance(Voltage/Current) • Reverse power	• Earth leakage(Option) • Over/Under voltage • Over/Under frequency • Unbalance(Voltage/Current) • Reverse power
Measurement function	-	• Current (R / S / T / N)	• 3 Phase Voltage/Current RMS/Vector • Power(P, Q, S), PF(3-Phase) • Energy(Positive/Negative) • Frequency, Demand	• 3 Phase Voltage/Current RMS/Vector • Power(P, Q, S), PF(3-Phase) • Energy(Positive/Negative) • Frequency, Demand • Voltage/Current harmonics (1st~63th) • 3 Phase Waveforms • THD, TDD, K-Factor
Fine adjustment	-	-	• Fine adjustment for long/short time delay/instantaneous/ ground	• Fine adjustment for long/short time delay/instantaneous/ ground
Pre Trip Alarm	-		• Overload protection relays : DO (Alarm) (Ground fault is not available when using Pre trip alarm)	• Overload protection relays : DO (Alarm) (Ground fault is not available when using Pre trip alarm)
Digital Output	-	• 3DO (Fixed) • L, S/I, G Alarm	• 3DO (Programmable) • Trip, Alarm, General	• 3DO (Programmable) • Trip, Alarm, General
IDMTL setting	-	-	• Compliance with IEC60255-3 SIT, VIT, EIT, DT	• Compliance with IEC60255-3 SIT, VIT, EIT, DT
Communication	-	• Modbus/RS-485 • Profibus-DP	• Modbus / RS-485 • Profibus-DP	• Modbus / RS-485 • Profibus-DP
Power supply	• Self Power -Power source works over 25% of current of In (one pole)	• Self Power - Power source works over 25% of current of In (one pole) - External power source are required for comm. • AC/DC 100~250V • DC 24~60V	• AC/DC 100~250V • DC 24~60V Basic protection function(L / S / I / G) is still under normal operation without control power.	• AC/DC 100~250V • DC 24~60V
RTC timer	• Available	• Available	• Available	• Available
LED for trip info.	• Long time delay • Short time delay/Instantaneous • Ground fault	• Long time delay • Short time delay/Instantaneous • Ground fault	• Long time delay • Short time delay/Instantaneous • Ground fault	• Long time delay • Short time delay/Instantaneous • Ground fault
Fault recording	-	• 10 records (Fault/Current/Date and Time)	• 256 records (Fault/Current/Date and Time)	• 256 records • Last fault wave recording (3 Phase)
Event recording		-	• 256 records(Content, Status, Date)	• 256 records(Content, Status, Date)
Operating button	• Reset button -	• Reset, Menu Up/Down, Left/Right, Enter	• Reset, Menu Up/Down, Left/Right, Enter	• Reset, Menu Up/Down, Left/Right, Enter

N type: 「Normal」 type

- Optimized protection function
- OCR, OCGR function according IEC60947-2
- Overload protection
  - -Long-time delay
  - -Thermal
- Short-circuit protection
  - -Short-time delay / Instantaneous
  - -I^2t On/Off optional (for short-time delay)
- Ground fault protection
  - -I^2t On/Off optional
- Self-Power



① **LED: Indication of trip info. and overload state**



Ig: LED indicating ground-fault
Isd/Ii: LED indicating short-time or instantaneous tripping
Ir: LED indicating long-time delay
SP: Self-protection and battery test LED
Alarm: LED indicating an overload
(Turn on above 90%, Blink above 105%)

② **Reset Key: Fault reset or battery check**

③ **Iu, Ir: Long-time current setting, tr: Long-time tripping delay setting**

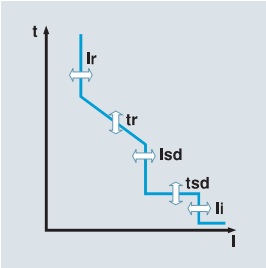
④ **Isd: Short-time current setting, tsd: Short-time tripping delay setting**

⑤ **Ii: Instantaneous current setting**

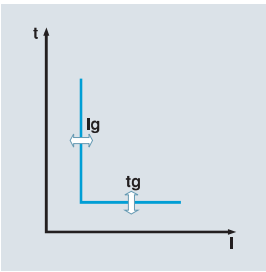
⑥ **Ig: Ground fault current setting, tg: Ground fault tripping delay setting**

⑦ **Test terminal: OCR test terminal (Connected with OCR tester)**

Protection



Long time											
Current setting (A)	Iu = In×...		0.5	0.6	0.7	0.8	0.9	1.0			
	Ir = Iu×...		0.8	0.83	0.85	0.88	0.9	0.93	0.95	0.98	1.0
Time delay (s)	tr@(1.5×Ir)		12.5	25	50	100	200	300	400	500	Off
Accuracy: ±15% or below	tr@(6.0×Ir)		0.5	1	2	4	8	12	16	20	Off
100ms	tr@(7.2×Ir)		0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	Off
Short time											
Current setting (A) Accuracy: ±10%	Isd = Ir×...		1.5	2	3	4	5	6	8	10	Off
Time delay (s) @ 10×Ir	tsd	I²t Off	0.05	0.1	0.2	0.3	0.4				
		I²t On		0.1	0.2	0.3	0.4				
	(I²t Off)	Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				
Instantaneous											
Current setting (A)	Ii = In×...		2	3	4	6	8	10	12	15	Off
Tripping time			50(±10ms)								



Ground fault											
Pick-up (A) Accuracy: ±10%(Ig>0.4In) ±20%(Ig≤0.4In)	Ig = In×...		0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off
Time delay (s) @ 1×In	tg	I²t Off	0.05	0.1	0.2	0.3	0.4				
		I²t On		0.1	0.2	0.3	0.4				
	(I²t Off)	Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				

NV type (For ship only)

Protection

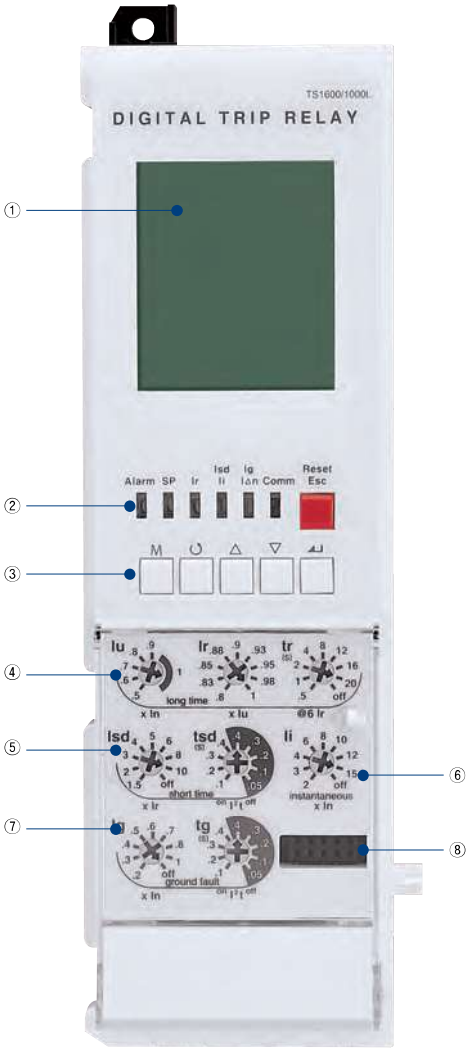
Long time											
Current setting (A)	Ir = In×...		0.8	0.9	1.0	1.05	1.1	1.15	1.2	1.25	Off
Time delay (s)	tr@(1.2×Ir)		10	15	20	25	30	40	50	60	100
Accuracy: ±15% or below	tr@(3×Ir)		0.99	1.49	1.99	2.48	2.98	3.97	4.97	5.96	9.93
100ms	tr@(6×Ir)		0.24	0.36	0.48	0.59	0.71	0.95	1.19	1.43	2.38
Short time											
Current setting (A) Accuracy: ±10%	Isd = In×...		2	2.5	2.7	3	3.5	4	4.5	5	Off
Time delay (s) @ 10×Ir	tsd	I²t Off	0.05	0.1	0.2	0.3	0.4				
		I²t On		0.1	0.2	0.3	0.4				
	(I²t Off)	Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				
Instantaneous											
Current setting (A)	Ii = In×...		2	4	6	8	10	12	14	16	Off
Tripping time			50(±10ms)								

■ The fine-adjustable setting of the rated current[In]

- In = Ict×[0.4~1.0]
- Setting range: 40~100% of Ict (unit: 0.5%)

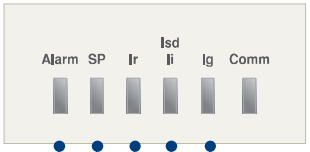
A type: 「Ammeter」 type

- Overload protection
  - -Long-time delay
  - -Thermal
- Short-circuit protection
  - -Short-time delay / Instantaneous
  - -I^2t On/Off optional (for short-time delay)
- Ground fault protection
  - -I^2t On/Off optional
- Realization of protective coordination by ZSI (Zone Selective Interlocking)
- High-performance and high-speed MCU built-in
  - -Accurate measurement with tolerance of 1.0%
- Fault recording
  - -Records Max. up to 10 fault information about fault type, fault phase, fault data, occurrence time of fault
- SBO (Select Before Operation)
  - -High reliability for control and setting change method
- 3 DO(Digital Output)
  - -Fixed
- Communication
  - -Modbus/RS485
  - -Profibus-DP



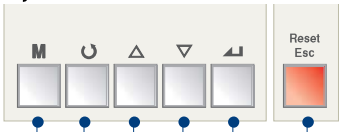
① **LCD: Indication of measurement and information**

② **LED: Indication of trip info. and overload state**



Ig: LED indicating ground-fault
Isd/Ii: LED indicating short-time or instantaneous tripping
Ir: LED indicating long-time delay
SP: Self-protection and battery test LED
Alarm: LED indicating an overload
(Turn on above 90%, Blink above 105%)

③ **Key: Move to menu or reset**



Reset/ESC: Fault reset or ESC from menu
Enter: Enter into secondary menu or setting input
Up/Down: Move the cursor up/down on screen or increase/decrease a setting value
Right/Left: Move the cursor or setting right/left on screen (Rotation)
Menu: Menu display ↔ Measurement display

④ **Iu, Ir: Long-time current setting, tr: Long-time tripping delay setting**

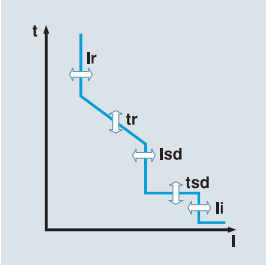
⑤ **Isd: Short-time current setting, tsd: Short-time tripping delay setting**

⑥ **Ii: Instantaneous current setting**

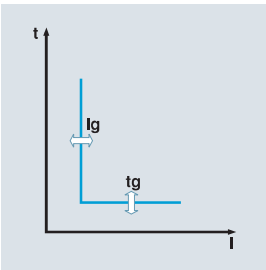
⑦ **Ig: Ground fault current setting, tg: Ground fault tripping delay setting**

⑧ **Test terminal: OCR test terminal (Connected with OCR tester)**

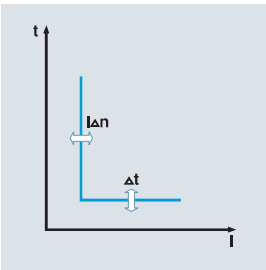
Protection



Long time											
Current setting (A)	Iu = In×...		0.5	0.6	0.7	0.8	0.9	1.0			
	Ir = Iu×...		0.8	0.83	0.85	0.88	0.9	0.93	0.95	0.98	1.0
Time delay (s)	tr@(1.5×Ir)		12.5	25	50	100	200	300	400	500	Off
Accuracy: ±15% or below	tr@(6.0×Ir)		0.5	1	2	4	8	12	16	20	Off
100ms	tr@(7.2×Ir)		0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	Off
Short time											
Current setting (A)	Isd = Ir×...		1.5	2	3	4	5	6	8	10	Off
Accuracy: ±10%											
Time delay (s)	tsd	I²t Off	0.05	0.1	0.2	0.3	0.4				
@ 10×Ir		I²t On		0.1	0.2	0.3	0.4				
	(I²t Off)	Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				
Instantaneous											
Current setting (A)	Ii = In×...		2	3	4	6	8	10	12	15	Off
Tripping time			50(±10ms)								



Ground fault										
Pick-up (A)	Ig = In×...		0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off
Accuracy: ±10%(Ig>0.4In) ±20%(Ig≤0.4In)											
Time delay (s)	tg	I²t Off	0.05	0.1	0.2	0.3	0.4				
@ 1×In		I²t On		0.1	0.2	0.3	0.4				
	(I²t Off)	Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				

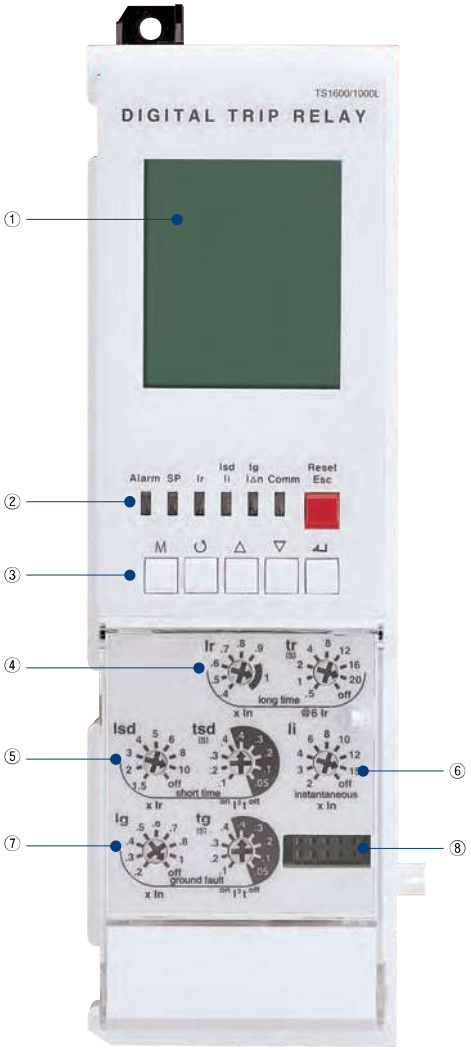


Earth leakage (Option)										
Current setting (A)	I△n		0.5	1	2	3	5	10	20	30	Off
Time delay (ms)	△t	Alarm Time(ms)	140	230	350	800	950				
Accuracy: ±15%		Trip Time(ms)	140	230	350	800					

Note) Earth leakage function is available with ZCT or external CT

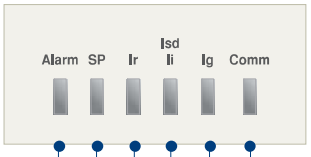
P type: 「Power meter」 type

- Overload protection
  - -Long-time delay
  - -Thermal
- Short-circuit protection
  - -Short-time delay / Instantaneous
  - -I^2t On/Off optional (for short-time delay)
- Ground fault protection
  - -I^2t On/Off optional
- Protection for Over voltage/Under voltage/Over frequency/Under frequency/Unbalance/Reverse power
- Realization of protective coordination by ZSI (Zone Selective Interlocking)
- The fine-adjustable setting by knob and Key
- IDMTL setting (SIT, VIT, EIT, DT curve)
  - Basic setting : “None”. Thermal curve.
- Measurement and Display Function
  - -High detailed measurement for 3 phase current/Voltage/Power/Energy/Phase angle/Frequency/PF/Demand
  - -128 x 128 Graphic LCD
  - -Indicates current/voltage Vector Diagram and Waveform
- Fault recording
  - -Records Max. up to 256 fault information about fault type, fault phase, fault value, occurrence time of fault
- Event recording
  - -Records events of device related to setting change, operation and state change. (Max. up to 256)
- SBO (Select Before Operation)
  - -High reliability for control and setting change method
- 3 DO(Digital output)
  - -Programmable for alarm, trip and general DO
- Communication
  - -Modbus/RS485
  - -Profibus-DP



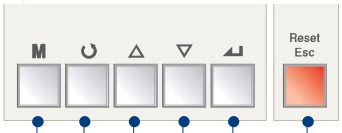
① **Graphic LCD: Indication of measurement and information**

② **LED: Indication of trip info. and overload state**



Comm: LED indicating comm. state (Blink when running)
Ig: LED indicating ground-fault
Isd/Ii: LED indicating short-time or instantaneous tripping
Ir: LED indicating long-time delay
SP: Self-protection and battery test LED
Alarm: LED indicating an overload
(Turn on above 90%, Blink above 105%)

③ **Key: Move to menu or reset**



Reset/ESC: Fault reset or ESC from menu
Enter: Enter into secondary menu or setting input
Up/Down: Move the cursor up/down on screen or increase/decrease a setting value
Right/Left: Move the cursor or setting right/left on screen (Rotation)
Menu: Menu display ↔ Measurement display

④ **Ir: Long-time current setting, tr: Long-time tripping delay setting**

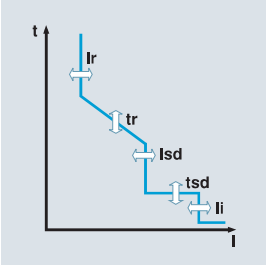
⑤ **Isd: Short-time current setting, tsd: Short-time tripping delay setting**

⑥ **Ii: Instantaneous current setting**

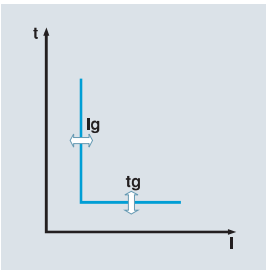
⑦ **Ig: Ground fault current setting, tg: Ground fault tripping delay setting**

⑧ **Test terminal: OCR test terminal (Connected with OCR tester)**

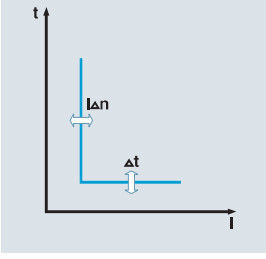
Protection



Long time										
Current setting (A)	Ir = In×...		0.4	0.5	0.6	0.7	0.8	0.9	1.0	
Time delay (s)	tr@(1.5×Ir)		12.5	25	50	100	200	300	400	500	Off
Accuracy: ±15% or below	tr@(6.0×Ir)		0.5	1	2	4	8	12	16	20	Off
100ms	tr@(7.2×Ir)		0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	Off
Short time										
Current setting (A) Accuracy: ±10%	Isd = Ir×...		1.5	2	3	4	5	6	8	10	Off
Time delay (s) @ 10×Ir	tsd	I²t Off	0.05	0.1	0.2	0.3	0.4				
		I²t On		0.1	0.2	0.3	0.4				
	(I²t Off)	Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				
Instantaneous										
Current setting (A)	Ii = In×...		2	3	4	6	8	10	12	15	Off
Tripping time			50(±10ms)								



Ground fault										
Pick-up (A) Accuracy: ±10%(Ig>0.4In) ±20%(Ig≤0.4In)	Ig = In×...		0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off
Time delay (s) @ 1×In	tg	I²t Off	0.05	0.1	0.2	0.3	0.4				
		I²t On		0.1	0.2	0.3	0.4				
	(I²t Off)	Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				



Earth leakage (Option)										
Current setting (A)	I△n		0.5	1	2	3	5	10	20	30	Off
Time delay (ms) Accuracy: ±15%	△t	Alarm Time(ms)	140	230	350	800	950				
		Trip Time(ms)	140	230	350	800					

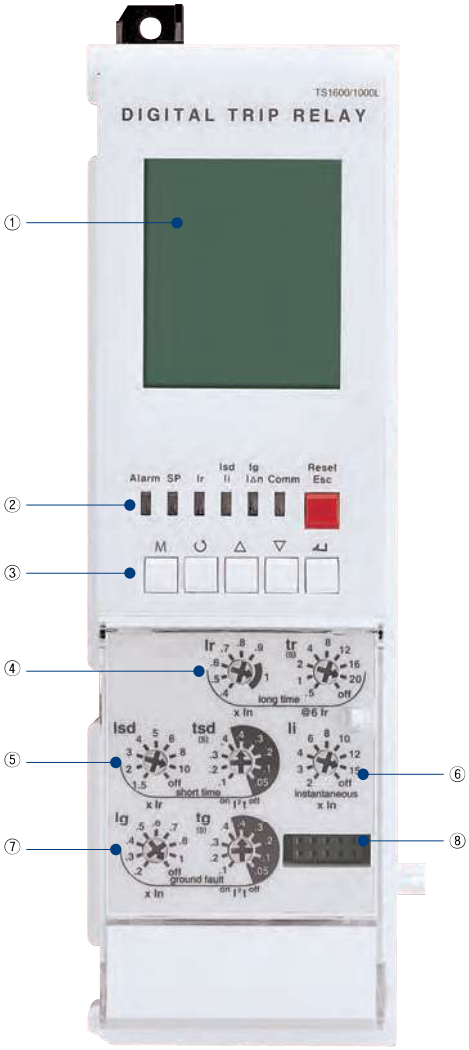
Note) Earth leakage function is available with ZCT or external CT

PTA(Pre Trip Alarm)										
Current setting (A)	Ip = Ir x ···	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1
Time delay (s) Accuracy: ±15%	tp@(1.2×Ip)	1	5	10	15	20	25	30	35	Off

Other protection		Pick-up			Time delay(s)		
		Setting range	Step	Accuracy	Setting range	Step	Accuracy
Under voltage		80V ~ 0V_Pick-up	1V	±5%	1.2~40sec	0.1sec	±0.1sec
Over voltage		UV_Pick-up ~ 980V	1V	±5%			
Voltage unbalance		6% ~ 99%	1%	±2.5% or (*±10%)			
Reverse power		10~500 kW	1kW	±10%	0.2~40sec		
Over power		500~5000 kW	1kW	±10%			
Current unbalance		6% ~ 99%	1%	±2.5% or (*±10%)	1.2~40sec		
Over frequency	60Hz	UF_Pick-up ~ 65	1Hz	±0.1Hz			
	50Hz	UF_Pick-up ~ 55	1Hz	±0.1Hz			
Under frequency	60Hz	55Hz ~ OF_Pick-up	1Hz	±0.1Hz			
	50Hz	45Hz ~ OF_Pick-up	1Hz	±0.1Hz			

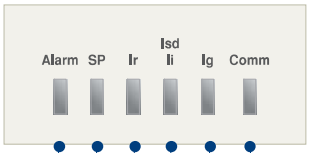
S type: 「Supreme meter」 type

- Overload protection
  - -Long-time delay
  - -Thermal
- Short-circuit protection
  - -Short-time delay / Instantaneous
  - -I^2t On/Off optional (for short-time delay)
- Ground fault protection
  - -I^2t On/Off optional
- Protection for Over voltage/Under voltage/Over frequency/Under frequency/Unbalance/Reverse power
- Realization of protective coordination by ZSI (Zone Selective Interlocking)
- The fine-adjustable setting by knob and Key
- IDMTL setting (SIT, VIT, EIT, DT curve)
  - - Basic setting : “None”. Thermal curve.
- Measurement and Display Function
  - -High detailed measurement for 3 phase current/Voltage/Power/Energy/ Phase angle/Frequency/PF/Demand
  - -128 x 128 Graphic LCD
  - -Indicates current/voltage Vector Diagram and Waveform
- Fault recording
  - -Records Max. up to 256 fault information about fault type, fault phase, fault value, occurrence time of fault
  - -Fault wave recording: records the latest fault wave
- Event recording
  - -Records events of device related to setting change, operation and state change. (Max. up to 256)
- SBO (Select Before Operation)
  - -High reliability for control and setting change method
- Power quality analysis
  - -Measurement for 1st~63th harmonics
  - -THD, TDD, k-Factor
  - -Voltage/current waveform capture
- 3 DO(Digital output)
  - -Programmable for alarm, trip and general DO
- Communication
  - -Modbus/RS485
  - -Profibus-DP



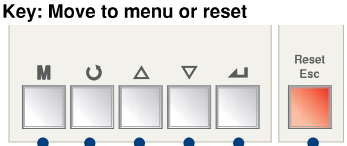
① **Graphic LCD: Indication of measurement and information**

② **LED: Indication of trip info. and overload state**



Comm: LED indicating comm. state (Blink when running)
Ig: LED indicating ground-fault
Isd/Ii: LED indicating short-time or instantaneous tripping
Ir: LED indicating long-time delay
SP: Self-protection LED and battery test LED
Alarm: LED indicating an overload
(Turn on above 90%, Blink above 105%)

③ **Key: Move to menu or reset**



Reset/ESC: Fault reset or ESC from menu
Enter: Enter into secondary menu or setting input
Up/Down: Move the cursor up/down on screen or increase/decrease a setting value
Right/Left: Move the cursor or setting right/left on screen (Rotation)
Menu: Menu display ↔ Measurement display

④ **Ir: Long-time current setting, tr: Long-time tripping delay setting**

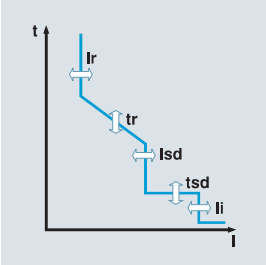
⑤ **Isd: Short-time current setting, tsd: Short-time tripping delay setting**

⑥ **Ii: Instantaneous current setting**

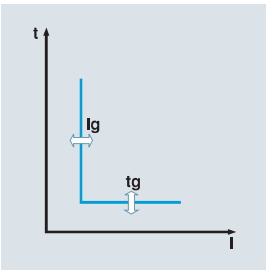
⑦ **Ig: Ground fault current setting, tg: Ground fault tripping delay setting**

⑧ **Test terminal: OCR test terminal (Connected with OCR tester)**

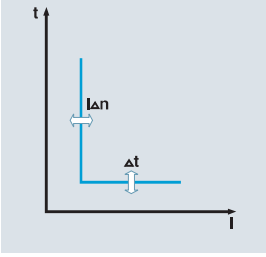
Protection



Long time										
Current setting (A)	Iu = In×...		0.4	0.5	0.6	0.7	0.8	0.9	1.0	
Time delay (s)	tr@(1.5×Ir)		12.5	25	50	100	200	300	400	500	Off
Accuracy: ±15% or below	tr@(6.0×Ir)		0.5	1	2	4	6	12	16	20	Off
100ms	tr@(7.2×Ir)		0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	Off
Short time										
Current setting (A) Accuracy: ±10%	Isd = Ir×...		1.5	2	3	4	5	6	8	10	Off
Time delay (s) @ 10×Ir	tsd	I²t Off	0.05	0.1	0.2	0.3	0.4				
		I²t On		0.1	0.2	0.3	0.4				
	(I²t Off)	Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				
Instantaneous										
Current setting (A)	Ii = In×...		2	3	4	6	8	10	12	15	Off
Tripping time			50(±10ms)								



Ground fault										
Pick-up (A) Accuracy: ±10%(Ig>0.4In) ±20%(Ig≤0.4In)	Ig = In×...		0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off
Time delay (s) @ 1×In	tg	I²t Off	0.05	0.1	0.2	0.3	0.4				
		I²t On		0.1	0.2	0.3	0.4				
	(I²t Off)	Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				



Earth leakage (Option)										
Current setting (A)	I△n		0.5	1	2	3	5	10	20	30	Off
Time delay (ms) Accuracy: ±15%	△t	Alarm Time(ms)	140	230	350	800	950				
		Trip Time(ms)	140	230	350	800					

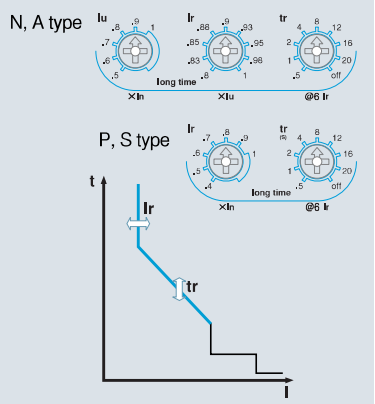
Note) Earth leakage function is available with ZCT or external CT

PTA(Pre Trip Alarm)										
Current setting (A)	Ip = Ir x ···	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1
Time delay (s) Accuracy: ±15%	tp@(1.2×Ip)	1	5	10	15	20	25	30	35	Off

Other protection		Pick-up			Time delay(s)		
		Setting range	Step	Accuracy	Setting range	Step	Accuracy
Under voltage		80V ~ 0V_Pick-up	1V	±5%	1.2~40sec	0.1sec	±0.1sec
Over voltage		UV_Pick-up ~ 980V	1V	±5%			
Voltage unbalance		6% ~ 99%	1%	±2.5% or (*±10%)			
Reverse power		10~500 kW	1kW	±10%	0.2~40sec		
Over power		500~5000 kW	1kW	±10%			
Current unbalance		6% ~ 99%	1%	±2.5% or (*±10%)	1.2~40sec		
Over frequency	60Hz	UF_Pick-up ~ 65	1Hz	±0.1Hz			
	50Hz	UF_Pick-up ~ 55	1Hz	±0.1Hz			
Under frequency	60Hz	55Hz ~ OF_Pick-up	1Hz	±0.1Hz			
	50Hz	45Hz ~ OF_Pick-up	1Hz	±0.1Hz			

Operation characteristic

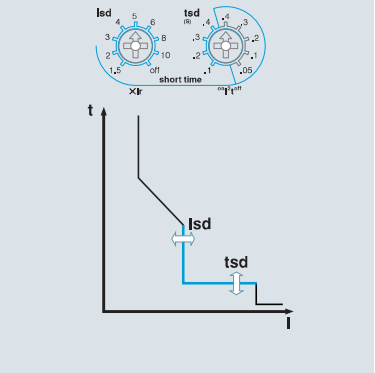
Long-time delay (L)



The function for overload protection which has time delayed characteristic in inverse ratio to fault current.

1. Standard current setting knob: Ir
   1) Setting range in P type and S type: (0.4-0.5-0.6-0.7-0.8-0.9-1.0)×In
   2) Setting range in N type and A type: (0.4 ~1.0)×In
      - Iu: (0.5-0.6-0.7-0.8-0.9-1.0)×In
      - Ir: (0.8-0.83-0.85-0.88-0.9-0.93-0.95-0.98-1.0)×Iu
2. Time delay setting knob: tr
   - Standard operating time is based on the time of 6×Ir
   - Setting range: 0.5-1-2-4-8-12-16-20-Off sec (9 modes)
3. Relay pick-up current
   - When current over (1.15)×Ir flows in, relay is picked up.
4. Relay operates basing on the largest load current among R/S/T/N phase.

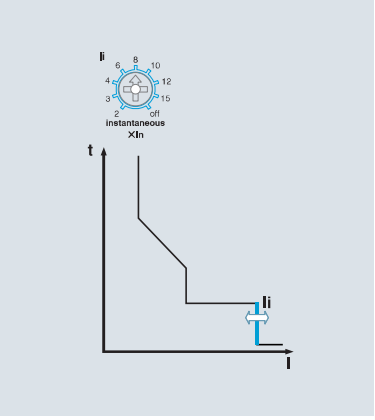
Short-time delay (S)



The function for fault current (over current) protection which has definite time characteristic and time delayed in inverse ratio to fault current.

1. Standard current setting knob: Isd
   - Setting range: (1.5-2-3-4-5-6-8-10-Off)×Ir
2. Time delay setting knob: tsd
   - Standard operating time is based on the time of 10×Ir.
   - Inverse time (I^2t On): 0.1-0.2-0.3-0.4 sec
   - Definite time (I^2t Off): 0.05-0.1-0.2-0.3-0.4 sec
3. Relay operates basing on the largest load current among R/S/T/N phase.
4. When ZSI function was set, the protection operation will take place instantaneously with input absence by downstream devices. It is advised to disable its ZSI function on the last downstream device.

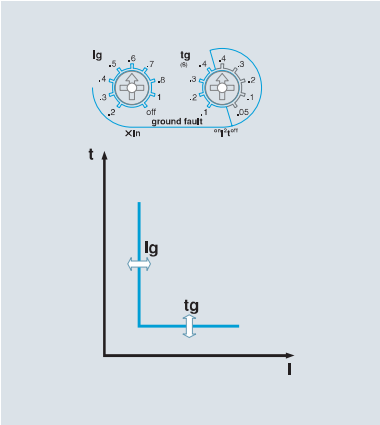
Instantaneous (I)



The function for breaking fault current above the setting value within the shortest time to protect the circuit from short-circuit.

1. Standard current setting knob: Ii
   - Setting range: (2-3-4-6-8-10-12-15-Off)×In
2. Relay operates basing on the largest load current among R/S/T/N phase.
3. Total breaking time is below 50 (±10)ms.

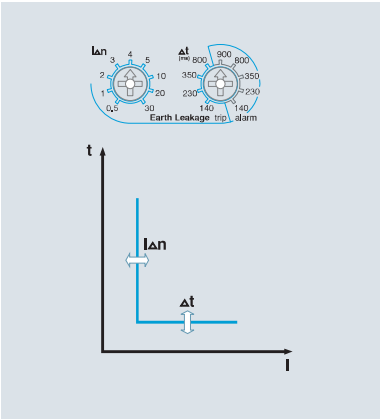
Ground Fault (G)



The function for breaking ground fault current above setting value after time-delay to protect the circuit from ground fault.

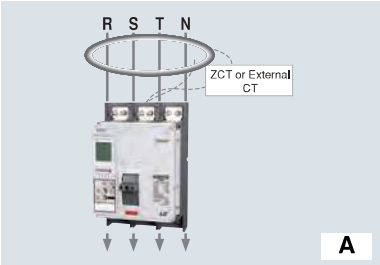
1. Standard setting current knob: Ig
   - Setting range: (0.2-0.3-0.4-0.5-0.6-0.7-0.8-1.0-Off)×In
2. Time delay setting knob: tg
   - Inverse time (I^2t On): 0.1-0.2-0.3-0.4 sec
   - Definite time (I^2t Off): 0.05-0.1-0.2-0.3-0.4 sec
3. Ground fault current is vector sum of each phase current. Therefore, 3Pole products may operate under its phase-unbalance including ground fault situations.(R+S+T+(N) Phase)
4. When ZSI function was set, the protection operation will take place instantaneously with input absence by downstream devices. It is advised to disable its ZSI function on the last downstream device.
5. Ground-fault functions are basically provided with products equipped with a trip relay through its internal CT that is embedded in each phase.(But, it can't be used with earth-leakage protection function at the same time)

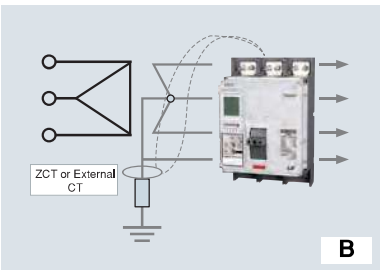
Earth Leakage (G) - Option



The function for breaking earth leakage current above setting value after time delay to protect the circuit from earth leakage. (A, P, S type)

1. Standard setting current knob: I△n
   - Setting range: 0.5-1-2-3-4-5-10-20-30-Off (A)
2. Time delay setting knob: △t
   - Trip time: 140-230-350-800 ms
   - Alarm time: 140-230-350-800-950 ms
3. Settings within its alarm range will prevent its breaker from tripping but activating its alarm.
4. This function is enabled and can be used only with standard ZCT provided by LS or private external CT(secondary output 5A) selected by customers.
5. When ZSI function was set, the protection operation will take place instantaneously with input absence by downstream devices. It is advised to disable its ZSI function on the last downstream device.





※Use cautions with earth-leakage current settings

- When using a standard ZCT provided by LS, the setting range is from 0.5 to 30A which is based on its primary current. But MCCB installed like A type (displayed on the left side) should only be cable-connected and its rated current should be less than 1600A.
- When using other CT selected by customers, the setting range is from 0.5 to 5A based on its secondary current.(Secondary output rating : 5A)
  Hence, under 100:5A CT, if trip relay is set to 0.5A, earth-leakage exceeding 10A will activate its operation (0.5A×20 = 10A)

※Guideline for the external CT usage

- Earth-leakage protection characteristics using the standard CT which is installed inside of MCCB can protect currents from 20 to 100% range on its rated current.
- As rated currents on MCCB increases, current that is covered by its standard CT increase as well. This can not protect against small leakage currents.
  ex) 400A MCCB Min. Earth-leakage current 400A×20% =80A
  4000A MCCB Min. Earth-leakage current 4000A×20% =800A
- Therefore, customers are advised to install an external CT in accordance with its rated currents within its systems. And choose trip relay(E, X type) which is required with external CT usage in order to provide earth-leakage functions.

Measurement function

A type / P type / S type

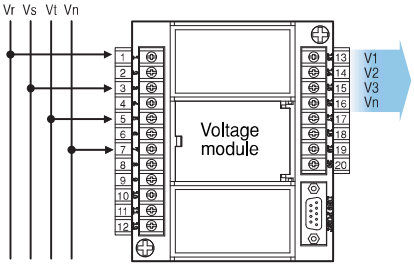
Class.	Measurement element	Detailed element	Unit	Display range	Accuracy
Current	Line current	Ia,Ib,Ic	A	80A~65,535A	±3%
	Normal current	I_1			
	Reverse current	I_2			
Voltage	Line voltage	Vab,Vbc,Vca	V	60~690V	±1%
	Phase voltage	Va,Vb,Vc			±1%
	Normal voltage	V_1			
	Reverse voltage	V_2			
Angle	Line-to-line Line-to-current	∠VabIa, ∠VabIb, ∠VabIc, ∠VabVbc, ∠VabVca	°	0~360 °	±1 °
	Phase-to-phase	∠VaVb, ∠VaVc			±1 °
	Phase-to-current	∠VaIa, ∠VbIb, ∠VcIc			±1 °
Power	Active power	Pa(ab), Pb(bc), Pc(ca), P	kW	1kW~99,999kW	±3%
	Reactive power	Qa(ab), Qb(bc), Qc(ca), Q	kVar	1kVar~99,999kVar	±3%
	Apparent power	Sa(ab), Sb(bc), Sc(ca), S	kVA	1kVA~99,999kVA	±3%
Energy	Active energy	WHa(ab), WHb(bc), WHc(ca), WH	kWh MWh	1kWh~9999.99MWh	±3%
	Reactive energy	VARHa(ab), VARHb(bc), VARHc(ca), VARH	kVarh Mvarh	1kVarh~9999.99MVarh	±3%
	Reverse active energy	rWHa(ab), rWHb(bc), rWHc(ca), rWH	kWh MWh	1kWh ~9999.99MWh	±3%
Freq.	Frequency	F	Hz	45~65Hz	
Power factor	Power factor(PF)	PFa(ab), PFb(bc), PFc(ca), PF		+: Lead, -: Lag	
Unbalance	Unbalance rate	Iunalance, Vunbalance	%	0.0~100.0	
Demand	Active power demand	Peak demand	kW	1kW~99999kW	
	Current demand	Peak demand	A	80A~65,535A	
Harmonics	Voltage harmonics	1st~63th harmonics of Va(ab),Vb(bc),Vc(ca)	V	60~690V	
	Current harmonics	1st~63th harmonics of Ia,Ib,Ic	A	80A~65,535A	
	THD, TDD		%	0.0~100.0	
	K-Factor		-	0.0~100.0	



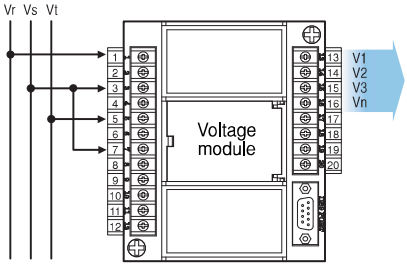
Voltage module

For P and S type Trip relay, separate voltage module is necessary to measure other element besides current (Separate purchase is needed)
- Voltage input range: AC 60~690V





3P4W wiring

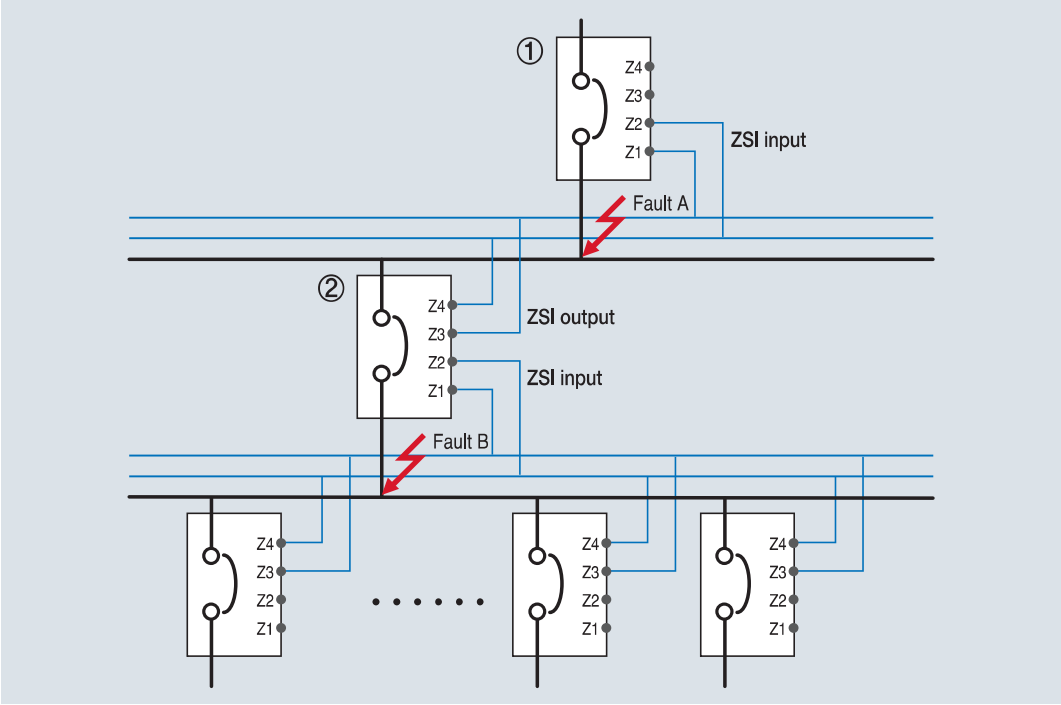


3P3W wiring

ZSI - Zone Selective Interlocking (A, P, S type)

Zone-selective interlocking drops delay time that eliminates faults for breakers. It minimizes the shock that all kinds of electric machineries get under fault conditions.

1. In case of that short time-delay or ground fault accident occurs at ZSI built in system, the breaker at accident site sends ZSI signal to halt upstream breaker's operation.
2. To eliminate a breakdown, trip relay of MCCB at accident site activates trip operation without time delay.
3. The upstream breaker that received ZSI signal adhere to pre-set short time-delay or ground fault time-delay for protective coordination in the system.
   However upstream breaker that did not receive its signal will trip instantaneously.
4. For ordinary ZSI operation, it should arrange operation time accordingly so that downstream circuit breakers will react before upstream ones under overcurrent/short time delay/ ground fault situations.
5. ZSI connecting line needs to be Max. 3m.



1) Occurrence of fault A
   - Only breaker ① performs instantaneous trip operation.
2) Occurrence of fault B
   - Breaker ② performs instantaneous trip operation,
     breaker ① performs trip operation after prearranged delay time
   - But if breaker ② did not break the fault normally,
     breaker ① performs instantaneous trip operation to protect system.

Remote reset and digital I/O (A, P, S type)

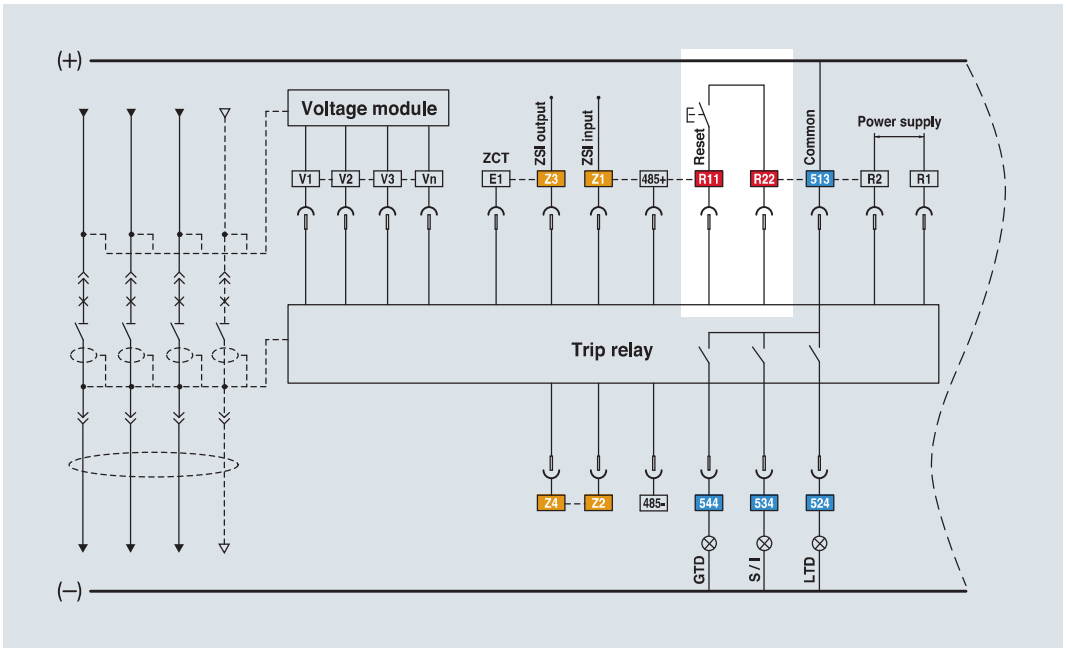
**In case of that MCCB operates due to accidents or over current,
Trip relay indicates the information of the accident through the LED and LCD.
Trip relay A, P and S type is possible to perform the remote reset by digital input,
and have 3 DO(Digital output).**

1. Methods to reset Trip relay is to push the Reset button on the frontal side and to use the remote reset.

2. Digital input
   - [R11-R22] input: Remote reset
   - [Z1-Z2] Input: ZSI input
   - [E1-E2] Input: ZCT for earth leakage detection or external CT input

※All DI are dry contact that has 3.3V of recognition voltage. When inputting close by SSR(Solid State Relay) or open-collector, connect collector(Drain) to R11.

3. Digital output 3a(524, 534, 544-513)
   - Fault output: Long/Short time delay, Instantaneous, Ground fault, UVR, OVR, UFR, OFR, rPower, Vunbal, Iunbal
     (Maintains state as Latch form until user pushes reset.)
   - General DO: when setting L/R as remote, it is available to control close/open remotely by using communication.

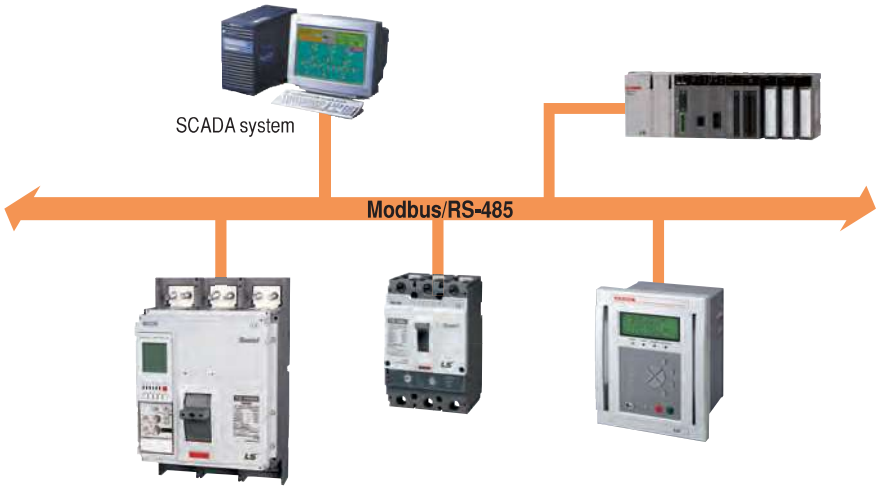


Trip Relay	Digital Output	Long time	Short time	Instantaneous	Ground	Overload Alarm	OVR	UVR	rPower	Vunbal	Iunbal	OFR	UFR	OPR	Note
P, S type	DO1(524)	●	○	○	○	○	○	○	○	○	○	○	○	○	Programmable
	DO2(534)	○	●	●	○	○	○	○	○	○	○	○	○	○	
	DO3(544)	○	○	○	●	○	○	○	○	○	○	○	○	○	
A type	DO1(524)	●	×	×	×	Not available									Fixed
	DO2(534)	×	●	●	×										
	DO3(544)	×	×	×	●										

Communication

Modbus/RS-485

- Operation mode: Differential
- Distance: Max. 1.2km
- Cable :
  General RS-485 shielded twist 2-pair cable
- Baud rate :
  9600bps, 19200bps, 38400bps
- Transmission method: Half-Duplex
- Termination: 150Ω

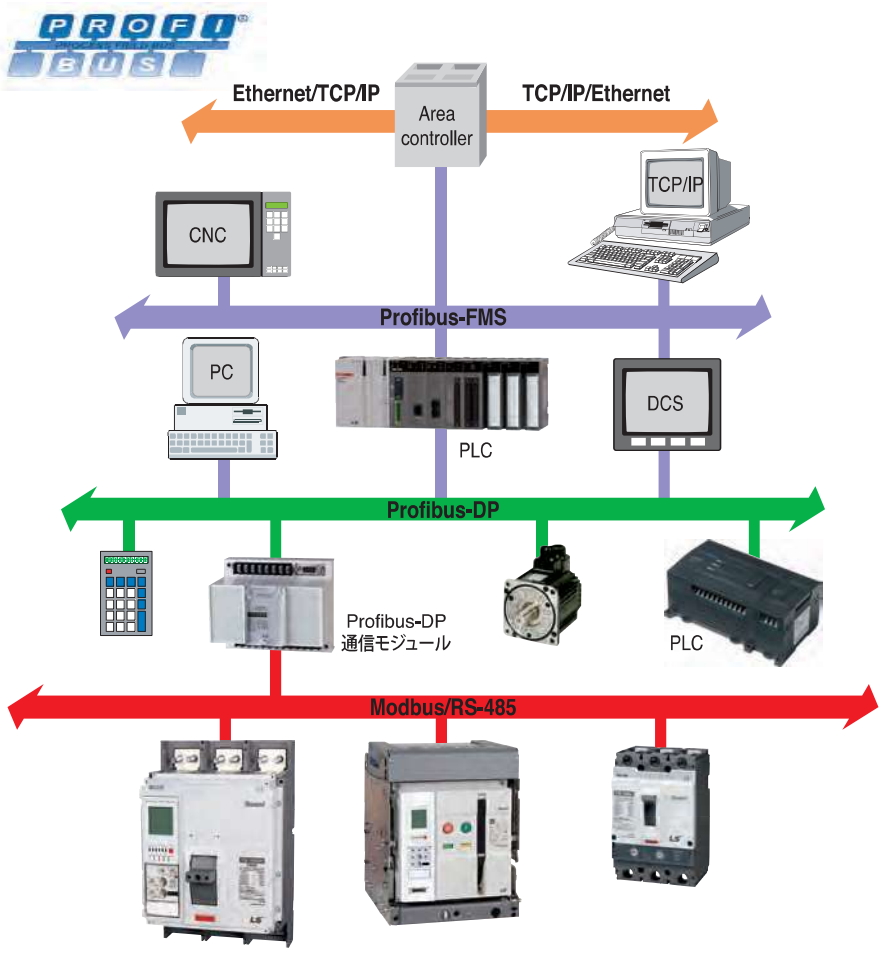


Profibus-DP

- Profibus-DP module is installed separately (Option)
- Operation mode: Differential
- Distance: Max. 1.2km
- Cable :
  Profibus-DP shielded twist 2-pair cable
- Baud rate: 9600bps~12Mbps
- Transmission method: Half-Duplex
- Termination: 150Ω
- Standard: EN 50170 / DIN 19245



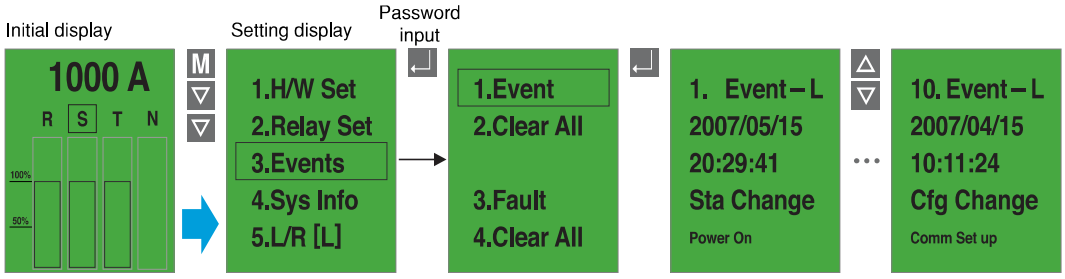
Profibus-DP communication module (Option)



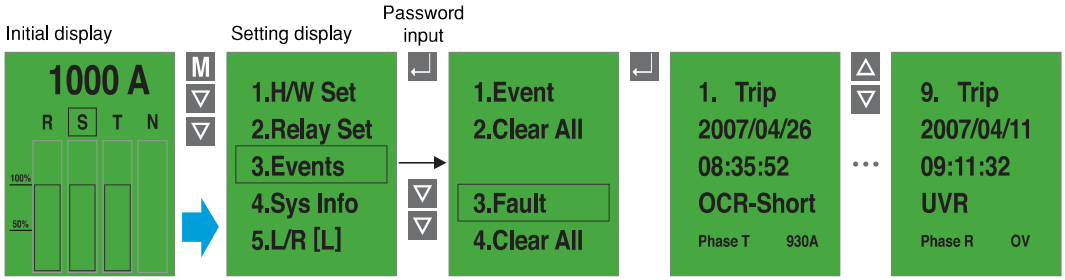
Event & fault recording (P, S type)

When there are events such as setting change, Info. change, error of self-diagnose, state change, P and S type record Max. up to 256 information of the events in accordance with time(ms). In addition, they can record Max. up to 256(up to 10 for A type) information of the faults such as fault cause, fault phase, fault value and so on in accordance with time(ms).

Event information display



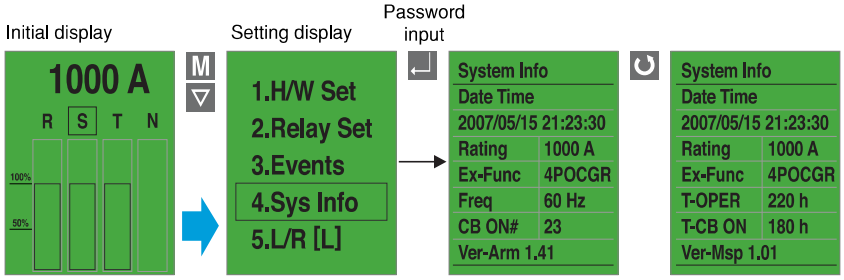
Fault information display



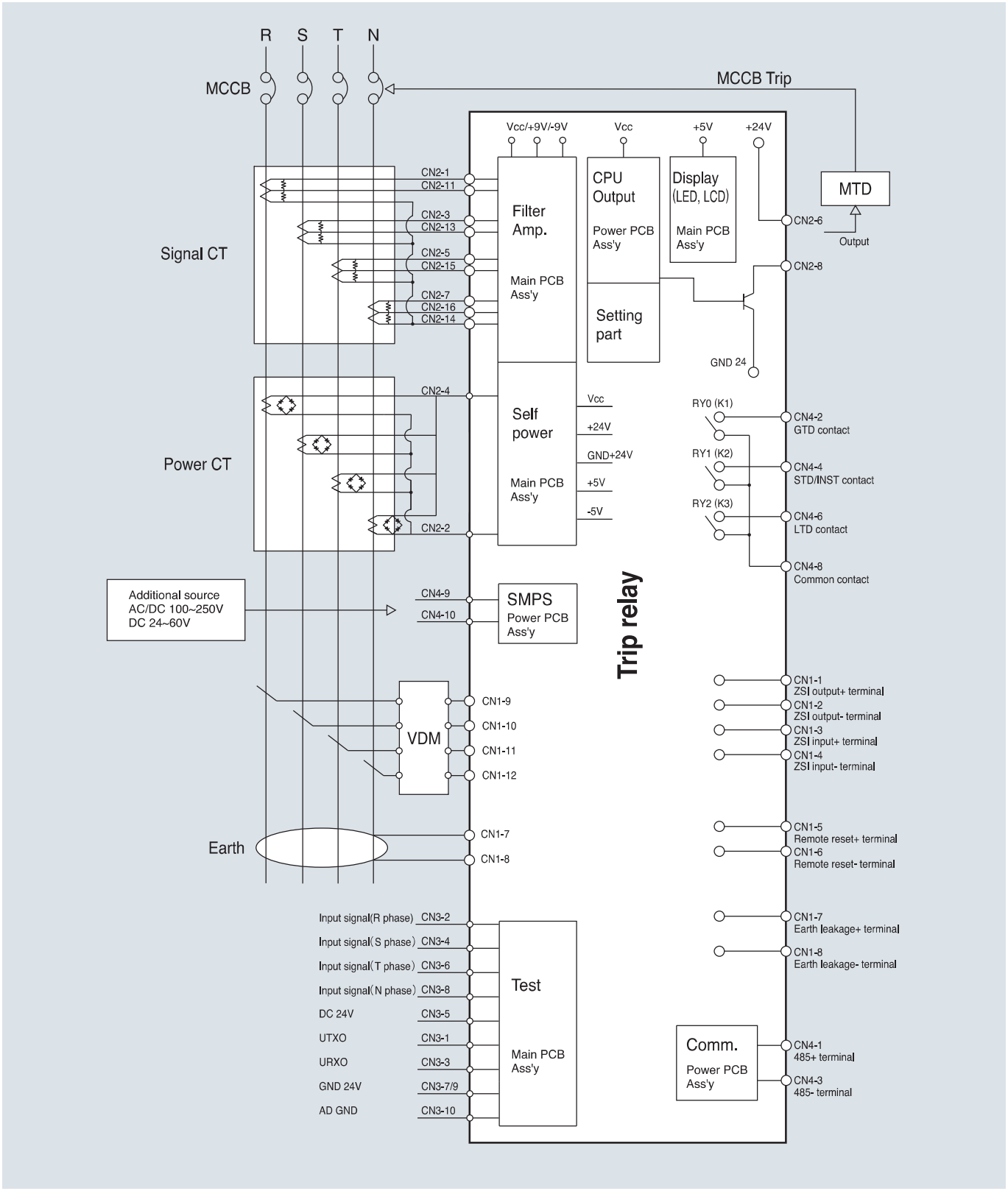
System information

P and S type can indicate information as followings with the information of the MCCB.
- Present time: year/month/date/hour/minute/ms
- MCCB current ratings
- N-phase current ratings: 100%
- Frequency information: 60Hz / 50Hz
- Closing numbers of breaker: CB ON numbers
- Trip relay operating time: OCR ON time
- ON time of breaker: CB ON time
- S/W ver. information

System information display



System block diagram

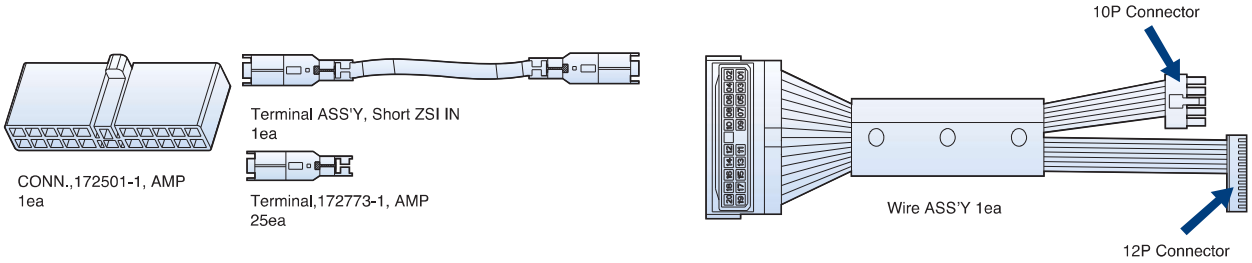


Installation and Handling

Withdrawal Wiring for Trip Relay

⚠ Caution

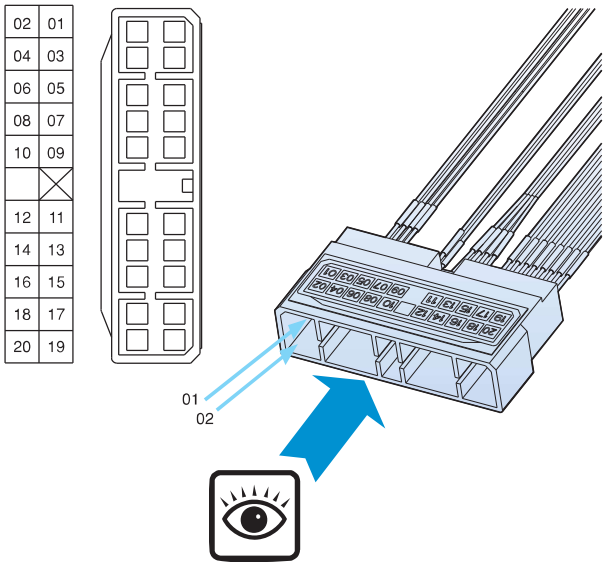
1. In case of disassembling and assembling the main cover, screw should be tightened in specific torque of1.5N.m (15.3kgf.cm)
2. In case of disassembling and assembling the main cover by over tightening torque, the parts of MCCB can be damaged.



WIRE ASS'Y OCR types

No.	Drawing No.	Part Name	Functions	OCR
1	76671176262	WIRE ASS'Y AG AC OCR	Communication, Digital Output, ZSI, Remote Reset	A Type
2	76671176263	WIRE ASS'Y A ZK PS CKA OCR	Communication, Digital Output, ZSI, Remote Reset, Earth Leakage(<30A), Voltage Module	P, S Type
3	76671176264	WIRE ASS'Y AE AX PX SX OCR	Communication, Digital Output, ZSI, Remote Reset, Earth Leakage(>30A), Voltage Module	P, S Type

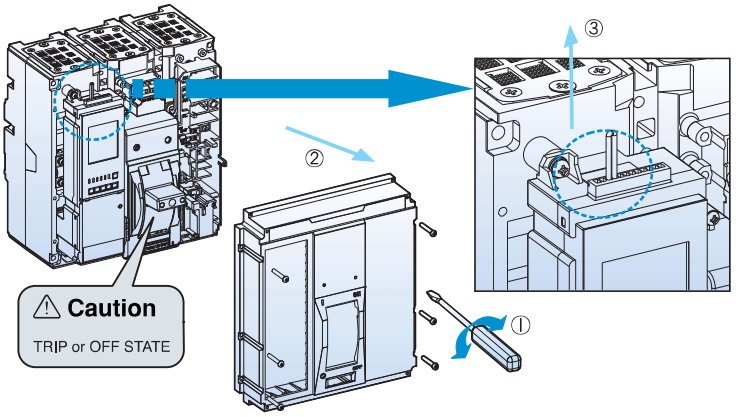
Components of wire ass'y OCR and types



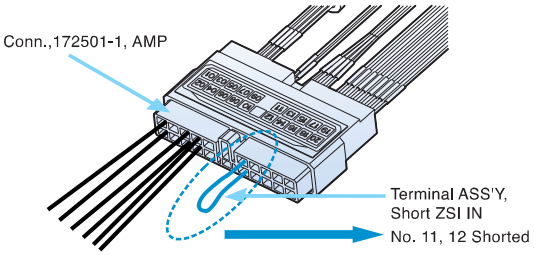
Terminal number and Description

Number	Marking	Description
01	485+	Comm. +
02	485-	Comm. -
03	R1	Power +
04	R2	Power -
05	524	Relay Output (Long time)
06	534	Relay Output (Short time/Instantaneous)
07	544	Relay Output (Ground fault/PAL)
08	513	Relay Output Common
09	Z3	ZSI Out +
10	Z4	ZSI Out -
11	Z1	ZSI In +
12	Z2	ZSI In -
13	R11	Remote Reset +
14	R22	Remote Reset -
15	E1 or B1	Earth Leakage +
16	E2 or B2	Earth Leakage -
17	V1	VR Input
18	V2	VS Input
19	V3	VT Input
20	VN	V Input Common

1. Disassembling cover and short connector

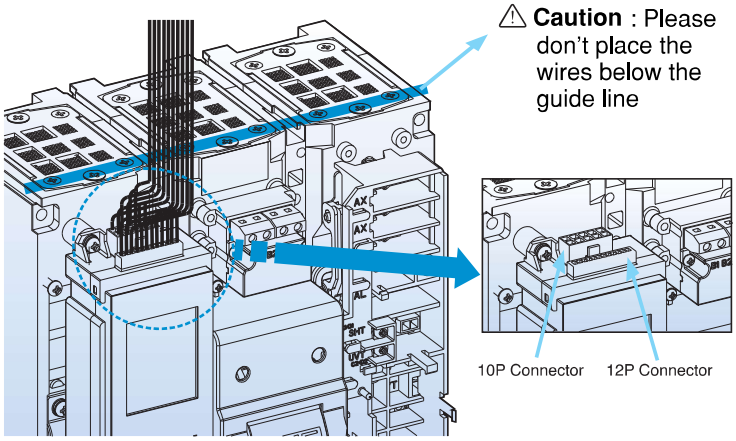


In case of not using ZSI function



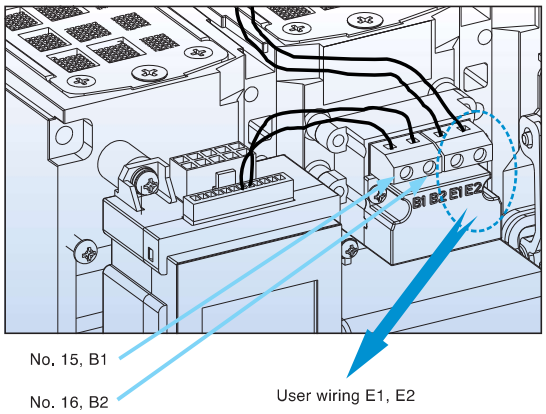
⚠ **Caution** : If not using ZSI function of Trip Relay (OCR), please short ZSI INPUT of terminal No.11,12 (ZSI IN +, ZSI IN-) by using the "TERMINAL ASS'Y,SHORT ZSI IN"

2. Assembly of wire ass'y and withdrawal of wire



In case of the wiring of Earth Leakage ≥30A

Drawing No.	Part Name
76671176264	WIRE ASS'Y AE AX PX SX OCR



Installation of withdrawal wiring for Trip Relay

Trip Relay (OCR) type and applied wire ass'y

No	Type	WIRE ASS'Y, [ ] ,OCR,TS1600		
		[AG AC] 76671176262	[A ZK PS CKA] 76671176263	[AE AX PX SX] 76671176264
1	NG0			
2	NG5			
3	AG0			
4	AG1	■		
5	AG2	■		
6	AG5			
7	AG6	■		
8	AG7	■		
9	AZ0			
10	AZ1		■	
11	AZ2		■	
12	AZ5			
13	AZ6		■	
14	AZ7		■	
15	AE0			
16	AE1			■
17	AE2			■
18	AE5			
19	AE6			■
20	AE7			■
21	AC1	■		
22	AC2	■		
23	AC6	■		
24	AC7	■		
25	AK1		■	
26	AK2		■	
27	AK6		■	
28	AK7		■	
29	AX1			■
30	AX2			■
31	AX6			■
32	AX7			■

No	Type	WIRE ASS'Y, [ ] ,OCR,TS1600		
		[AG AC] 76671176262	[A ZK PS CKA] 76671176263	[AE AX PX SX] 76671176264
33	PC1		■	
34	PC2		■	
35	PC6		■	
36	PC7		■	
37	PK1		■	
38	PK2		■	
39	PK6		■	
40	PK7		■	
41	PX1			■
42	PX2			■
43	PX6			■
44	PX7			■
45	PA1		■	
46	PA2		■	
47	PA6		■	
48	PA7		■	
49	SC1		■	
50	SC2		■	
51	SC6		■	
52	SC7		■	
53	SK1		■	
54	SK2		■	
55	SK6		■	
56	SK7		■	
57	SX1			■
58	SX2			■
59	SX6			■
60	SX7			■
61	SA1		■	
62	SA2		■	
63	SA6		■	
64	SA7		■	
65	NV1	■		
66	NV6	■		