

ETAP TIP – No. 012

Adding a Solid State Trip Device to the Library

Applicable ETAP Versions: 6.0.0

(For lower versions, some of the descriptions and procedures below may differ in some ways)

The following illustrates in detail how to register a solid state trip device shown in Attachment 1 to the ETAP library.

1. Run the ETAP program.
2. Open the “Example-ANSI.oti” sample project.
Note: You may open any ETAP project.
3. Select the library file where the new data is intended to be added:
 - a. On the main menu, select “Library→Open...” (See Fig. 1).
 - b. The “Warning” dialog box will be displayed. Click the “Yes” button. See Fig. 2.
 - c. Browse the “etaplibXXX.lib” library file located at “Y:\ETAP XXX\Lib” folder. See Fig. 3.

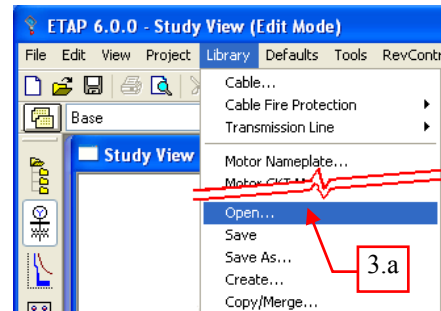


Fig. 1

Notes:

- i. “Y:\ETAP XXX” is the drive and folder where the ETAP program was installed and “XXX” refers to the version of ETAP. If ETAP was installed on the default location, the drive and folder is “C:\ETAP XXX”.
- ii. The new data will be added to “etaplibXXX.lib” library file.
- iii. You may create a copy of the “etaplibXXX.lib” file using the “Windows Explorer” program and work on the copied file to preserve the default library file.
- iv. You may also create a new library file. To do so, from the main menu, select “Library→Create”. Browse to the folder where you want the library file to be located and enter the desired filename. Then, you may merge this library later with the other libraries.

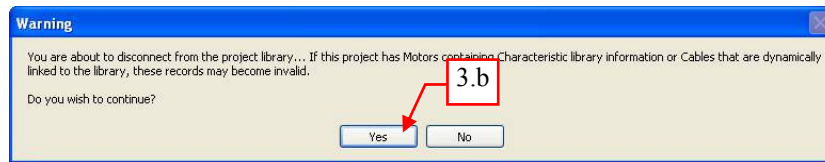


Fig. 2

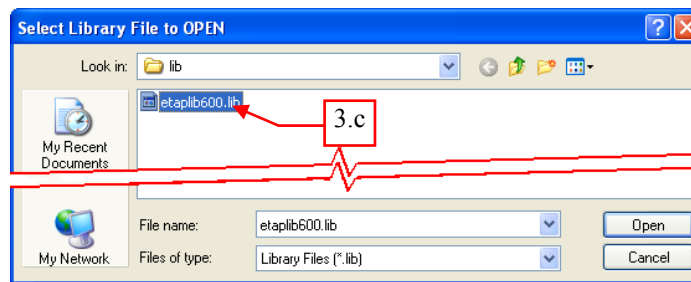
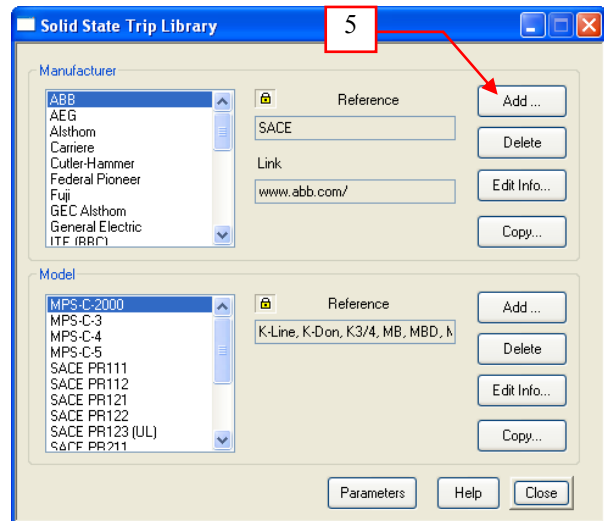


Fig. 3

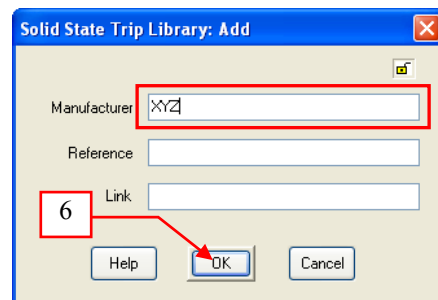
4. On main menu, select “Library→Trip Device→Solid State...” The “Solid State Trip Library” dialog window will be displayed.

- In the “Manufacturer” frame of the “Solid State Trip Library” dialog window, click the “Add...” button.

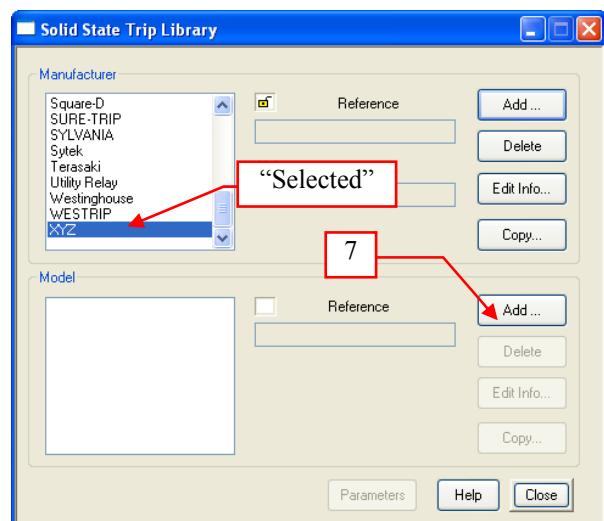
Note: click the “Add” button only if the manufacturer is not yet available on the list box. Otherwise, just select the manufacturer.



- On the “Solid State Trip Library: Add” dialog window enter the “XYZ” in Manufacturer field and click the “OK” button.



- With the “XYZ” selected in the list box of the “Manufacturer” frame, click the “Add...” button in the “Model” frame.



8. On the “Solid State Trip Library: Add” dialog window, enter the model name “AGR-11L” and click the “OK” button. See Fig. 4.
9. With the “AGR-11L” selected in the “Model” frame of the “Solid State Trip Library” dialog window, click the “Parameters” button. See Fig. 5. The “Solid State Library: Parameters” dialog window will be displayed.

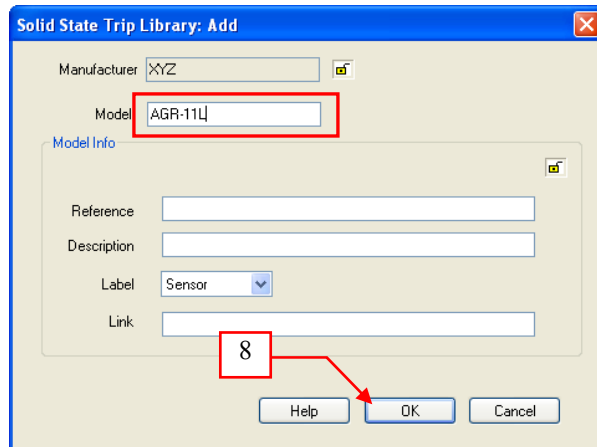


Fig. 4

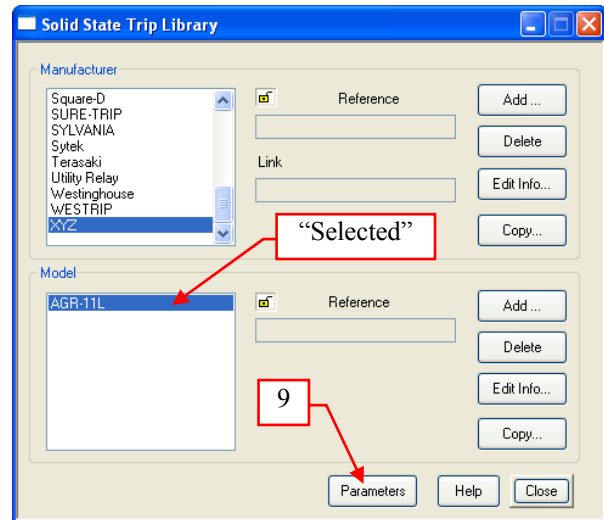


Fig. 5

10. Guided by the information from the manufacturer catalog shown in Attachment 1, do the following:
 - a. “Rating” Frame (See Fig. 6)
 1. Click the “Add...” button.
 2. Click the cell under “Sensor ID” column and enter “200”.
 3. Click the cell under “Sensor” column and enter “200” (CT Rated primary current).
 4. Click the cell under “Plug” column and enter “100;125;160;200” (4 different Rated Current for 200A CT Rated primary current).
 5. Select “Amp” in the “Unit” column.
 - b. “LT” tab (See Fig. 6)
 1. Click “LT” tab.
 2. Check “Long-Time” check box.
 3. Under “LT Pickup” Frame
 - i. Select “Discrete” radio button.
 - ii. Select “Rating Plug” in the “Multiplier” drop down list.
 - iii. Click “Add” button .
 - iv. Click the cell under “Label” column and enter “0.80”.
 - v. Click the cell under “Multiples” column and enter “0.8”.
 - vi. Click the “% Tol. Min” column and enter “5”.
 - vii. Click the “% Tol. Max” column and enter “20”.
 - viii. Repeat steps “iii” to “vii” to add the remaining long time trip pickup current settings. Refer to Attachment 1, page 1, letter “C” for the rest of the pickup current settings.

4. Under “LT Band” Frame
 - i. Select “Discrete” radio button.
 - ii. Click “Add” button.
 - iii. Click the cell under “Label” column and enter “0.50”.
 - iv. Click the cell under “Multiple” column and enter “6” (current value in multiples at which the LT band is defined).
 - v. Click the “Min Clearing” column and enter “0.425” (0.5sec – 15% of 0.5sec).
 - vi. Click the “Max Clearing” column and enter “0.725” (0.5sec + 15% of 0.5sec+0.15sec).
 - vii. Similarly, perform steps “ii” to “vi” to add the remaining long time bands.
 - viii. Check the “Track Pickup” in order for the Long Time band to track the Long-time pickup.
 - ix. On the “Slope”, enter “-2.12”. This is the slope of the long time band.

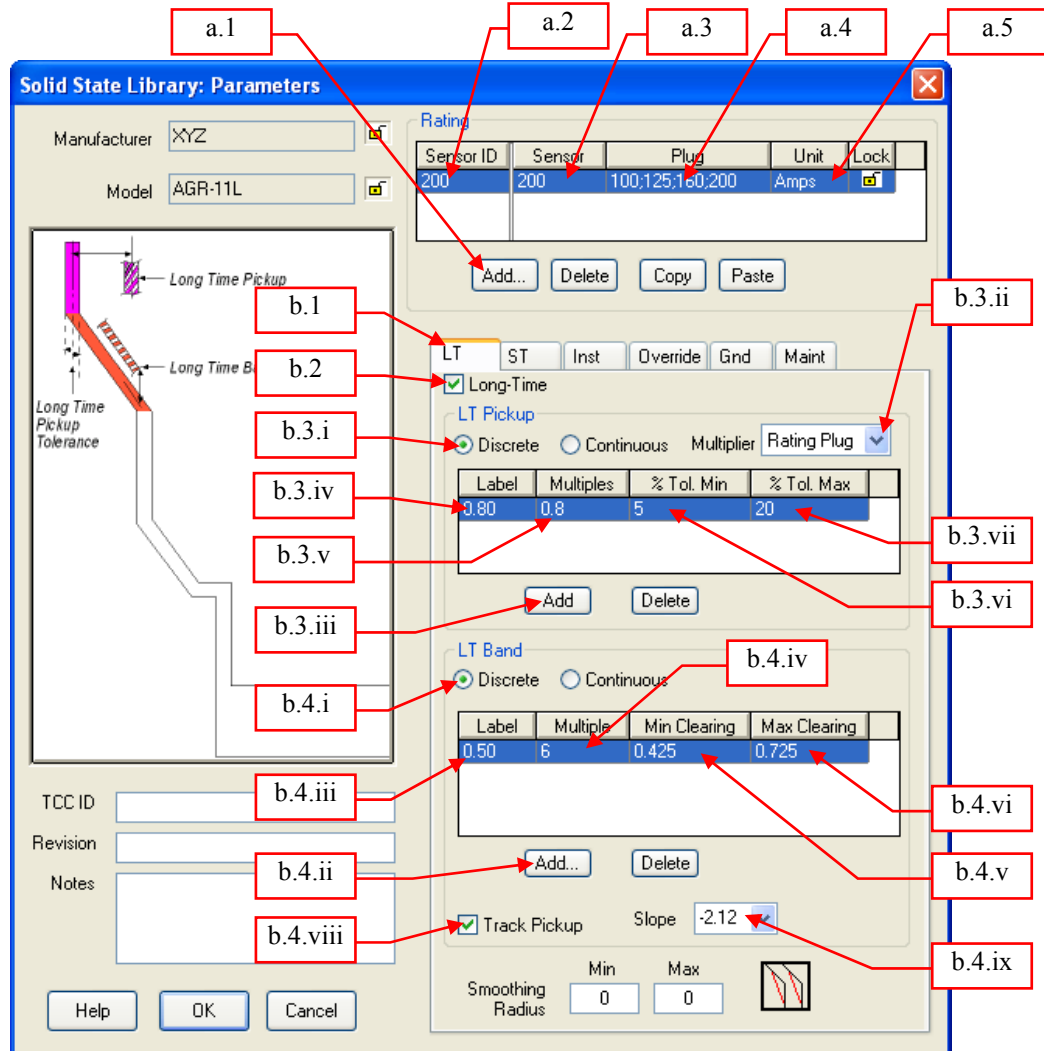


Fig. 6

- c. “ST” tab (see Fig. 7)
1. Click “ST” tab.
 2. Check “Short-Time” check box.
 3. Under “ST Pickup” Frame
 - i. Select “Discrete” radio button.
 - ii. Select “Rating Plug” on the “Multiplier” drop down list.
 - iii. Click “Add” button.
 - iv. Click the cell under “Label” column and type “1.0”.
 - v. Click the cell under “Multiples” column and type “1”.
 - vi. Click the “% Tol. Min” column and type “-15”.
 - vii. Click the “% Tol. Max” column and type “15”.
 - viii. Similarly, perform steps “iii” to “vii” to add the remaining short time trip pickup currents.
 4. Under “ST Band” Frame
 - i. Select “Discrete” radio button.
 - ii. Check “I²t” checkbox since the short time band has I²t mode.
 - iii. Click “Add” button.
 - iv. Click the cell under “Label” column and type “0.05”.
 - v. Click the cell under “Min Clearing” column and type “0.025”.
 - vi. Click the “Max Clearing” column and type “0.12”.
 - vii. Click the “I²t Multiples” column and type “6” (this is the reference point at which the “Min I²t clearing” and “Max I²t clearing” times are measured).
 - viii. Click “Min I²t clearing” column and enter “0.05” sec.
 - ix. Click “Max I²t clearing” column and enter “0.45” sec.
 - x. Similarly, perform steps “iii” to “ix” to add the rest of the short time bands.
 - xi. Select “IN/OUT” in the “Type” drop down list.
 - xii. Enter in the “-2.02” in the first and second text boxes of the “Slope”. These slopes correspond to the slope of the Minimum and Maximum clearing short time bands respectively.
 5. Enter “1.2” in the “Smoothing Radius – Min”
 6. Enter “1.7” in the “Smoothing Radius – Max”

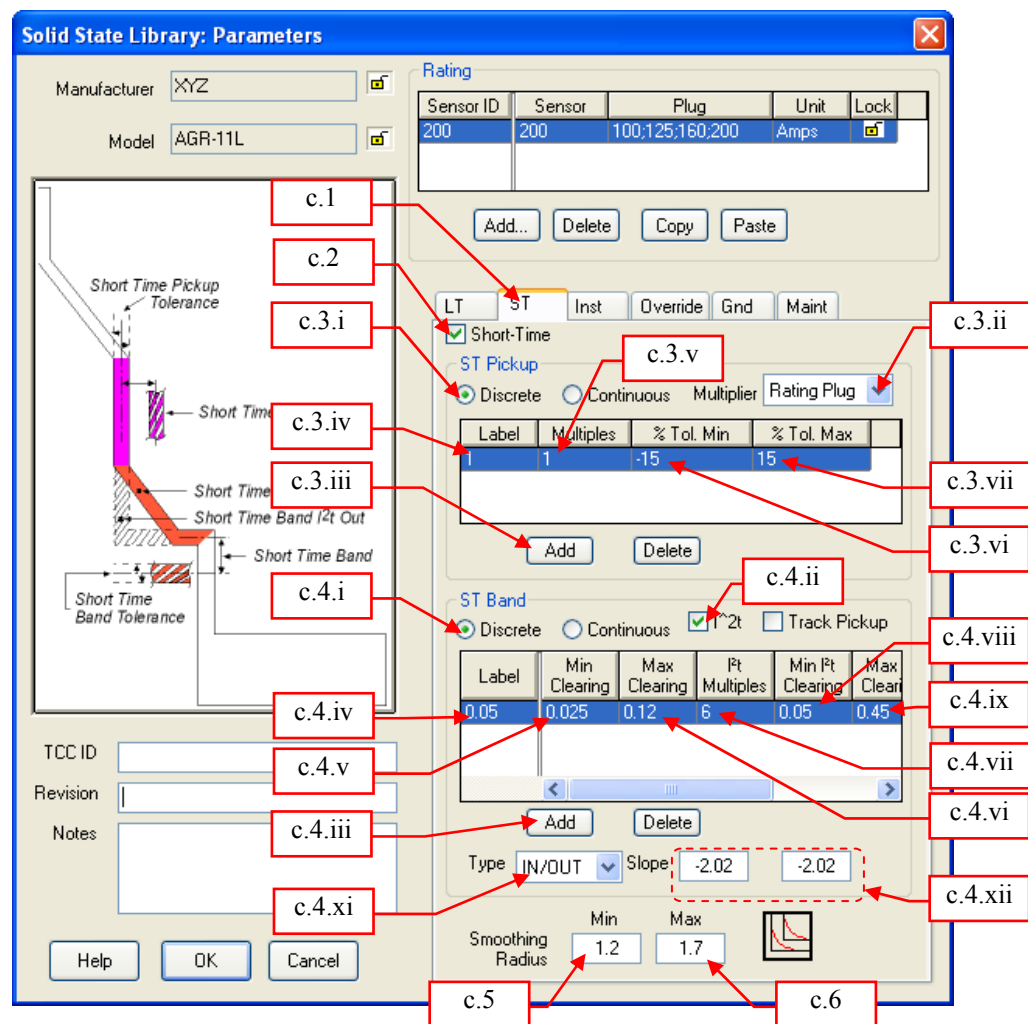


Fig. 7

d. "Inst" tab (see Fig. 8)

1. Click "Inst" tab.
2. Check "Instantaneous" check box.
3. Under "Inst. Pickup" Frame
 - i. Select "Discrete" radio button.
 - ii. Select "Rating Plug" under Multiplier.
 - iii. Click "Add" button.
 - iv. Click the cell under "Label" column and enter "2".
 - v. Click the cell under "Multiples" column and enter "2".
 - vi. Click the "% Tol. Min" column and enter "-20".
 - vii. Click the "% Tol. Max" column and enter "20".
 - viii. Repeat steps "iii" to "vii" to add the remaining instantaneous time trip pickup current settings.
 - ix. Enter "0.03" sec on the "Clearing Time" text box.
 - x. Enter "0.005" sec on the "Opening Time" text box.

4. Enter "0" in the "Smoothing Radius, Min".
5. Enter "2.8" in the "Smoothing Radius, Max".

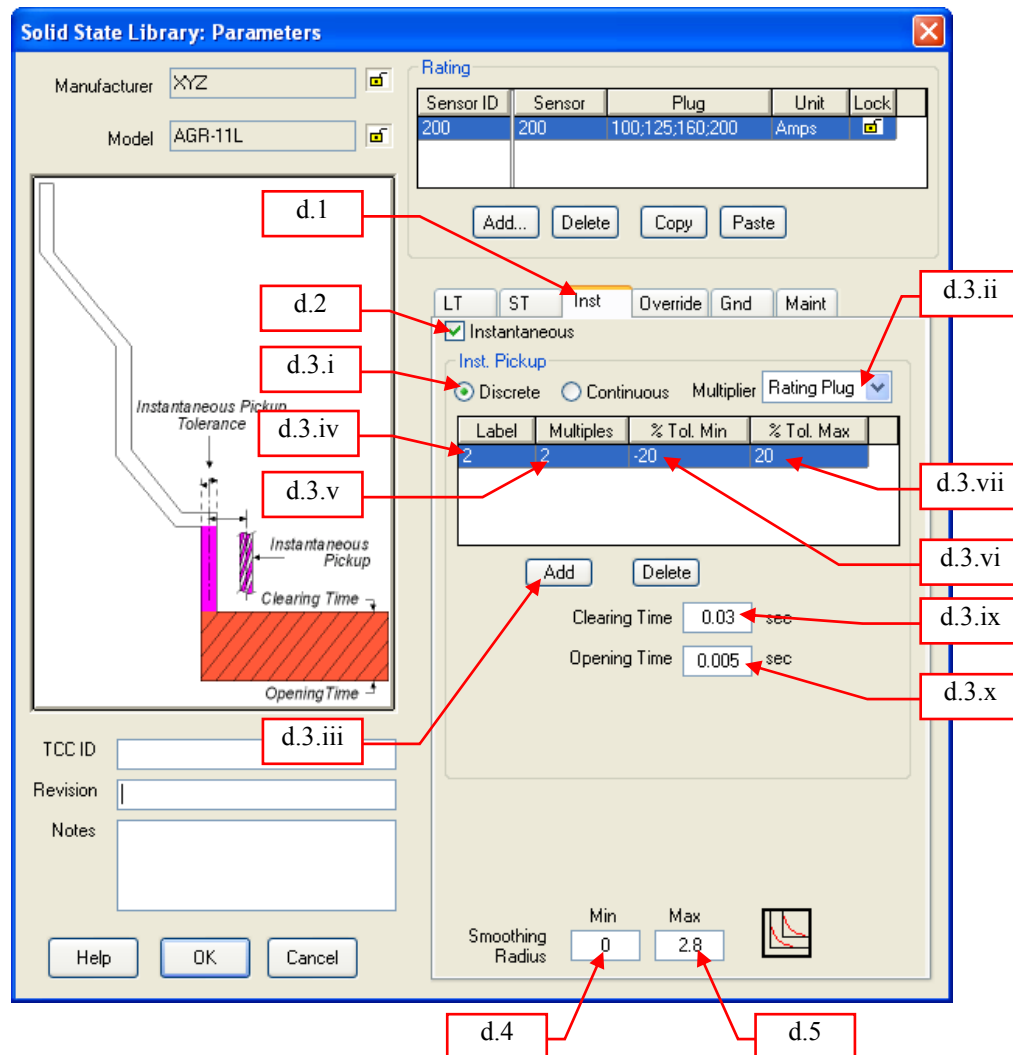


Fig. 8

- e. Override tab (see Fig. 9)
 1. Click "Override" tab.
 2. Uncheck "Override" check box.

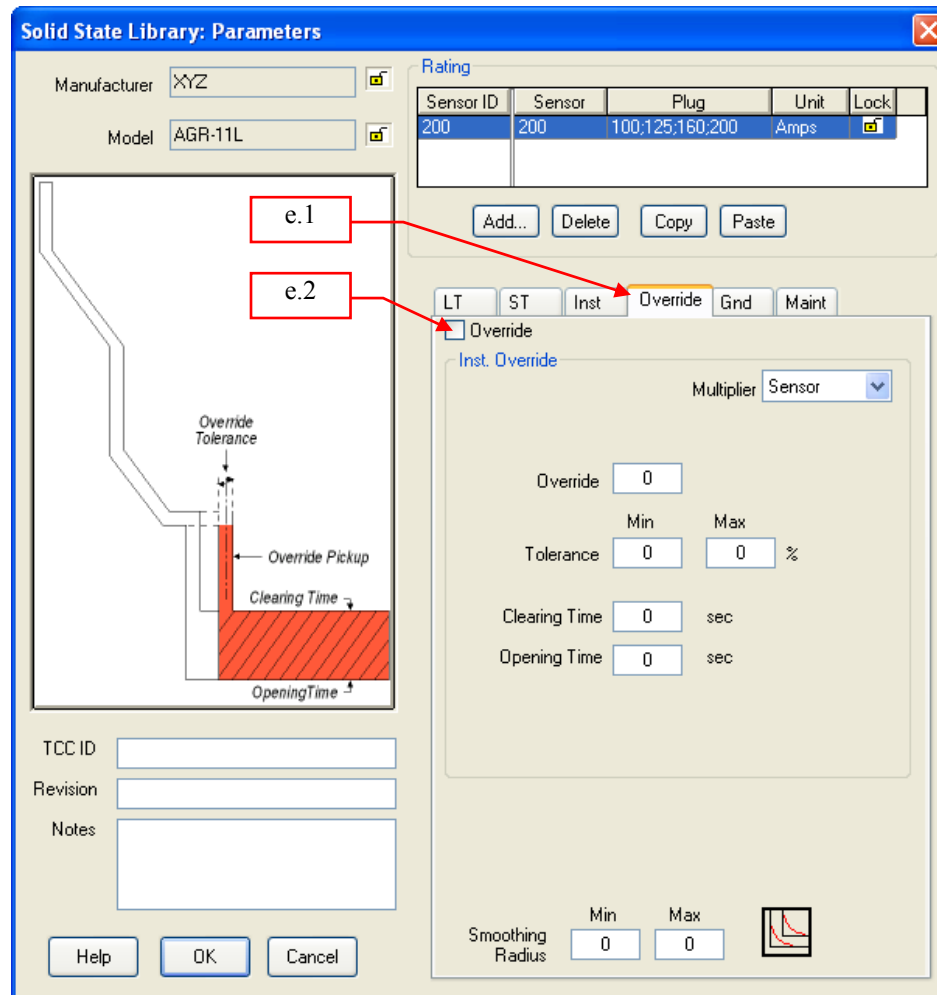


Fig. 9

- f. “Gnd” tab (see Fig. 10)
1. Click “Gnd” tab.
 2. Check “Ground” check box.
 3. Under “Ground Pickup” Frame
 - i. Select “Discrete” radio button.
 - ii. Select “Sensor” in the “Multiplier” drop down list.
 - iii. Click “Add” button.
 - iv. Click the cell under “Label” column and type “0.1”.
 - v. Click the cell under “Multiples” column and type “0.1”.
 - vi. Click the “% Tol. Min” column and type “-20”.
 - vii. Click the “% Tol. Max” column and type “20”.
 - viii. Repeat steps “iii” to “vii” to add the remaining ground trip pickup current settings.
 4. Under “Ground Band” Frame
 - i. Select “Discrete” radio button.
 - ii. Check “I²t” checkbox since the Ground time band has I²t mode.
 - iii. Click “Add” button.
 - iv. Click the cell under “Label” column and type “0.1”.
 - v. Click the cell under “Min Clearing” column and type “0.075”.
 - vi. Click the “Max Clearing” column and type “0.17”.
 - vii. Click the “I²t Multiples” column and type “0.6” (this is the reference point at which the “Min I²t clearing” and “Max I²t clearing” times are measured).
 - viii. Click “Min I²t clearing” column and enter “0.13” sec.
 - ix. Click “Max I²t clearing” column and enter “0.7” sec.
 - x. Repeat steps “iii” to “ix” to add the remaining ground time band settings.
 - xi. Select “IN/OUT” in the “Type” drop down list.
 - xii. Enter “-2.02” in the first and second text boxes of the “Slope”. These slopes correspond to the slope of the Minimum and Maximum clearing short time bands respectively.
 5. Enter “1.2” in the “Smoothing Radius, Min”.
 6. Enter “1.7” in the “Smoothing Radius, Max”.

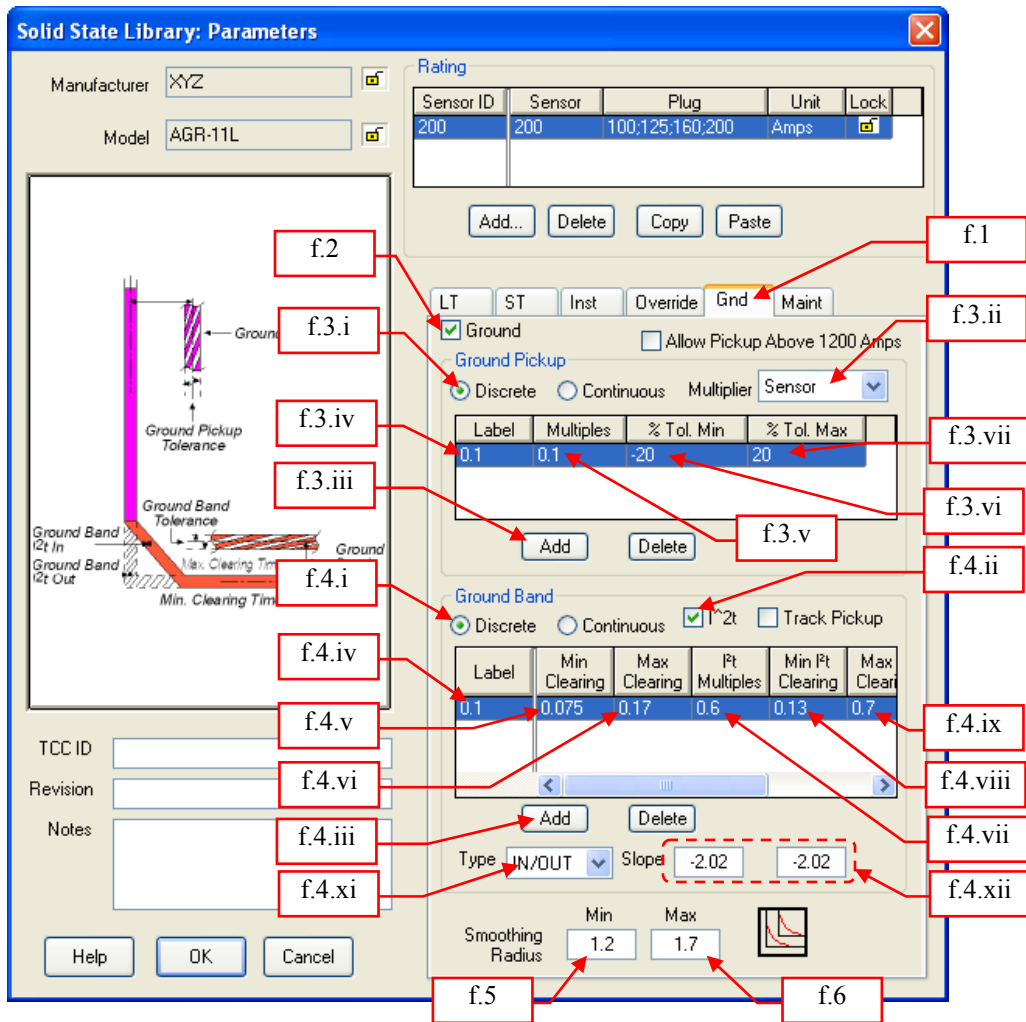


Fig. 10

- g. “Maint” tab (see Fig. 11)
1. Click “Maint” tab.
 2. Uncheck “Maintenance Mode” check box.

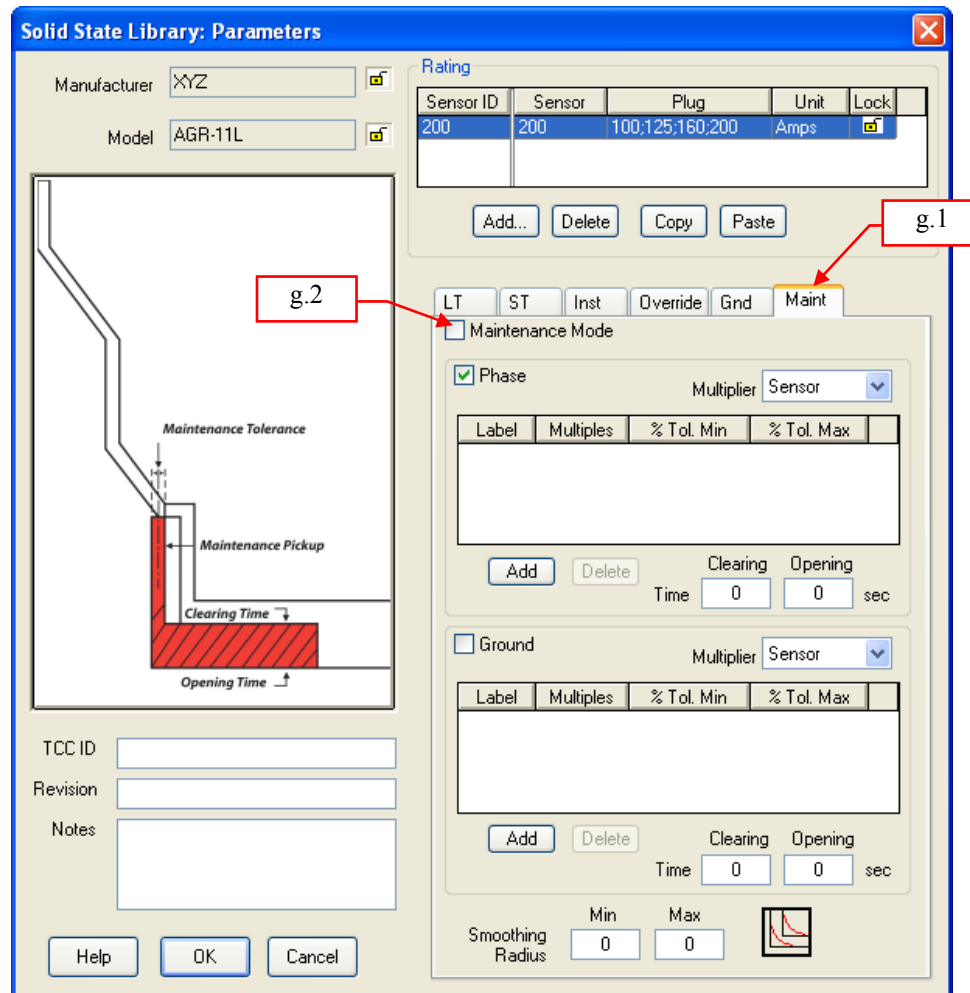


Fig. 11

11. The time current characteristic curves are common to all CT rating [200A, 400A, 800A, 1250A, 1600A, 2000A, 2500A, 3200A, 4000A]. Since the “200” rating has already been registered, you may just copy this one to complete the rest. See Fig. 12.
 - a. In the “Rating” frame, click the “Add...” button.
 - b. Move the mouse and click the 1st record (row).
 - c. Click “Copy” button.
 - d. Move and click the mouse to the 2nd record.
 - e. Click “Paste” button.
 - f. Change the data in the 2nd record as follows:
 - Sensor ID : 400
 - Sensor : 400
 - Plug : 200;250;320;400
 - Unit : Amps
 - g. Repeat steps “a” to “f” to add the rest of the ratings.
 - h. Click the “OK” button when complete.

12. Click the “Close” button to close the “Solid State Trip Library” dialog window.
13. In the main menu, select “Library→Save” to save the changes.
14. The End. You may associate this device to a LV Power Circuit Breaker. Refer to “ETAP-TIP-011” for similar instruction how to associate trip device to a LV CB.

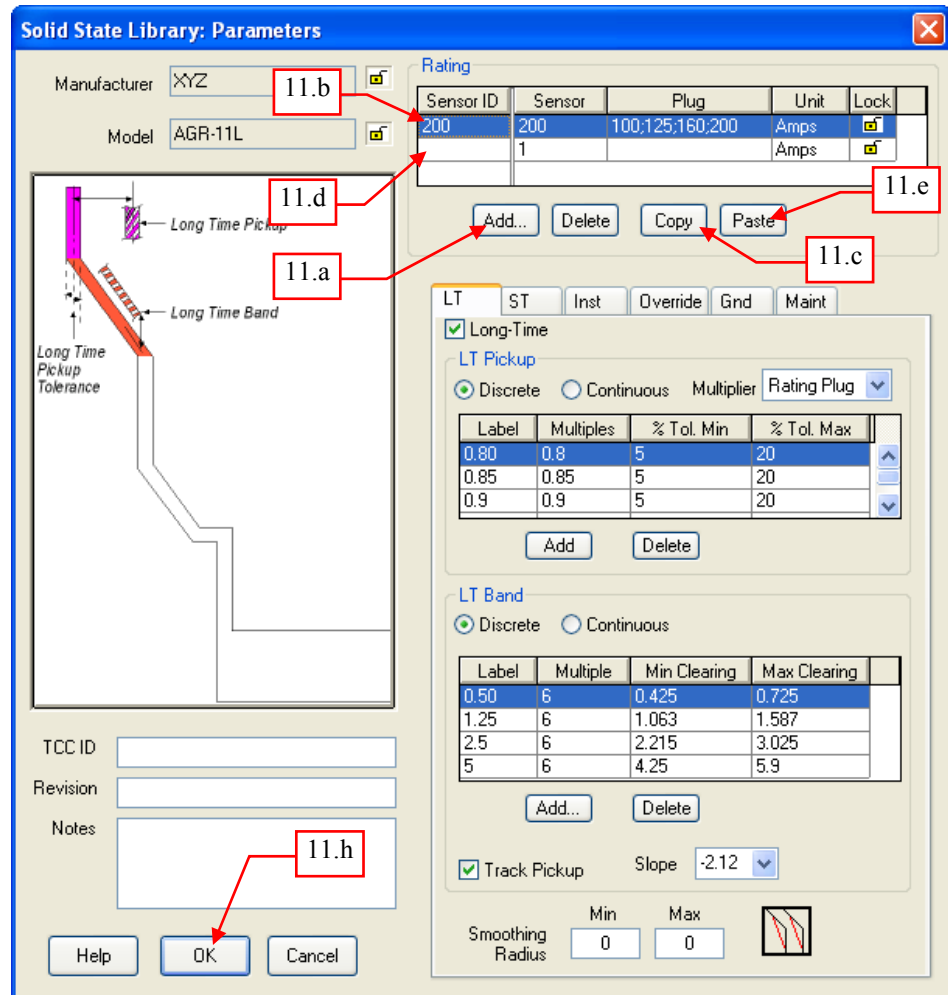


Fig. 12

5-3. Characteristic Setting

5-3-1. L characteristic for general feeder

A general view, characteristic settings, and characteristic curves of the type AGR-11L OCR (with L characteristic) are shown in Fig. 30, Table 19, and Fig. 31 respectively.

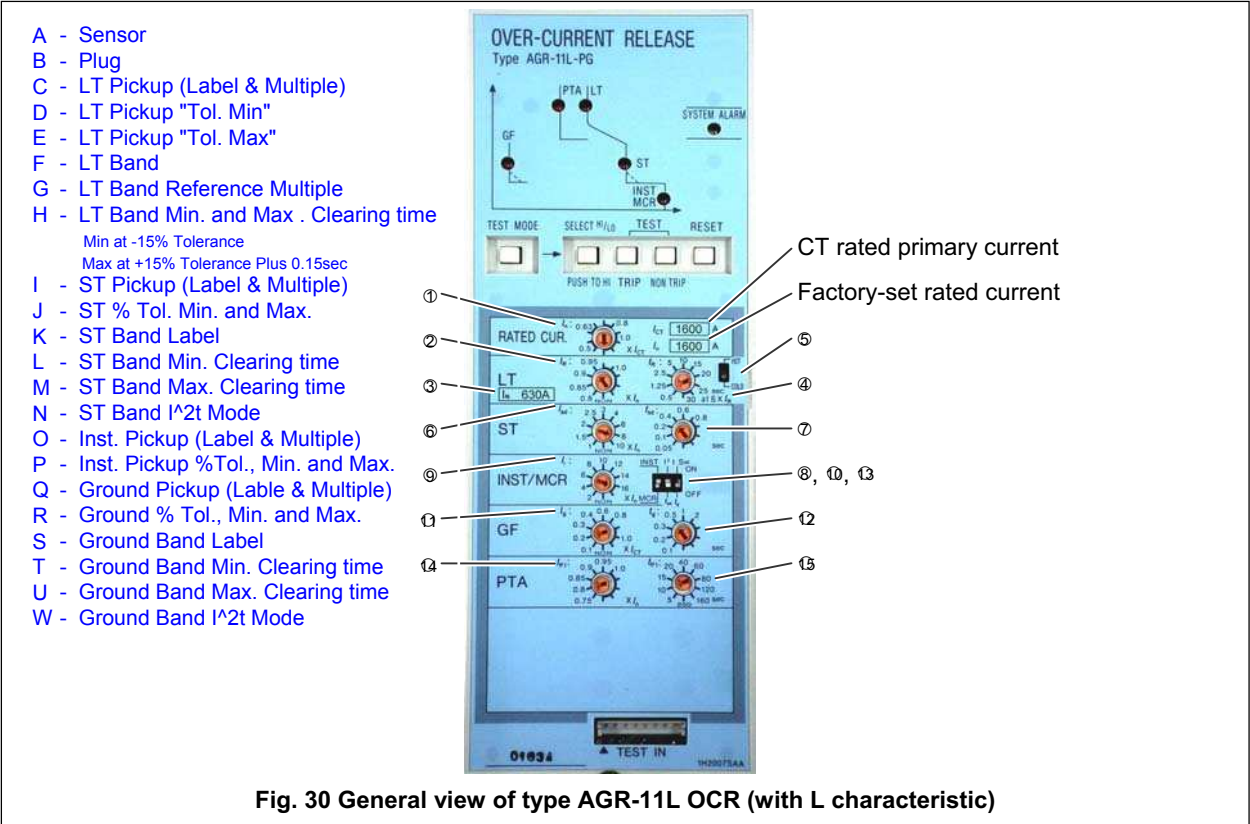
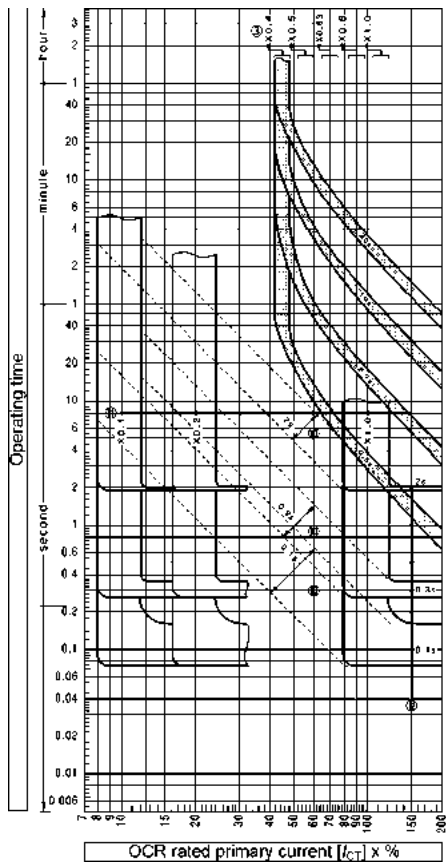
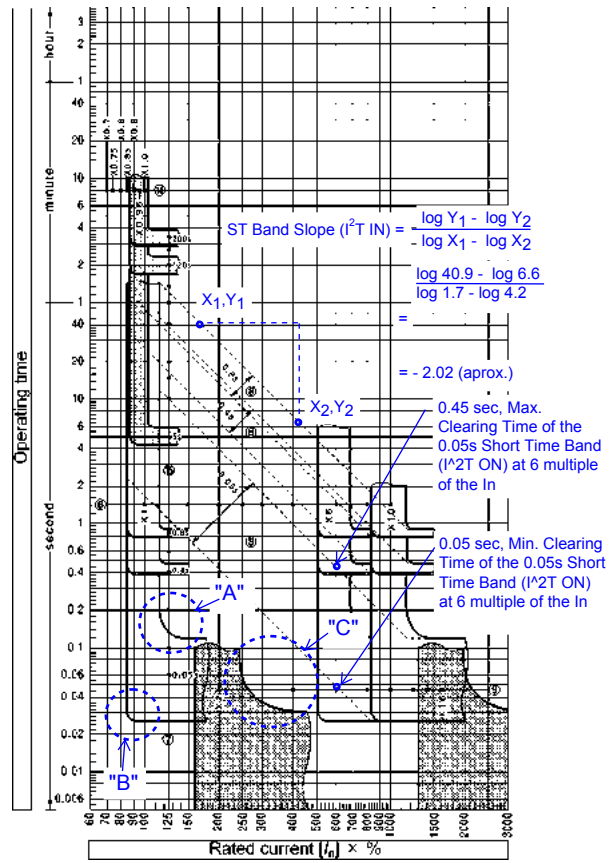
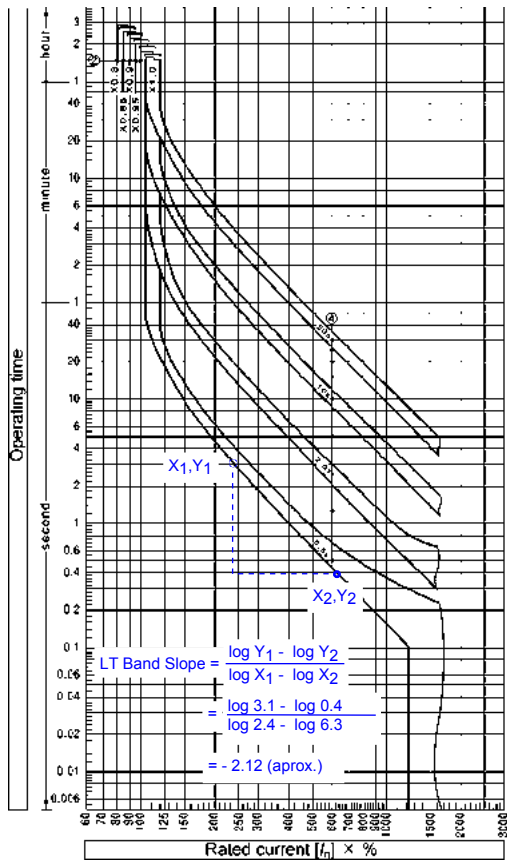


Fig. 30 General view of type AGR-11L OCR (with L characteristic)

Table 19 Settings of type AGR-11L OCR (with L characteristic)

No.	Setting item	Symbol	Setting range
①	Rated current*1	I_n	CT rated primary current $[I_{CT}] \times (0.5-0.63-0.8-1.0)$ (A)
			Applied $[I_{CT}]$ (A)
			Rated current $[I_{CT}] \times 0.5$
			Rated current $[I_{CT}] \times 0.63$
②	Long time delay trip pickup current (continuous)	I_R	$[I_n] \times (0.8-0.85-0.9-0.95-1.0-NON)$ (A) • Non tripping at not more than $[I_R] \times 1.05$. Tripping at more than $[I_R] \times 1.05$ and not more than $[I_R] \times 1.2$
③	N-phase protection trip pickup current (continuous)	I_n	$[I_{CT}] \times (0.4-0.5-0.63-0.8-1.0)$: Fixed to a single point • Non tripping at not more than $[I_n] \times 1.05$. Tripping at more than $[I_n] \times 1.05$ and not more than $[I_n] \times 1.2$
④	Long time delay/N-phase protection trip timing	t_R	Long time delay: <u>0.5-1.25-2.5-5-10-15-20-25-30</u> (sec) at 600% of $[I_n]$. Tolerance: $\pm 15\%$, $+0.15s-0s$ N-phase protection: (0.5-1.25-2.5-5-10-15-20-25-30) (sec) at 600% of $[I_n]$. Tolerance: $\pm 15\%$, $+0.15s-0s$
⑤	Long time delay/N-phase protection trip mode	-	HOT/COLD, selectable
⑥	Short time delay trip pickup current	I_{sd}	$[I_n] \times (1-1.5-2-2.5-3-4-6-8-10-NON)$ (A), Tolerance: $\pm 15\%$
⑦	Short time delay trip timing	t_{sd}	Relaying time (ms.)
			Resettable time (ms.)
			Max. total clearing time (ms.)
⑧	Short time delay trip I^2t mode	I^2t_{sd}	ON/OFF
⑨	Instantaneous trip pickup current	I_i	$[I_n] \times (2-4-6-8-10-12-14-16-NON)$ (A), Tolerance: $\pm 20\%$
⑩	INST/MCR	-	Selectable
⑪	Ground fault trip pickup current *2	I_q	$[I_{CT}] \times (0.1-0.2-0.3-0.4-0.6-0.8-1.0-NON)$ (A), Tolerance: $\pm 20\%$
⑫	Ground fault trip timing	t_q	Relaying time (ms.)
			Resettable time (ms.)
			Max. total clearing time (ms.)
⑬	Ground fault trip I^2t mode	I^2t_{tq}	ON/OFF
⑭	Pretrip alarm pickup current	I_{p1}	$[I_n] \times (0.75-0.8-0.85-0.9-0.95-1.0)$ (A), Tolerance: $\pm 7.5\%$
⑮	Pretrip alarm timing	t_{p1}	(5-10-15-20-40-60-80-120-160-200) (sec) at not less than $[I_{p1}]$. Tolerance: $\pm 15\%$, $+0.1s-0$

• Underlined values are default settings.
 • NON setting disables protective functions. If the short time delay trip function and the instantaneous trip (or MCR) function are set to NON, however, the fail-safe operates so that:
 • The instantaneous trip function is activated at $[I_n] \times 16$ or more if the short time delay trip function and the instantaneous trip function are set to NON.
 • The short time delay trip function is activated at $[I_n] \times 10$ or more if the short time delay trip function and the MCR function are set to NON.
 • A pickup current means the threshold by which the OCR determines whether or not an overcurrent occurs. When the current flowing through the OCR exceeds the pickup current setting provided that $[I_R] \times 1.05 < \text{pickup current setting} \leq [I_R] \times 1.2$, the OCR starts counting the time for tripping. Once the current flowing through the OCR reduces to less than the pickup current setting, time count is reset.
 *1: A change in rated current setting results in changes in long time delay, short time delay, instantaneous, and pretrip alarm pickup current settings accordingly.
 *2: The ground fault trip pickup current setting should not exceed 1200A.



Note 1: The operating time (t) at a long time delay (or N-phase protection) trip pickup current setting is given by

$$t = -27.94 t_R \ln \left\{ 1 - \frac{(1.125 I_R)^2}{I^2} \right\} \pm 15\%_{-0}^{+0.15} [\text{sec}]$$

I_R = Long time delay (or N-phase protection) trip pickup current setting
 I = Overcurrent t_R = Time setting

Note 2: The short time delay trip function has precedence over the long time delay trip function. The OCR operates at the short time delay trip timing even in those current ranges in which the long time delay trip time setting is shorter than the short time delay time setting.

"A" (Short Time Band, Smoothing Radius Max.) = $0.198/0.117 = 1.7$ (approx.)
 "B" (Short Time Band, Smoothing Radius Min.) = $0.030/0.025 = 1.2$ (approx.)
 "C" (Instantaneous Band, Smoothing Radius Max.) = $0.085/0.030 = 2.8$ (approx.)

