



# 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.



- 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.





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







5. 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.

Solid State Trip Library	5							
ABB AEG Alsthom Carriere Cutler-Hammer Federal Pioneer Fuji GEC Alsthom General Electric ITF (RRP)	Reference SACE Link www.abb.com/	Add Delete Edit Info Copy						
Model MPS-C3 MPS-C4 MPS-C5 SACE PR111 SACE PR122 SACE PR122 SACE PR123 (UL) SAFE PR211	B Reference K-Line, K-Don, K3/4, MB, MBD, N	Add Delete Edit Info Copy						
Parameters Help Close								

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

Solid State Trip Library: Add	
	đ
Manufacturer XYZ	
Reference	
6 Help OK Cancel	

7. With the "XYZ" selected in the list box of the "Manufacturer" frame, click the "Add..." button in the "Model" frame.

Solid State Trip Library					
Manufacturer Square-D SURE-TRIP SYLVANIA SYLVANIA	Reference	Add			
Sytek Terasaki Utility Relay Westinghouse	"Selected"	Edit Info			
	7	Сору			
Model	Reference	Add			
		Delete			
		Copy			
	Parameters	Help Close			



- 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.

Solid State Trip Library: Add	Solid State Trip Library
Manufacturer XYZ       Model       AGR-11L       Model       Into       Reference       Description       Label       Sensor       Link       8       Help       OK       Cancel	Manufacturer Square-D SVLRE-TRIP SVLVANIA SVLRE-TRIP SVLVANIA SVLRE-TRIP SVLVANIA Vestinghouse Westinghou
	F1g. 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 "I^2t" 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 "I<sup>2</sup>t Multiples" column and type "6" (this is the reference point at which the "Min I<sup>2</sup>t clearing" and "Max I<sup>2</sup>t clearing" times are measured).
  - viii. Click "Min I<sup>2</sup>t clearing" column and enter "0.05" sec.
  - ix. Click "Max I<sup>2</sup>t 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.

Solid State Library: Parameters	
Manufacturer XYZ	Rating
Model AGR-11L	200 200 100;125;160;200 Amps
e.1 e.2 Override Tolerance Clearing Time	Add Delete Copy Paste  LT ST Inst Override Gnd Maint Override Inst. Override Over
TCC ID Revision Notes	
Help OK Cancel	Smoothing 0 0

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 "I^2t" 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 "I<sup>2</sup>t Multiples" column and type "0.6" (this is the reference point at which the "Min I<sup>2</sup>t clearing" and "Max I<sup>2</sup>t clearing" times are measured).
  - viii. Click "Min I<sup>2</sup>t clearing" column and enter "0.13" sec.
  - ix. Click "Max I<sup>2</sup>t 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.

Solid State Library: Parameters	
Manufacturer XYZ 11.b C Model AGR-11L	Sensor ID     Sensor     Plug     Unit     Lock       200     200     100;125;160;200     Amps     Important       1     Amps     Important
Long Time Pickap Long Time Band Long Time Pickup Tolerance	Add       Delete       Copy       Paste       11.c         LT       ST       Inst       Override       Gnd       Maint         ✓       Long-Time       LT       Pickup       Oiscrete       Continuous       Multiplier       Rating Plug         ✓       Discrete       Continuous       Multiplier       Rating Plug
	0.80 0.8 5 20 0.85 0.85 5 20 0.9 0.9 5 20 Add Delete LT Band ● Discrete ○ Continuous Label Multiple Min Clearing Max Clearing
	0.50         6         0.425         0.725           1.25         6         1.063         1.587           2.5         6         2.215         3.025           5         6         4.25         5.9
Notes 11.h	Add Delete Track Pickup Slope -2.12
Help OK Cancel	Min Max Smoothing 0 0

Fig. 12

ATTACHMENT 1					
(1/2)					

### 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.



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

No.	Setting item	Symbol	B Setting range D										
			CT rated primary current [/ct] × (0.5-0.63/0.8-1.0) (A)										
Rated current*1     C			App	lied [/ <sub>ct</sub> ] (A)	200	400	800	1250	1600	2000	2500	3200	4000
	,	Rated	[/ <sub>ст</sub> ] × 0.5	100	200	400	630	800	1000	1250	1600	2000	
	/n	current	[/ <sub>ст</sub> ] × 0.63	125	250	500	800	1000	1250	1600	2000	2500	
			[/ <sub>n</sub> ]	[/ <sub>CT</sub> ] × 0.8	160	320	630	1000	1250	1600	2000	2500	3200
			(A)	[/ <sub>ст</sub> ] × 1.0	200	400	800	1250	1600	2000	2500	3200	4000
(2)	Long time delay trip pickup current (continuous)	In	[/ <sub>n</sub> ] × (0.8-0	.85-0.9-0.95- <u>1.0</u> -NC	DN) (A)	K	G					_	K
$\cup$	Long time delay trip plottap ourient (continuouo)	'R	<ul> <li>Non trippir</li> </ul>	ng at not more than	[/ <sub>R</sub> ] x(1.0	5, Trippir	ig at more	e than [/ <sub>R</sub>	× 1.05 ;	and not r	nore tha	n [/ <sub>R</sub> ] 🔨	.2
(3)	N-phase protection trip pickup current	1	[/ <sub>ст</sub> ] × ( <u>0.4</u> -(	0.5-0.63-0.8-1.0): F	ixed to a	single po	int						
	(continuous)		<ul> <li>Non trippir</li> </ul>	ng at not more than	[/ <sub>N</sub> ] × 1.0	5, Trippir	ng at mor	e than [/	] x 1.05	and not	more that	an [/ <sub>R</sub> ] × '	1.2
(4)	Long time delay/N-phase protection trip timing	t <sub>R</sub>	Long time d	lelaý: (0.5-1.25-2.5-	5- <u>10</u> -15-2	0-25-30	) (sec) at	600% of	[/ <sub>R</sub> ], Tol	erance:	:15%, +0	).15s –0s	\$
(E)			N-phase pro	otection: (0.5-1.25-2	2.5-5- <u>10</u> -1	5-20-25-	-30) (sec)	at 600%	o of [/ <sub>N</sub> ],	Ioleranc	e: ±15%	, +0.15s	-0s
U U	Long time delay/in-phase protection trip mode	-	Howcold, selectable										
6	Short time delay trip pickup current	/ <sub>sd</sub>	[ <i>I</i> <sub>n</sub> ] × (1-1.5	[/ <sub>n</sub> ] × (1-1.5-2-2.5-3-4- <u>6</u> -8-10-NON)(A), Tolerance(±15%)									
~		t <sub>sd</sub>	Relaying tin	ne (ms.)		<u>→ 50</u> D	100	)	200	400		600	800
(7)	Short time delay trip timing		Resettable	time (ms.)		<u>&gt;(25)</u>	7	5	175	375		575	775
		1	Max. total c	learing time (ms.)		(120)	17(	)	270	470		670	870
8	Short time delay trip I <sup>2</sup> t mode	l <sup>2</sup> t t <sub>sd</sub>											
9	Instantaneous trip pickup current	/ <sub>i</sub>	[/ <sub>n</sub> ] × (2-4-6	-8-10-12-14- <u>16</u> -NO	N) (A), To	lerance:	±20%	< <u>'</u>					
(10)	INST/MCR		Selectable						R				
(11)	Ground fault trip pickup current *2	l <sub>g</sub>	[/ <sub>ст</sub> ] × (0.1-(	<u>0.2</u> -0.3-0.4-0.6-0.8-	1.0-NON)	(A), Tole	erance:(±	20%					
_		tg	Relaying tin	ne (ms.)	<mark></mark>	100	200	0	300	500	1	000	2000
(12)	Ground fault trip timing		Resettable	time (ms.)	-	75	17	5	275	475	1	975	1975
	<u> </u>		Max. total c	learing time (ms.)		(170)	270	)	370	570	1	070	2070
(13)	Ground fault trip I <sup>2</sup> t mode	$ ^{2}t t_{g}$	ON/OFF		U								
(14)	Pretrip alarm pickup current	I <sub>P1</sub>	$[l_n] \times (0.75-0.8-0.85-0.9-0.95-1.0)$ (A), Tolerance: $\pm 7.5\%$										
(15)	Pretrip alarm timing	t <sub>P1</sub>	(5-10-15-20-40-60-80- <u>120</u> -160-200) (sec) at not less than [ <i>I</i> <sub>P1</sub> ], Tolerance: ±15%, +0.1s -0										

Α

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<sub>k</sub>] x 1.05 < pickup current setting ≤ [I<sub>k</sub> × 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



\*₽ 20 - 2.02 (aprox.) 0.45 sec, Max.
 Clearing Time of the
 0.05s Short Time Band
 (I<sup>o</sup>2T ON) at 6 multiple 10 X<sub>2</sub>,Y<sub>2</sub> of the In 101% 0.05 sec, Min. Clearing Time of the 0.05s Short t su 0.6 0.4 Time Band (I^2T ON) ---at 6 multiple of the In 0 2 ÷. 'C' 0 1 0.06 0.64 0.02 0.01 "В 810.0 3 × 8 × 8 × 8 125 260 250 300 Rated current [In] × % Short time delay trip, instantaneous trip and pretrip alarm

ST Band Slope (I<sup>2</sup>T IN) =

log Y1 - log Y2

- log X1 - log X2

log 40.9 - log 6.6 log 1.7 - log 4.2

3

ΤC

ł. ħ٩

X1.Y1

40

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

t

$$= -27.94 t_{\rm R} \ln \left\{ 1 - \frac{(1.125 I_{\rm R})^2}{i^2} \right\} \pm 15\%_0^{+0.15} [\rm sec]$$

 $I_{\rm R}$  = Long time delay (or N-phase protection) trip pickup current setting i = Overcurrent $t_{\mathsf{R}}$  = 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 (aprox.) "B" (Short Time Band, Smoothing Radius Min.) = 0.030/0.025 = 1.2 (aprox.) "C" (Instantaneous Band, Smoothing Radius Max.) = 0.085/0.030 = 2.8 (aprox.)  $X_1, Y_1$ Radius X2,Y2 <u>"A", "B", "C"</u>