



Application Bulletin

000-1096 REV. C

1250B Programming Instructions for Non-Linear LTC Taps

I. Purpose:

- To instruct technicians in programming the model 1250B Programmable Position Monitor, for monitoring transformer load tap changers that have non-linear characteristics. These include LTC's with an inconsistent number of degrees between two or more taps, LTC's with an unequal number of taps above and below the neutral tap, and LTC's with more than one group of "wide" or multiple taps at locations other than neutral position (tap 0).

II. Scope:

- This procedure applies to models 1250B with firmware version 1.10 or higher. This procedure covers the programming needed to make the 1250B read proper LTC position when there is a non-linear relationship between the degrees of rotation of the synchro transmitter and the tap number.

III. Associated Documents or Data:

- 000-1077 1250 Installation & Programming Manual

There are two approaches to programming the 1250 for this application:

- 1.0 The easiest method is to let the 1250 "**LEARN**" each tap's position. This will usually render sufficient accuracy for LTC position indication. It requires that the LTC be moved to every tap.
- 2.0 The most accurate method involves carefully calculating the degree value of the midpoint between each tap and programming a non-linear conversion table that will "jump" the display to the next tap number at the mid point between each tap, in a **STAIR-STEP** fashion. This method requires that the LTC be moved through several taps.

“LEARN” Method, Procedure:

- 1.1 Cold Boot the monitor:
 - 1.1.1 Press and hold the ZERO key while turning on the power to the 1250. The display should read “FA-3” for a few seconds. This action deletes all previous programming and restores the monitor to factory default parameters. The display should read “OP 0”.
- 1.2 Press the UP key to scroll to “OP 2”. Press the SELECT / ENTER key and change the program value to “2”. Press the SELECT / ENTER key.
- 1.3 Scroll up to “OP 4” and press the SELECT / ENTER key. Change the program value to “5” and press the SELECT / ENTER key.
- 1.4 Scroll up to “OP 5” and press the SELECT / ENTER key. Change the program value to the lowest tap position number (use negative numbers for lowered tap values) and press the SELECT / ENTER key.
- 1.5 Scroll up to “OP 6” and press the SELECT / ENTER key. Change the program value to the highest tap position number and press the SELECT / ENTER key.
- 1.6 Scroll up to “OP 17” and press the SELECT / ENTER key. Change the program value to the present tap number and press the SELECT / ENTER key. Scroll up to “OP 18” and Press the SELECT/ENTER key. The display should read “LD”. Press the SELECT / ENTER key. The display should go blank for a few seconds as the present tap position is memorized. Scroll up to “OP 64”.
- 1.7 Press the SELECT / ENTER key. The display will read “0.0000” with the first zero blinking. Change this value to the present tap number (use positive numbers for raised taps, negative numbers for lowered taps.) and press the SELECT / ENTER key. The display should go blank for a few seconds as the present tap position is memorized.
- 1.8 Move the LTC to another tap position and repeat step 1.7. Repeat this step until every tap position has been “LEARNED”.
- 1.9 Scroll down to “OP 0” and press the SELECT / ENTER key. The display will read “run”. Press the SELECT / ENTER key. The display should show the correct tap position. Move the LTC to other positions. The 1250 should display the correct tap position.

“STAIR-STEP” Method, Procedure:

- 2.1 Cold Boot the monitor:
- 2.1.1 Press and hold the MENU key while turning on the power to the 1250. The display should read “**FA-3**” for a few seconds. This action deletes all previous programming and restores the monitor to factory default parameters. The display should read “OP 0”.
- 2.2 Press the UP key to scroll to “OP 2”. Press the SELECT / ENTER key and change the program value to “1”. Press the SELECT / ENTER key.
- 2.3 Scroll up to “OP 4” and press the SELECT / ENTER key. Change the program value to “5” and press the SELECT / ENTER key.
- 2.4 Scroll up to “OP 5” and press the SELECT / ENTER key. Change the program value to the lowest tap position number (use negative numbers for lowered tap values) and press the SELECT / ENTER key.
- 2.5 Scroll up to “OP 6” and press the SELECT / ENTER key. Change the program value to the highest tap position number and press the SELECT / ENTER key.
- 2.6 Scroll up to “OP 17” and press the SELECT / ENTER key. Change the program value to “**0.0000, POS**” and press the SELECT / ENTER key. Scroll up to “OP 18” and Press the SELECT/ENTER key. The display should read “LD”. Press the SELECT / ENTER key. The display should go blank for a few seconds as the present tap position is memorized.
- 2.7 Scroll down to “OP 0” and press the SELECT / ENTER key. The display will read “run”. Press the SELECT / ENTER key. The display should show “0.00”.
- 2.8 **Create a table** with three columns on a sheet of paper.
 - 2.8.1 In the right column write each LTC tap number **twice** (see example below).
 - 2.8.2 In the center “Measured:” column, next to each tap number, write the value displayed on the 1250 for each tap position. Move the LTC to as many tap positions as possible and fill in these values as you can.
 - 2.8.3 For cases where the LTC cannot be moved to every tap, you must calculate the **average degrees per tap** by subtracting one measured value from the next. Average several measurements if you can. Fill in the remaining “Measured:” values by adding the average degrees per tap to the last measured values until the column is filled.
 - 2.8.4 In the left column, next to the first of each tap degree value; write the degree value of the **mid-point between that and the next lower tap, plus 0.01** (see example below).
 - 2.8.5 In the left column, next to the second of each tap degree value; write the degree value of the **mid-point between that and the next higher tap, minus 0.01** (see example below).

Application Bulletin

000-1096C

Program:	Measured:	Tap No.
-176.00	-160.00	-16
-164.01	-160.00	-16
-163.99	-150.00	-15
-155.01	-150.00	-15
-154.99	-140.00	-14
-145.01	-140.00	-14
-144.99	-130.00	-13
-134.01	-130.00	-13
-133.99	-128.00	-12
-123.01	-128.00	-12
-122.99	-118.00	-11
-112.01	-118.00	-11
-111.99	-106.00	-10
-100.01	-106.00	-10
-99.990	-94.00	-9
-89.010	-94.00	-9
-88.990	-84.00	-8
-79.010	-84.00	-8
-78.990	-74.00	-7
-67.510	-74.00	-7
-67.490	-63.00	-6
-58.010	-63.00	-6
-57.990	-53.00	-5
-48.510	-53.00	-5
-48.490	-44.00	-4
-40.010	-44.00	-4
-39.990	-36.00	-3
-31.510	-36.00	-3
-31.490	-27.00	-2
-23.510	-27.00	-2
-23.490	-20.00	-1
-10.010	-20.00	-1
-9.9900	0.00	0

Program:	Measured:	Tap No.
9.9900	0.00	0
10.010	20.00	1
24.990	20.00	1
25.010	30.00	2
33.990	30.00	2
34.010	38.00	3
43.990	38.00	3
44.010	46.00	4
49.990	46.00	4
50.010	54.00	5
58.990	54.00	5
59.010	64.00	6
69.990	64.00	6
70.010	76.00	7
80.990	76.00	7
81.010	86.00	8
91.990	86.00	8
92.010	98.00	9
103.99	98.00	9
104.01	110.00	10
114.99	110.00	10
115.01	120.00	11
124.99	120.00	11
125.01	130.00	12
133.99	130.00	12
134.01	138.00	13
141.99	138.00	13
142.01	146.00	14
149.99	146.00	14
150.01	154.00	15
158.99	154.00	15
159.01	164.00	16
170.00	164.00	16

- 2.9 Press and hold the MENU key until the display goes blank and press the SELECT / ENTER key. The display should read “run”. Scroll up to “OP 2”, change the program value to “2” and press the SELECT / ENTER key. Scroll up to “OP 60”.
- 2.10 Press the SELECT / ENTER key. The display will read “0.0000” with the first zero blinking. Notice that the LED is lit over the UP key. This indicates that the value being entered is the “degrees value”.
- 2.11 Change this value to the first entry in the “Program:” column in the table. Press the DOWN key for negative numbers and the UP key for positive numbers, locate the decimal point properly, and press the SET key.
- 2.12 The display will read “0.0000” with the first zero blinking. Notice that the LED is lit over the DOWN key. This indicates that the value being entered is the “tap number”.
- 2.13 Change this value to the first entry in the “Tap No.” column in the table. Press the DOWN key for negative numbers and the UP key for positive numbers, locate the decimal point properly, and press the SET key. The display should read “OP 60”.
- 2.14 Repeat steps 2.10 through 2.13 for each line of data in the table. If an error is made in entering data it can be corrected by selecting “OP 62” (See 1250 Manual page 9). Scroll through the entered data and select the erroneous entry. Correct the data using the same method as entering new data.
- 2.15 When all data from the table is entered, scroll down to “OP 0”. Press the SELECT / ENTER key. The display will read “run”. Press the SELECT / ENTER key. The display should show the correct tap position. Move the LTC to other positions. The 1250 should display the correct tap position.