

Setting Pointers and Changing Timing

This section describes how to generate pointer movements within the transmitted SDH signal. When stress testing a network, you may want to move pointers or introduce a frequency offset. The CTS850 SDH/PDH Test Set allows you to control this type of testing five ways. You can:

- H Make discrete pointer movements under manual control
- H Make repetitive pointer movements at a rate you determine
- H Generate sequences of pointer movements
- H Introduce a frequency offset in the internally generated AU
- H Introduce a frequency offset in the transmit rate

Setting Pointers

To set up the CTS850 to make discrete or repetitive pointer movements:

1. Specify the pointer mode as follows:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|-------------------|-----------------------|------------------|
| TRANSMIT | POINTERS & TIMING | Pointer / Timing Mode | Pointer Movement |

The choices allow you to choose to move pointers using time parameters or with a frequency offset. Selecting Pointer Movements moves pointers utilizing time parameters.

2. Specify the pointer type as follows:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|-------------------|---------------------|---------------|
| TRANSMIT | POINTERS & TIMING | Pointer Type | AU Pointer |
| | | | TU Pointer |

Manual Pointer Control

You can move pointers under manual control using the POINTER ACTION button on the front panel. To set up for this type of control, use the knob to highlight the **Pointer Control** line.

There are three types of manual pointer movements: Single, Burst, and Continuous (see Figure 3 75). The choices are described in detail below; some require additional setup.

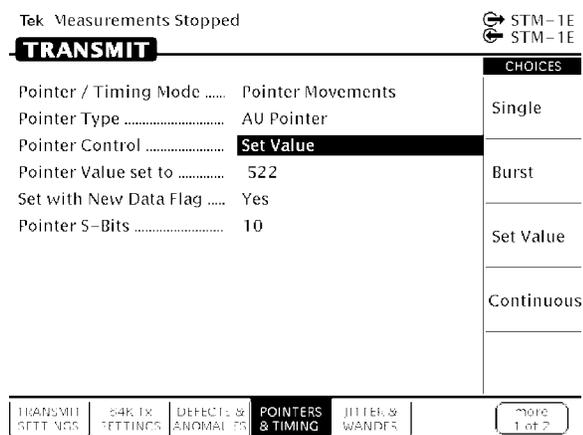


Figure 3 75: Manual Pointer Control Choices

Single Pointer Movements. With Single selected, each press of the POINTER ACTION button on the front panel of the test set moves the pointer up or down by one location. The first press increments the pointer, the second press decrements it, the third press increments it, and so forth.

Burst Pointer Movements. With Burst selected, pressing the front-panel POINTER ACTION button starts a burst of pointer movements. Each burst consists of a series of one-location pointer movements that are spaced four frames apart. Pressing the POINTER ACTION button repeatedly alternates between an incrementing burst and a decrementing burst (see Figure 3 76).

To set the number of pointer movements in the burst:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|------------------|---------------------|---------------|
| | | Pointer Control | Burst |
| | | Burst Size | 2 |
| | | | 3 |
| | | | 4 |
| | | | 5 |
| | | | 6 |
| | | | 7 |
| | | | 8 |

To start a burst of pointer movements, press the **POINTER ACTION** button on the front panel of the test set.

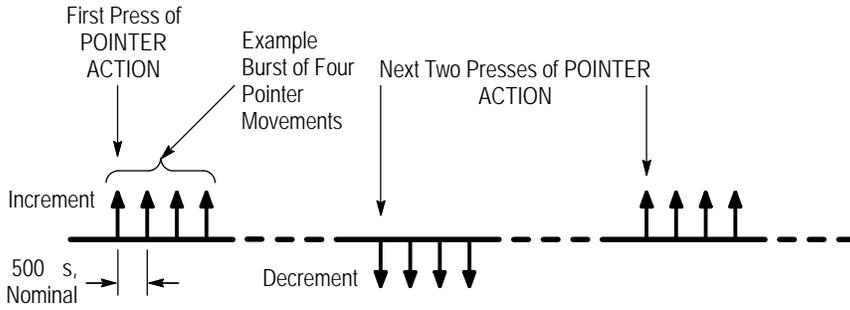


Figure 3 76: Alternating Burst Pointer Movement

Setting Pointer to a Specific Value. With Set to Value selected, you can move the pointer immediately to a new location, with or without a new data flag being set. Payload data can be lost when you use jump pointer movements of this type.

To set the new pointer value for an AU **pointer**:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|------------------|----------------------|-------------------|
| | | Pointer Control | Set Value |
| | | Pointer Value Set to | Min 0 |
| | | | Max 782 |
| | | | Default 522 |
| | | | Illegal (Max + 1) |
| | | | USER DEFINED |

H Select **Min 0** to set the pointer to location zero (points to the byte immediately following the H3 transport overhead byte). If you choose this setting, the pointer is moved immediately; you do not need to press POINTER ACTION.

- H Select **Max 782** to set the pointer to location 782 (points to the byte immediately preceding the H1 transport overhead byte of the next frame). If you choose this setting, the pointer is moved immediately; you do not need to press POINTER ACTION.
- H Select **Default 522** to set the pointer to location 522 (points to the first payload byte in the next frame). If you choose this setting, the pointer is moved immediately; you do not need to press POINTER ACTION.
- H Select **Illegal (Max+1)** to move the pointer to illegal location 783 (the maximum allowed location + 1). Choosing the illegal pointer location may cause a loss-of-pointer failure. If you choose this setting, the pointer is moved immediately; you do not need to press POINTER ACTION.
- H Select **USER DEFINED** to set the pointer to a value different from the preset choices.

Selecting USER DEFINED places the CTS850 into Edit Mode.

- H Select **DONE** when you are finished setting the pointer value.
As soon as you press DONE, the pointer is moved; you do not need to press POINTER ACTION.

To set the new pointer value for a **TU pointer**:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|------------------|----------------------|-------------------|
| | | Pointer Control | Set Value |
| | | Pointer Value Set to | Min 0 |
| | | | Max 139 |
| | | | Default 0 |
| | | | Illegal (Max + 1) |
| | | | USER DEFINED |

- H Select **Min 0** to set the pointer to location zero. If you choose this setting, the pointer is moved immediately; you do not need to press POINTER ACTION.
 - H Select **Max 139** to set the pointer to location 139. If you choose this setting, the pointer is moved immediately; you do not need to press POINTER ACTION.
 - H Select **Default 0** to set the pointer to location 0. If you choose this setting, the pointer is moved immediately; you do not need to press POINTER ACTION.
 - H Select **Illegal (Max+1)** to move the pointer to illegal location 140 (the maximum allowed location + 1). Choosing the illegal pointer location may cause a loss-of-pointer failure. If you choose this setting, the pointer is moved immediately; you do not need to press POINTER ACTION.
3. Specify whether a New Data Flag is set with the pointer movement as follows:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|------------------|------------------------|---------------|
| | | Set with New Data Flag | Yes |
| | | | No |

4. Set the Pointer ss-Bits as follows:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|------------------|---------------------|---------------|
| | | Pointer ss Bits | 00 |
| | | | 01 |
| | | | 10 |
| | | | 11 |

Continuous Pointer Movement

To make repetitive pointer movements:

1. Specify the type of pointer control and movement rate as follows:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|------------------|---------------------|---------------|
| | | Pointer Control | Continuous |
| | | Pointer Rate | Max 2ms |
| | | | Min 10000ms |
| | | | Default 50ms |
| | | | USER DEFINED |

- H Select **Max 2ms** to move the pointer one location every sixteen frames.
 - H Select **Min 10000ms** to move the pointer location one location every 10 seconds.
 - H Select **Default 50ms** to move the pointer one location every 50 ms.
 - H Select **USER DEFINED** to set continuous pointer movement at a rate different from the preset choices.
2. Select **USER DEFINED** to set the pointer movement to a value different from the preset choices.

Selecting **USER DEFINED** places the CTS850 into Edit Mode. Now you can set the rate to the exact value you want, with 1 ms resolution. The maximum rate is 1 ms. The minimum rate is 10000 ms.

3. Specify the pointer movement direction as follows:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|------------------|---------------------|---------------|
| | | Pointer Direction | Increment |
| | | | Decrement |
| | | | Alternate |

- H Selecting **Increment** causes the pointer to increment at the set rate.
- H Selecting **Decrement** causes the pointer to decrement at the set rate.
- H Selecting **Alternate** causes pointer movements at the set rate, but they alternate in incrementing and decrementing directions.

When using continuous pointer movement, a message line in the display tells you the equivalent payload frequency offset in parts per million if the pointer direction is set to either increment or decrement (see Figure 3 77).

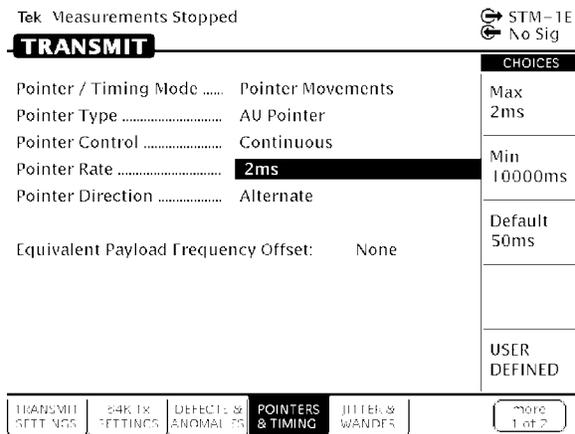


Figure 3 77: Incrementing Pointer Location Once Every Two Milliseconds

Changing Timing

As an alternative to setting pointer movements directly, you can introduce a frequency offset in the internally-generated AU, the transmit line rate, or both together.

To generate pointer movements using frequency offset:

1. Specify the pointer/timing mode as follows:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|-------------------|-----------------------|------------------|
| TRANSMIT | POINTERS & TIMING | Pointer / Timing Mode | Frequency Offset |

2. Specify the Offset Mode as follows:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|------------------|---------------------|-----------------------|
| | | Offset Mode | Line |
| | | | Payload (AU Pointers) |
| | | | Tributary (Mapping) |

H Select **Line** to change the transmit line rate. With this setting, the AU location (pointer) does not move relative to the transmitted frame.

H Select **Payload** to change the offset of the payload.

H Select **Tributary** to change the clock tributary offset.

3. Specify the frequency offset as follows:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|------------------|---------------------|----------------|
| | | Frequency Offset | Max +100ppm |
| | | | Stress +4.6ppm |
| | | | Stress 4.6ppm |
| | | | Default 0ppm |
| | | | USER DEFINED |

H Select **Max +100ppm** to set the frequency offset to the maximum available amount.

H Select **Stress +4.6ppm** to set the frequency offset at the upper SDH Equipment Clock (SEC) limit.

H Select **Stress 4.6ppm** to set the frequency offset at the lower SDH Equipment Clock (SEC) limit.

- H Select **Default Oppm** to turn off frequency offset.
- H Select **USER DEFINED** to set a frequency offset different from the preset choices.

Selecting USER DEFINED places the CTS850 in Edit Mode. The knob is assigned to change the value of the frequency offset.

- H Coarse changes the frequency offset by 10.0 ppm.
- H Fine changes the frequency offset by 0.1 ppm.

The frequency offset can be changed by ± 100.0 ppm.

- H Select **DONE** to enter the frequency offset when you are finished setting it.

When using a frequency offset, a message line in the display tells you the equivalent pointer movement rate. Figure 3 78 shows an example of frequency offset and the resulting message.

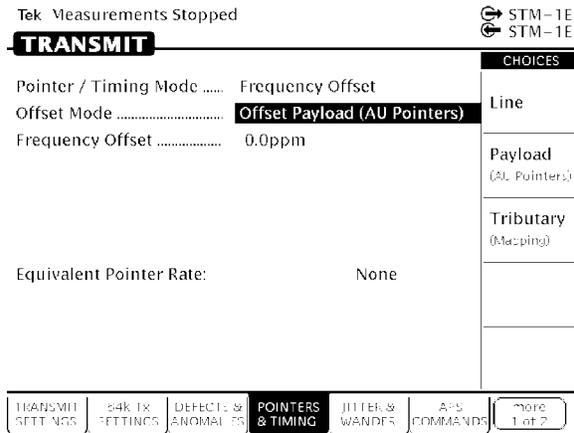


Figure 3 78: Offsetting the Payload

Generating Pointer Sequences

In addition to the simpler pointer movements previously described, the CTS850 can generate pointer sequences (sequences of pointer movements). Pointer sequences are made up of three periods: the Initialization Period, the Cool Down Period, and the Sequence Period (see Figure 3 79).

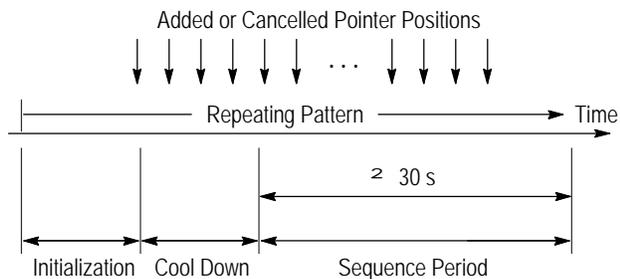


Figure 3 79: The Three Periods of a Pointer Sequence

- H Initialization Period a thirty second period where the CTS850 produces a 30 second burst of 1 pointer movement per second in the same direction as the specified pointer sequence. The Initialization time can be turned on or off.
- H Cool Down Period a period at least 60 seconds long, following the Initialization Period. Pointer activity can occur during this period. The Cool Down time can be turned on or off.
- H Sequence Period the period following the Cool Down period where the specified pointer sequence runs continuously.

The CTS850 generates the pointer sequences described in the revised ITU-T G.783 standard. An example of a pointer sequence is shown in Figure 3 80. The details of these sequences are shown in Table 3 27. Note that not all pointer sequences are available all the time. Some sequences are available only with one pointer type or with a specific mapping, as shown in Table 3 28 on page 3 211.

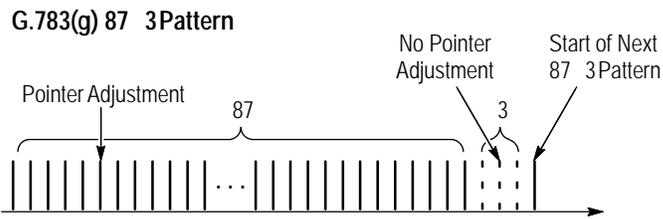


Figure 3 80: An Example of a Pointer Sequence

Table 3 27: Pointer Sequences Generated (as specified by G.783)

| Pointer Sequence | Description |
|------------------------|--|
| (a) Single Alternating | Alternating single pointer movement. The time between pointer movements is 30 s. |
| (b) Regular + Double | <p>Time between added pointer movement and previous normal pointer movement for AU-4 and TU-3 pointers is 0.5 ms and for TU-12 pointers is 2 ms. Time between normal pointer movements is as follows:</p> <p>D AU-4 and TU-3 pointers have a range of 34 ms to 10 s with a resolution of 1 ms.</p> <p>D TU-12 pointer movements has a range of 760 ms to 10 s with a resolution of 1 ms.</p> <p>Time between added pointers is equal to: (the time between pointer movements $\div N$) where N is selected to be the smallest integer that makes the product ≈ 30 s.</p> |
| (c) Regular + Missing | <p>Time between AU pointers has a range of 34 ms to 10 s with a resolution of 1 ms.</p> <p>Time between missing pointers is equal to: (time between pointer movements $\div N$), where N is selected to be the smallest integer that makes the product ≈ 30 s.</p> |
| (d) Double Alternating | Alternating double pointer movement. The time between the double pointer movements is 2 ms, and the time between each pair of pointer movements is 30 s. |
| (e) Single | Time between pointer adjustments is 30 s. |

Table 3 27: Pointer Sequences Generated (as specified by G.783) (Cont.)

| Pointer Sequence | Description |
|-------------------------------------|--|
| (f) Burst | <p>Time between bursts of 3 pointers for AU pointers is 0.5 ms and for TU pointers is 2 ms.</p> <p>Time between pointer bursts is 30 s.</p> |
| (g) Periodic 87 3 | <p>Sequence pattern is 87 pointer movements followed by 3 missing pointer movements.</p> <p>Time between AU pointer movements has a range of 0.34 s to 10 s with a resolution of 1 ms.</p> |
| (g) Periodic 87 3With Cancel | <p>Sequence pattern is 87 pointer movements followed by 3 missing pointer movements with a cancelled pointer movement at the 87th pointer.</p> <p>Time between AU pointer movements has a range of 0.34 s to 10 s with a resolution of 1 ms.</p> <p>Time between cancelled pointers is equal to: (time between pointers ϕ 90 ϕ N) where N is selected to be the smallest integer that makes this product \approx 30 s.</p> |
| (g) Periodic 87 3With Add | <p>Sequence pattern is 87 pointer movements followed by 3 missing pointer movements with an added pointer movement after the 43rd pointer.</p> <p>Time between AU pointer movements has a range of 34 ms to 10 s with a resolution of 1 ms; time between added pointer movement and previous normal pointer movement for AU pointers is 0.5 ms.</p> <p>Time between added pointers is equal to: (time between pointers ϕ 90 ϕ N) where N is selected to be the smallest integer that makes this product \approx 30 s.</p> |
| (h) Periodic Continuous | <p>Time between AU pointers has a range of 34 ms to 10 s with a resolution of 1 ms.</p> |
| (h) Periodic Continuous with Cancel | <p>Time between AU pointers has a range of 34 ms to 10 s with a resolution of 1 ms.</p> <p>Time between cancelled pointers is equal to: (time between pointer movements ϕ N), where N is selected to be the smallest integer that makes the product \approx 30 s.</p> |

Table 3 27: Pointer Sequences Generated (as specified by G.783) (Cont.)

| Pointer Sequence | Description |
|--------------------------------|---|
| (h) Periodic with Add | <p>Time between added pointer movement and previous normal pointer movement for AU-4 and TU-3 pointers is 0.5 ms and for TU-12 pointers is 2 ms. Time between normal pointer movements is as follows:</p> <p>D AU-4 and TU-3 pointers have a range of 34 ms to 10 s with a resolution of 1 ms.</p> <p>D TU-12 pointer movements has a range of 760 ms to 10 s with a resolution of 1 ms.</p> <p>Time between added pointers is equal to: (the time between pointer movements $\div N$) where N is selected to be the smallest integer that makes the product ≥ 30 s.</p> |
| Phase Transient Pointer | <p>Time between pointer movement burst of seven pointers is 0.25 s, 0.25 s, 0.5 s, 0.5 s, 0.5 s, 0.5 s.</p> <p>Time between pointer bursts is 30 s.</p> |
| TU-3 Periodic 85 5 | <p>Sequence pattern is 85 pointer movements followed by 5 missing pointer movements.</p> <p>Time between pointer movements has a range of 34 ms to 10 s with a resolution of 1 ms.</p> |
| TU-3 Periodic 85 5 With Cancel | <p>Sequence pattern is 85 pointer movements followed by 5 missing pointer movements with a cancelled pointer movement at the 85th pointer, yielding a gap of 6.</p> <p>Time between pointer movements has a range of 34 ms to 10 s with a resolution of 1 ms.</p> <p>Time between cancelled pointers is equal to: (time between pointers $\div 90 \div N$) where N is selected to be the smallest integer that makes this product ≥ 30 s.</p> |

Table 3 27: Pointer Sequences Generated (as specified by G.783) (Cont.)

| Pointer Sequence | Description |
|--------------------------------------|---|
| TU-3 Periodic 85 5With Add | <p>Sequence pattern is 85 pointer movements followed by 5 missing pointer movements with an added pointer movement after the 43rd pointer.</p> <p>Time between AU pointer movements has a range of 34 ms to 10 s with a resolution of 1 ms; time between added pointer movement and previous normal pointer movement for AU pointers is 0.5 ms</p> <p>Time between added pointers is equal to: (time between pointers ϕ 90 ϕ N) where N is selected to be the smallest integer that makes this product \approx 30 s.</p> |
| TU-12 Periodic 35 1 | <p>Sequence pattern is 35 pointer movements followed by 1 missing pointer movement.</p> <p>Time between pointer movements has a range of 760 ms to 10 s with a resolution of 1 ms.</p> |
| TU-12 Periodic 35 1With Cancel | <p>Sequence pattern is 35 pointer movements followed by 1 missing pointer movement with a cancelled pointer movement at the 35th pointer, yielding a gap of 2.</p> <p>Time between pointer movements has a range of 760 ms to 10 s with a resolution of 1 ms.</p> <p>Time between cancelled pointers is equal to: (time between pointers ϕ 36 ϕ N) where N is selected to be the smallest integer that makes this product \approx 30 s.</p> |
| TU-12 Periodic 35 1With Add | <p>Sequence pattern is 35 pointer movements followed by 1 missing pointer movement with an added pointer movement after the 17th pointer.</p> <p>Time between normal pointer movements has a range of 760 ms to 10 s with a resolution of 1 ms; time between added pointer movement and previous normal pointer movement is 2 ms.</p> <p>Time between added pointers is equal to: (time between pointers ϕ 36 ϕ N) where N is selected to be the smallest integer that makes this product \approx 30 s.</p> |

Table 3 28: Availability of Pointer Sequences

| Pointer Sequence | Mapping | | |
|-------------------------------------|---------|------|-------|
| | AU | TU-3 | TU-12 |
| (a) Single Alternating | ✓ | ✓ | ✓ |
| (d) Double Alternating | ✓ | ✓ | ✓ |
| (e) Single | ✓ | ✓ | ✓ |
| (f) Burst | ✓ | ✓ | ✓ |
| (g) Periodic 87 3 | ✓ | | |
| (g) Periodic 87 3With Cancel | ✓ | | |
| (g) Periodic 87 3With Add | ✓ | | |
| (h) Periodic Continuous | ✓ | ✓ | ✓ |
| (h) Periodic Continuous with Cancel | ✓ | ✓ | ✓ |
| (h) Periodic with Add | ✓ | ✓ | ✓ |
| Phase Transient Pointer | ✓ | ✓ | ✓ |
| TU-3 Periodic 85 5 | | ✓ | |
| TU-3 Periodic 85 5With Cancel | | ✓ | |
| TU-3 Periodic 85 5With Add | | ✓ | |
| TU-12 Periodic 35 1 | | | ✓ |
| TU-12 Periodic 35 1With Cancel | | | ✓ |
| TU-12 Periodic 35 1With Add | | | ✓ |

Starting Pointer Sequences

To set up the CTS850 to make generate pointer sequences:

1. Specify the pointer mode as follows:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|-------------------|-----------------------|-------------------|
| TRANSMIT | POINTERS & TIMING | Pointer / Timing Mode | Pointer Sequences |

The choices allow you to move pointers using time parameters, with a frequency offset, or in sequences. Selecting Pointer Sequences moves pointers in sequential patterns.

2. Specify the pointer type as follows:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|------------------|---------------------|---------------|
| | | Pointer Type | AU Pointer |
| | | | TU Pointer |

3. Specify the Sequence Type as follows:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|------------------|---------------------|-----------------------|
| | | Sequence Type | <i>as appropriate</i> |

NOTE. The pointer sequences available depend on the selected Pointer Type.

4. If Sequence Type is set to anything other than Single or Double Alternating, set the pointer direction as follows:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|------------------|---------------------|---------------|
| | | Pointer Direction | Increment |
| | | | Decrement |

5. If Sequence Type is set to one of the continuous patterns, set the pointer rate as follows:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|------------------|---------------------|---------------|
| | | Pointer Rate | 1000ms |
| | | | 2000ms |
| | | | 5000ms |
| | | | 10000ms |
| | | | USER DEFINED |

H Select **USER DEFINED** to set a pointer rate different from the preset choices.

6. Specify whether Initialization Time is included as part of the pointer sequence as follows. If performing conformance testing,

set Initialization Time to ON. If testing in a laboratory and quicker results are sought, set Initialization Time to OFF.

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|------------------|---------------------|---------------|
| | | Initialization Time | On |
| | | | Off |

NOTE. The Initialization Time is a set value (either 0 seconds or 30 seconds); it cannot be changed directly.

7. Specify whether Cool Down Time is included as part of the pointer sequence as follows:

| Press Menu Button | Select Menu Page | Highlight Parameter | Select Choice |
|-------------------|------------------|---------------------|---------------|
| | | Cool Down Time | On |
| | | | Off |

NOTE. The Cool Down Time is a calculated value based on the sequence type; it cannot be changed directly.

8. To initiate a pointer sequence, press **POINTER ACTION**.

Pointer sequences will continue to run until they are stopped.

9. To stop a pointer sequence, press **POINTER ACTION**.

After you press POINTER ACTION, the pointer sequence begins. The status area at the bottom of the display will change to indicate where the CTS850 is within the pointer sequence; see Figure 3 81. Table 3 29 describes the meaning of the lines in the status display.

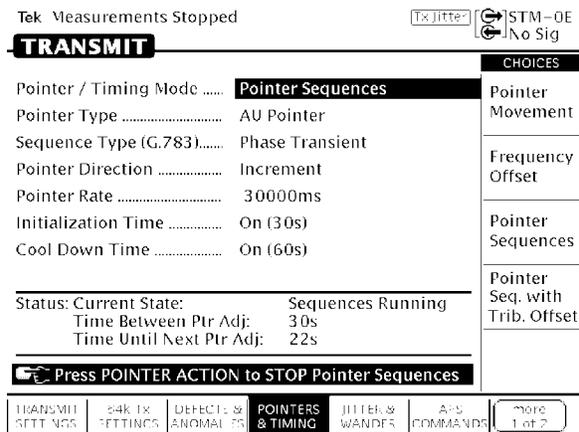


Figure 3 81: Status Display While Pointer Sequences are Running

Table 3 29: Status Lines for Pointer Sequences

| Status Line | Description |
|--------------------------------------|--|
| Current State | Indicates the state of Pointer Sequences: Not Running, Initialization State, Cool Down, or Sequences Running |
| Time Between Anomalies ¹ | Indicates the time between pointer anomalies |
| Time Until Next Anomaly ¹ | Indicates the time remaining until the next anomaly occurs |
| Time Between Ptr Adj ¹ | Indicates the time between pointer adjustments |
| Time Until Next Ptr Adj ¹ | Indicates the time remaining until the next pointer adjustment occurs |

¹ This information is displayed depending on sequence type. Not all information is displayed. When this information is displayed, Time Between Anomalies is displayed with Time Until Next Anomaly, and Time Between Ptr Adj is displayed with Time Until Next Ptr Adj.

Starting Pointer Sequences with Tributary Offset

This choice is identical to the **Pointer Sequences** choice, with the exception that it selects clock tributary offset and adds a menu item to set that offset. The transmit rate must be SDH, and the SDH structure must be TU-3 or TU-12 in order to access these menu choices.

When the selected mode for Pointers/ Timing is **Frequency Offset**, the selector for Offset Mode has a third selection, Tributary (Mapping). This choice selects tributary offset.

This clock mode uses a different assignment of clock resources to system clocks. Disruptions in the output signal may occur when switching to or from this offset mode.

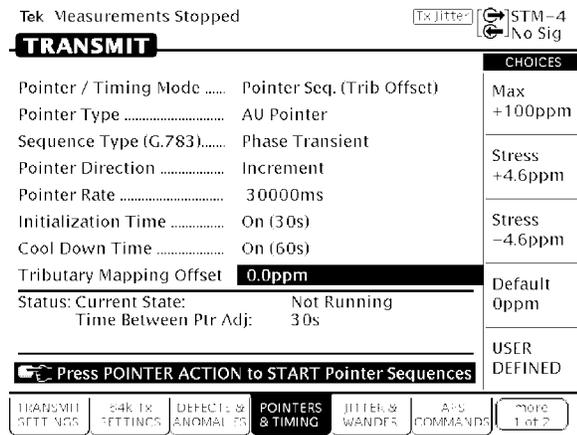


Figure 3 82: Example of Pointer Sequences (Tributary Offset)