

## USING THE US VTP-99 VERTICAL TRANSIT RATE PACER



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### **FEDERAL INTERAGENCY SEDIMENTATION PROJECT**

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## Instructions

The US VTP-99 transit rate pacer is a commercially manufactured electronic programmable metronome. It provides an audible time-interval reference for pacing the lowering and raising of a suspended-sediment sampler when collecting depth-integrated samples. The audible signal eliminates the use of a stopwatch. The uniformity of the vertical speed of a sampler directly affects the accuracy of depth-integrated samples. The pacer makes uniform vertical rates possible and therefore helps to ensure an accurate flow-weighted sample. Any operator may reproduce a given vertical rate at any time and at any location. Reproducibility is particularly important when collecting samples using the ETR (equal-transit-rate) method. The pacer may be used with hand-held samplers as well as mechanically hoisted samplers. The small size permits carrying the device in a shirt pocket. The tone is audible for several feet so that in a quiet environment a headphone is not required. The US VTP-99 has a miniature phone type monaural headphone jack. Headphones are not supplied.

To use the pacer, first select an appropriate vertical transit rate, the speed that the sampler is raised or lowered. The selected vertical rate should be less than four tenths the mean velocity in the vertical (see p. 44-45, Report 14, "Determination of fluvial sediment discharge", 1963:

Federal Interagency Sedimentation Project: or p. 33, "Techniques of Water-Resources Investigations of the U.S. Geological Survey, Field methods for measurement of fluvial sediment", bk. 3. C2). Next refer to the table for the type reel being used. If using a wading rod suspended sampler, the "A" reel chart should be used. Select the "beeps per min" setting for the selected vertical transit rate. To program the pacer, first press the "POWER" button (1). Next press the up or down "MODE" button (2) to select "TEMPO" on the upper left side of the display. "TEMPO" is the number of beeps per minute the pacer will produce. Set the "TEMPO" (A) to the "beeps per min" setting that corresponds to the selected transit rate. This setting is made by pressing the up or down "VALUE" button (3) until the appropriate number appears in the display. Next press the up or down "MODE" button (2) to select "BEAT" on the upper left side of the display. Adjustments can be made quickly by holding down both "value" buttons. If the rate is to be increased, press and hold the top button then press and hold the bottom button. If the rate is to be slowed, press and hold the bottom button then follow this by pressing and holding the top button.



If the selected transit rate is in the column labeled "Four Beeps Per Revolution" the display for the "BEAT" (B) setting should be 4. If the selected transit rate is in a column labeled "One Beep Per Revolution" the display for the "BEAT" (B) setting should be 1. To change the "BEAT"

setting press the up or down “VALUE” button (3). Once these settings have been completed, the pacer is ready to use. Press the “START/STOP” button (4) and begin cranking the reel at a speed that synchronizes each revolution to the beeps from the pacer. For transit rates listed in the column labeled “Four Beeps Per Revolution” there will be four beeps per revolution of the reel (one beep for every quarter revolution of the reel). The “high tone” beep signals the time when the reel should have revolved one complete revolution. For transit rates listed in the columns labeled “One Beep per Minute” the reel should be cranked at rate to produce a single revolution per beep of the pacer.

For reels with a different drum circumference than listed in the tables, the operator can calculate the “beeps per min” setting for specific transit rates. The formula to calculate the setting is  $N=60T/C$  where  $N$  = “beeps per min”,  $T$  = “transit rate in ft/min”, and  $C$  = “drum circumference in feet”. For transit rates lower than 1.2 ft/sec the formula is  $N=240T/C$ . This will provide four beeps per revolution of the reel.

For a powered reel the tone should be synchronized with a mark on the reel. For a hand- or rod-suspended sampler, use the one-foot mark on the rod. The water surface provides a convenient reference point.

There is no servicing or adjustment to the pacer other than battery replacement. The pacer uses a CR2032 Lithium Battery. No modifications or repairs are recommended. The unit is not weather proof and should be protected from moisture, and extreme heat and cold.

**Questions and comments regarding operation the US VTP-99 should be addressed to:**

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| Four Beeps per Revolution |               | One Beep per Revolution |               |                        |               |
|---------------------------|---------------|-------------------------|---------------|------------------------|---------------|
| transit rate in ft/sec    | beeps per min | transit rate in ft/sec  | beeps per min | transit rate in ft/sec | beeps per min |
| 0.15                      | 36            | 1.00                    | 60            | 2.60                   | 156           |
| 0.20                      | 48            | 1.05                    | 63            | 2.65                   | 159           |
| 0.25                      | 60            | 1.10                    | 66            | 2.70                   | 162           |
| 0.30                      | 72            | 1.15                    | 69            | 2.75                   | 165           |
| 0.35                      | 84            | 1.20                    | 72            | 2.80                   | 168           |
| 0.40                      | 96            | 1.25                    | 75            | 2.85                   | 171           |
| 0.45                      | 108           | 1.30                    | 78            | 2.90                   | 174           |
| 0.50                      | 120           | 1.35                    | 81            | 2.95                   | 177           |
| 0.55                      | 132           | 1.40                    | 84            | 3.00                   | 180           |
| 0.60                      | 144           | 1.45                    | 87            | 3.05                   | 183           |
| 0.65                      | 156           | 1.50                    | 90            | 3.10                   | 186           |
| 0.70                      | 168           | 1.55                    | 93            | 3.15                   | 189           |
| 0.75                      | 180           | 1.60                    | 96            | 3.20                   | 192           |
| 0.80                      | 192           | 1.65                    | 99            | 3.25                   | 195           |
| 0.85                      | 204           | 1.70                    | 102           | 3.30                   | 198           |
| 0.90                      | 216           | 1.75                    | 105           | 3.35                   | 201           |
| 0.95                      | 228           | 1.80                    | 108           | 3.40                   | 204           |
| 1.00                      | 240           | 1.85                    | 111           | 3.45                   | 207           |
|                           |               | 1.90                    | 114           | 3.50                   | 210           |
|                           |               | 1.95                    | 117           | 3.55                   | 213           |
|                           |               | 2.00                    | 120           | 3.60                   | 216           |
|                           |               | 2.05                    | 123           | 3.65                   | 219           |
|                           |               | 2.10                    | 126           | 3.70                   | 222           |
|                           |               | 2.15                    | 129           | 3.75                   | 225           |
|                           |               | 2.20                    | 132           | 3.80                   | 228           |
|                           |               | 2.25                    | 135           | 3.85                   | 231           |
|                           |               | 2.30                    | 138           | 3.90                   | 234           |
|                           |               | 2.35                    | 141           | 3.95                   | 237           |
|                           |               | 2.40                    | 144           | 4.00                   | 240           |
|                           |               | 2.45                    | 147           | 4.05                   | 243           |
|                           |               | 2.50                    | 150           | 4.10                   | 246           |
|                           |               | 2.55                    | 153           | 4.15                   | 249           |

Table 1. Settings for a one foot circumference reel (type “A” reel)

| Four Beeps per Revolution |               | One Beep per Revolution |               |                        |               |                        |               |                        |               |
|---------------------------|---------------|-------------------------|---------------|------------------------|---------------|------------------------|---------------|------------------------|---------------|
| transit rate in ft/sec    | beeps per min | transit rate in ft/sec  | beeps per min | transit rate in ft/sec | beeps per min | transit rate in ft/sec | beeps per min | transit rate in ft/sec | beeps per min |
| 0.25                      | 40            | 1.00                    | 40            | 2.60                   | 104           | 4.20                   | 168           | 5.80                   | 232           |
| 0.30                      | 48            | 1.05                    | 42            | 2.65                   | 106           | 4.25                   | 170           | 5.85                   | 234           |
| 0.35                      | 56            | 1.10                    | 44            | 2.70                   | 108           | 4.30                   | 172           | 5.90                   | 236           |
| 0.40                      | 64            | 1.15                    | 46            | 2.75                   | 110           | 4.35                   | 174           | 5.95                   | 238           |
| 0.45                      | 72            | 1.20                    | 48            | 2.80                   | 112           | 4.40                   | 176           | 6.00                   | 240           |
| 0.50                      | 80            | 1.25                    | 50            | 2.85                   | 114           | 4.45                   | 178           |                        |               |
| 0.55                      | 88            | 1.30                    | 52            | 2.90                   | 116           | 4.50                   | 180           |                        |               |
| 0.60                      | 96            | 1.35                    | 54            | 2.95                   | 118           | 4.55                   | 182           |                        |               |
| 0.65                      | 104           | 1.40                    | 56            | 3.00                   | 120           | 4.60                   | 184           |                        |               |
| 0.70                      | 112           | 1.45                    | 58            | 3.05                   | 122           | 4.65                   | 186           |                        |               |
| 0.75                      | 120           | 1.50                    | 60            | 3.10                   | 124           | 4.70                   | 188           |                        |               |
| 0.80                      | 128           | 1.55                    | 62            | 3.15                   | 126           | 4.75                   | 190           |                        |               |
| 0.85                      | 136           | 1.60                    | 64            | 3.20                   | 128           | 4.80                   | 192           |                        |               |
| 0.90                      | 144           | 1.65                    | 66            | 3.25                   | 130           | 4.85                   | 194           |                        |               |
| 0.95                      | 152           | 1.70                    | 68            | 3.30                   | 132           | 4.90                   | 196           |                        |               |
| 1.00                      | 160           | 1.75                    | 70            | 3.35                   | 134           | 4.95                   | 198           |                        |               |
|                           |               | 1.80                    | 72            | 3.40                   | 136           | 5.00                   | 200           |                        |               |
|                           |               | 1.85                    | 74            | 3.45                   | 138           | 5.05                   | 202           |                        |               |
|                           |               | 1.90                    | 76            | 3.50                   | 140           | 5.10                   | 204           |                        |               |
|                           |               | 1.95                    | 78            | 3.55                   | 142           | 5.15                   | 206           |                        |               |
|                           |               | 2.00                    | 80            | 3.60                   | 144           | 5.20                   | 208           |                        |               |
|                           |               | 2.05                    | 82            | 3.65                   | 146           | 5.25                   | 210           |                        |               |
|                           |               | 2.10                    | 84            | 3.70                   | 148           | 5.30                   | 212           |                        |               |
|                           |               | 2.15                    | 86            | 3.75                   | 150           | 5.35                   | 214           |                        |               |
|                           |               | 2.20                    | 88            | 3.80                   | 152           | 5.40                   | 216           |                        |               |
|                           |               | 2.25                    | 90            | 3.85                   | 154           | 5.45                   | 218           |                        |               |
|                           |               | 2.30                    | 92            | 3.90                   | 156           | 5.50                   | 220           |                        |               |
|                           |               | 2.35                    | 94            | 3.95                   | 158           | 5.55                   | 222           |                        |               |
|                           |               | 2.40                    | 96            | 4.00                   | 160           | 5.60                   | 224           |                        |               |
|                           |               | 2.45                    | 98            | 4.05                   | 162           | 5.65                   | 226           |                        |               |
|                           |               | 2.50                    | 100           | 4.10                   | 164           | 5.70                   | 228           |                        |               |
|                           |               | 2.55                    | 102           | 4.15                   | 166           | 5.75                   | 230           |                        |               |

Table 2. Settings for a one and one-half foot circumference reel (type “B” reel)

| Four Beeps per Revolution |               | One Beep per Revolution |               |                        |               |
|---------------------------|---------------|-------------------------|---------------|------------------------|---------------|
| transit rate in ft/sec    | beeps per min | transit rate in ft/sec  | beeps per min | transit rate in ft/sec | beeps per min |
| 0.30                      | 36            | 1.20                    | 36            | 3.40                   | 102           |
| 0.35                      | 42            | 1.30                    | 39            | 3.50                   | 105           |
| 0.40                      | 48            | 1.40                    | 42            | 3.60                   | 108           |
| 0.45                      | 54            | 1.50                    | 45            | 3.70                   | 111           |
| 0.50                      | 60            | 1.60                    | 48            | 3.80                   | 114           |
| 0.55                      | 66            | 1.30                    | 39            | 3.90                   | 117           |
| 0.60                      | 72            | 1.40                    | 42            | 4.00                   | 120           |
| 0.65                      | 78            | 1.50                    | 45            | 4.10                   | 123           |
| 0.70                      | 84            | 1.60                    | 48            | 4.20                   | 126           |
| 0.75                      | 90            | 1.70                    | 51            | 4.30                   | 129           |
| 0.80                      | 96            | 1.80                    | 54            | 4.40                   | 132           |
| 0.85                      | 102           | 1.90                    | 57            | 4.50                   | 135           |
| 0.90                      | 108           | 2.00                    | 60            | 4.60                   | 138           |
| 0.95                      | 114           | 2.10                    | 63            | 4.70                   | 141           |
| 1.00                      | 120           | 2.20                    | 66            | 4.80                   | 144           |
| 1.05                      | 126           | 2.30                    | 69            | 4.90                   | 147           |
| 1.10                      | 132           | 2.40                    | 72            | 5.00                   | 150           |
| 1.15                      | 138           | 2.50                    | 75            | 5.10                   | 153           |
| 1.20                      | 144           | 2.60                    | 78            | 5.20                   | 156           |
|                           |               | 2.70                    | 81            | 5.30                   | 159           |
|                           |               | 2.80                    | 84            | 5.40                   | 162           |
|                           |               | 2.90                    | 87            | 5.50                   | 165           |
|                           |               | 2.80                    | 84            | 5.60                   | 168           |
|                           |               | 2.90                    | 87            | 5.70                   | 171           |
|                           |               | 3.00                    | 90            | 5.80                   | 174           |
|                           |               | 3.10                    | 93            | 5.90                   | 177           |
|                           |               | 3.20                    | 96            | 6.00                   | 180           |
|                           |               | 3.30                    | 99            |                        |               |

Table 3. Settings for a two foot circumference reel (type “E” reel)