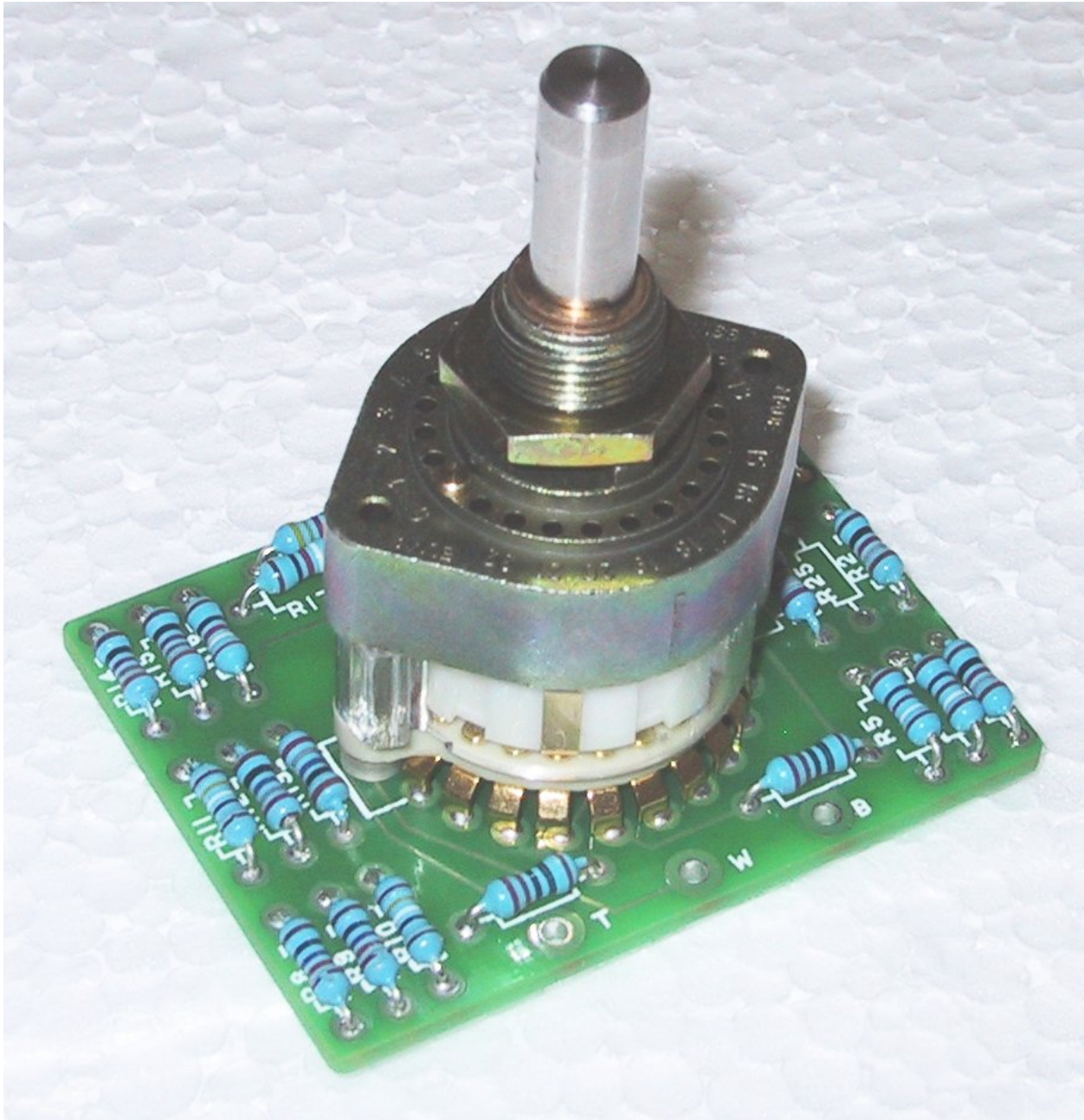


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**24 position stepped attenuator**

## Assembly Instructions

- Step 1: Assemble circuit board by inserting resistors onto component side of circuit board. Solder on solder side. See tables for resistor values. Clean the board.
- Step 2: Check the circuit board with DMM. The resistance between I and B pads should be within 2% of nominal value (eg. 50K +/- 1K)
- Step 3: Attach lead wires: I: brown, W: red, B: orange.

Table 1

10K nominal, log taper, 1.0 dB steps  
Special taper for XM9LS

| ID  | Value    | Description          | Attenuation        |      |
|-----|----------|----------------------|--------------------|------|
|     |          |                      | CCW rotation steps | dB   |
| R27 | 806      | 1% ,1/4W, Metal Film | 1                  | 1.0  |
| R25 | not used |                      | 3                  | 3.0  |
| R23 | 806 Ohm  | 1% ,1/4W, Metal Film | 5                  | 3.0  |
| R22 | 806 Ohm  | 1% ,1/4W, Metal Film | 6                  | 5.0  |
| R21 | 768 Ohm  | 1% ,1/4W, Metal Film | 7                  | 6.0  |
| R20 | 768 Ohm  | 1% ,1/4W, Metal Film | 8                  | 7.0  |
| R19 | 681 Ohm  | 1% ,1/4W, Metal Film | 9                  | 8.0  |
| R18 | 681 Ohm  | 1% ,1/4W, Metal Film | 10                 | 9.0  |
| R17 | 549 Ohm  | 1% ,1/4W, Metal Film | 11                 | 10.0 |
| R16 | 549 Ohm  | 1% ,1/4W, Metal Film | 12                 | 11.0 |
| R15 | 442 Ohm  | 1% ,1/4W, Metal Film | 13                 | 12.0 |
| R14 | 442 Ohm  | 1% ,1/4W, Metal Film | 14                 | 13.0 |
| R13 | 332 Ohm  | 1% ,1/4W, Metal Film | 15                 | 14.0 |
| R12 | 332 Ohm  | 1% ,1/4W, Metal Film | 16                 | 15.0 |
| R11 | 287 Ohm  | 1% ,1/4W, Metal Film | 17                 | 16.0 |
| R10 | 287 Ohm  | 1% ,1/4W, Metal Film | 18                 | 17.0 |
| R9  | 237 Ohm  | 1% ,1/4W, Metal Film | 19                 | 18.0 |
| R8  | 237 Ohm  | 1% ,1/4W, Metal Film | 20                 | 19.0 |
| R7  | 182 Ohm  | 1% ,1/4W, Metal Film | 21                 | 20.0 |
| R6  | 182 Ohm  | 1% ,1/4W, Metal Film | 22                 | 21.0 |
| R5  | 137 Ohm  | 1% ,1/4W, Metal Film | 23                 | off  |
| R4  | 137 Ohm  | 1% ,1/4W, Metal Film |                    |      |
| R3  | 102 Ohm  | 1% ,1/4W, Metal Film |                    |      |
| R2  | 102 Ohm  | 1% ,1/4W, Metal Film |                    |      |

Parts list

- | #  | Description          |
|----|----------------------|
| 1  | 24 position switch   |
| 2' | brown hookup wire    |
| 2' | red hookup wire      |
| 2' | orange hookup wire   |
| 1  | ELMA01 circuit board |
|    | resistors            |

Table 2

50K nominal, log taper, 0.5 dB steps  
Special taper for XM126LS

| ID  | Value    | Description          | Attenuation        |      |
|-----|----------|----------------------|--------------------|------|
|     |          |                      | CCW rotation steps | dB   |
| R27 | 6.49K    | 1% ,1/4W, Metal Film | 1                  | 1.0  |
| R25 | not used |                      | 3                  | 2.0  |
| R23 | 4.53K    | 1% ,1/4W, Metal Film | 5                  | 3.0  |
| R22 | 2.21K    | 1% ,1/4W, Metal Film | 6                  | 3.5  |
| R21 | 2.21K    | 1% ,1/4W, Metal Film | 7                  | 4.0  |
| R20 | 2.05K    | 1% ,1/4W, Metal Film | 8                  | 4.5  |
| R19 | 2.05K    | 1% ,1/4W, Metal Film | 9                  | 5.0  |
| R18 | 1.91K    | 1% ,1/4W, Metal Film | 10                 | 5.5  |
| R17 | 1.91K    | 1% ,1/4W, Metal Film | 11                 | 6.0  |
| R16 | 1.65K    | 1% ,1/4W, Metal Film | 12                 | 6.5  |
| R15 | 1.65K    | 1% ,1/4W, Metal Film | 13                 | 7.0  |
| R14 | 1.54K    | 1% ,1/4W, Metal Film | 14                 | 7.5  |
| R13 | 1.54K    | 1% ,1/4W, Metal Film | 15                 | 8.0  |
| R12 | 1.50K    | 1% ,1/4W, Metal Film | 16                 | 8.5  |
| R11 | 1.50K    | 1% ,1/4W, Metal Film | 17                 | 9.0  |
| R10 | 1.24K    | 1% ,1/4W, Metal Film | 18                 | 9.5  |
| R9  | 1.24K    | 1% ,1/4W, Metal Film | 19                 | 10.0 |
| R8  | 1.18K    | 1% ,1/4W, Metal Film | 20                 | 10.5 |
| R7  | 1.18K    | 1% ,1/4W, Metal Film | 21                 | 11.0 |
| R6  | 1.02K    | 1% ,1/4W, Metal Film | 22                 | 18.0 |
| R5  | 1.02K    | 1% ,1/4W, Metal Film | 23                 | off  |
| R4  | 953 Ohm  | 1% ,1/4W, Metal Film |                    |      |
| R3  | 953 Ohm  | 1% ,1/4W, Metal Film |                    |      |
| R2  | 8.06K    | 1% ,1/4W, Metal Film |                    |      |

Parts list

- | #  | Description          |
|----|----------------------|
| 1  | 24 position switch   |
| 2' | brown hookup wire    |
| 2' | red hookup wire      |
| 2' | orange hookup wire   |
| 1  | ELMA01 circuit board |
|    | resistors            |

**Table 3**  
100K nominal, log taper, 0.5 dB steps

| ID  | Value    | Description          | Attenuation        |            |
|-----|----------|----------------------|--------------------|------------|
|     |          |                      | CCW rotation steps | dB         |
| R27 | 28.0K    | 1% ,1/4W, Metal Film | 1                  | 0.5        |
| R25 | not used |                      | 3                  | 1.5        |
| R23 | 5.23K    | 1% ,1/4W, Metal Film | 5                  | 2.5        |
| R22 | 5.23K    | 1% ,1/4W, Metal Film | 6                  | 3.0        |
| R21 | 4.99K    | 1% ,1/4W, Metal Film | 7                  | 3.5        |
| R20 | 4.99K    | 1% ,1/4W, Metal Film | 8                  | 4.0        |
| R19 | 4.22K    | 1% ,1/4W, Metal Film | 9                  | 4.5        |
| R18 | 4.22K    | 1% ,1/4W, Metal Film | 10                 | 5.0        |
| R17 | 3.92K    | 1% ,1/4W, Metal Film | 11                 | 5.5        |
| R16 | 3.92K    | 1% ,1/4W, Metal Film | 12                 | 6.0        |
| R15 | 3.40K    | 1% ,1/4W, Metal Film | 13                 | 6.5        |
| R14 | 3.40K    | 1% ,1/4W, Metal Film | 14                 | 7.0        |
| R13 | 2.94K    | 1% ,1/4W, Metal Film | 15                 | 7.5        |
| R12 | 2.94K    | 1% ,1/4W, Metal Film | 16                 | 8.0        |
| R11 | 2.61K    | 1% ,1/4W, Metal Film | 17                 | 8.5        |
| R10 | 2.61K    | 1% ,1/4W, Metal Film | 18                 | 9.0        |
| R9  | 2.21K    | 1% ,1/4W, Metal Film | 19                 | 9.5        |
| R8  | 2.21K    | 1% ,1/4W, Metal Film | 20                 | 10.0       |
| R7  | 2.05K    | 1% ,1/4W, Metal Film | 21                 | 10.5       |
| R6  | 2.05K    | 1% ,1/4W, Metal Film | 22                 | 11.0       |
| R5  | 1.91K    | 1% ,1/4W, Metal Film | 23                 | Off (open) |
| R4  | 1.91K    | 1% ,1/4W, Metal Film |                    |            |
| R3  | 1.78K    | 1% ,1/4W, Metal Film |                    |            |
| R2  | 1.78K    | 1% ,1/4W, Metal Film |                    |            |

### Parts list

| #  | Description          |
|----|----------------------|
| 1  | 24 position switch   |
| 2' | brown hookup wire    |
| 2' | red hookup wire      |
| 2' | orange hookup wire   |
| 1  | ELMA01 circuit board |
|    | resistors            |

**Table 4**  
50K nominal, log taper, 0.5 dB steps

| ID  | Value    | Description          | Attenuation        |            |
|-----|----------|----------------------|--------------------|------------|
|     |          |                      | CCW rotation steps | dB         |
| R27 | 15.0K    | 1% ,1/4W, Metal Film | 1                  | 0.5        |
| R25 | not used |                      | 3                  | 1.5        |
| R23 | 2.55K    | 1% ,1/4W, Metal Film | 5                  | 2.5        |
| R22 | 2.55K    | 1% ,1/4W, Metal Film | 6                  | 3.0        |
| R21 | 2.21K    | 1% ,1/4W, Metal Film | 7                  | 3.5        |
| R20 | 2.21K    | 1% ,1/4W, Metal Film | 8                  | 4.0        |
| R19 | 2.05K    | 1% ,1/4W, Metal Film | 9                  | 4.5        |
| R18 | 2.05K    | 1% ,1/4W, Metal Film | 10                 | 5.0        |
| R17 | 1.91K    | 1% ,1/4W, Metal Film | 11                 | 5.5        |
| R16 | 1.91K    | 1% ,1/4W, Metal Film | 12                 | 6.0        |
| R15 | 1.78K    | 1% ,1/4W, Metal Film | 13                 | 6.5        |
| R14 | 1.78K    | 1% ,1/4W, Metal Film | 14                 | 7.0        |
| R13 | 1.58K    | 1% ,1/4W, Metal Film | 15                 | 7.5        |
| R12 | 1.58K    | 1% ,1/4W, Metal Film | 16                 | 8.0        |
| R11 | 1.43K    | 1% ,1/4W, Metal Film | 17                 | 8.5        |
| R10 | 1.43K    | 1% ,1/4W, Metal Film | 18                 | 9.0        |
| R9  | 1.27K    | 1% ,1/4W, Metal Film | 19                 | 9.5        |
| R8  | 1.27K    | 1% ,1/4W, Metal Film | 20                 | 10.0       |
| R7  | 1.15K    | 1% ,1/4W, Metal Film | 21                 | 10.5       |
| R6  | 1.15K    | 1% ,1/4W, Metal Film | 22                 | 11.0       |
| R5  | 1.02K    | 1% ,1/4W, Metal Film | 23                 | Off (open) |
| R4  | 1.02K    | 1% ,1/4W, Metal Film |                    |            |
| R3  | 909      | 1% ,1/4W, Metal Film |                    |            |
| R2  | 909      | 1% ,1/4W, Metal Film |                    |            |

### Parts list

| #  | Description          |
|----|----------------------|
| 1  | 24 position switch   |
| 2' | brown hookup wire    |
| 2' | red hookup wire      |
| 2' | orange hookup wire   |
| 1  | ELMA01 circuit board |
|    | resistors            |

**Table 5**  
10K nominal, log taper, 0.5 dB steps

| ID  | Value    | Description          | Attenuation        |            |
|-----|----------|----------------------|--------------------|------------|
|     |          |                      | CCW rotation steps | dB         |
| R27 | 2.94K    | 1% ,1/4W, Metal Film | 1                  | 0.5        |
| R25 | not used |                      | 3                  | 1.5        |
| R23 | 536 Ohm  | 1% ,1/4W, Metal Film | 5                  | 2.5        |
| R22 | 536 Ohm  | 1% ,1/4W, Metal Film | 6                  | 3.0        |
| R21 | 499 Ohm  | 1% ,1/4W, Metal Film | 7                  | 3.5        |
| R20 | 499 Ohm  | 1% ,1/4W, Metal Film | 8                  | 4.0        |
| R19 | 442 Ohm  | 1% ,1/4W, Metal Film | 9                  | 4.5        |
| R18 | 442 Ohm  | 1% ,1/4W, Metal Film | 10                 | 5.0        |
| R17 | 392 Ohm  | 1% ,1/4W, Metal Film | 11                 | 5.5        |
| R16 | 392 Ohm  | 1% ,1/4W, Metal Film | 12                 | 6.0        |
| R15 | 332 Ohm  | 1% ,1/4W, Metal Film | 13                 | 6.5        |
| R14 | 332 Ohm  | 1% ,1/4W, Metal Film | 14                 | 7.0        |
| R13 | 287 Ohm  | 1% ,1/4W, Metal Film | 15                 | 7.5        |
| R12 | 287 Ohm  | 1% ,1/4W, Metal Film | 16                 | 8.0        |
| R11 | 249 Ohm  | 1% ,1/4W, Metal Film | 17                 | 8.5        |
| R10 | 249 Ohm  | 1% ,1/4W, Metal Film | 18                 | 9.0        |
| R9  | 237 Ohm  | 1% ,1/4W, Metal Film | 19                 | 9.5        |
| R8  | 237 Ohm  | 1% ,1/4W, Metal Film | 20                 | 10.0       |
| R7  | 210 Ohm  | 1% ,1/4W, Metal Film | 21                 | 10.5       |
| R6  | 210 Ohm  | 1% ,1/4W, Metal Film | 22                 | 11.0       |
| R5  | 191 Ohm  | 1% ,1/4W, Metal Film | 23                 | Off (open) |
| R4  | 191 Ohm  | 1% ,1/4W, Metal Film |                    |            |
| R3  | 182 Ohm  | 1% ,1/4W, Metal Film |                    |            |
| R2  | 182 Ohm  | 1% ,1/4W, Metal Film |                    |            |

### Parts list

| #  | Description          |
|----|----------------------|
| 1  | 24 position switch   |
| 2' | brown hookup wire    |
| 2' | red hookup wire      |
| 2' | orange hookup wire   |
| 1  | ELMA01 circuit board |
|    | resistors            |

**Table 6**  
50K nominal, linear taper, 17 positions.

| ID  | Value    | Description          | Attenuation        |       |
|-----|----------|----------------------|--------------------|-------|
|     |          |                      | CCW rotation steps | dB    |
| R27 | not used |                      | 1                  | 0.56  |
| R25 | jumper   |                      | 3                  | 1.80  |
| R23 | 3.24K    | 1% ,1/4W, Metal Film | 5                  | 3.25  |
| R22 | 3.24K    | 1% ,1/4W, Metal Film | 6                  | 4.08  |
| R21 | 3.24K    | 1% ,1/4W, Metal Film | 7                  | 5.00  |
| R20 | 3.24K    | 1% ,1/4W, Metal Film | 8                  | 6.00  |
| R19 | 3.24K    | 1% ,1/4W, Metal Film | 9                  | 7.18  |
| R18 | 3.24K    | 1% ,1/4W, Metal Film | 10                 | 8.52  |
| R17 | 3.24K    | 1% ,1/4W, Metal Film | 11                 | 10.10 |
| R16 | 3.24K    | 1% ,1/4W, Metal Film | 12                 | 12.04 |
| R15 | 3.24K    | 1% ,1/4W, Metal Film | 13                 | 14.54 |
| R14 | 3.24K    | 1% ,1/4W, Metal Film | 14                 | 18.06 |
| R13 | 3.24K    | 1% ,1/4W, Metal Film | 15                 | 24.08 |
| R12 | 3.24K    | 1% ,1/4W, Metal Film | 16                 | Off   |
| R11 | 3.24K    | 1% ,1/4W, Metal Film |                    |       |
| R10 | 3.24K    | 1% ,1/4W, Metal Film |                    |       |
| R9  | 3.24K    | 1% ,1/4W, Metal Film |                    |       |
| R8  | 3.24K    | 1% ,1/4W, Metal Film |                    |       |
| R7  | not used |                      |                    |       |
| R6  | not used |                      |                    |       |
| R5  | not used |                      |                    |       |
| R4  | not used |                      |                    |       |
| R3  | not used |                      |                    |       |
| R2  | not used |                      |                    |       |
| R1  | not used |                      |                    |       |

**Parts list**

- | #  | Description          |
|----|----------------------|
| 1  | 24 position switch   |
| 2' | brown hookup wire    |
| 2' | red hookup wire      |
| 2' | orange hookup wire   |
| 1  | ELMA01 circuit board |
|    | resistors            |



Table 7

20K nominal, log taper, 2.5 dB steps  
Special taper for PR41, AT24 standard

| ID  | Value    | Description          | Attenuation        |      |
|-----|----------|----------------------|--------------------|------|
|     |          |                      | CCW rotation steps | dB   |
| R27 | 182 Ohm  | 1% ,1/4W, Metal Film | 1                  | 2.5  |
| R25 | 237 Ohm  | 1% ,1/4W, Metal Film | 3                  | 7.5  |
| R23 | 3.92 K   | 1% ,1/4W, Metal Film | 5                  | 12.5 |
| R22 | 3.48 K   | 1% ,1/4W, Metal Film | 6                  | 15.0 |
| R21 | 2.94 K   | 1% ,1/4W, Metal Film | 7                  | 17.5 |
| R20 | 2.55 K   | 1% ,1/4W, Metal Film | 8                  | 20.0 |
| R19 | 1.78 K   | 1% ,1/4W, Metal Film | 9                  | 22.5 |
| R18 | 1.43 K   | 1% ,1/4W, Metal Film | 10                 | 25.0 |
| R17 | 1.00 K   | 1% ,1/4W, Metal Film | 11                 | 27.5 |
| R16 | 715 Ohm  | 1% ,1/4W, Metal Film | 12                 | 30.0 |
| R15 | 536 Ohm  | 1% ,1/4W, Metal Film | 13                 | 32.5 |
| R14 | 392 Ohm  | 1% ,1/4W, Metal Film | 14                 | 35.0 |
| R13 | 287 Ohm  | 1% ,1/4W, Metal Film | 15                 | 37.5 |
| R12 | 210 Ohm  | 1% ,1/4W, Metal Film | 16                 | 40.0 |
| R11 | 154 Ohm  | 1% ,1/4W, Metal Film | 17                 | 42.5 |
| R10 | 115 Ohm  | 1% ,1/4W, Metal Film | 18                 | 45.0 |
| R9  | 100 Ohm  | 1% ,1/4W, Metal Film | 19                 | 47.5 |
| R8  | 64.9 Ohm | 1% ,1/4W, Metal Film | 20                 | 50.0 |
| R7  | 249 Ohm  | 1% ,1/4W, Metal Film | 21                 | 52.5 |
| R6  | 191 Ohm  | 1% ,1/4W, Metal Film | 22                 | 55.0 |
| R5  | 137 Ohm  | 1% ,1/4W, Metal Film | 23                 | off  |
| R4  | 102 Ohm  | 1% ,1/4W, Metal Film |                    |      |
| R3  | 75 Ohm   | 1% ,1/4W, Metal Film |                    |      |
| R2  | 54.9 Ohm | 1% ,1/4W, Metal Film |                    |      |

Parts list

- | #  | Description          |
|----|----------------------|
| 1  | 24 position switch   |
| 2' | brown hookup wire    |
| 2' | red hookup wire      |
| 2' | orange hookup wire   |
| 1  | ELMA01 circuit board |
|    | resistors            |

Table 8

50K nominal, log taper, 2.5 dB steps  
 Special taper for PR41, AT24 standard

| ID  | Value    | Description          | Attenuation        |      |
|-----|----------|----------------------|--------------------|------|
|     |          |                      | CCW rotation steps | dB   |
| R27 | 86.6 Ohm | 1% ,1/4W, Metal Film | 1                  | 2.5  |
| R25 | not used | 1% ,1/4W, Metal Film | 3                  | 7.5  |
| R23 | 12K4     | 1% ,1/4W, Metal Film | 5                  | 12.5 |
| R22 | 9K53     | 1% ,1/4W, Metal Film | 6                  | 15.0 |
| R21 | 6K98     | 1% ,1/4W, Metal Film | 7                  | 17.5 |
| R20 | 5K23     | 1% ,1/4W, Metal Film | 8                  | 20.0 |
| R19 | 3K92     | 1% ,1/4W, Metal Film | 9                  | 22.5 |
| R18 | 2K94     | 1% ,1/4W, Metal Film | 10                 | 25.0 |
| R17 | 2K21     | 1% ,1/4W, Metal Film | 11                 | 27.5 |
| R16 | 1K65     | 1% ,1/4W, Metal Film | 12                 | 30.0 |
| R15 | 1K27     | 1% ,1/4W, Metal Film | 13                 | 32.5 |
| R14 | 953 Ohm  | 1% ,1/4W, Metal Film | 14                 | 35.0 |
| R13 | 698 Ohm  | 1% ,1/4W, Metal Film | 15                 | 37.5 |
| R12 | 536 Ohm  | 1% ,1/4W, Metal Film | 16                 | 40.0 |
| R11 | 392 Ohm  | 1% ,1/4W, Metal Film | 17                 | 42.5 |
| R10 | 287 Ohm  | 1% ,1/4W, Metal Film | 18                 | 45.0 |
| R9  | 210 Ohm  | 1% ,1/4W, Metal Film | 19                 | 47.5 |
| R8  | 154 Ohm  | 1% ,1/4W, Metal Film | 20                 | 50.0 |
| R7  | 115 Ohm  | 1% ,1/4W, Metal Film | 21                 | 52.5 |
| R6  | 100 Ohm  | 1% ,1/4W, Metal Film | 22                 | 55.0 |
| R5  | 75 Ohm   | 1% ,1/4W, Metal Film | 23                 | off  |
| R4  | 54.9 Ohm | 1% ,1/4W, Metal Film |                    |      |
| R3  | 42.2 Ohm | 1% ,1/4W, Metal Film |                    |      |
| R2  | 30.9 Ohm | 1% ,1/4W, Metal Film |                    |      |

Parts list

- # Description
- 1 24 position switch
- 2' brown hookup wire
- 2' red hookup wire
- 2' orange hookup wire
- 1 ELMA01 circuit board
- resistors

Table9

Custom Worksheet

| ID  | Value | Description | Attenuation        |    |
|-----|-------|-------------|--------------------|----|
|     |       |             | CCW rotation steps | dB |
| R27 |       |             | 1                  |    |
| R25 |       |             | 3                  |    |
| R23 |       |             | 5                  |    |
| R22 |       |             | 6                  |    |
| R21 |       |             | 7                  |    |
| R20 |       |             | 8                  |    |
| R19 |       |             | 9                  |    |
| R18 |       |             | 10                 |    |
| R17 |       |             | 11                 |    |
| R16 |       |             | 12                 |    |
| R15 |       |             | 13                 |    |
| R14 |       |             | 14                 |    |
| R13 |       |             | 15                 |    |
| R12 |       |             | 16                 |    |
| R11 |       |             | 17                 |    |
| R10 |       |             | 18                 |    |
| R9  |       |             | 19                 |    |
| R8  |       |             | 20                 |    |
| R7  |       |             | 21                 |    |
| R6  |       |             | 22                 |    |
| R5  |       |             | 23                 |    |
| R4  |       |             |                    |    |
| R3  |       |             |                    |    |
| R2  |       |             |                    |    |

Parts list

- # Description
- 1 24 position switch
- 2' brown hookup wire
- 2' red hookup wire
- 2' orange hookup wire
- 1 ELMA01 circuit board resistors

