

# 9901 and 9902 Pulse Correctors

## contents

Section 1	General Description	page 1
Section 2	Application	page 1
Section 3	Installation	page 2
Section 4	Circuit Description	page 2
Section 5	Block Diagram	page 2
Section 6	Specifications	page 2
Section 7	Testing Guide	page 2

## 1. general description

1.01 The 9901 and 9902 Pulse Corrector subassemblies contribute dial pulse make/break ratio correction to signaling facilities where pulse distortion may present a problem. Because they reshape the entire dial pulse, both the 9901 and 9902 are referred to as "full" Correctors. Both 9901 and 9902 are solid state devices, providing stable operation over a range of conditions.

1.02 As subassemblies, the 9901 and 9902 Pulse Correctors mount in "piggyback" fashion to the printed circuit board portion of various Tellabs modules. Mounting is accomplished via a four-pin connector (male end on the 9901 or 9902) and a snap-in plastic retainer.

1.03 The 9901 provides dial pulse correction for dial pulses transmitted at an 8 to 14pps (pulses per second) rate, while the 9902 corrects dial pulses transmitted at a 20pps rate.

1.04 The 9901 corrects dial pulses transmitted at 8 to 12pps with 30-70% break to  $58 \pm 2\%$  break, and pulses transmitted at 14pps with 40-65% break to  $57 \pm 3\%$  break.

1.05 A modified version of the 9901, the 9901M1, corrects dial pulses transmitted at 8-12pps with 30-70% break to  $67 \pm 2\%$  break, and pulses transmitted at 14pps with 40-65% break to  $66 \pm 3\%$  break. Other operating parameters are the same as the 9901.

1.06 The 9902 corrects dial pulses at 20pps with 30-70% break to  $58 \pm 2\%$  break.

## 2. application

2.01 The 9901 and 9902 are used in association with various Tellabs modules (Dial Long Lines, Signaling Converters, etc.) that may be applied to circuits over which dial pulses are transmitted. Both Pulse Correctors access the pulse train through the E-lead of their associated modules. They contribute make/break ratio correction to the circuit to ensure reliable interpretation of dial pulses by the circuit's receive signaling equipment.

2.02 The 9901 is normally applied to lines, where telephone instruments or other pulse generating equipment operate in the 8-14pps range.

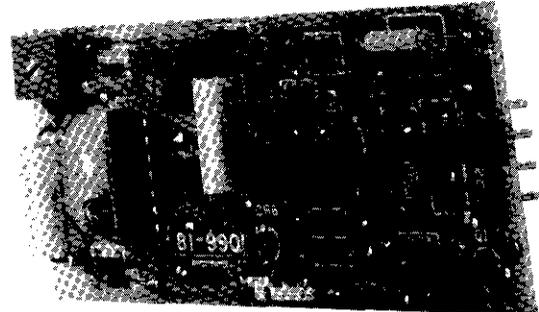


figure 1. 9901 Pulse Corrector subassembly

2.03 The 9902 is normally applied to trunks, where stored number equipment or PBX consoles send pulses at the 20pps rate.

2.04 While the 58% break interval realized with the 9901 and 9902 is compatible with most North American applications, the 67% break of the 9901M1 is more compatible with European and other systems utilizing similar break ratios.

2.05 In order to determine whether a 9901 or 9902 Pulse Corrector is required in a circuit, two basic things must be considered — the inherent pulse distortion of the circuit and the susceptibility to error of the end equipment that must interpret the pulses. A step-by-step CO, for example, requires cleaner dial pulses than a crossbar office. There are two basic kinds of pulse correctors available: "full" and "minimum break". Tellabs manufactures both kinds. While the full corrector (9901/9902) reshapes both the make and the break portions of the dial pulse, the minimum break corrector remedies only the most common dial pulse malady — a too short break cycle. On at least one Tellabs module, the minimum break corrector is standard and the 9901 or 9902 Corrector is optional. The minimum break corrector will suffice in applications except those requiring more precise correction — each application must be considered on its own merits.

2.06 There are two situations where a minimum break corrector is favored over the full (9901/9902) corrector. The minimum break corrector has a range that is greater with respect to extremely shortened break cycles (20ms as opposed to 30 or 40ms for the 9901 and 9902), and will perform in an application with these severely distorted pulses, where a full (9901/9902) corrector might not. The minimum break device may also be applied in favor of the 9901 or 9902 in cases where receive switching equipment is designed to interpret a wink or hookswitch flash signal of less than 100ms in duration. In these two applications, if a choice is available, utilize the minimum break corrector.

### 3. installation

3.01 The 9901 or 9902 Pulse Corrector should be visually inspected upon arrival to find possible damage incurred during shipment. If damage is noted, a claim should immediately be filed with the shipper.

3.02 The 9901 or 9902 is installed by simply plugging the four connector pins into the receptacle on the associated Tellabs module and snapping the plastic retainer/standoff at the opposite end of the Pulse Corrector into the hole provided on the host module. Make sure that the connector pins are seated firmly in the receptacle.

3.03 The Pulse Corrector, itself, has no adjustments or options. The associated host module, however, usually has an option switch that must be set to accommodate operation with or without the Pulse Corrector subassembly.

### 4. circuit description

4.01 Dial pulse correction is applied by the 9901 and 9902 subassemblies to the E-lead of the associated Tellabs module.

4.02 The 9901 or 9902 provides dial pulse correction through use of three time-delay circuits — TD1, TD2 and TD3. Time delay circuit TD1 provides an initial time delay of approximately 15ms, so that signals of less than 15ms duration do not activate the pulse correction circuitry.

4.03 When the 990X input is seized by the application of a ground of more than 15ms duration, the DC BYPASS CKT is activated, causing the DRIVER circuit to turn on, providing a ground to the output, pin 2. At the beginning of the first break interval, TD2 is set and holds the DC BYPASS CKT activated, maintaining the ground output at pin 2. After TD2 completes timing, a third time delay circuit, TD3, is activated, providing a signal that causes an open to appear at the output of pin 2. The open output condition remains until TD3 completes its timing cycle. TD3 is a variable timing circuit, and if TD2 is reset by the next input break pulse before TD3 completes its timing interval, that timing interval will be shortened. The resetting of TD2 and TD3 before expiration of their natural timing intervals accommodates pulsing rates of greater than 10pps.

### 6. specifications

*pulse correction (9901 and 9901M1)*

input 8 to 12pps, 30 to 70% break is corrected to  $58 \pm 2\%$  break in the 9901 and  $67 \pm 2\%$  break in the 9901M1

input 14pps, 40 to 65% break is corrected to  $57 \pm 3\%$  break in the 9901 and  $66 \pm 3\%$  break in the 9901M1

*pulse correction (9902)*

input 20pps, 30 to 70% break is corrected to  $58 \pm 2\%$  break

*input to output delay*

10ms minimum, 15ms nominal

*input states*

ground (make) and open (break)

*output states*

ground (make) and open (break) (100mA maximum current, 50Vdc maximum);

*input power*

22 to 50Vdc, 5mA

*mounting*

via 4-pin connector and standoff to various Tellabs modules

*weight*

1 ounce (28 grams)

*operating environment*

20° to 130° F (-7° to 54° C), humidity to 95%, no condensation

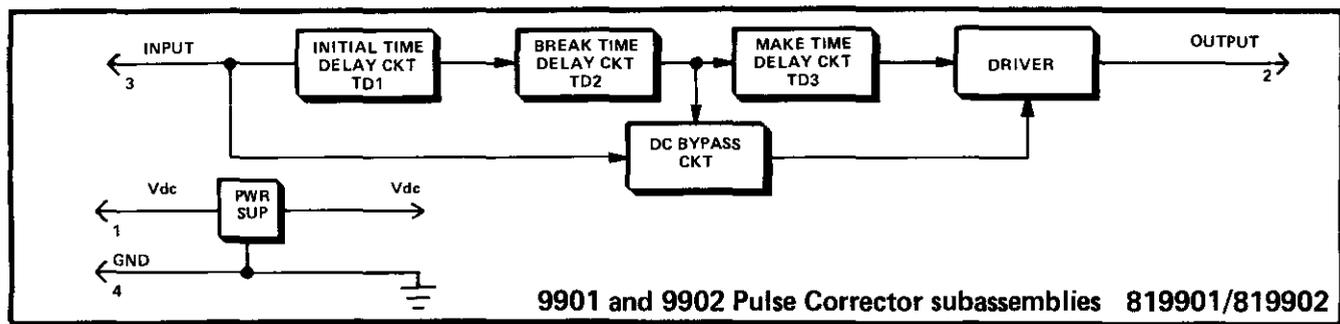
### 7. testing and troubleshooting

7.01 To verify proper operation of the 9901 or 9902 Pulse Corrector subassemblies, arrange to transmit dial pulses into the circuit prior to the Pulse Corrector input, and measure output pulses of the 9901 or 9902. (See the Testing section of the Practice pertaining to the module to which the Pulse Corrector subassembly is attached for input and output test access points.) Input dial pulses at 50% break (10pps for the 9901 and 20pps for the 9902) and measure output pulses at  $58 \pm 2\%$  break. Repeat the procedure at 30% break and at 70% break, and continue to read  $58 \pm 2\%$  break output.

7.02 If the specified output is not achieved, verify that the Pulse Corrector is firmly seated in its receptacle, that the host module is switch-optional for use with the 990X Corrector, and that the host module operates properly without the Pulse Corrector. If these three points are verified and the circuit continues to malfunction, replace the 9901 or 9902 and retest. If the host module operates improperly, replace it and retest.

7.03 If a subassembly or module is suspected of being defective, consult the Testing and Troubleshooting section of the host module's Practice for instructions concerning the replacement or repair of this equipment under terms of the Tellabs warranty. It is strongly recommended that no "internal" testing or repairs be conducted on this equipment. Unauthorized testing or repairs may void the equipment's warranty.

7.04 If a situation arises that is not covered in this Testing section, contact Tellabs Customer Service at (312) 969-8800 for further assistance.



5. Block Diagram