tellabs
technical manual
76-819024
rev A

practice section 819024

9024 Sealing Current Module

contents

1. general description

1.01 The 9024 Sealing Current module (figure 1) provides a variable, balanced dc source of sealing current for two individual circuits. Each individual circuit is provided with a *loopback/normal* switch, which may be used to activate polarity-sensitive dc loopback circuitry at the far end of the transmission facility. Panel-mounted LED's provide a visible indication of loopback status.

1.02 Loopback switches, test points, LED's, and current level adjustments are accessible from the 9024's front panel. Separate output connections are provided for each of the module's two circuits.

1.03 The 9024 module mounts in one position of the Tellabs Type 10 Mounting Shelf, versions of which are available for relay rack and KTU apparatus case installation. In relay rack applications, up to 12 modules may be mounted across a 19 inch rack, and up to 14 modules may be mounted across a 23 inch rack. In either case, 6 inches of vertical rack space is utilized.

2. application

2.01 A metallic facility may have many unsoldered cable splices and other interconnections between terminations. If corrosion (in the form of high-resistance metal oxide films) builds up at these most vulnerable interconnection points, the conductive properties of the connection will be degraded and noise and erratic or intermittent transmission may result. This noise may be of two types: a "popping" noise due to the increased resistance (this occurs, for example, as a result of corroded jacks or relay contacts), and longitudinal noise if the corrosion causes the tip and ring conductors to become unbalanced.

2.02 Not all interconnection points in a metallic facility can be physically sealed to prevent corrosion, nor can highly anticorrosive materials always be used. Thus, corrosion will always occur to some degree. Sufficient current, however, when interrupted by a corroded connection, develops a voltage that will arc over the corroded area and "burn" away the corrosion, thus restoring the connection.

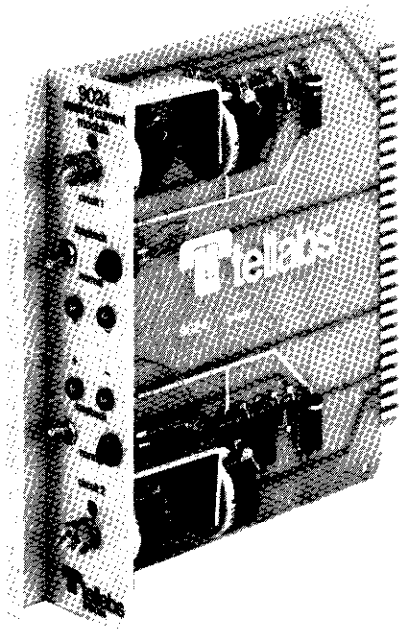


figure 1. 9024 Sealing Current module

Circuits that do not carry sufficient current (in the form of loop signaling or ringing current) to break down corrosion are commonly referred to as "dry" circuits. Dry circuits generally transmit only low-level ac (signaling tones and voice energy) and are thus more susceptible to corrosion problems than "wet" circuits.

2.03 Current that is continuously applied to otherwise dry circuits for the purpose of retarding corrosion at metallic connections and thus preventing "popping" and longitudinal noise is known as "sealing current". Sealing current can be applied in various ways, but, generally, simplex leads are used in 4wire applications and either simplex or A and B leads are used in 2wire applications. The 9024 Sealing Current module converts dry circuits to wet circuits, i.e., it provides a balanced, variable-level source of sealing current for use on metallic facilities over which low-level ac signals with no dc component are transmitted. A current of approximately 20mA has been found to be adequate for this purpose.

2.04 The maximum and minimum ranges (providing 20mA) of a 9024 module supplied from 48, 72, and 96Vdc sources are listed in table 1.

source voltage	minimum loop for providing 20mA	maximum loop for providing 20mA
48Vdc	0 ohms	1400 ohms
72Vdc	600 ohms	2600 ohms
96Vdc	1800 ohms	3800 ohms

table 1. Sealing current ranges

2.05 Front-panel-adjustable controls permit levels to each of the two circuits served by the Sealing Current module to be individually adjusted. The 20mA level may thereby be attained on any loop within the loop limits. These level controls provide tandem adjustment of the series resistance in both the negative (battery) and the positive (ground) side of each circuit, ensuring a balanced ouptut. This is particularly useful for minimizing longitudinal imbalance when applied to 2wire circuits through the A and B leads. Figures 2 through 5 show typical 2wire and 4wire applications.

2.06 Loopback switches enable the 9024 to be used for reversing the polarity of the simplex current in order to activate polarity-sensitive dc loopback equipment located at the distant end of each circuit. An LED located above each switch provides

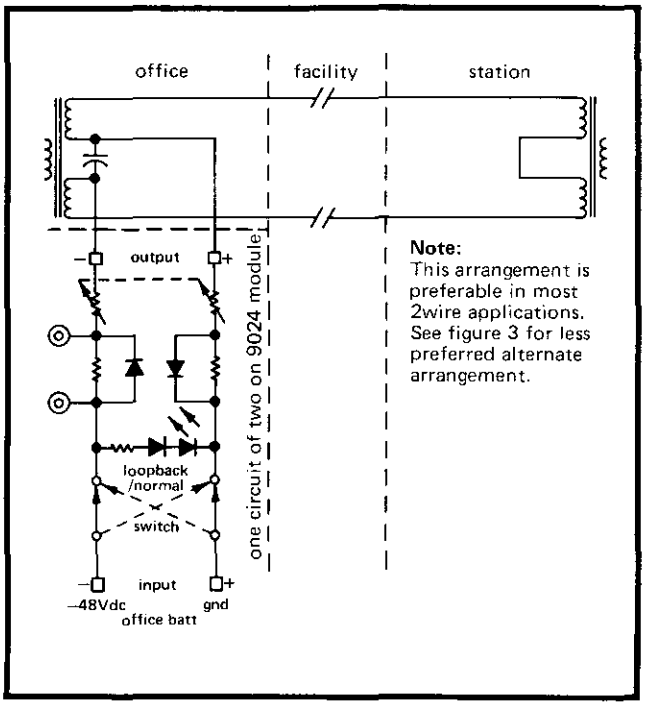


figure 2. Single circuit of 9024 in 2wire application (preferred arrangement)

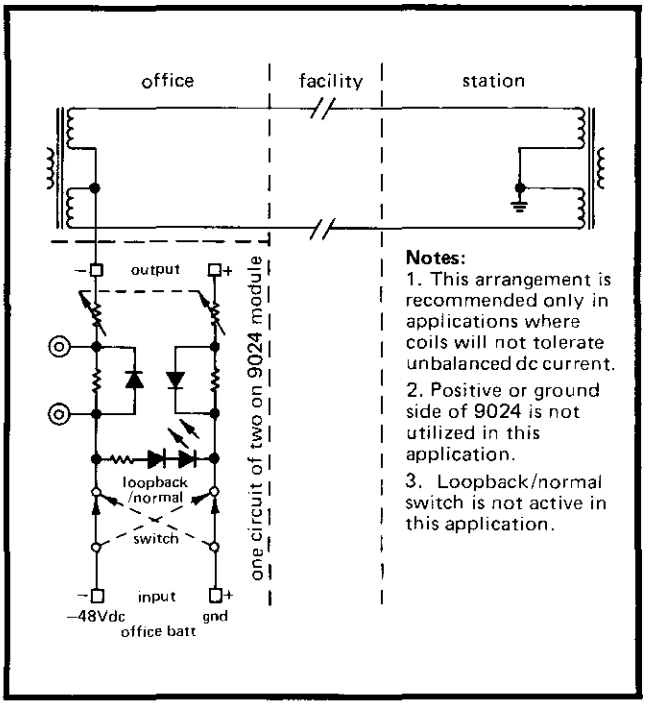


figure 3. Single circuit of 9024 in 2wire application (alternate arrangement)

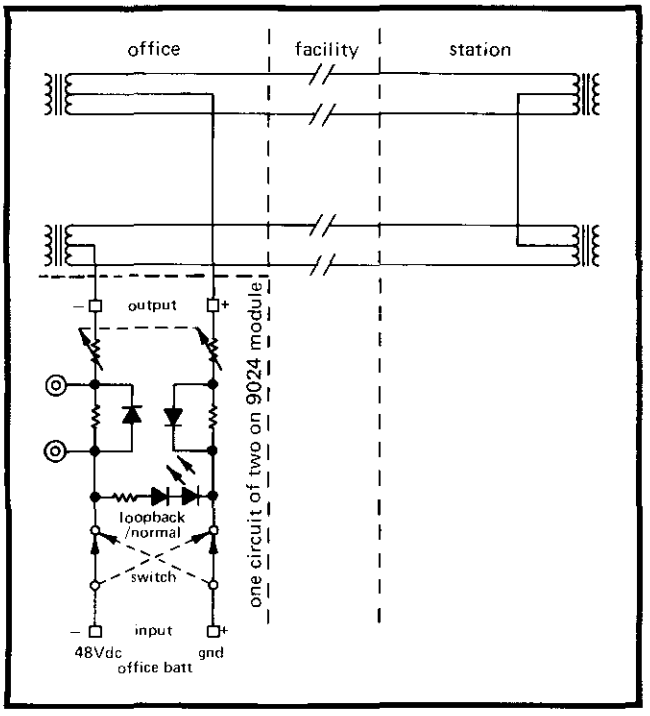


figure 4. Single circuit of 9024 in 4wire application

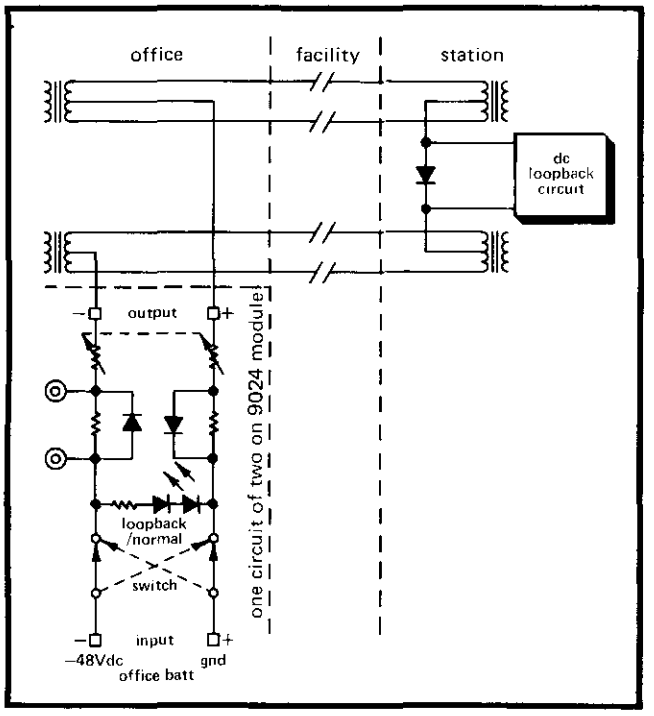


figure 5. Single circuit of 9024 in 4wire application with loopback

visual indication whenever the switch is in the loopback mode. Shorting diodes across the fixed resistors in each circuit increase the applied potential by 20 volts in the loopback mode. Loopback is used to measure or verify transmission characteristics of a 4wire circuit.

3. installation

inspection

3.01 The 9024 Sealing Current module should be visually inspected upon arrival in order to find possible damage incurred during shipment. If damage is noted, a claim should immediately be filed with the carrier. If stored, the unit should be visually inspected again prior to installation.

mounting

3.02 The 9024 module mounts in one position of the Tellabs Type 10 Mounting Shelf. The module plugs physically and electrically into a 56-pin connector at the rear of the Type 10 Shelf. All connections are made at the rear of the Shelf to wire-wrap pins that are part of the 56-pin connector.

installer connections

3.03 Before making any connections to the Mounting Shelf, ensure that power is **off** and that modules are **removed**. The 9024 module should be inserted into place only **after** wiring has been completed.

3.04 Table 2 lists the connections to the 9024. Pin numbers are found on the body of the connector.

connect:	to pin:
FACILITY (CIRCUIT 1) (negative)*	51
FACILITY (CIRCUIT 1) (positive)*	47
FACILITY (CIRCUIT 2) (negative)*	5
FACILITY (CIRCUIT 2) (positive)*	9
BATT (–48, –72, or –96Vdc battery)**	35
GND (ground)	17

Polarity is reversed in loopback mode.
***See paragraph 2.04 and table 1 for loop ranges.*

table 2. External connections

adjustment

3.05 Each of the two circuits in the 9024 module is provided with an adjustable attenuator and two (+ and –) test points. These devices are located on the front panel of the module. The test points are bridged across a 500 ohm resistor in series with each circuit to permit measurement of the resultant voltage drop during adjustment. With wiring completed and the loopback switch in the *normal* position, connect a high-resistance dc voltmeter (Simpson 260 or equivalent) to the + and – pins and adjust the variable attenuator associated with that circuit until the meter reads 10 volts. This corresponds to 20mA of current through the circuit. (If other than 20mA is desired, each volt read on the meter is equivalent to 2mA.)

loopback

3.06 If the circuit to which sealing current is being supplied is provided with polarity-sensitive dc loopback, operation may be verified by setting the respective *loopback/normal* switch to the *loopback* position. The associated LED should light. Once loopback operation is verified, return the switch to the *normal* position. The LED should extinguish.

4. circuit description

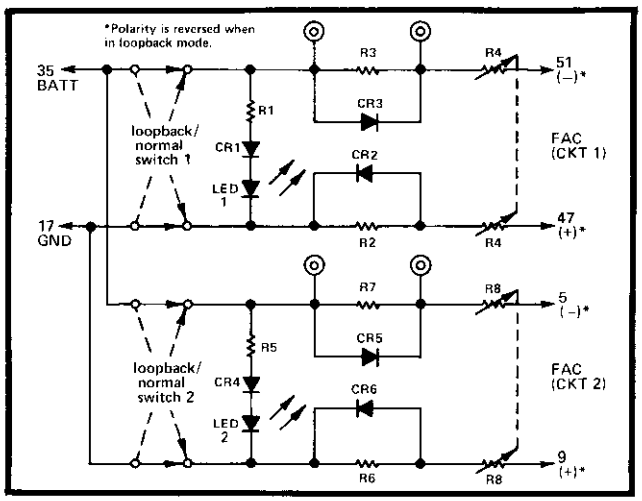
4.01 The 9024 Sealing Current module consists of two individual circuits, each with isolated input and output terminations. Because both circuits are identical, this description will be limited to circuit 1 only. The description may be followed on the associated functional schematic, section 5.

4.02 With the *loopback/normal* switch in the *normal* position, the negative side of the source is routed through *R3*, one section of *R4* and, via the negative (–) output terminal, to one side of the facility. The other side of the facility returns through the positive (+) output terminal, through the other section of *R4*, through *R2*, to the positive side of the source. Current adjustment is effected by varying both sections of *R4*, which are ganged to the screwdriver adjustment on the front of the module.

4.03 The – and + test points connected to each end of *R3* allow monitoring of the voltage drop (resulting from the sealing current) across *R3*. The value of *R3* is such that each ½ volt of drop is equivalent to 1mA of sealing current.

4.04 With the *loopback/normal* switch in the *loopback* position, the negative side of the source is routed through *CR2* (which is now forward-biased, bypassing *R2*) and thence through one section of *R4* to the positive (+) output terminal. From the positive (+) output terminal, the current travels through the facility, back to the negative (–) output terminal, through the other section of *R4*, through *CR3* (which is now forward-biased) and back to the positive side of the source. The potential thereby placed across *R1, CR1* and the LED in the loopback mode (*CR1* and the LED are forward-biased) allows current to flow through, and thus light, the LED.

4.05 With the *loopback/normal* switch in the *normal* position, *CR1, CR2* and *CR3* are all back-biased, forcing the current to pass through *R2* and *R3* and preventing current from flowing through *R1* to the LED.



5. block diagram

6. specifications

number of circuits
two circuits, each with individual output connections

range
0 to 1400 ohms with 48Vdc input power
600 to 2600 ohms with 72Vdc input
1800 to 3800 ohms with 96Vdc input

current requirements (sealing current mode)
20mA nominal per circuit (40mA for two circuits)
(current requirements in the loopback mode are dependent upon resistance of equipment at far end of facility)
maximum current per circuit: approximately 100mA

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

dimensions
5.58 inches (14.17cm) high
1.42 inches (3.61cm) wide
5.96 inches (15.14cm) deep

weight
approximately 7 ounces (198 grams)

mounting
relay rack or apparatus case via one position of Tellabs Type 10 (or Wescom Type 400) Mounting Shelf

7. testing and troubleshooting

7.01 This Testing Guide may be used to assist in the installation, testing, or troubleshooting of the 9024 Sealing Current module. The Guide is intended as an aid in the localization of trouble to a specific module. If a module is suspected of being defective, a new module should be substituted and the test conducted again. If the substitute module operates correctly, the original module should be considered defective and returned to Tellabs for repair or replacement. It is strongly recommended that no internal (component level) testing or repairs be attempted on the 9024 module. Unauthorized testing or repairs may void the warranty.

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

7.03 If a 9024 is diagnosed as defective, the situation may be remedied by either *replacement* or *repair and return*. Because it is the more expedient method, the *replacement* procedure should be followed whenever time is a critical factor (e.g., service outages, etc.).

replacement

7.04 If a defective 9024 is encountered, notify Tellabs via telephone, letter or twx. Notification should include all relevant information, including the 8X9024 part number (from which we can determine the issue of the module in question). Upon notification, we shall ship a replacement module to you. If the warranty period of the defective module has not elapsed, the replacement module will be shipped at no charge. Package the defective module in the replacement module's carton; sign the packing list included with the replacement module and enclose it with the defective module (this is your return authorization); affix the preaddressed label provided with the replacement module to the carton being returned; and ship the equipment prepaid to Tellabs.

repair and return

7.05 Return the defective 9024 module, shipment prepaid, to: Tellabs Incorporated
4951 Indiana Avenue
Lisle, Illinois 60532
Attn: repair and return dept.
Enclose an explanation of the module's malfunction. Follow your company's standard procedure with respect to administrative paperwork. Tellabs will repair the module and ship it back to you. If the module is in warranty, no invoice will be issued.

testing guide checklist

test	test procedure	normal result	if normal conditions are not met, verify:
sealing current (circuit 1)	Before wiring facility to outputs, set ckt 1 switch to *normal,* connect 1000 ohm resistor (½W or larger) across ckt 1 + and − outputs, and connect proper* voltage across ckt 1 + and − inputs. Connect voltmeter set to 50Vdc scale across ckt 1 test points.	As ckt 1 control is varied from full counterclockwise to full clockwise, meter reading increases from approximately 6Vdc to approximately 12Vdc ☐.	Presence of source voltage ☐. Polarity of source ☐. Value of resistor across output ☐. Wiring correct ☐.
loopback (circuit 1)	Adjust control (per above) until meter reads 10 volts. Remove meter from test points and connect across 1000 ohm resistor. Note polarity. Note voltage reading. Reverse meter's polarity. Set ckt 1 switch to *loopback.*	Meter reads approximately 14 volts higher in loopback than in sealing current test ☐. Polarity of voltage is reversed ☐. LED is lighted ☐.	Presence of source voltage ☐. Polarity of source voltage ☐. Loose connections ☐.
circuit 2	Repeat above tests, using appropriate input and output terminals.	Same as circuit 1 ☐.	Same as circuit 1 ☐.

*See paragraph 2.04.