

412-00 Pad and 412-01 Pad/Transformer Modules

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Figure 1. 412-01 Pad/Transformer Module

1. GENERAL

1.1 Document Purpose

This document provides circuit descriptions, installation procedures, and basic testing information for the Charles Industries 412-00 Pad and 412-01 Pad Transformer Modules (Figure 1).

1.2 Document Status

This document is reprinted to include a general editorial update.

1.3 Equipment Function

The 412-00 and 412-01 modules are used to provide variable 0.6 to 30dB attenuation on 4-wire, voice frequency or data transmission facilities. The attenuators are mounted on the front panel and have slotted shafts with locking nuts. Test jacks are also provided on the front panel to monitor the transmit and receive levels of both the line and drop.

In addition, the 412-01 is equipped with impedance-matching and dc isolation transformers that permit switch-selectable 150-, 600-, or 1200-ohm termination to the 4-wire drop. The 1200-ohm termination is provided in lieu of a 900-ohm termination because this impedance normally provides a better match for nominal 900-ohm cable facilities. It also provides for simplex signaling. In the remainder of this Practice, the 412-00 and 412-01 will be referred to as 412 where no distinction is necessary.

1.4 Equipment Location/Mounting

The 412 is designed to mount in one position of a Charles Type 400 Mounting Assembly. Type 400 Mounting Assemblies are available in capacities of from 1 to 13 modules and allow for either Key Telephone Unit (KTU) apparatus-case or relay-rack mounting.

2. INSPECTION

2.1 Inspect for Damages

Inspect the equipment thoroughly upon delivery. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company.

2.2 Equipment Identification

Charles Industries' equipment is identified by a model and issue number imprinted on the front panel or located elsewhere on the equipment. Each time a major engineering design change is made on the equipment, the issue number is advanced by 1 and imprinted on subsequent units manufactured. Therefore, be sure to include both the model number and its issue number when making inquiries about the equipment.

2.3 Static Concerns

Each unit is shipped in static-protective packaging to prevent electrostatic charges from damaging static-sensitive devices. Use approved static-preventive measures, such as static-conductive wrist straps and a static-dissipative mat, when handling units outside of their protective packaging. A unit intended for future use should be tested as soon as possible and returned to its original protective packaging for storage.



STATIC-SENSITIVE



This equipment contains static-sensitive electronic devices. To prevent electrostatic charges from damaging static-sensitive units:

- **Use approved static preventive measures (such as a static-conductive wrist strap and a static-dissipative mat) at all times whenever touching units outside of their original, shipped static-protective packaging.**
- **Do not ship or store units near strong electrostatic, electromagnetic, or magnetic fields.**
- **Use static-protective packaging for shipping or storage.**

3. CIRCUIT DESCRIPTION

3.1 412-00

Refer to Figure 2, the 412-00 Schematic Diagram, while reading the following description.

An incoming signal to the 412-00 is applied over the 4-wire receive line to the variable T-pad (AT 1) where it is attenuated to the required level. The signals are then applied to the T and R leads to the receive drop. An outgoing signal is applied to the T and R leads of the transmit drop, attenuated by AT2, and applied to the transmit line.

3.2 412-01

Refer to Figure 4, the 412-01 Schematic Diagram, while reading the following description. The 412-01 controls transmission levels, isolates dc voltages, matches line-to-drop impedances, and provides for simplex signaling.

An incoming signal to the 412-01 is applied over the 4-wire receive line to the variable T-pad (AT1) where it is attenuated to the required level. The signal is then applied to the primary of transformer T_i, inducing a signal in the secondary winding of T_i. Signals from the secondary of T_i are applied over the T and R leads to the receive drop. The secondary of T_i is center-tapped to provide a simplex leg for dc signaling. It is also provided with 150-, 600-, and 1200-ohm switch-selectable options.

An outgoing signal is applied to the T and R leads of the transmit drop and is treated in reverse of the manner described above.

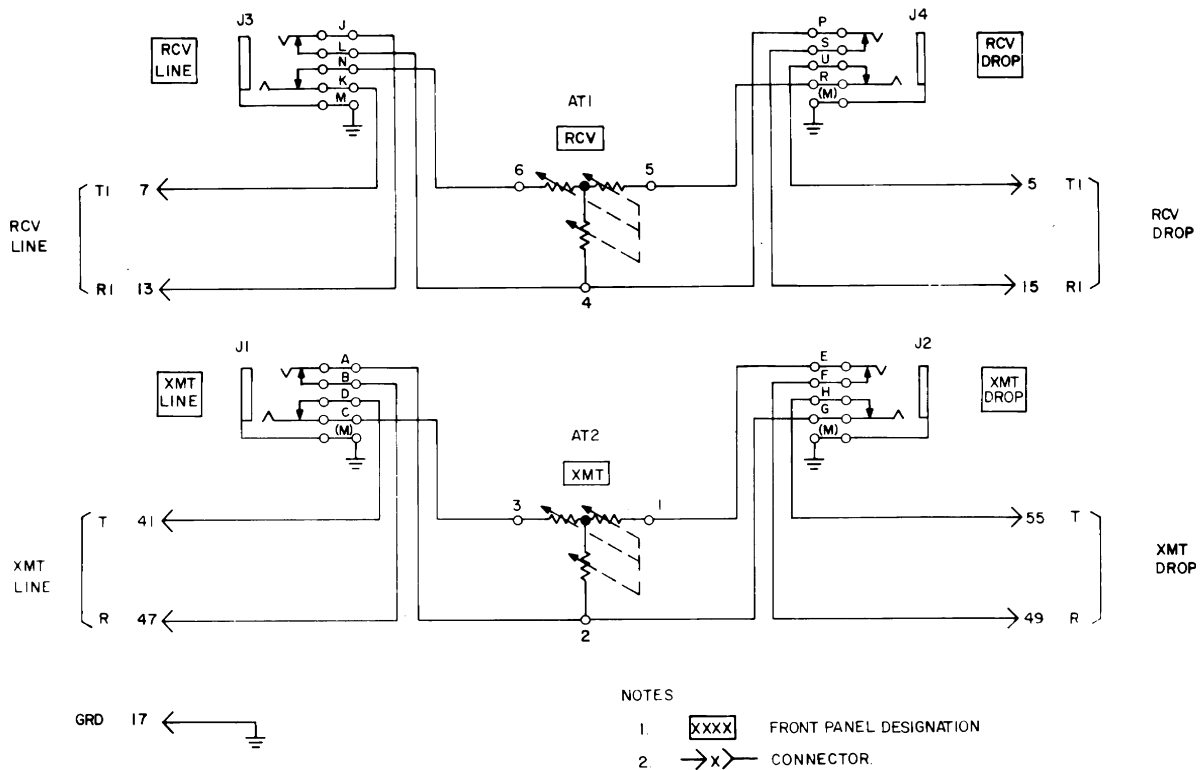


Figure 2. 412-00 Pad Schematic Diagram

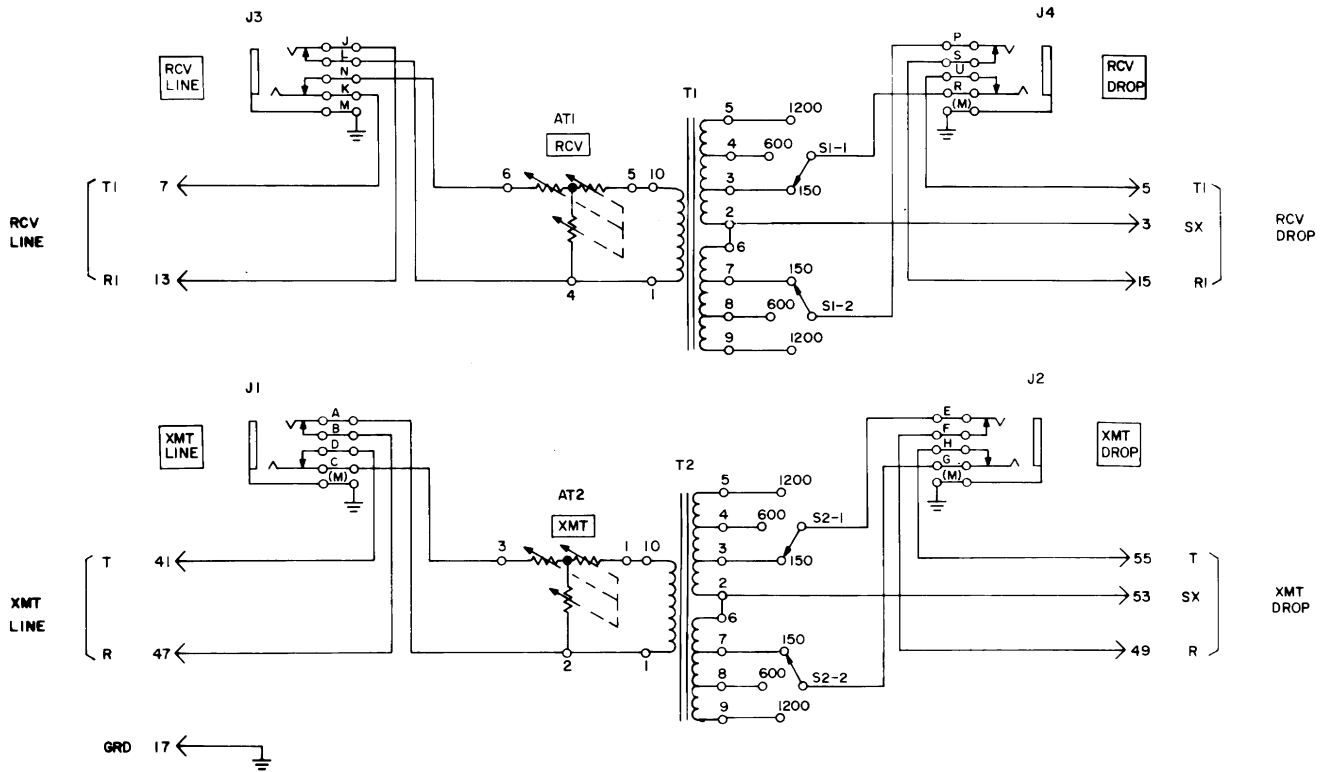


Figure 3. 412-01 Pad/Transformer Schematic Diagram

4. INSTALLER CONNECTIONS

All electrical connections for the 412-00 and 412-01 modules are made through a 56-pin, wire-wrapped card connector. Make all installer connections in accordance with Table 1.

Table 1. Table 1. 412-00 and 412-01 Installer

Connect	To 56-Pin Connector
Transmit line tip lead	41
Transmit line ring lead	47
Receive line tip lead	7
Receive line ring lead	13
Transmit drop tip lead	55
Transmit drop ring lead	49
Receive drop tip lead	5
Receive drop ring lead	15
SX lead (XMT drop)	53 (412-21 only)
SX lead (RCV drop)	3 (412-01 only)
Ground	17

CAUTION

Do not make any connections with power applied to the equipment or modules installed in the mounting assembly.

5. OPTIONS

The 412-01 module is provided with slide switches which provide 150-, 600-, or 1200-ohm impedance matching on the drop side of both the receive and transmit transformers. Refer to Figure 4 for option locations and place the slides of S1 and S2 in the proper position for the installation.

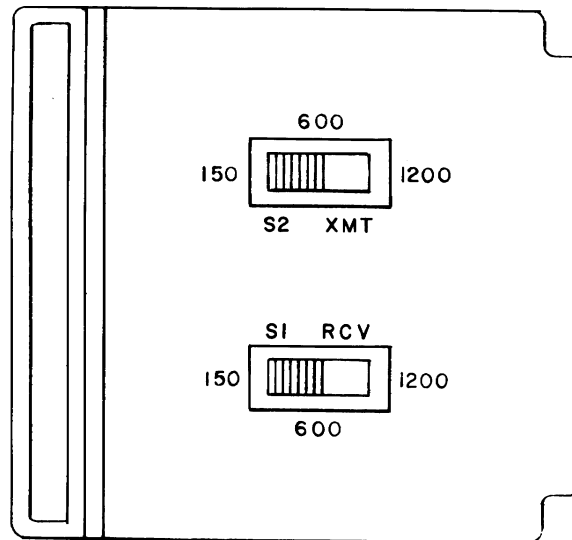


Figure 4. Option Locations for 412-01

There are no options on the 412-00 module.

6. ALIGNMENT

The alignment procedure for these modules consists of adjusting the T-pad attenuator controls, which set the level of attenuation at the receive and transmit drop.

6.1 Equipment Required

Test equipment required to align the modules is as follows:

- Transmission Measurement Set (TMS): WECO 23A or Hewlett-Packard 3550 (or equivalent), with self-contained Variable Frequency Oscillator (VFO).
- Two 2-conductor or 3-conductor test cords equipped with a standard 310 plug on each end.

Use the following steps to align the 412-00 Pad and 412-01 Pad/Transformer:

Step	Action
1.	Request the technician at the distant terminal to send 1000Hz test-tone at the impedance and level specified on the CLR card.
2.	Condition the TMS for 600-ohm terminated measurement and connect it to the RCV LINE test jack on the front panel of the 412. Verify that the received tone is at the correct level for the receive line port of the 412, as determined from the CLR card.
3.	Move the TMS to the RCV DROP test jack on the 412 and arrange it for terminated measurement at the impedance of the receive drop. Adjust the RCV attenuator until the TMS reads the correct level for the receive drop port of the 412, as determined from the CLR card.
4.	Arrange the VFO to provide 1000Hz test-tone at the level and impedance required for the transmit drop port of the 412 as determined from the CLR card.

Step	Action
5.	Move the TMS to the XMT LINE test jack and arrange it for 600-ohm terminated measurement. Adjust the XMT attenuator until the TMS reads the correct level for the transmit line port of the 412 as determined from the CLR card.
6.	Disconnect the VFO and the TMS. This concludes the alignment of the unit.

7. TESTING

If trouble is encountered with the operation of the 412-00 or 412-01, verify that all installer connections have been properly made in accordance with Table 1 and that all options have been properly conditioned. Make certain that the module is making good connections by removing and reinserting the module.

If the trouble persists, use the alignment procedure described in part 7 to determine that signal continuity and proper attenuation are provided by the module.

8. TECHNICAL ASSISTANCE

If technical assistance is required, contact Charles Industries' Technical Services Center at:

847-806-8500

847-806-8556 (FAX)

800-607-8500

techserv@charlesindustries.com (e-mail)

9. WARRANTY & CUSTOMER SERVICE

9.1 Warranty

Charles Industries, Ltd. offers an industry-leading, 5-year warranty on products manufactured by Charles Industries. Contact your local Sales Representative at the address or telephone numbers below for warranty details. The warranty provisions are subject to change without notice. The terms and conditions applicable to any specific sale of product shall be defined in the resulting sales contract.

Charles Industries, Ltd.

5600 Apollo Drive

Rolling Meadows, Illinois 60008-4049

847-806-6300 (Main Office)

847-806-6231 (FAX)

9.2 Field Repairs (In-Warranty Units)

Field repairs involving the replacement of components within a unit are not recommended and may void the warranty and compatibility with any applicable regulatory or agency requirements. If a unit needs repair, contact Charles Industries, Ltd. for replacement or repair instructions, or follow the *Repair Service Procedure* below.

9.3 Advanced Replacement Service (In-Warranty Units)

Charles Industries, Ltd. offers an "advanced replacement" service if a replacement unit is required as soon as possible. With this service, the unit will be shipped in the fastest manner consistent with the urgency of the situation. In most cases, there are no charges for in-warranty repairs, except for the transportation charges of the unit and for a testing and handling charge for units returned with no trouble found. Upon receipt of the advanced replacement unit, return the out-of-service unit in the carton in which the replacement was shipped, using the pre-addressed shipping label provided. Call your customer service representative at the telephone number above for more details.

9.4 Standard Repair and Replacement Service (Both In-Warranty and Out-Of-Warranty Units)

Charles Industries, Ltd. offers a standard repair or exchange service for units either in- or out-of-warranty. With this service, units may be shipped to Charles Industries for either repair and quality testing or exchanged for a

replacement unit, as determined by Charles Industries. Follow the *Repair Service Procedure* below to return units and to secure a repair or replacement. A handling charge applies for equipment returned with no trouble found. To obtain more details of this service and a schedule of prices, contact the CI Service Center at 217-932-5288 (FAX 217-932-2943).

Repair Service Procedure

1. Prepare, complete, and enclose a purchase order in the box with the equipment to be returned.
2. Include the following information:
 - Company name and address
 - Contact name and phone number
 - Inventory of equipment being shipped
 - Particulars as to the nature of the failure
 - Return shipping address
3. Ship the equipment, purchase order, and above-listed information, transportation prepaid, to the service center address shown below.

CI Service Center
503 N.E. 15th St., P.O. Box 339
Casey, IL 62420-2054
4. Most repaired or replaced units will be returned within 30 or 45 days, depending on the product type and availability of repair parts. Repaired units are warranted for either 90 days from the date of repair or for the remaining unexpired portion of the original warranty, whichever is longer.

10. SPECIFICATIONS

The electrical and physical characteristics of the 412-00 and 412-01 Pad Transformers are as follows:

- (a) PAD RANGE: 0.6 to 30dB, continuously variable.
- (b) IMPEDANCE: 412-00 line, 600 ohms; drop, 600 ohms. 412-01 line, 600 ohms; drop, 150, 600, or 1200 ohms (switch selectable).

See Table 2 for the physical characteristics of the

Table 2. Physical Specifications

Feature	U.S.	Metric
Height	5.6 inches	14.2 centimeters
Width	1.5 inches	3.8 centimeters
Depth	6 inches	15.2 centimeters
Weight	412-00 0.7 pound	0.32 kilogram
	412-01 0.8 pound	0.36 kilogram
Operating Temperature	–5 to 150 F	–20 to 65 C
Humidity	0 to 90%	

