TBAA03-15 TB9100 Antenna Relay Installation Instructions

Introduction

For simplex applications, the Tait TB9100 base station can be set up with an antenna relay, enabling the receiver and transmitter to share the same antenna. Before the transmitter keys up, the base station activates the relay, disconnecting the receiver and connecting the transmitter to the antenna. It then powers the transmitter up. After it powers the transmitter down, it opens the relay again, so that it is ready to receive.

If the transmit and receive frequencies are equal, the base station automatically increases the transmitter frequency by 25 kHz when the base station is not transmitting, to minimize stray coupling. When the base station is transmitting, the receiver is disabled.

The TBAA03-15 Relay Coaxial Assembly kit contains all the equipment for an antenna relay system, including the wiring for the relay coil. The antenna relay will handle 66–560 MHz. This document shows how to install the kit, and how to configure the base station for antenna relay operation using the CSS. It also provides details on antenna relay operation, with timing diagrams.

Notice   Make sure that you do not manually operate the relay while the TB9100 is transmitting. The PA is protected against a mismatched load, but not against removing the load while transmitting.

The use of an isolator is recommended. See the TB9100/P25 TAG/P25 CG Installation and Operation Manual for details. The isolator can be fitted between the relay and the antenna, as the TB9100 antenna relay driver will not operate the relay when the PA is transmitting.

Notice   If you install an antenna relay other than the one provided in the antenna relay kit, check its specifications and make sure that the relay closing time is less than 20 ms. The antenna relay must close its contacts within 20 ms of activating the antenna relay driver. Otherwise, transmissions can begin before the contacts have closed. This can damage the PA. It will also burn the relay contacts. Check also that the isolation is >30 dB for *all* frequencies you intend using.
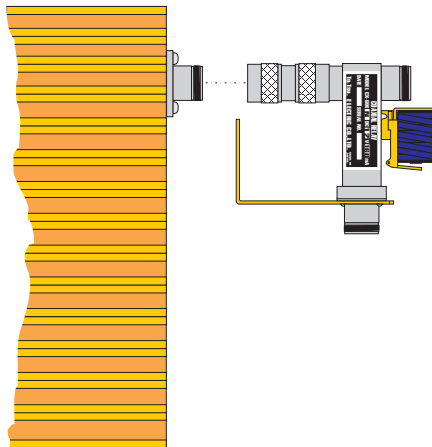
Installation

Follow these steps to install a Tait TBAA03-15 Relay Coax Assembly kit. The drawings show a 50 W PA but the instructions apply equally to a base station with a 100 W PA.
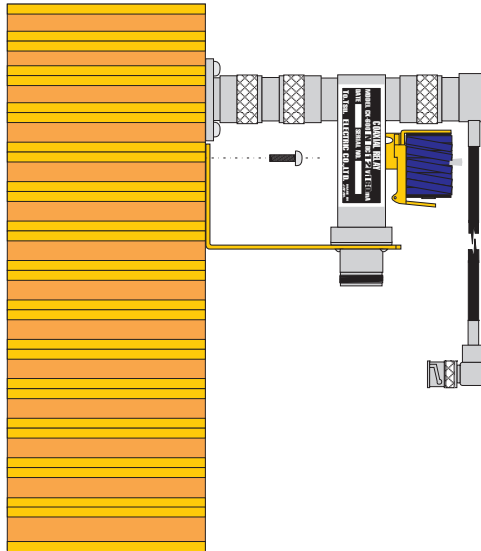
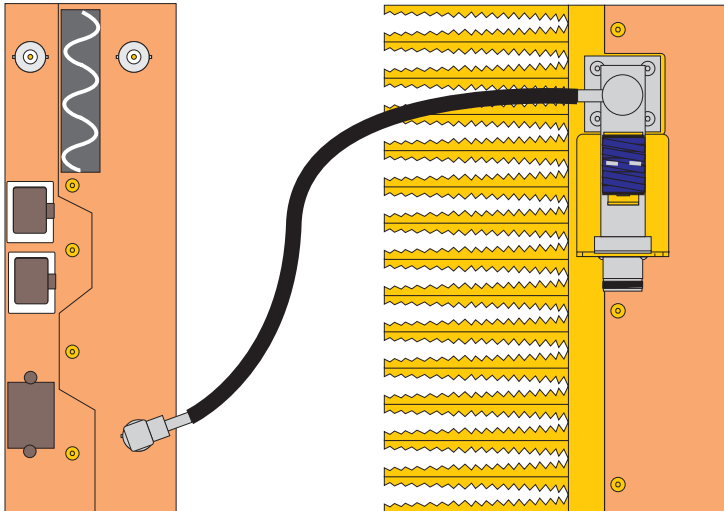1. Remove the cover screw next to the N-connector.
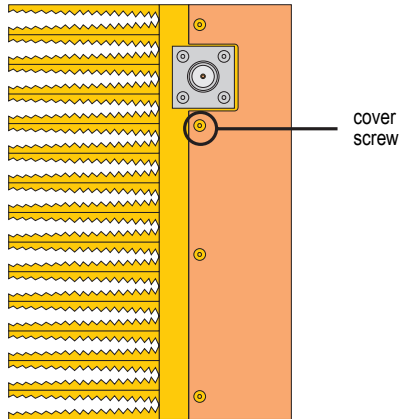
2. Fit the male-to-male barrel connector on to the PA N-connector and then fit the antenna relay on to the barrel connector.

3. Secure the antenna relay bracket by fitting the supplied M3 x 8 mm screw through the bracket to the PA chassis.

4. Fit the supplied cable (N-type to BNC) from the antenna relay to the receiver RF input.

5. Connect up the antenna relay, as follows. Plug the DB9 connector to the DIG socket on the reciter.

ⓘ If the system requires the use of other digital inputs or outputs, remove the DB9 connector cover and connect them to the appropriate digital pins.

Notice Do not operate the base station until it has been programmed for antenna relay operation. Incorrect programming could result in damage to the PA.
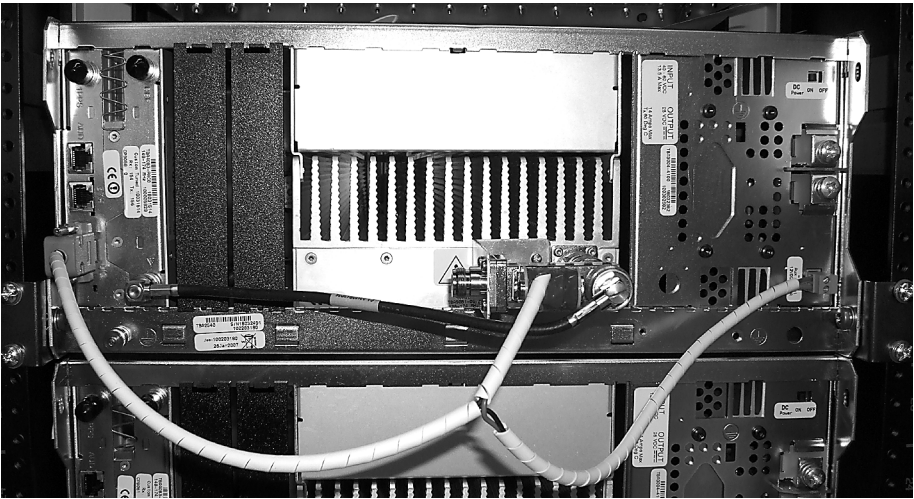
Base Station Programming

Using the CSS, you need to modify the base station's configuration for working with the antenna relay.

Enabling Antenna Relay Operation

If the base station will operate with an antenna relay, you must configure pin 1 of the DB9 labeled DIG as an antenna relay driver. It is pulled to ground whenever the transmitter is keyed. Selecting this function for the pin also instructs the base station to operate with built-in timing delays (see "Start Timing Delays" and "End Timing Delays") to ensure that the PA begins its output after the relay contacts have closed and that the relay contacts open only after the PA has ceased its output.

1. In the CSS, select Configure > Base Station > System Interface.

2. Under **Pin 1**, click **Antenna relay**.

3. In the channel table, make sure that RF repeat is disabled in all channels.

   Using an antenna relay when RF repeat is enabled will result in relay chatter. When the base station receives a signal, it switches to transmit so that it can repeat it. The result is that it can no longer see the signal. As there is nothing to transmit, it switches back to receive, which causes it to switch to transmit again, and so on.

4. Program these settings into the base station.

Configuring the Auxiliary Power Output

By default, the auxiliary power output only operates when the PMU is using AC power

(Auxiliary Power Control (Configure > Base Station > Miscellaneous) set to Mains). If the PMU is only connected to mains, you can use the default configuration. If the PMU is connected to a DC supply, you must set Auxiliary Power Control to Task Manager and create the following Task Manager action.

IF **Base station in Run mode** THEN **Unlock auxiliary supply**

This ensures that the auxiliary power output is always turned on when the base station is in Run mode.

(i) Before testing the antenna relay, make sure that you put the base station in Run mode. After start-up, the antenna relay has no power until the base station enters Run mode.

Preventing Relay Chatter

It has been found that relay chatter can also occur when a TB9100 base station is connected to some analog dispatch console models. The chatter is caused by the following. When the dispatcher presses PTT, the console re-sends the last function tone. Task Manager responds to the function tone by (for example) instructing the base station to go to a particular channel, even though it is already on that channel. The relay closes to begin the transmission, then opens again while Task Manager changes the channel, before closing again.

Task Manager programming such as the following can prevent this relay chatter.

1. Create custom inputs that will only become true if the base station receives the function tone for changing channel and it is not already on that channel.
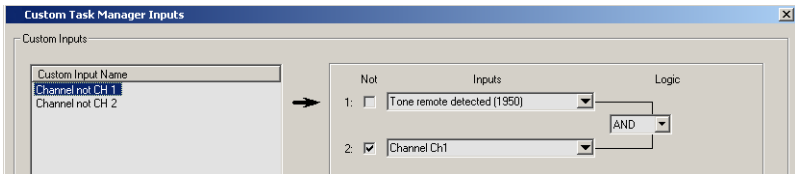
2. Create tasks that instruct the base station to go to the other channel when the custom input becomes true.

   IF **Channel not CH 1** THEN **Go to Channel Ch1**
   IF **Channel not CH 2** THEN **Go to Channel Ch2**

Antenna Relay Operation

When Pin 1 of the DIG output is configured for antenna relay, the base station operates with the following built-in timing delays. These ensure that transmissions do not begin before the relay contacts have closed, avoiding damage to the PA and burning of the relay contacts.

Start Timing Delays

The diagram below shows timings for the start of an over. The base station asserts the antenna relay driver at least 20 ms before the PA becomes active, to allow time for the relay contacts to close.

Antenna relay timing diagram for the beginning of an over
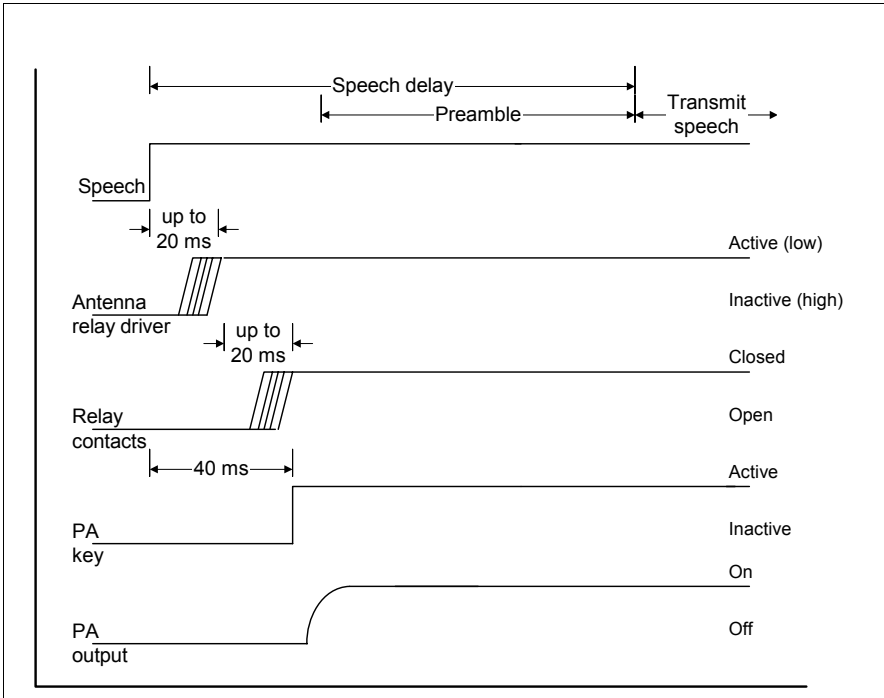
When the voter begins providing output for transmitting, the base station waits for 20 ms before activating the antenna relay line (Pin 1). It then waits a further 20 ms for the antenna relay to close before activating the PA key signal, which instructs the PA to begin transmitting. In digital P25 mode, it transmits the full preamble before beginning to transmit speech (speech transmission only begins after the antenna relay delay and the preamble time).

ⓘ The configured preamble duration is unaffected up to a maximum of 260 ms. Increasing the preamble duration beyond 260 ms has no effect on a base station with an antenna relay.

End Timing Delays

The diagram below shows timings for the end of an over. After the PA key goes inactive at the end of an over, the PA output can continue for up to 20 ms, if the keying duration was very short. The base station makes sure that the PA output has been off for at least 10 ms before de-activating the antenna relay driver.

Antenna relay timing diagram for the end of an over