

# Replacement of power transistors SRFH1008 and MRF455

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## Introduction

This service bulletin affects the users of transceivers with power amplifier (PA) output transistors SRFH1008 or MRF455. There are two transistors (matching pair) on each PA PCB. The following transceivers are affected:

- 85xx series transceivers, including variants 9313 and 9480
- 9105 (X2) transceiver
- 9323, 9360, 9390, 9780 transceivers including low power (LP) models

The transistors SRFH1008 and MRF455 are obsolete. The replacement transistor is MS1253-CDN.

## Symptoms

If the modifications described below are not made when replacing the transistors, the PAs continue to operate but they may display the following symptoms:

- some spurious oscillations on the output
- the intermodulation distortion (IMD) not meeting the specifications according to the Technical Service Manual (TSM), causing minor distortion of transmitted voice and data

## Actions

When replacing transistor SRFH1008 or MRF455 with MS1253-CDN the following is required:

- a modification to the PAs of 93xx series/9780 and LP transceivers (part number 08-05872-xxx or 08-04963-xxx), including an adjustment to the driver bias
- a modification to the 85xx series/9313/9480 transceivers
- an additional adjustment to the output bias on the PAs of all the affected transceivers

## Equipment required

The equipment required to perform the modifications include:

- a soldering iron
- a small posi drive screw driver for trimpot adjustment
- a resistor box or a series of E12 resistors
- a multimeter that can read both milliamps (mA) and amps (A)
- a pair of long nose pliers
- a microphone compatible with the transceiver
- TSM for the transceiver under repair

## Modifying the power amplifiers in the 93xx series/9780 and LP transceivers

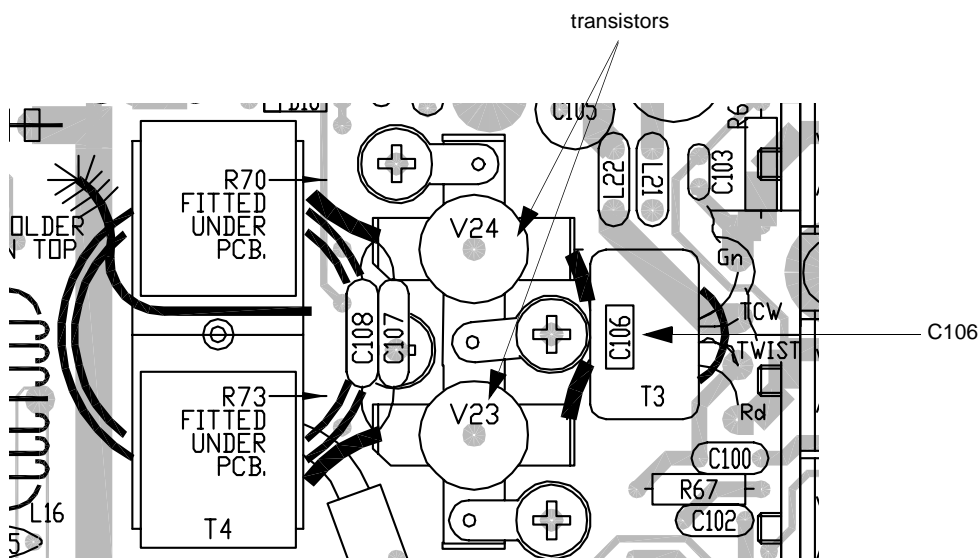


All surface-mount PAs (Codan part number 08-05872-xxx) have a 470 pf capacitor on the board already, therefore the following modification is *not* required.

To modify the PAs in the 93xx series/9780 and LP transceivers:

- Remove the two faulty transistors from the PA PCB (see Figure 1).

Figure 1: Power amplifier PCB for the 93xx series/9780 and LP transceivers



- Replace C106 with a capacitor that has a value of 470 pf.



Later model 93xx series/9780 PAs (Codan part number 08-04963-xxx) may already have the 470 pf capacitor in place. If you are unsure of the value of C106, it is recommended you replace it with a 470 pf capacitor as a precaution.

- Replace the transistors with MS1253-CDN.
- Continue from [page 3, Adjusting the driver bias for power amplifiers in 93xx series/9780 and LP transceivers.](#)

## Adjusting the driver bias for power amplifiers in 93xx series/9780 and LP transceivers

To adjust the driver bias for PAs in 93xx series/9780 and LP transceivers:

- Disconnect the exciter output to the PA by removing the J2 connector on the PA ([see Table 2](#)).
- Switch off the transceiver and disconnect it from the DC supply.
- Remove the wire link between the **LINK** stakes on the PA PCB (Codan part number 08-04963-xxx or 08-05872-xxx).
- Connect a multimeter (set to mA range) across the stakes. As viewed from the front, the positive stake is to the left.
- Reconnect the DC supply and switch on the transceiver.
- Select any channel and press the press-to-talk (PTT) button on the microphone. Measure the current across the stakes.
- Do one of the following:
  - For older PAs, adjust select on test resistor R54 if necessary as shown in [Table 1](#).
  - For surface-mount technology PAs, adjust trimpot R54 if necessary as shown in [Table 1](#).

Table 1: Driver bias currents

Model	SRFH1008/MRF455 bias current	MS1253-CDN bias current
93xx series/9780	17±1 mA	30±5 mA
93xx series/9780 LP	21±1 mA	30±1 mA

- Switch off the transceiver and disconnect the power supply.
- Use a length of tinned copper wire (TCW) or resistor leg to replace the wire link between the **LINK** stakes.
- Continue from [page 5, Adjusting the output bias in all transceivers.](#)

## Modifying the power amplifiers in the 85xx series/9313/9480 transceivers

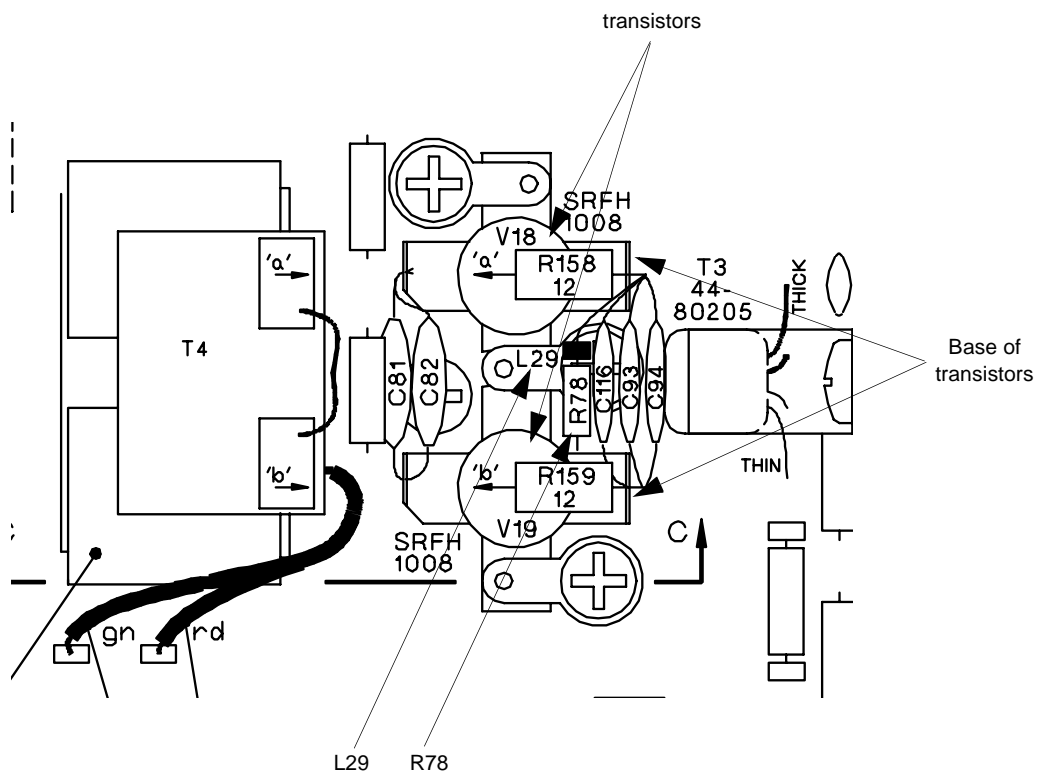
↪ If the SRFH1008 or MRF455 transistors are not faulty and do not require replacement, there is some benefit in fitting a resistor/choke circuit as described below.

↪ This modification is only required in very early 85xx series/9313/9480 PAs.

To modify the PAs in 85xx series/9313/9480 transceivers:

- Check if there is a resistor/choke (R78/L29) across the base of both transistors on the PA PCB (Codan part number 08-03743-xxx) (see Figure 2).

Figure 2: Power amplifier PCB for the 85xx series/9313/9480 transceivers



If R78/L29 is not present, it must be fitted.

Without the resistor/choke in place, spurious oscillations at approximately 4 MHz occur. The resistor/choke network consists of a:

- ↪ • 12  $\Omega$  ¼ W 5% resistor
- ferrite bead placed on one leg of the resistor with a small amount of silastic to stop any movement

- Replace the transistors with MS1253-CDN (see Figure 2).
- Continue from [page 5, Adjusting the output bias in all transceivers](#).

## Adjusting the output bias in all transceivers

To adjust the output bias:

- Disconnect the exciter output to the PA by removing the associated connector on the PA (see [Table 2](#)).

Table 2: Exciter connector reference

Model	Connector
93xx series/9780 and 93xx series/9780 LP	J2
X2	P2
85xx series/9313/9480	P2

- Switch off the transceiver and disconnect it from the DC supply.
- Remove the wire link from the **PA O/P** stakes on the PA PCB, located below the relay (see [Table 3](#) for the relay specific to the transceiver type).

Table 3: Relay reference

Transceivers	Relay
85xx series/9313/9480	K7
X2, 93xx series/9780, 93xx series/9780 LP	K8

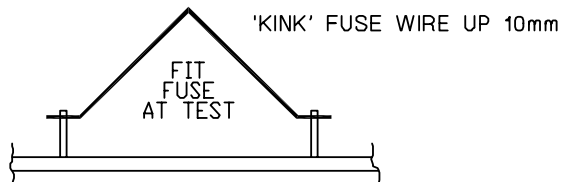
- Connect a multimeter (set to A range) across the stakes. As viewed from the front, the positive stake is to the left.
- Reconnect the DC supply and switch on the transceiver.
- Select any channel and press the PTT button on the microphone. Measure the current across the stakes.
- Adjust associated trimpot for the correct current as shown in [Table 4](#).

Table 4: Output bias current

Model	Trimpot allocation	SRFH1008/MRF455 bias current	MS1253-CDN bias current
93xx series/9780	R59	250±10 mA	300±10 mA
93xx series/9780 LP	R59	145±25 mA	145±25 mA
X2	R45	180±10 mA	200±5 mA
85xx series/9313/9480	R48	150±50 mA	200±10 mA

- If the **PA O/P** fuse is broken, do the following:
  - Replace the **PA O/P** fuse with two strands ( $2 \times 0.2$  mm TCW) taken from a piece of  $7 \times 0.2$  mm cable.
  - Solder the wire ends to the stakes as shown in [Figure 3](#).
  - Kink the wire up 10 mm to form an inverted V as shown in [Figure 3](#).

Figure 3: Replacing the fuse



## Testing the power amplifiers

As a final test it is recommended that you test the IMD of each PA. For instructions on how to test the IMD, refer to the adjustments section in the TSMs for the transceivers.