5 Fault Finding

This Section gives general fault finding assistance by explaining error messages, detailing the test facilities available in T3000 radios and providing fault finding charts. Before attempting any disassembly or repair, refer to Section 3, “Introduction To Servicing”.

The following topics are covered in this Section:

5.1 Servicing Warning

The T3000 Series II handportable radios require specialised servicing techniques. This equipment should be serviced only at an approved Tait Service Centre equipped with the necessary facilities.

Repairs attempted with incorrect equipment or by untrained personnel may result in permanent damage. If in doubt, contact Tait Electronics Ltd or your nearest Tait Branch or Subsidiary.

5.2 Test Facilities

5.2.1 Introduction

Standard test facilities have been developed to perform functions independently of the radios normal operation. These are either:

- internal radio test functions that occur at power-up or at other times during normal operation (e.g. power-on memory checks), or
- user selectible functions available when the radio is either in computer controlled test mode (CCTM) or manual test mode (MTM).

Within the tables in this Section, the following conventions apply:

" "	indicates a string sent or received via the radios SCI. Numbers without " " are test codes entered via the front panel of the radio in MTM operation.
'-'	indicates that a facility is not available
'yes'	indicates that a facility is available
'n'	a 1 to 4 digit channel number, to be entered with no leading zeros.
[l-MON]	indicates a long (>1s) press of the monitor key.
[s-MON]	indicates a short (<1s) press of the monitor key.

5.2.2 User Controls & Indicators

	T3010 & T3020		T3040	T3030, T3035 & T3040
	Normal	**CCTM**	**MTM**	**CCTM**
radio channel control: select a channel	CH+, CH-	"*n"	*nnn	"*nnn"
single character commands: perform a system restart select program mode select CCTM	 "^" "#" "%"	 "^" "#" "%"	 "^" "#" "%"	 "^" "#" "%"
radio controls & indicators: select Tx mode receive mode channel increment input Tx indicator synth. out of lock indicator RF signal detected indicator	 [PTT]/[EPTT] press [PTT]/[EPTT] release - red LED audible beep on start-up green LED	 [EPTT] press or "33" [EPTT] release or "32" - - "72" -	 [PTT] press [PTT] release [ECR] red LED [SVC] green LED	 [EPTT] press or "33" [EPTT] release or "32" - - "72" -

Table 5.1 T3000 User Controls & Interfaces

5.2.3 Self Test Facilities

Test Facility	T3010 T3020	T3030 T3035 T3040	Error Code
MCU Internal Configuration	-	yes	**X06** - the MCU internal configuration now programmed: microprocessor's internal configuration has now been set correctly, but the radio must be switched off then on for the change to take effect
ROM Checksum	yes	yes	The radio attempts to toggle a hardware port output line at 10Hz, with a mark-space ratio of 50%.
MCU Internal RAM	yes	yes	The radio attempts to toggle a hardware port output line at 50Hz, with a mark-space ratio of 50%.
External RAM	-	yes	The radio attempts to toggle a hardware port output line at 200Hz, with a mark-space ratio of 50%.
ESN Checksum	-	yes	**X31 - ESN error.** The radio's ESN checksum is incorrect - programming mode is immediately adopted.

Table 5.2 T3000 Self Test Facilities

Test Facility	T3010 T3020	T3030 T3035 T3040	Error Code
Database Checksum	yes	yes	**X32 - Database error.** The database checksum is incorrect. The programming mode is immediately adopted.
Calibration Database Checksum	yes	yes	The radio displays an appropriate message & adopts either CCTM or programming mode.
Operational checks:			
Temperature > T1 threshold	yes	yes	**X35 - High temperature.** Impending turn down of transmit power. User mode: two *'beeps'* sound before power turns down.
Temperature >T2 threshold	yes	yes	**X36 - Very high temperature.** Impending turn off of transmitter. User mode: radio turns off.
Voltage < V1 threshold	yes	yes	**X37 - Low battery warning.** User mode: warning *'beeps'* sound and red LED flashes. On T3040, there is a 'battery low' message on the display.
Voltage < V2 threshold	yes	yes	**X38 - Very low battery warning.** The battery is very low, but the radio will not turn off while in CCTM. User mode: the radio turns off.

Table 5.2 T3000 Self Test Facilities (Continued)

5.2.4 Test Mode

The radio can be operated in one of two modes specifically designed to provide testing functions. In CCTM, the radio's SCI is used for selecting test functions and returning test results. In MTM (available only in the T3040), the keys and LEDs on the radio's front panel are used to select test functions and display test results.

5.2.4.1 CCTM

CCTM Communications Settings

Use the following settings when running a terminal program:

Baud rate	.. 4,800 baud
Number Of Data Bits	.. 8 bits
Number Of Stop Bits	.. 1 bit
Parity	.. none
Flow Control	.. X_{on}/X_{off}

Entering CCTM

To enter CCTM, send the following commands to the radio:

Send the reset character "^" (SHIFT-6)

Send the "select CCTM" character, "%", (SHIFT-5) within 0.5 seconds of sending the reset command. The radio will now be in CCTM, and the terminal program will display a "-" prompt.

5.2.4.2 Entering MTM (T3040 Radios)

Run the T3000 programming software, and select **Unit - Miscellaneous Controls** from the **Edit** keyword menu.

Click on the **Test Mode On Power-up** list box arrow, and select **Enabled**. When the radio is next powered-up, it will enter MTM.

The following table summarises the MTM and CCTM test facilities available on T3000 series handportables.

	T3010 T3020		T3040	T3030, T3035 & T3040
	Normal	**CCTM**	**MTM**	**CCTM**
Signalling functions:				
10. set modem to send zeros	-	10	10	"10"
11. set modem to send ones	-	11	11	"11"
12. set modem to send preamble	-	12	12	"12"
13. disable modem transmit	-	13	13	"13"
14. read modem receive state	-	-	-	"14"
15. disable subaudible signal	} programmed	-	-	"15"
16. enable subaudible signal	} per channel	-	-	"16"
17. read signalling decode status	speaker	-	-	"17"
18. enable Selcall encode	-	-	-	"18"
19. enable DTMF transmission	-	-	-	-
Mute functions:				
20. force receive audio muted	-	"20"	20	"20"
21. force receive audio unmuted	l-MON	"21"	21	"21"
22. mute microphone audio	-	"22"	22	"22"
23. unmute microphone audio	-	"23"	23	"23"
24. let squelch control receive audio	s-MON	"24"	24	"24"
25. read squelch receive busy status	-	"25"	-	"25"
26. relax receive audio mute control	s-MON	"26"	-	_
Radio receive/transmit functions:				
30. inhibit the PA (transmit mode)	-	"30"	30	"30"
31. enable the PA (transmit mode)	-	"31"	31	"31"
32. set radio to receive	see	"32"	32	"32"
33. set radio to transmit	below	"33"	33	"33"
34. set PA to low power	programmed	"34"	34	"34"
35. set PA to high power	} per	"35"	35	"35"
36. set PA to max power	} channel	"36"	36	"36"
37. relax PA power control	-	-	-	-
Power supply functions				
40. unlatch reg supply	-	-	-	-
41. latch reg supply	-	-	-	-
42. +5V ECON off / ECN on	-	"42"	-	-
43. +5V ECON on / ECN off	-	"43"	-	-
44. set-up for current drain test	-	-	-	-
45. reinstate display after 44	-	-	-	-
46. read voltage level	-	"46"	-	"46"
User interface test functions:				
50. keypad test on	-	"50"	-	"50"
51. keypad test off	-	"51"	-	"51"
52. display test on	-	"52"	-	"52"
53. display test off	-	"53"	-	"53"
RSSI functions:				
61. Set L1 threshold	-	-	-	-
62. set L2 threshold	-	-	-	-
63. read averaged RSSI level	-	"63"	-	"63"
64. read L1	-	-	-	"64"
65 read L2	-	-	-	"65"
66. select fast averaged RSSI	-	"66"	-	"66"
67. select normal averaged RSSI	-	"67"	-	"67"

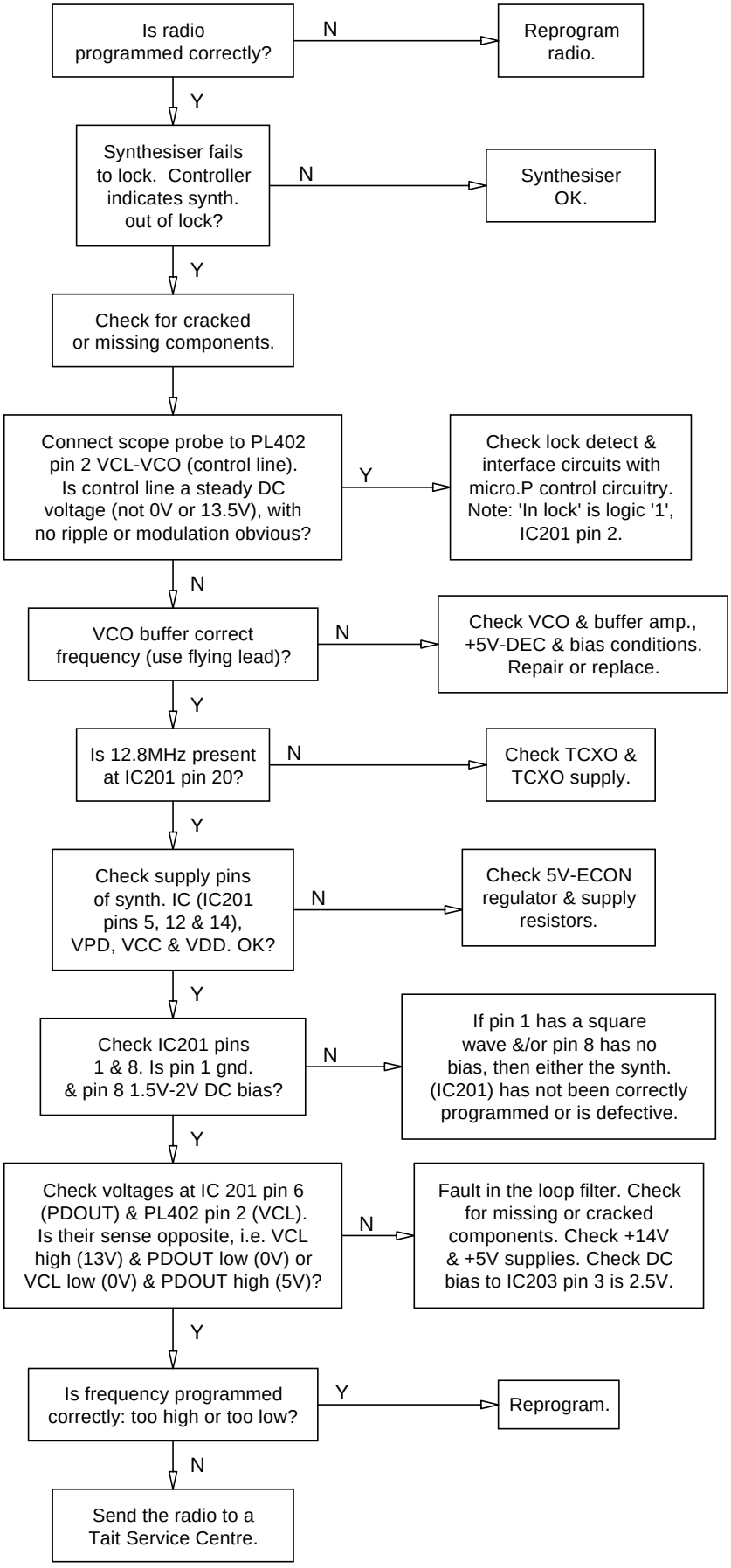
	T3010 T3020		T3040	T3030, T3035 & T3040
	Normal	**CCTM**	**MTM**	**CCTM**
Miscellaneous functions:				
70. select normal MCU clock rate	} programmed	"70"	-	"70"
71. select birdie MCU clock rate	} per channel	"71"	-	"71"
72. read synth. lock status	-	"72"	-	"72"
73. relax MCU clock control	-	-	-	-
74. switch external speaker/mic. on	-	"74"	-	"74"
75. switch external speaker/mic off	-	"75"	-	"75"
76. switch handset mode on	-	-	-	-
77. switch handset mode off	-	-	-	-
79. stop the MCU clock	-	-	-	"79"
Options functions:				
80. test the hire timer	-	"80"	-	-
Special functions:				
92. set 'sticky' manual test mode	-	-	-	"92"
93. clear 'sticky' manual test mode	-	-	-	"93"
94. read CSN	-	"94"	-	"94"
95. read factory model ID	-	"95"	-	"95"
96. read software version	-	"96"	-	"96"
97. read ESN	-	-	-	"97"
99. get current channel number	-	-	-	-
Synthesiser functions: 101. Load absolute frequency	-	"101"	-	"101"
Configuration control functions:				
110. set volume pot.	-	"110"	-	"110"
112. set TCXO modulation gain	-	"112"	-	"112"
113. set VCO modulation gain	-	"113"	-	"113"
114. set transmit power level	-	"114"	-	"114"
115. set TCXO coarse frequency	-	"115"	-	"115"
116. set TCXO fine frequency trim	-	"116"	-	"116"
117. set Rx front end tuning	-	'117"	-	'117"
118. set squelch threshold	-	"118"	-	"118"
119. set sub-audible modulation	-	"119"	-	-
Command errors: C101 - An invalid command code has been received. C102 - A valid command code has been received with invalid parameters.				

5.3 Fault Finding Charts

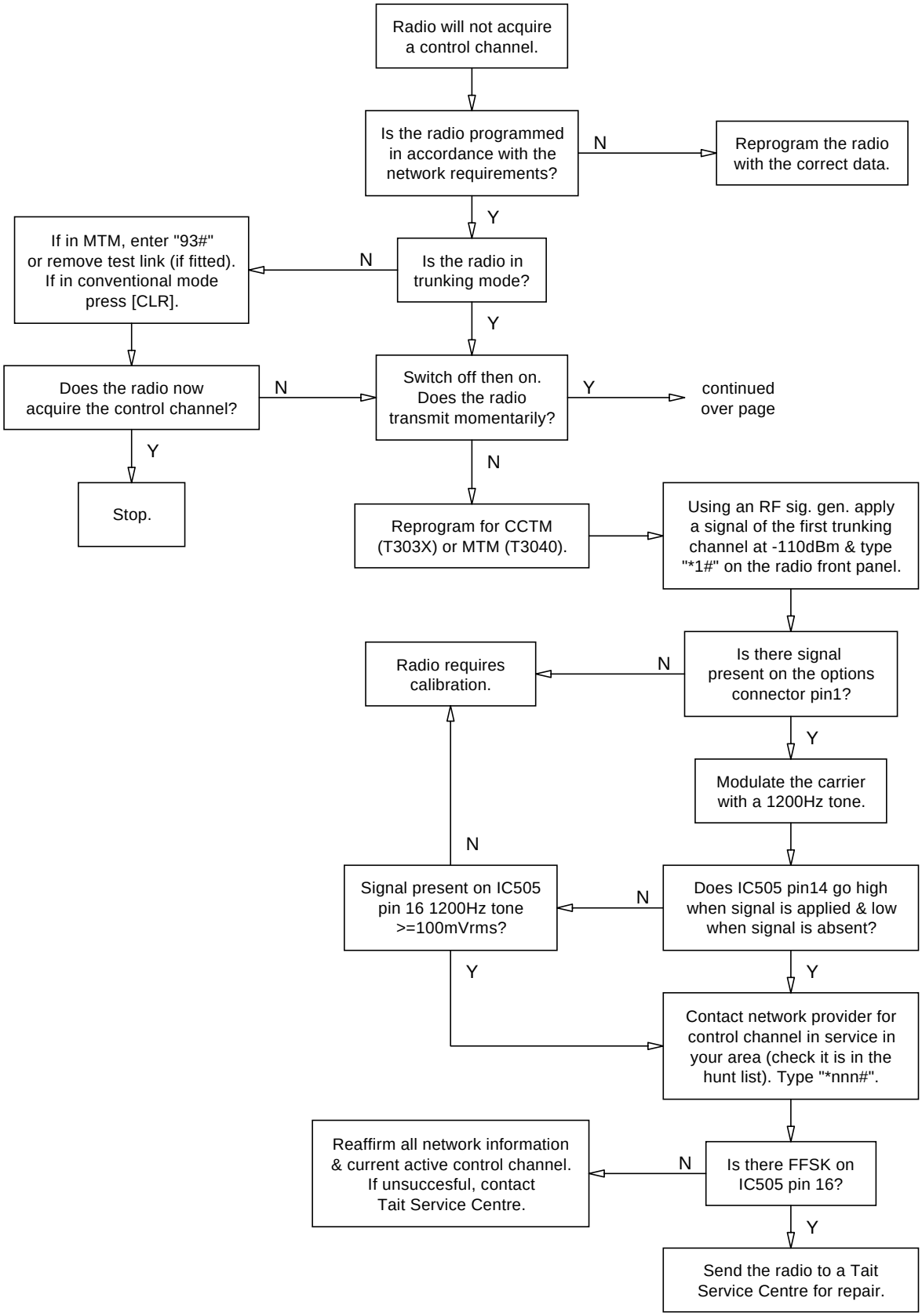
5.3.1 Introduction

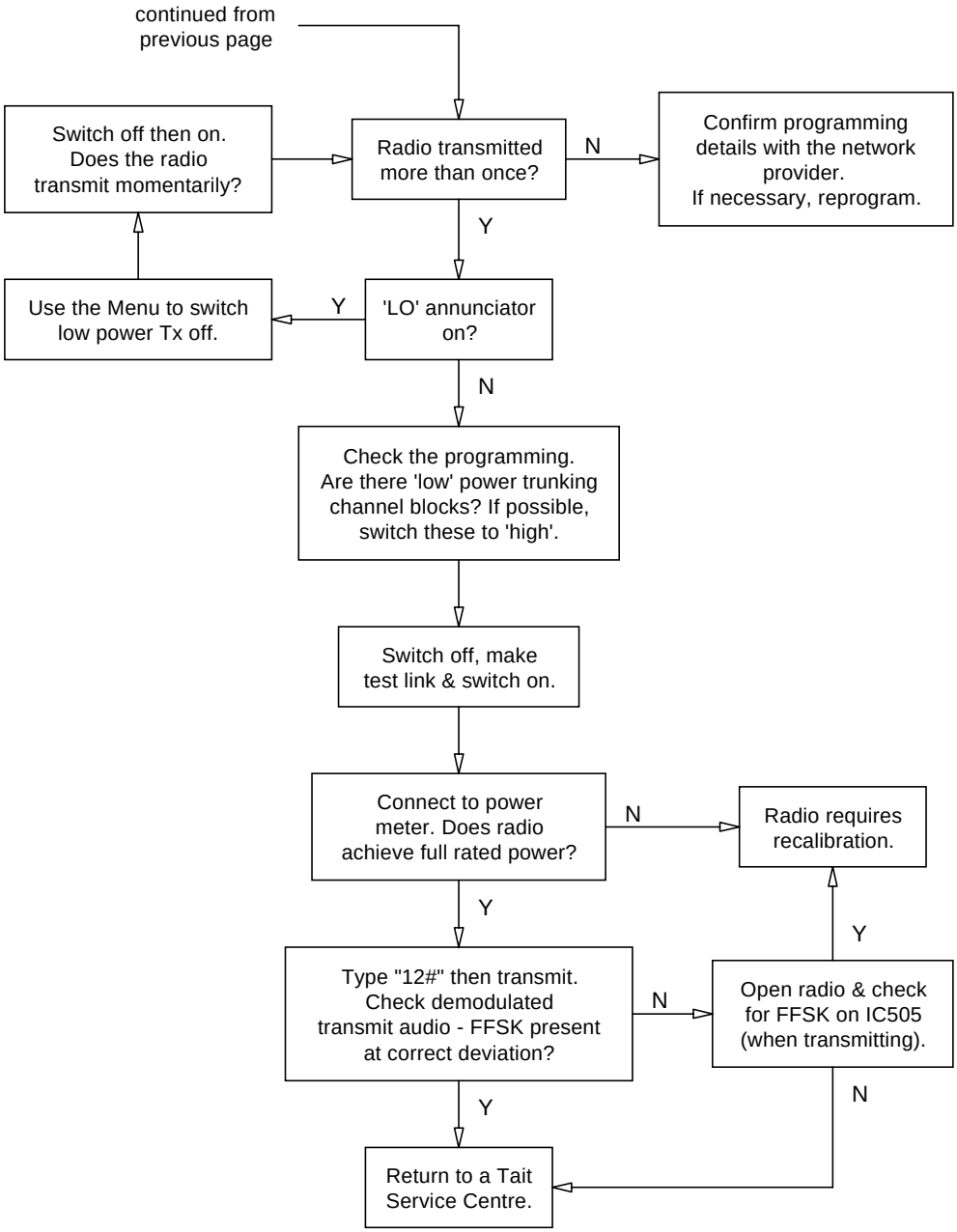
The fault finding charts listed below are intended to be used in conjunction with the circuit diagrams and other PCB information found in Section 6, and with the circuit descriptions and block diagrams found in Section2.

5.3.2 Synthesiser Fault Finding Chart

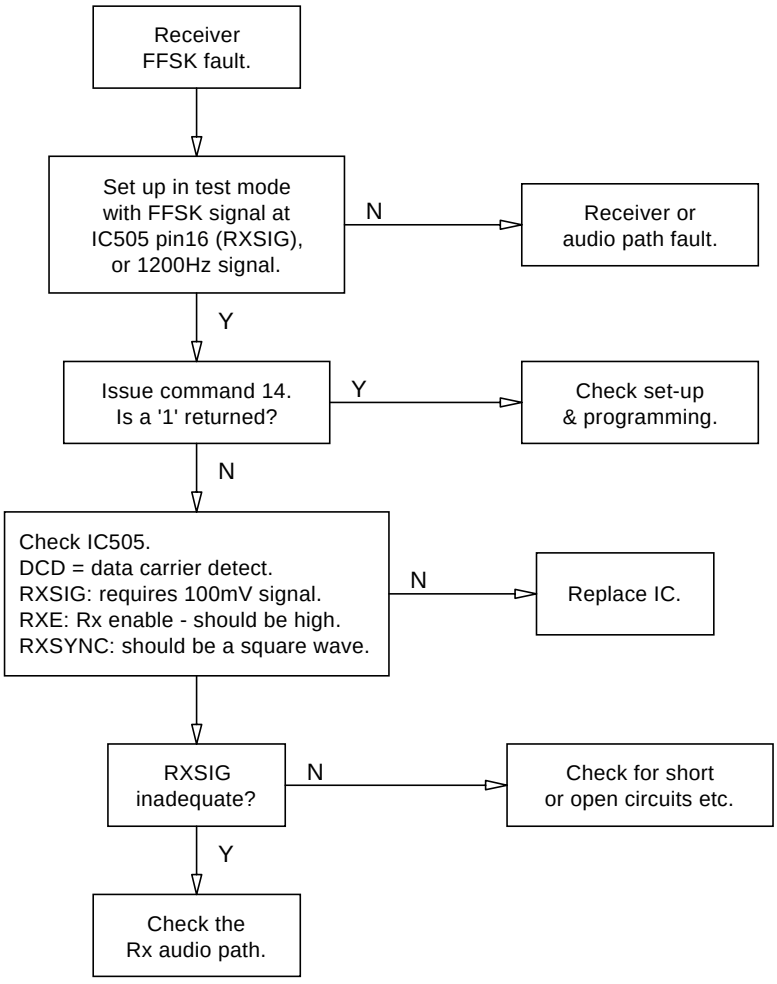


5.3.3 T3030, T3035 & T3040: Radio Will Not Acquire A Control Channel

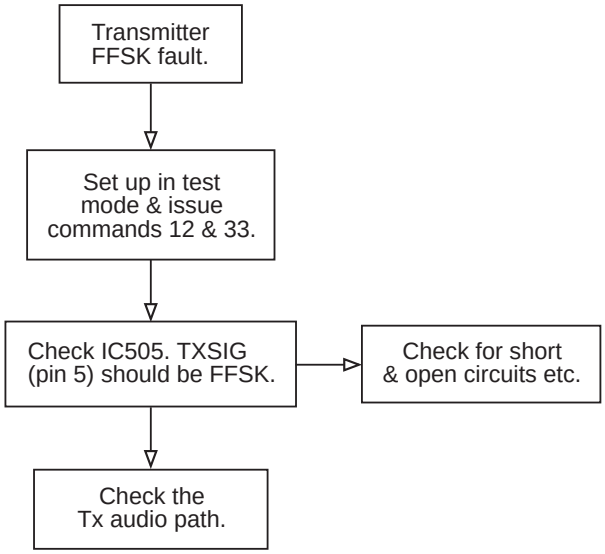



continued from previous page
Switch off then on. Does the radio transmit momentarily?
Radio transmitted more than once?
N
Confirm programming details with the network provider. If necessary, reprogram.
Y
Use the Menu to switch low power Tx off.
Y
'LO' annunciator on?
N
Check the programming. Are there 'low' power trunking channel blocks? If possible, switch these to 'high'.
Switch off, make test link & switch on.
Connect to power meter. Does radio achieve full rated power?
N
Radio requires recalibration.
Y
Type "12#" then transmit. Check demodulated transmit audio - FFSK present at correct deviation?
N
Open radio & check for FFSK on IC505 (when transmitting).
Y
N
Y
Return to a Tait Service Centre.

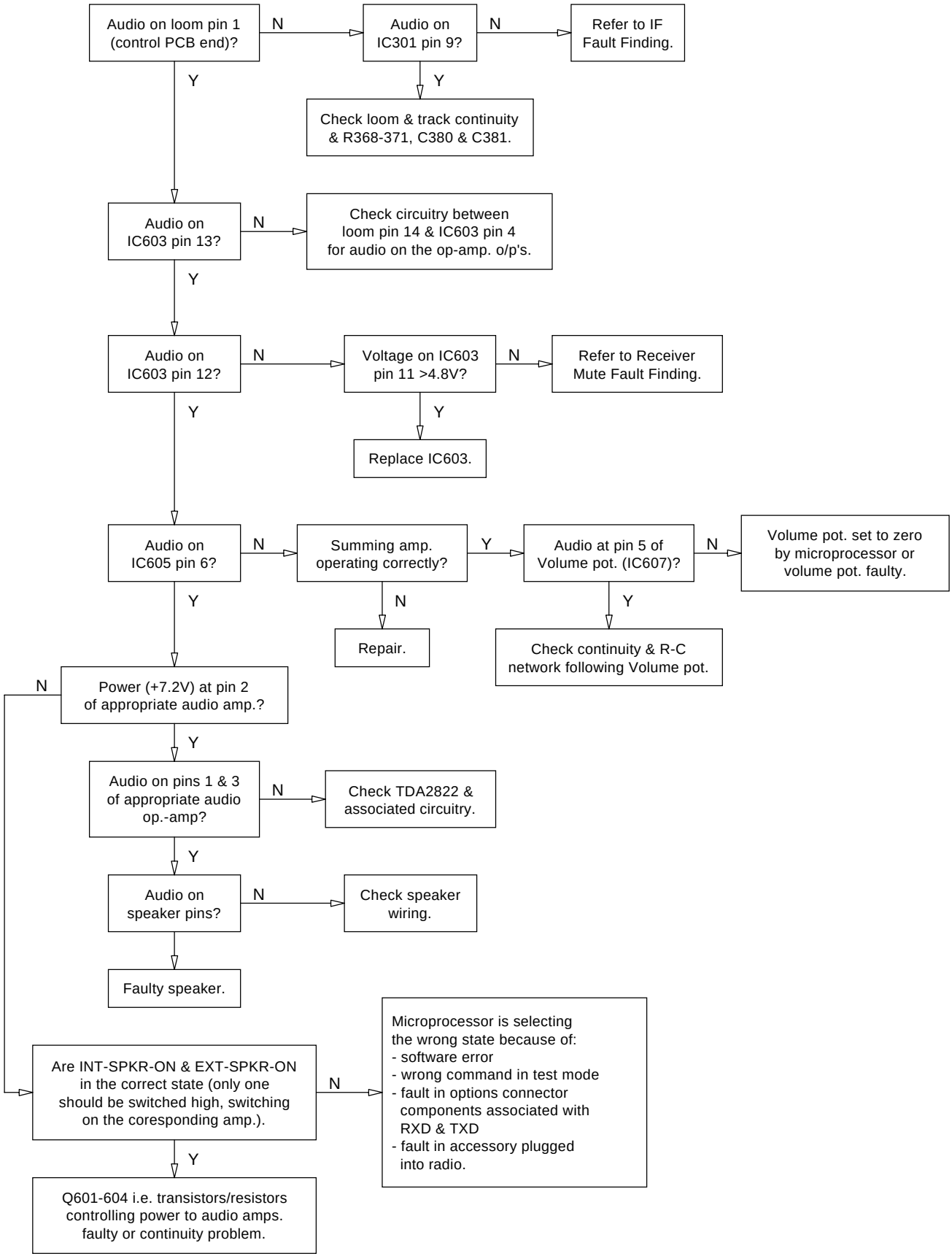
5.3.4 T3030, T3035 & T3040: Receiver FFSK Fault



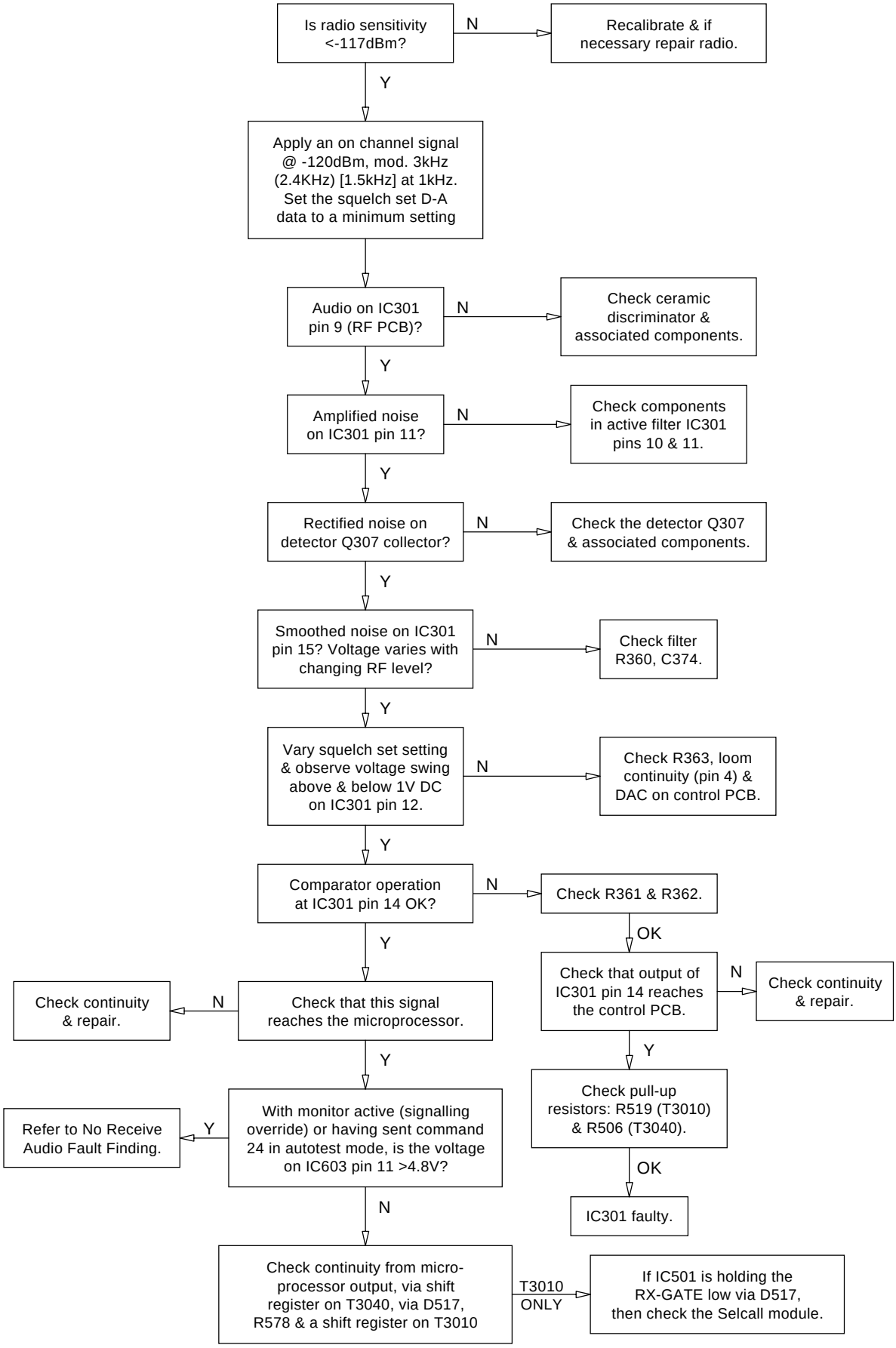
5.3.5 T3030, T3035 & T3040: Transmitter FFSK Fault



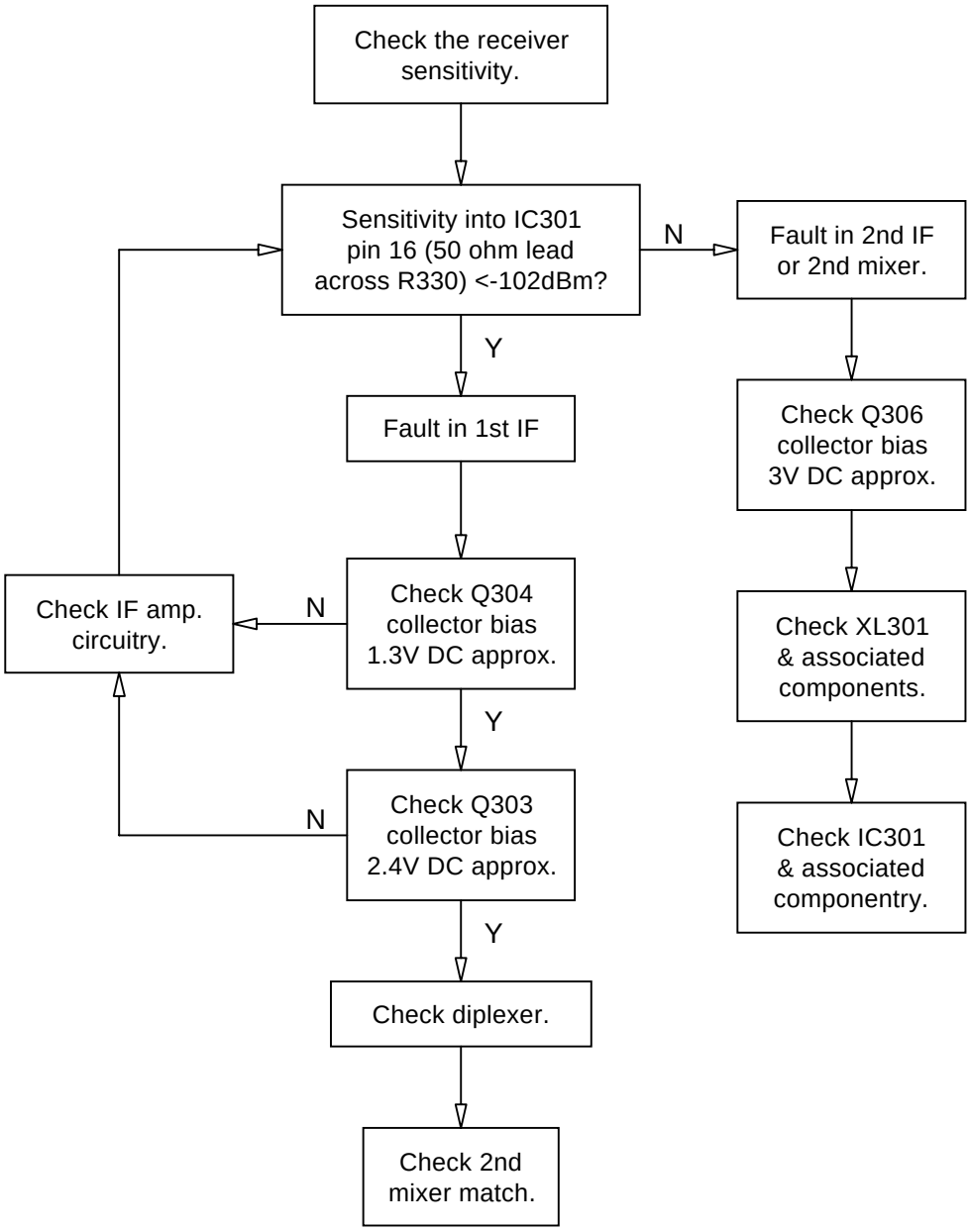
5.3.6 No Receive Audio Fault Finding



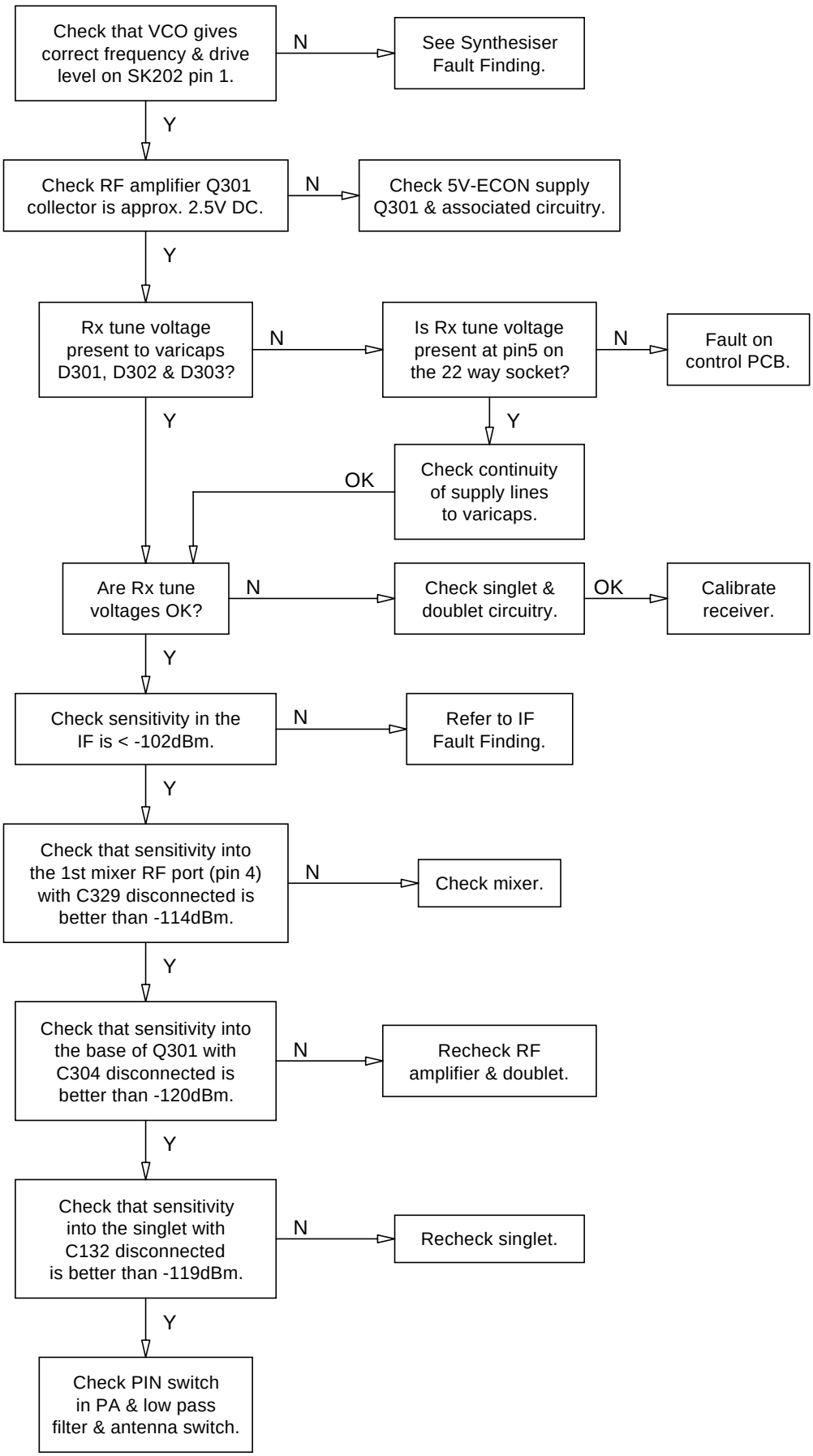
5.3.7 Receiver Squelch Fault Finding



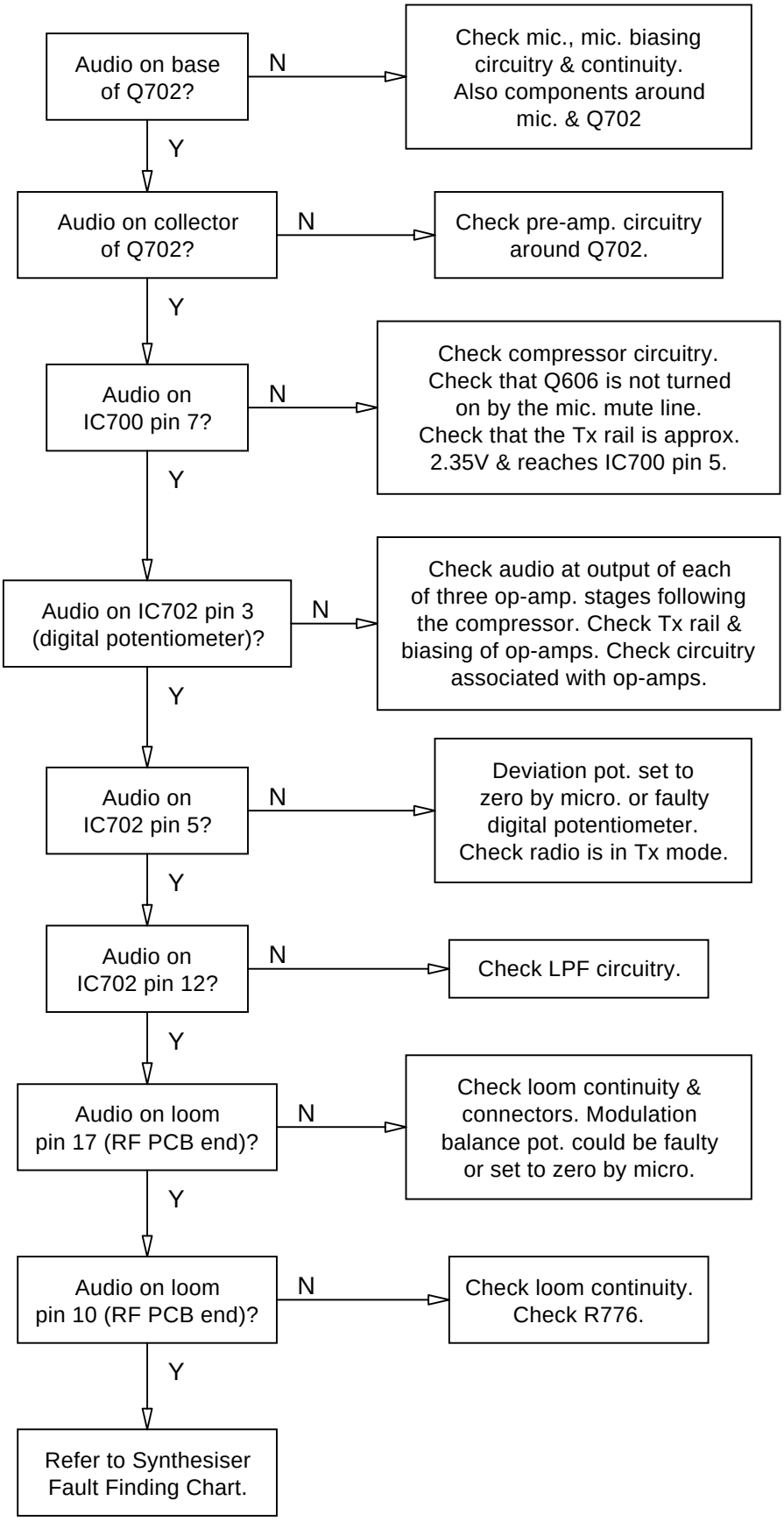
5.3.8 IF Fault Finding



5.3.9 Receiver Front End Fault Finding



5.3.10 Transmit Audio Fault Finding



5.3.11 Power Amplifier Fault Finding