THE SERVICE MONITOR

A Presentation
By

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MARC Tactical Repeater Committee
February 22 2021

THE SERVICE MONITOR

DEFINITION

- **A Test Instrument Designed Specifically for Servicing & Monitoring Communications Equipment**
  - **different service monitors have simple to complex test capabilities**

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SOME TYPICAL SERVICE MONITORS

Cushman CE-3

THE SERVICE MONITOR

SOME TYPICAL SERVICE MONITORS

IFR 1000S

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SOME TYPICAL SERVICE MONITORS

Motorola R-2000D

THE SERVICE MONITOR

WHY DO YOU USE IT

- **To Test/Measure/Adjust -**
  - **am modulation**
  - **audio distortion**
  - **audio line levels**
  - **audio frequency response**
  - **desensitization**
  - **frequency**

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WHY DO YOU USE IT

- **To Test/Measure/Adjust, cont.**
  - **modulation**
  - **quieting**
  - **receiver sensitivity**
  - **squelch sensitivity**
  - **transmitter power**
  - **duplexer tuning**

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WHY DO YOU USE IT

- **To Test/Measure/Adjust, cont.**
  - **ferrite isolators**
  - **sub audio tones (CTCSS & others)**

THE SERVICE MONITOR

TYPICAL COMPONENTS FOR A RF SERVICE MONITOR

- Spectrum Analyzer
- Duplex Generator
- Modulation Oscilloscope
- Frequency Counter
- AC/DC Digital Voltmeter
- RF Wattmeter/Signal-Level Meter
- General Purpose Oscilloscope

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TYPICAL COMPONENTS FOR A RF SERVICE MONITOR

- **Multi-Mode Code Synthesizer**
- **Distortion/SINAD Meter**
- **Sweep Generator**

THE SERVICE MONITOR

THE MOTOROLA R2000D SERVICE MONITOR*

- This instrument is a portable analyzer, designed for servicing & monitoring communications systems
- Functions supersede those of earlier service monitors, expanding features & capabilities so only a single instrument is use rather than a host of separate test gear

* unit owned by MARC Club Repeater Committee

THE SERVICE MONITOR

THE COMMUNICATIONS SYSTEM ANALYZER GENERATES AND MONITORS SIGNALS

-performing the tests associated with the

- **Spectrum Analyzer**
- **Duplex Generator**
- **Modulation Oscilloscope**
- **Frequency Counter**
- **AC/DC Digital Voltmeter**

THE SERVICE MONITOR

THE COMMUNICATIONS SYSTEM ANALYZER GENERATES AND MONITORS SIGNALS

-performing the tests associated with the

- **RF Wattmeter/Signal-Level Meter**
- **General Purpose Oscilloscope**
- **Multi-Mode Code Synthesizer**
- **Distortion/SINAD Meter**
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THE SERVICE MONITOR

THE COMMUNICATIONS SYSTEM ANALYZER GENERATES AND MONITORS SIGNALS

-performing the tests associated with the

- **This instrument is a portable analyzer, designed for servicing & monitoring communications systems**
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TEST SETUPS (see R2000D Operator's Manual)

- AM modulation test setup - fig 4-12 – p4-22
- AM modulation linearity test setup - fig 4-13 – p4-24
- Audio distortion setup - fig 4-9 – p4-18
- Audio frequency response; EIA Standard RS-204C - fig 4-4 – p4-8
- Audio frequency response setup - fig 4-10 – p4-20
- Desensitization test setup – fig 4-24 – p4-45

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TEST SETUPS (see R2000D Operator's Manual)

- **Duplexer adjustment setups – various figs – pgs 4-37, 4-39, 4-41, 4-43**
- **Ferrite isolator test setup - fig 4-25 – p 4-47**
- **Frequency adjustment setup - fig 4-6 – p 4-12**
- **Frequency setup; community repeater - fig 4-15 – p 4-27**
- **Modulation setup; remote base - fig 4-16 – p 4-29**
- **Phone line levels setups - fig 4-17 – p 4-31**

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TEST SETUPS (see R2000D Operator's Manual)

- Probe setup fig 4-5 – p 4-10
- Quieting (20db) test setup & display fig 4-2 – p 4-4
- Receiver sensitivity test 12db sinad audio distortion fig 4-1 – p 4-2
- Squelch sensitivity test setup fig 4-3 – p 4-6
- Transmitter tests setup fig 4-7 – p 4-14
- Transmitter test setup; power measurements fig 4-8 – p 4-17

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TEST SETUPS (see R2000D Operator's Manual)

RECEIVER FREQUENCY ADJUSTMENT

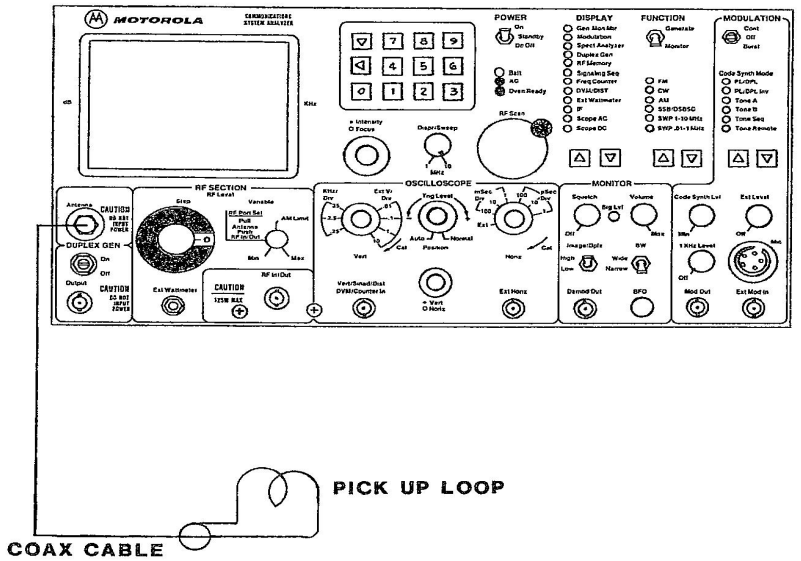

FIGURE 4-6. FREQUENCY ADJUSTMENT SETUP

BASIC FM TRANSMITTER TESTS
POWER, FREQUENCY, AND DEVIATION

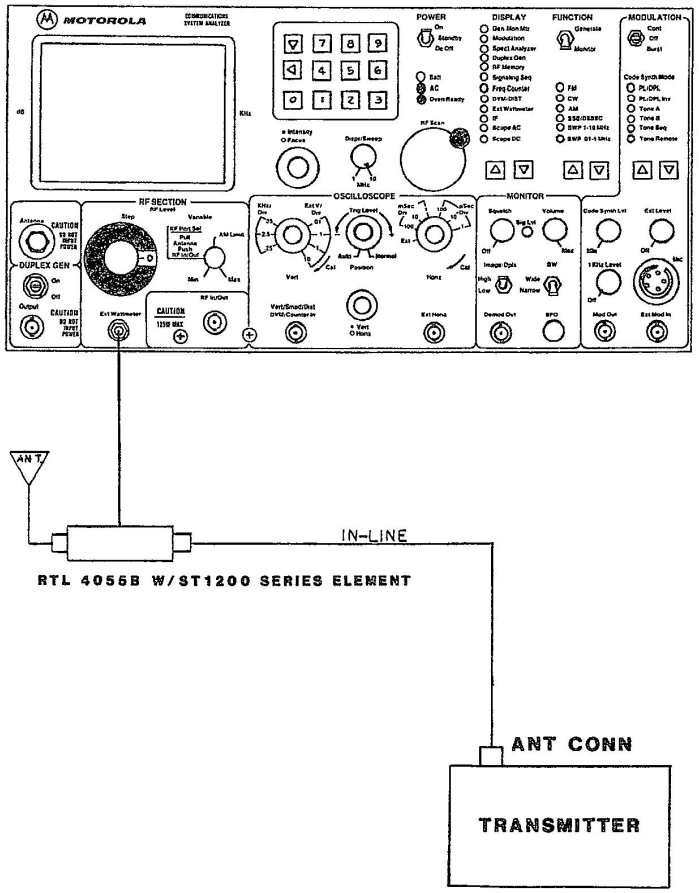

FIGURE 4-8. TRANSMITTER TEST SETUP; POWER MEASUREMENTS

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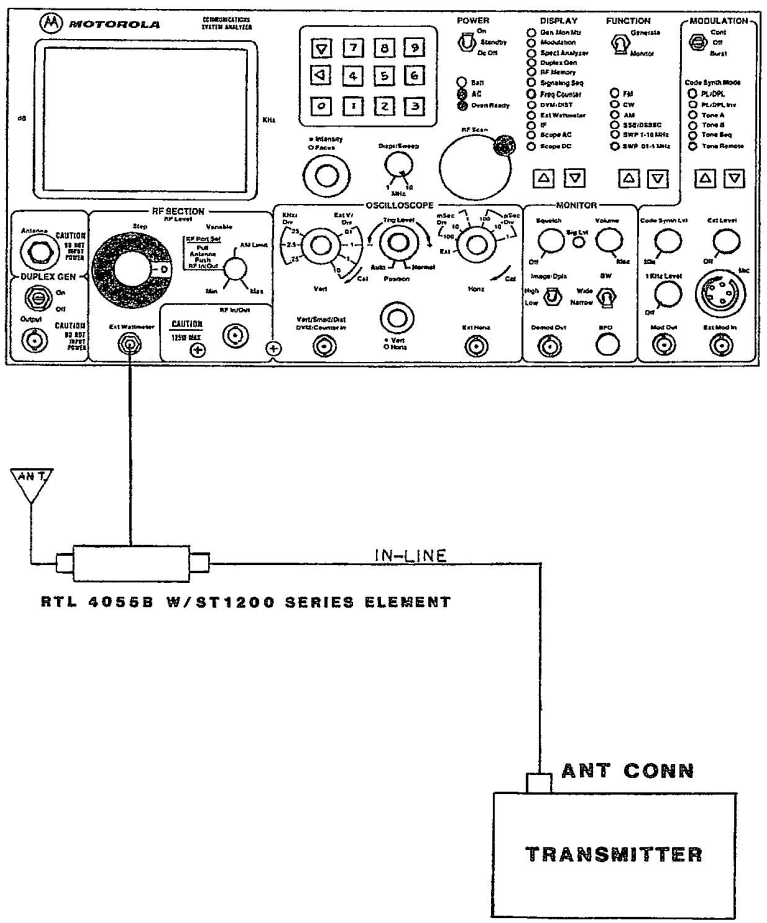
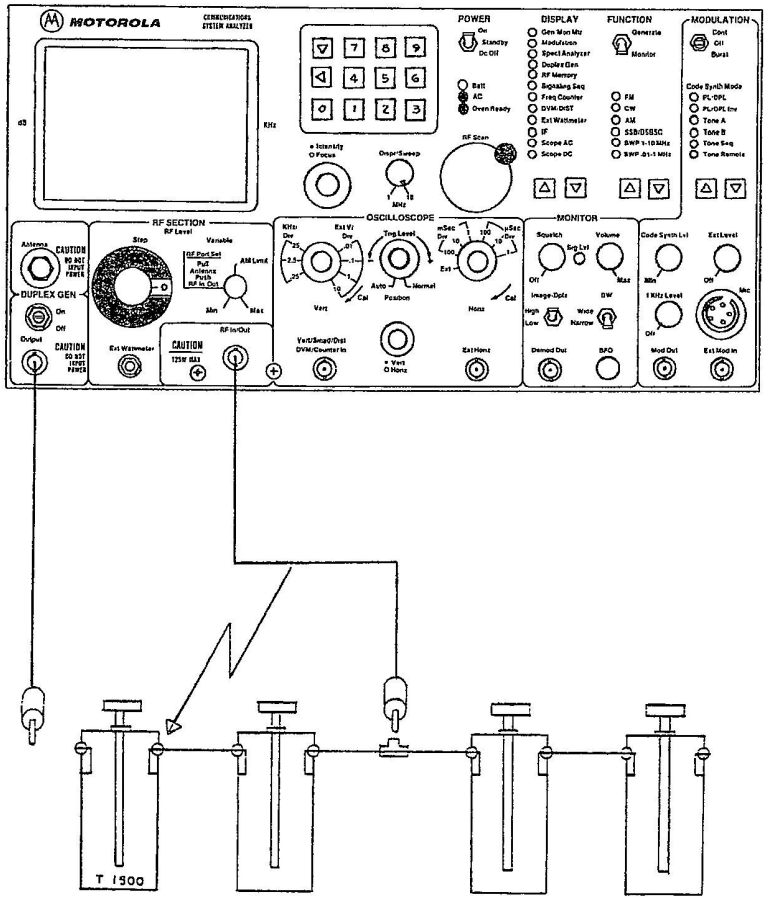
TEST SETUPS (see R2000D Operator's Manual)

BASIC FM TRANSMITTER TESTS
POWER, FREQUENCY, AND DEVIATION



BANDPASS CAVITY & DUPLEXER TUNING



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REFERENCES & FURTHER READING

- **Communications System Analyzer Operator's Manual – R-2001D, Motorola, 1985, 111 pgs**
- **Test Essentials: Series Overview – Greg Vaught, Rohde & Schwarz, 2020, 15 slides**

-T&M Categories discused in Test Essentials

  - **Signal Generators**
  - **Spectrum Analyzers**
  - **Network Analyzers**

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REFERENCES & FURTHER READING

-T&M Categories discused in Test Essentials, cont.

- **Power Meters**
- **Oscilloscopes**

- **Test & Measurement for Radio Communications Equipment – Thomas Boegl, DL9MDB, Rohde & Schwarz (In three parts), 2020, 106 slides**

- Part 1 Overview

- **Frequency ranges and their role for radio communication**

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REFERENCES & FURTHER READING

- **Test & Measurement for Radio Communications Equipment**

  - **Part 1 Overview, cont.**
    - **Introduction to typical radio communication equipment and systems of Rohde & Schwarz**
    - **A look into typical data sheets of communication radios**

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REFERENCES & FURTHER READING

- **Test & Measurement for Radio Communications Equipment –**

  - Part 2 Overview

  - **Short overview of relevant modulation schemes**
  - **Selection of applicable test equipment**
  - **Receiver measurements (with examples)**

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REFERENCES & FURTHER READING

- **Test & Measurement for Radio Communications Equipment**

  - Part 3 Overviews Omitted - See Handouts

- **The Test & Measurement Page, Adam Farson VA7OJ/AB4OJ**

  < https://www.ab4oj.com/test/main.html >

- **Test Procedures Manual By Bob Allison WB1GCM, Michael Tracy KC1SX, Mike Gruber W1MG, ARRL 1990-2010**

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QUESTIONS?

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This Concludes the Presentation

73 de Hank Black N3ESR

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