2.1033 (C) (13) Digital Modulation Techniques

Manchester, AFSK. Refer to 2.1047 for test data.

2.1033 (c) (14) Test Data

Refer to 2.1046 through 2.1057

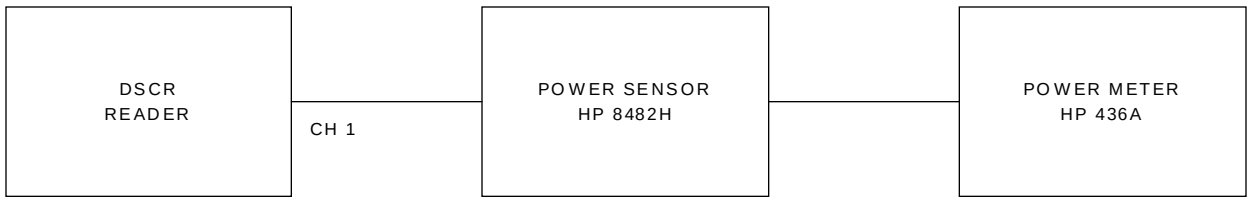
2.1046 Measurement of RF Power Output

Definition: Power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements.

Test Method: Power measurements were recorded using the test setup shown in Figure 1.

Test Results: Power was verified to not exceed 30 dBm (1 Watt). The measured power was 29.95 dBm (CW) and 18.03 dBm (ASK) at a nominal supply voltage of 13.8 Vdc. The power output did not change when the voltage was increased to 115% of nominal (15.9 Vdc).

Figure 1: Block Diagram – RF Power Output



TEST EQUIPMENT LOG

Customer: Raytheon Company
EUT: DSCR Reader
Model / Part #: 60020-2
Date: July 9, 2001

Test Procedure: CFR 47
Test Specification: Part 2.1055
Test Engineer: John Stanford
Customer Rep: Ira Feldman

DESCRIPTION	MANUFACTURER	MODEL # / SERIAL #	CAL DUE
Power Meter	HP	436A / 2604A24808	07/05/02
Power Sensor	HP	848H / 2609A03376	04/19/02

2.1047 Measurement of Modulation Characteristics

Definition: The VRC Reader uses Amplitude Shift Keying (ASK) and Manchester coding to transmit data at a 500 Kbps rate.

Manchester data encoding: A logic 0 is encoded as low for the first half of the bit interval and high for the second half; a logic 1 is represented as high for the first half of the bit interval and low for the second half.

ASK modulation: the transmitter switches on for a "high," and off for a "low."

Test Method: Connect the Equipment per Figure 2.

Observe the Reader's transmitter output using the Oscilloscope and diode detector. Verify the Amplitude Shift Keying, Manchester coding, and data rate by observing the detected transmitter waveforms.

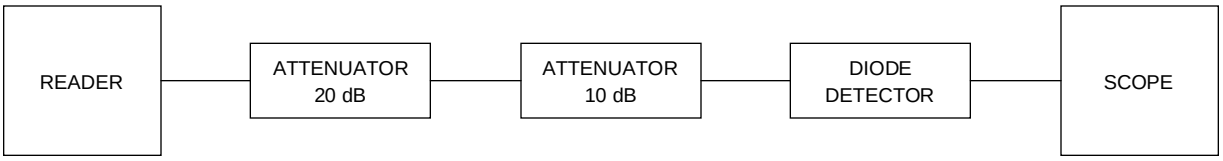
Test Results: See Figure 3 (photographs) and Figure 4.

The first plot shows one transmit frame, which has a duration of 9.8 msec.

The second plot shows a magnification of the first 20 microseconds of the extended header of a frame control message. The ASK modulation characteristic (Table 1, Item 8) is evident: the detected signal switches on for a "high," and off for a "low."

The third plot shows an expanded view of a 16-microsecond frame sync pulse. The digital representation of the sync pulse is 8D hex or 10001101 binary. This figure shows the appropriate Manchester coding (Table 1, Item 9). The 500 Kbps data rate (Table 1, Item 10) is also evident in this plot; each bit interval (Manchester high/low or low/high) occupies 2 microseconds.

Figure 2: Equipment Setup for Manchester Coding and Data Rate



TEST EQUIPMENT LOG

Customer: Raytheon Company
EUT: DSCR Reader
Model / Part #: 60020-2
Serial #:

Test Procedure: CFR 47
Test Specification: Part 2.1033 (13)
Test Engineer: John Stanford
Customer Rep: Steve Messerole

DESCRIPTION	MANUFACTURER	MODEL # / SERIAL #	CAL DUE
Oscilloscope	Tektronix	2465/4471438	8/2/02
Crystal Detector 100K – 4 GHz	Wiltron	73/77940	N/A
Attenuator, 10 dB	Narda	768-10	N/A
Attenuator, 20 dB	Narda	766-20	N/A
Coax	Belden	-	N/A

N/A – Not Applicable

Figure 3: Photographs for Manchester Coding and Data Rate

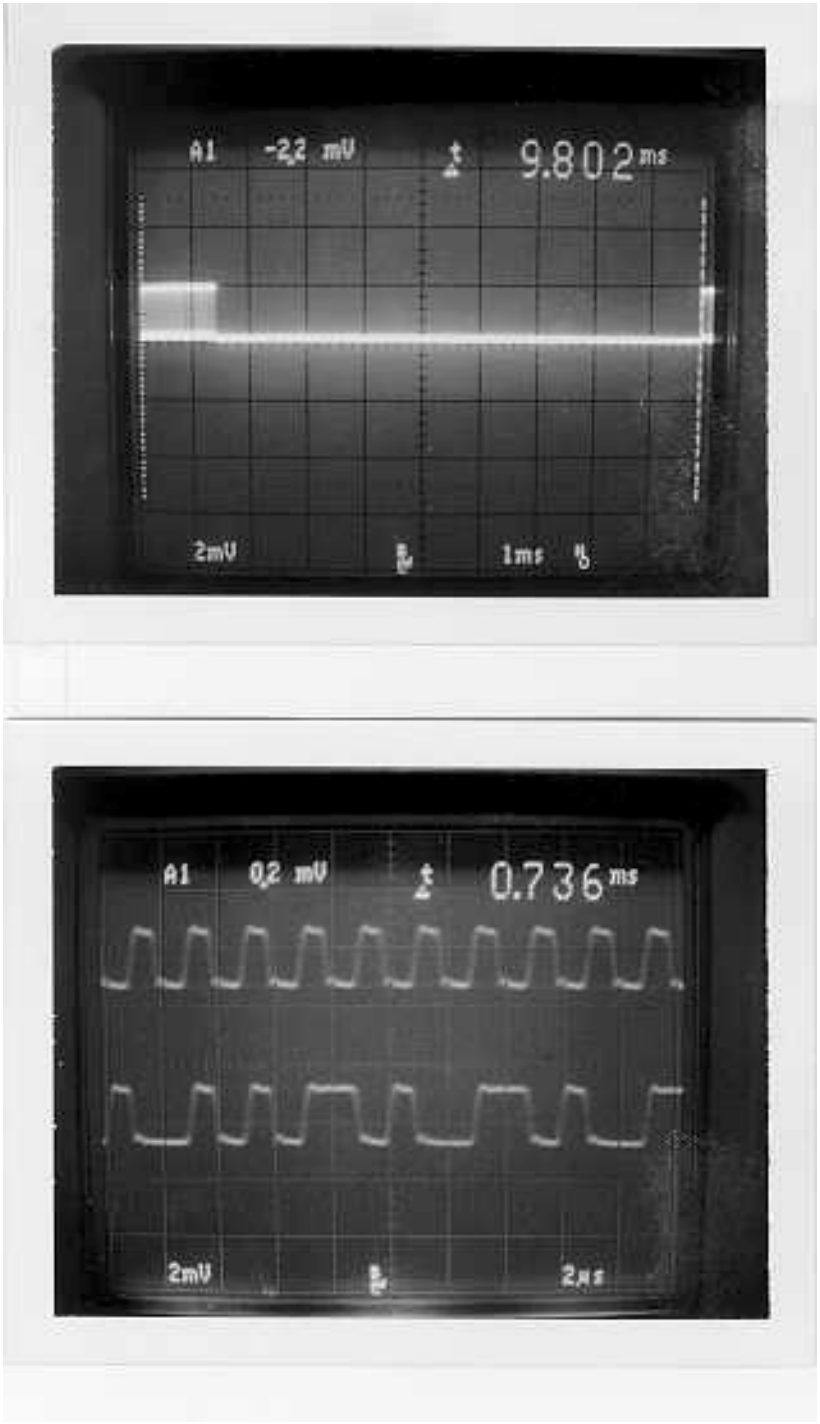
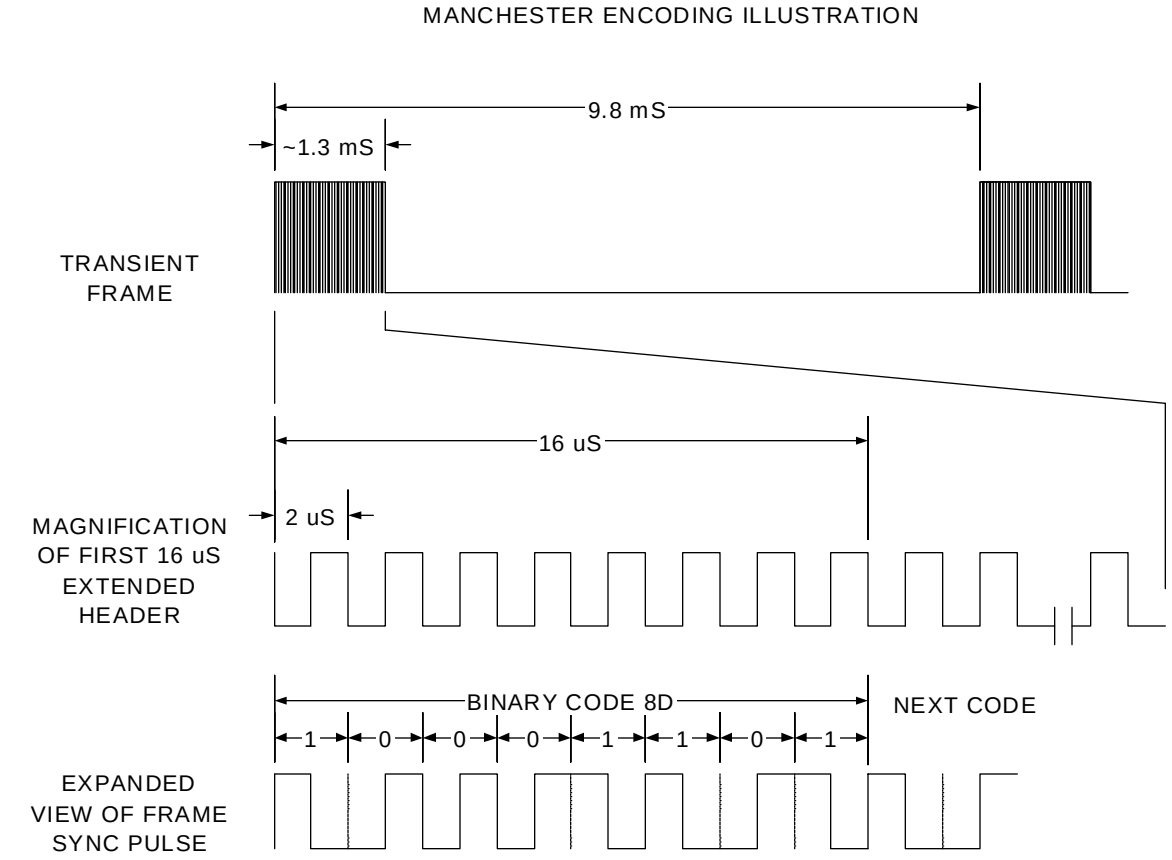


Figure 4: Illustration for Manchester Coding and Data Rate

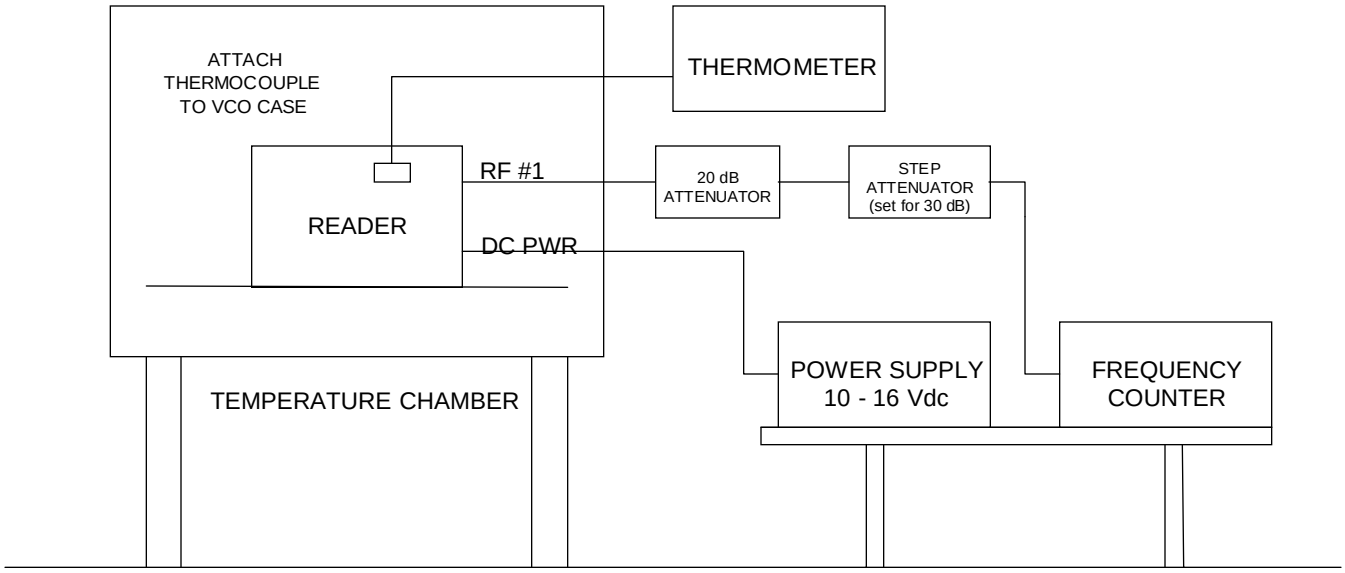


2.1055 Measurement of Frequency Stability

Definition: The equipment under test shall exhibit a frequency stability within 275 parts-per-million (Raytheon requirement) with respect to the fundamental frequency over a temperature range of –30 to +50 deg. C. when compared to the frequency measured at laboratory ambient temperature following a 30-minute stabilization period.

The nominal frequency of the EUT is 918 MHz. A frequency accuracy of 275 ppm equates to a frequency "drift" of plus or minus 252.45 kHz at this frequency.

Figure 8: Block Diagram – Frequency Stability



Test Method:

1. Set-up the equipment according to Figure 8.

2. Configure the reader to operate in the CW mode. The transmitter can be toggled on and off by using the mute (F12) control. To turn off the RF output and place the transmitter in a mute mode, press the F12 button. Press F12 again to turn it back on.

3. Allow equipment to operate for a period of at least 30 minutes at room temperature.

4. While the equipment is at 20 degrees C, turn on the transmitter and record the frequency on the frequency counter.

5. Calculate the lower and upper frequency limits and record in Table 1.

6. Reduce the temperature of the chamber to -30 deg. C.

7. As soon as the equipment has reached the desired temperature (allow sufficient time to soak), operate the transmitter and record the frequency on Table 1.

8. Repeat steps 6 through 7 for 10-degree increments in temperature up to and including +50 deg. C.

9. Repeat steps 6 through 8 for the lower operating voltages of 11.7 Vdc (85% of nominal) and the higher operating voltage of 15.9 Vdc (115% of nominal).

DATA SHEET

Customer: Raytheon Company **Test Procedure:** CFR 47

EUT: DSCR Reader **Test Specification:** Part 2.1055

Model / Part #: 60020-2 **Test Engineer:** John Stanford

Date: July 9, 2001 **Customer Rep:** Ira Feldman

SUPPLY VOLTAGE: 11.7 Vdc (85%), 13.8 Vdc (100%), 15.9 Vdc (115%)

Supply Voltage (Vdc)	TEMP (Deg C)	FREQ (Hz)	Lower Limit (-275 ppm)	Upper Limit (+275 ppm)
11.7	-30	917,967,560	917,735,158	918,240,052
11.7	-20	917,975,454		
11.7	-10	917,980,912		
11.7	0	917,984,350		
11.7	10	917,986,116		
11.7	20	917,987,560		
11.7	30	917,988,605		
11.7	40	917,989,734		
11.7	50	917,991,775		
13.8	-30	917,967,556	917,735,158	918,240,052
13.8	-20	917,975,553		
13.8	-10	917,980,877		
13.8	0	917,984,292		
13.8	10	917,986,106		
13.8	20	917,987,605		
13.8	30	917,988,588		
13.8	40	917,989,739		
13.8	50	917,991,746		
15.9	-30	917,967,534	917,735,158	918,240,052
15.9	-20	917,975,695		
15.9	-10	917,980,957		
15.9	0	917,984,258		
15.9	10	917,986,129		
15.9	20	917,987,603		
15.9	30	917,988,578		
15.9	40	917,989,773		
15.9	50	917,991,719		

TEST EQUIPMENT LOG

Customer: Raytheon Company
EUT: DSCR Reader
Model / Part #: 60020-2
Date: July 9, 2001

Test Procedure: CFR 47
Test Specification: Part 2.1055
Test Engineer: Mike Spaulding
Customer Rep: Ira Feldman

DESCRIPTION	MANUFACTURER	MODEL # / SERIAL #	CAL DUE
Frequency Counter	Systron-Donner	6245A/09046-1	06/04/02
Thermocouple Module	Fluke	80TK/003	11/20/01
VOM	Triplett	630-PL / 007	06/27/02
Step Attenuator	Hewlett-Packard	8496B/2728A12109	Reference
20 dB Attenuator	Inmet	1N100W / 001	03/15/02
Temperature Chamber	Missimers	FT8-100X350/C1650	N/A
Power Supply	Acopian	28PT10AFHP	N/A