

TIMCO ENGINEERING INC.

849 NW State Road 45

Newberry, Florida 32669

<http://www.timcoengr.com>

888.472.2424 F 352.472.2030 email: sid@timcoengr.com



Test Report

Product Name: 2W TELEMETR X TRANSC EIVER

FCC ID: EF0T200B

Applicant:

**Tactical Electronics Corporation
4000 Dow Road
Melbourne Fl. 32934
USA**

Date Receipt: 12/7/2004

Date Tested: 12/7/2004

APPLICANT: Tactical Electronics Corporation

FCC ID: EF0T200B

REPORT #: U:\T\Tactical_EF0\2055YT5\2055YT5TestReport.doc

COVER SHEET

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EXHIBITS CONTAINING:

BLOCK DIAGRAM
SCHEMATIC
PARTS LIST
USERS MANUAL
LABEL SAMPLE
LABEL LOCATION
EXTERNAL PHOTOGRAPHS
INTERNAL PHOTOGRAPHS
TUNING PROCEDURE
OPERATIONAL DESCRIPTION
TEST SET UP PHOTOGRAPH

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GENERAL INFORMATION REQUIRED **FOR CERTIFICATION OF A LICENSED TRANSMITTER**

Part 2.1033(c)(1)(2) Tactical Electronics Corporation will manufacture the FCCID: EFOT200B VHF TRANSCEIVER in quantity, for use under FCC RULES PART 90.

Tactical Electronics Corporation
4000 Dow Road
Melbourne, Fl. 32934 USA

Part 2.1033(c) TECHNICAL DESCRIPTION

Part 2.1033(c)(3) Instruction book. A draft copy of the instruction manual is included.

Part 2.1033(c)(4) Type of Emission: 11K25F2D

Part 90.209

Part 90.207

$B_n = 2M + 2DK$

$M = 9600$

$D = 825$

$K = 1$

$B_n = 2(9600/2) + 2(825) = 11.25k$

Part 2.1033(c)(5) Frequency Range: 216-220 MHz

Part 90.209 (b)(5)

Part 2.1033(c)(6)(7) Power Output shall not exceed 2 Watts into a 50 ohm resistive load. There are no user power controls.

Part 90.205

Part 2.1033(c)(8) DC Voltages and Current into Final Amplifier:
POWER INPUT:

FINAL AMPLIFIER ONLY

INPUT POWER - HIGH: $(13.6 \text{ V})(0.60 \text{ A}) = 8.16 \text{ Watts}$

Part 2.1033(c)(9) Tune-up procedure. The tune-up procedure is included.

Part 2.1033(c)(10) Complete Circuit Diagrams: The circuit diagram is included. The block diagram is included.

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Part 2.1033(c)(10): Description of all circuitry and devices provided for determining and stabilizing frequency is included in the circuit description.

Part 2.1033(c)(11): A photograph or drawing of the equipment identification label is included.

Part 2.1033(c)(12): Photographs of the equipment of sufficient clarity to reveal equipment construction and layout and label location are included.

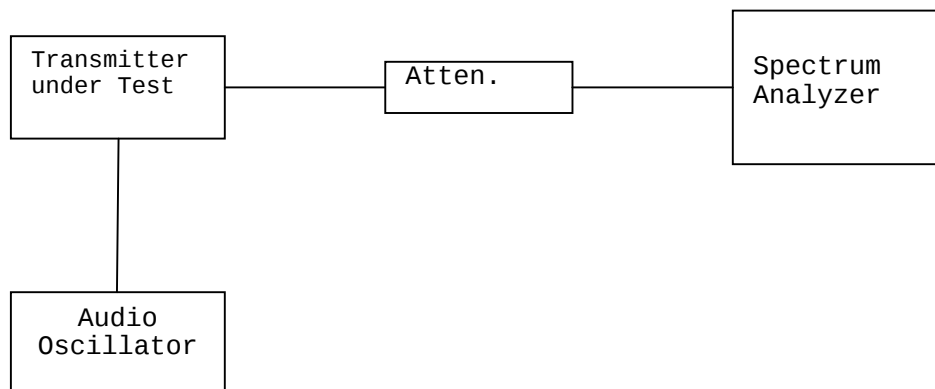
Part 2.1033(c)(13): For equipment employing digital modulation, a detailed description of the modulation technique. This UUT uses FSK to modulate the transmitter.

Part 2.1033(c)(14): The data required for 2.1046 through 2.1057 is submitted below.

Part 2.1046(a) RF POWER OUTPUT

RF power is measured by connecting a 50-ohm, resistive load wattmeter to the RF output connector. With a nominal battery voltage, and the transmitter properly adjusted the RF output measures:

OUTPUT POWER: HIGH - 2.00 Watts



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Part 2.1047(a)(b) Modulation characteristics:

AUDIO FREQUENCY RESPONSE

The audio frequency response was measured in accordance with TIA/EIA Specification 603. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 - 5000Hz shall be submitted. The audio frequency response curve is shown below.

AUDIO FREQUENCY RESPONSE PLOT

NOT APPLICABLE FOR DATA RADIOS

Part 2.1047(a) Voice modulated communication equipment: For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all the circuitry installed between the modulation limiter and the modulated stage shall be submitted.

NOT APPLICABLE FOR DATA RADIOS

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Part 2.1047(b) Modulation

The audio input level needed for a particular percentage of modulation was measured in accordance with TIA/EIA Specification 603. The audio input curves versus modulation are shown below. Curves are provided for audio input frequencies of 300, 1000, and 2500 Hz.

MODULATION LIMITING PLOT

NOT APPLICABLE FOR DATA RADIOS

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Part 2.1049 Occupied bandwidth:

Part 2.1049(c) EMISSION BANDWIDTH:

Part 90.210(c) 12.5kHz Channel Spacing Not Equipped with a Low Pass Filter

For transmitters that are not equipped with an audio low pass filter pursuant to S90.211 (b), the power of any emission must be attenuated below the unmodulated carrier output power as follows; (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5 kHz but not more than 10 kHz: At least $83 \log(f_d/5)$ dB; (2) ON any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but not more than 250% of the authorized bandwidth: At least $29 \log(f_d^2/11)$ dB or 50 dB, whichever is the lesser attenuation; (3) On any frequency removed from the center of the authorized bandwidth by more than 250% of the authorized bandwidth: At least $43 + 10 \log(P_o)$ dB.

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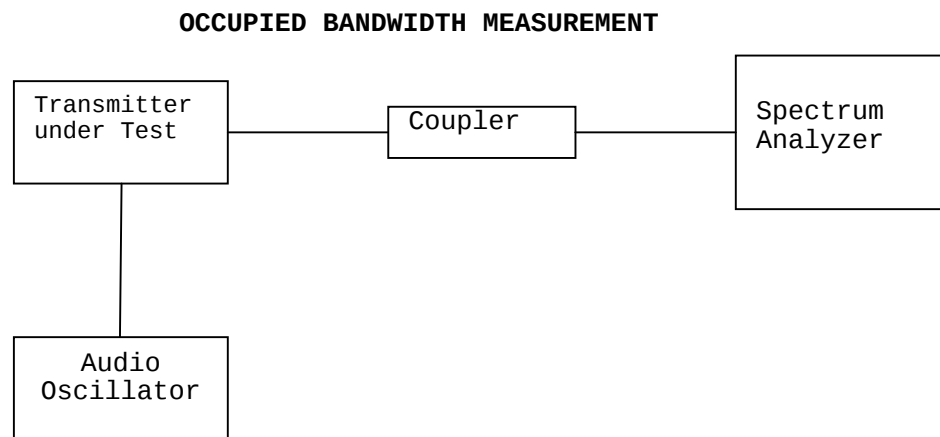
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Test procedure: TIA/EIA-603 para 2.2.11.

Test setup diagram



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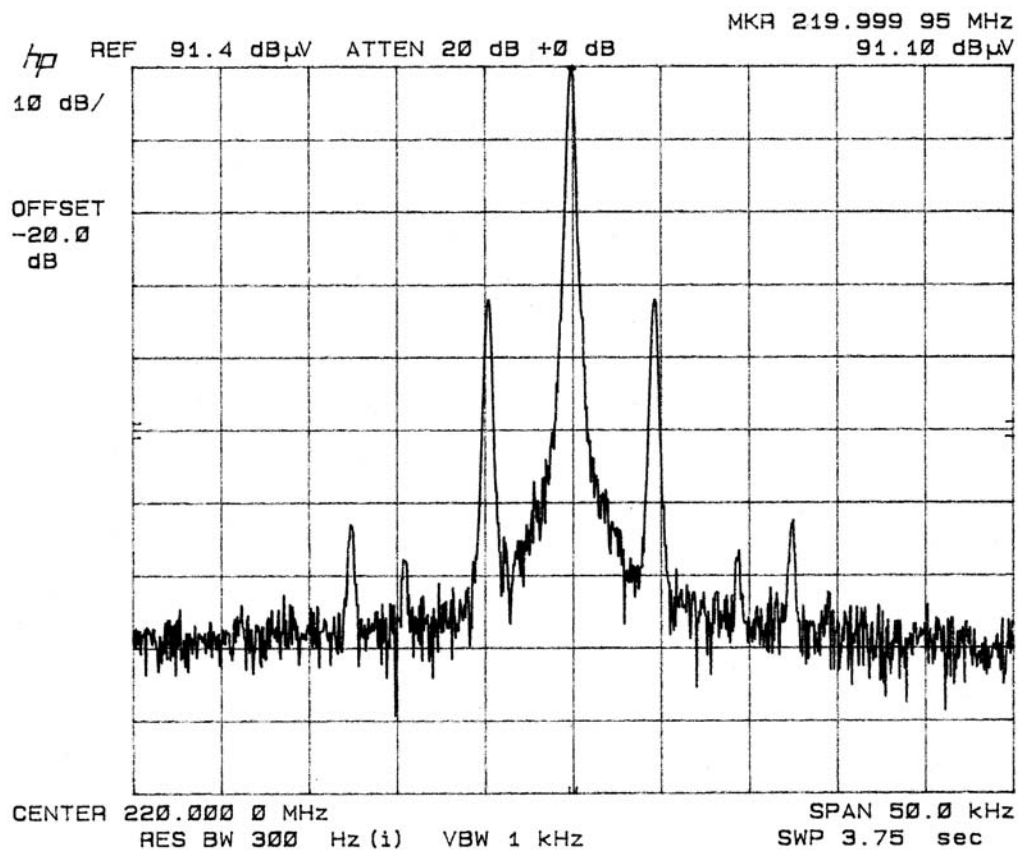
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OCCUPIED BANDWIDTH PLOT - 12.5 kHz



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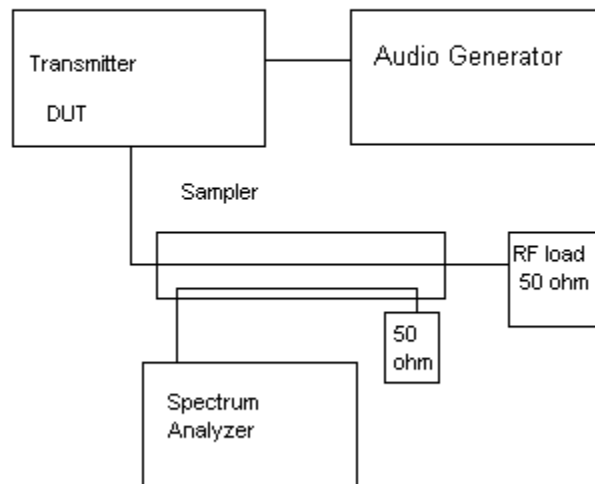
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Radiotelephone transmitter with modulation limiter:

Test procedure diagram

OCCUPIED BANDWIDTH MEASUREMENT

Occupied BW Test Equipment Setup



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Part 2.1051(a) Spurious emissions at antenna terminals (conducted):

Data below shows the level of conducted spurious responses. The carrier was modulated 100% using a 2500 Hz tone. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard TIA/EIA-603.

FCC Limit for:

$$12.5 \text{ kHz Channel Spacing} = 43 + 10 \log(2) = 46.0$$

EF	dB below carrier
220	0
440	62.4
660	67.2
880	72.3
1100	72.5
1320	83.7
1540	78.7
1760	83.7
1980	83.7
2200	83.7

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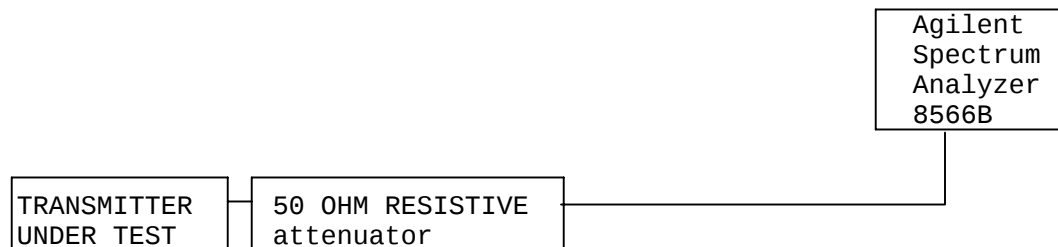
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Method of Measuring Conducted Spurious Emissions



METHOD OF MEASUREMENT: The procedure used was TIA/EIA-603 STANDARD without exceptions. The measurements were made at TIMCO ENGINEERING INC. 849 NW State Road 45, Newberry, Florida 32669.

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Part 2.1053 Field strength of spurious emissions:

NAME OF TEST: RADIATED SPURIOUS EMISSIONS

REQUIREMENTS: 12.5 kHz Channel Spacing = $43+10\log(2)$ = 46.0

TEST DATA:

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
220.00	H	0
440.00	V	61.45
660.00	H	69.77
880.00	H	87.41
1100.00	V	74.73
1320.00	V	60.99
1540.00	V	64.38
1760.00	V	61.63
1980.00	H	63.00
2200.00	H	81.56

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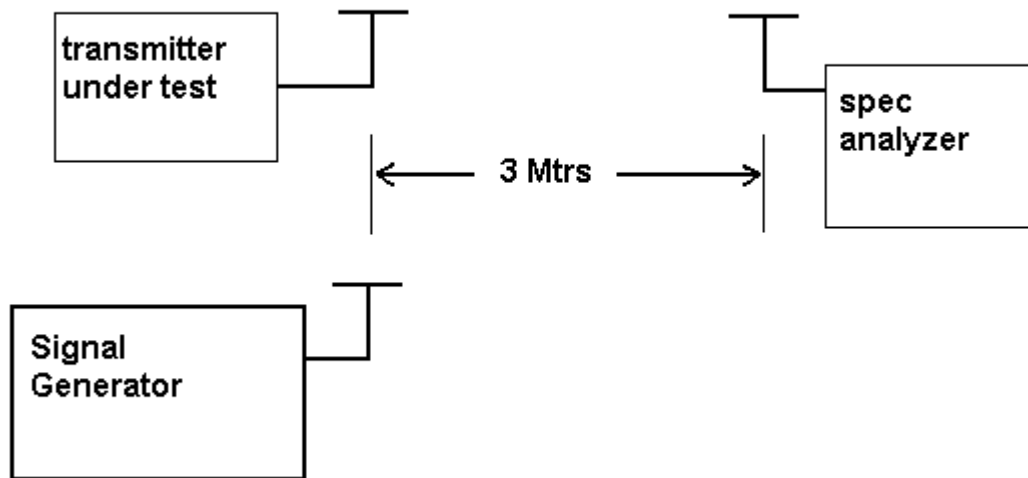
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Method of Measuring Radiated Spurious Emissions



METHOD OF MEASUREMENTS: The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per TIA/EIA STANDARD 603 using the substitution method. Measurements were made at the open field test site of TIMCO ENGINEERING, INC. located at 849 NW State Road 45, Newberry, FL 32669.

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Part 2.1055 Frequency stability: Part 90.213(a)(1) 90.266(b)(3)

Frequency Stability Requirement:

Temperature range requirements: -30 to +50° C.

Voltage Variation +, - 15%.

Measurement procedure per TIA/EIA 603.

MEASUREMENT DATA:

Assigned Frequency (Ref. Frequency): 220.000000 MHz

	Data	PPM
-30C	219.999	-4.55
-20C	219.999086	-4.15
-10C	219.999145	-3.89
0C	219.999286	-3.25
10C	219.999487	-2.33
20C	219.999745	-1.16
30C	219.999921	-0.36
40C	220.000087	0.40
50C	220.000135	0.61

Batt. Volts	Batt. Data	Batt. PPM
-15%	219.999945	-0.25
+15%	219.999936	-0.29

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Part 2.1055(a)(1)

Frequency stability:

Part 90.214

Transient Frequency Behavior

REQUIREMENTS: Not applicable for data radio.

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EMC Equipment List

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date or Status
3-Meter OATS	TEI	N/A	N/A	Listed 1/13/03	1/12/06
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/27/04	3/26/07
Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 9/23/03	9/23/05
Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 9/23/03	9/23/05
Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 9/23/03	9/23/05
Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 9/23/03	9/23/05
Biconnical Antenna	Eaton	94455-1	1096	CAL 8/17/04	8/17/06
BiconiLog Antenna	EMCO	3143	9409-1043	No Cal Required	
Log-Periodic Antenna	Electro-Metrics	LPA-25	1122	CAL 8/26/04	8/26/06
Dipole Antenna Kit	Electro-Metrics	TDA-30/1-4	153	CAL 9/26/03	9/26/05
Double-Ridged Horn Antenna	Electro-Metrics	RGA-180	2319	CAL 12/29/04	12/29/06
Horn Antenna *(at 3 meters)	Electro-Metrics	EM-6961	6246	CAL 3/31/03	3/31/05
Horn Antenna *(at 10 meters)	Electro-Metrics	EM-6961	6246	CAL 6/4/03	6/4/05
Termaline Wattmeter	Bird Electronic Corporation	611	16405	CAL 7/16/04	7/16/06
Termaline Wattmeter	Bird Electronic Corporation	6104	1926	CAL 7/16/04	7/16/06
Oscilloscope	Tektronix	2230	300572	CAL 7/3/03	7/3/05
Temperature Chamber	Tenney Engineering	TTRC	11717-7	CHAR 1/22/03	1/22/05
AC Voltmeter	HP	400FL	2213A14499	CAL 7/19/04	7/19/06
Peak Power Meter	HP	8900C	2131A00545	CAL 7/2/03	7/2/05
Power Sensor	Agilent	84811A	2551A02705	CAL	7/2/05

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Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date or Status
	Technologies			7/2/03	
Power Meter	HP	432A	1141A07655	CAL 4/11/05	4/11/07
Power Sensor	HP	478A	72129	CAL 4/11/05	4/11/07
Power Meter And Sensor	Bird	4421-107 & 4022	0166 & 0218	CAL 4/16/03	4/16/05
Digital Thermometer	Fluke	2166A	42032	CAL 7/19/04	7/19/06
Thermometer	Extech	4028	14871-2	CAL 3/7/03	3/7/05
Frequency Counter	HP	5352B	2632A00165	CAL 8/3/04	8/3/06
Frequency Counter	HP	5385A	2730A03025	CAL 4/15/05	4/15/07
Service Monitor	IFR	FM/AM 500A	5182	CAL 11/05/04	11/5/06
Signal Generator	HP	8640B	2308A21464	CAL 8/26/04	8/26/06
Sweep Generator	Wiltron	6648	101009	CAL 4/15/03	4/15/05
Sweep Generator	Wiltron	6669M	007005	CAL 3/3/03	3/3/05
Modulation Analyzer	HP	8901A	3435A06868	CAL 9/5/04	11/22/06
Audio Generator	B&K Precision	3010	8739686	CHAR 12/1/04	12/1/06
Frequency Counter	HP	5385A	3242A07460	CAL 4/15/05	4/15/07
Amplifier	HP	11975A	2738A01969	No Cal Required	
Measuring Tape-20M	Kraftixx	0631-20		CHAR 2/1/04	2/1/06
Measuring Tape-7.5M	Kraftixx	7.5M PROFI		CHAR 2/1/04	2/1/06
Compliance Test System - AC Power Source	California Instruments	1251RP	L05865	CAL 2/25/04	2/25/06
Compliance Test System - PACS-1 Module	California Instruments	PACS-1	X71484	CAL 2/25/04	2/25/06
Amplifier	Amplifier Research	10W1000B	23117	No Cal Required	

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Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date or Status
Field Monitor	Amplifier Research	FM5004	22288	No Cal Required	
Standard Gain Horn 1.0-2.4 GHz	Polarad	CA-L	235	No Cal Required	
Standard Gain Horn 2.14-4.34 GHz	Polarad	CA-S	203	No Cal Required	
Standard Gain Horn 3.95-5.85 GHz	Scientific-Atlanta Inc.	11A-3.9	8448CG	No Cal Required	
AC Voltmeter	HP	400F	0950A05433	CAL 8/13/03	8/13/05
Electric Field Sensor	Amplifier Research	FP6001	302504	CAL 8/23/04	8/23/06
Electric Field Sensor	Amplifier Research	FP6001	302510	CAL 6/1/04	6/1/06
RF Power Amplifier	Ophir RF, Inc.	5150F	1041	CHAR 10/31/03	10/31/05
3-Meter Anechoic Chamber	Panashield	N/A	N/A	Listed 5/12/04	5/11/07
Digital Multimeter	Fluke	77III	79510408	CAL 7/19/04	7/19/06
Signal Generator	HP	8648C	3847A04696	CAL 9/27/04	9/27/06

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