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APPLICANT: GMT INDUSTRIAL LTD.

FCC ID: BSYWT-113

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#### TEST EQUIPMENT LIST

1. Spectrum Analyzer: Hewlett Packard 8566B, with preselector HP 85685A, & Quasi-Peak Adapter HP 85650A, & HP 8449B OPT H02 Cal. 9/30/97
2. Eaton Biconnical Antenna Model 94455-1 20-200 MHz Serial No. 0997 Cal. 9/17/97
3. Electro-Metric Dipole Kit, 20-1000 MHz, Model TDA 25 cal. 5/15/97
4. Electro-Metric Horn 1-18 GHz, Model RGA-180, Cal. 9/24/97
5. Electro-Metric Antennas Model TDS-25-1, TDS-25-2, 9/3/97
6. Electro-Metric Line Impedance Stabilization Network Model No. EM-7821, Serial No. 101; 100KHz-30MHz 50uH. 9/30/97
7. Electro-Metric Line Impedance Stabilization Network Model No. EM-7820, Serial No. 2682; 10KHz-30MHz 50uH. 9/30/97

#### TEST PROCEDURE

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RADIATION INTERFERENCE: The test procedure used was ANSI STANDARD C63.4-1992 using a HEWLETT PACKARD spectrum analyzer with a preselector. The bandwidth of the spectrum analyzer was 100 kHz with an appropriate sweep speed. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100KHz and the video bandwidth was 300KHz. The ambient temperature of the UUT was 95oF with a humidity of 47%.

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the Spectrum Analyzer Meter Reading.

Example:

Freq (MHz) METER READING + ACF = FS  
33 20 dBuV + 10.36 dB = 30.36 dBuV/m @ 3m

POWER LINE CONDUCTED INTERFERENCE: The procedure used was ANSI STANDARD C63.4-1992 using a 50uH LISN. Both lines were observed. The bandwidth of the spectrum analyzer was 10kHz with an appropriate sweep speed. The ambient temperature of the UUT was 95oF with a humidity of 47%.

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## TEST PROCEDURES CONTINUED

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ANSI STANDARD C63.4-1992 10.1.7 MEASUREMENT PROCEDURES: The unit under test was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

The situation was similar for the conducted measurement except that the table did not rotate. The EUT was setup as described in ANSIC63.4-1992 with the EUT 40 cm from the vertical ground wall.

### CIRCUIT\_DESCRIPTION:

When Unit A is turned on it transmits on 49.86MHz. The signal comes in from the antenna through T9 to the double tuned circuit to Q4, the output stage of the transmitter. The frequency is generated by crystal controlled oscillator Q8. The transmitted signal is amplitude modulated by means of the microphone. The audio signal is fed into Q3 the preamplifier and then to Q2. Q2 drives the audio transformer that varies the current to the oscillator Q8. The received signal on 49.405MHz comes from the antenna to the doubled tuned circuit T10 and then to Q1 the mixer. The IF output of Q1 is coupled to a double tuned circuit and then to U1. U1 provides IF amplification and detection of the signal. The audio output of U1 is coupled to the audio stages Q11, Q12 & Q13. The Q12/Q13 drive the speaker.

When Unit B is turned on it transmits on 49.405MHz and receives on 49.86MHz. This frequency again serves as both the transmitter carrier and the receiver Local Oscillator. This signal provides low side injection to produce a 455 kHz IF from an incoming 49.86 MHz. signal.

### ANTENNA\_AND\_GROUND\_CIRCUITRY

This unit makes use of a short, helical antenna. The antenna is inductively coupled. The antenna is self contained, no provision is made for an external antenna. This unit is powered from a 9.0V battery.

No ground connection is provided. The unit relies on the ground track of the printed circuit board.

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FCC ID: BSYWT-113

NAME OF TEST: RADIATION INTERFERENCE

RULES PART NO.: 15.235

REQUIREMENTS: CARRIER FREQUENCY WILL NOT EXCEED 80 dBuV/m AT 3M.  
OUT-OF-BAND EMISSIONS SHALL NOT EXCEED:

30 - 88 MHz	40.0 dBuV/M	MEASURED AT 3 METERS
88 - 216 MHz	43.5 dBuV/M	
216 - 960 MHz	46.0 dBuV/M	
ABOVE 960 MHz	54.0 dBuV/M	

\* Harmonics must be less than the fundamental.

TEST DATA:

EMISSION FREQUENCY	METER READING AT 3 METERS	COAX LOSS	ANTENNA CORRECTION FACTOR	FIELD STRENGTH dBuV/m@3m	MARGIN dB	ANT. POL.
MHz	dBuV	dB				
49.86	56.80	0.25	10.99	68.04	11.96	V
99.72	15.80	0.80	8.38	24.98	18.52	V
149.58	8.30	0.80	16.90	26.00	17.50	V
199.44	16.70	0.90	12.66	30.26	13.24	V
249.30	25.30	1.20	13.35	39.85	6.15	V
299.16	26.80	1.40	15.65	43.85	2.15	V
349.02	22.50	1.40	15.52	39.42	6.58	V
398.88	19.30	1.40	16.97	37.67	8.33	V
448.74	20.90	1.60	18.12	40.62	5.38	V
498.70	20.10	1.60	19.27	40.97	5.03	V
548.46	21.40	1.60	19.69	42.69	3.31	V
598.32	20.90	1.60	20.09	42.59	3.41	V
648.19	18.30	1.60	21.16	41.06	4.94	V

SAMPLE CALCULATION:

$$FSdBuV/m = MR(dBuV) + ACFdB.$$

WITH THE TRANSMITTER SECTIONS OF THIS UNIT DISABLED BY REMOVING R11, THE SPECTRUM WAS SCANNED FROM 30 TO 1000 MHz. NO SIGNIFICANT EMISSIONS WERE NOTED.

TEST PROCEDURE: The procedure used was ANSI STANDARD C63.4-1992. The spectrum was scanned from 30 MHz to 1000 MHz. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported.

TEST RESULTS: THE UNIT DOES MEET THE FCC REQUIREMENTS.

PERFORMED BY: S. S. SANDERS

DATE: 7/4/98

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APPLICANT: GMT INDUSTRIAL LTD.

FCC ID: BSYWT-113

NAME OF TEST: RADIATION INTERFERENCE

RULES PART NUMBER: 15.209

REQUIREMENTS: 1.705 to 30 MHz: 49.54 dBuV/m @ 3 METERS  
30 to 88 MHz: 40.00 dBuV/M @ 3 METERS  
88 to 216 MHz: 43.52 dBuV/M  
216 to 960 MHz: 46.02 dBuV/M  
ABOVE 960 MHz: 54.00 dBuV/M

\* Harmonics must be less than the fundamental.

TEST RESULTS: A search was made of the spectrum from 25 to 1000 MHz and the measurements indicate that the unit DOES meet the FCC requirements.

TEST DATA:							
EMISSION FREQUENCY	METER AT 3 MHz	READING dBuV	COAX LOSS dB	ANTENNA CORRECTION FACTOR	FIELD STRENGTH dBuV/m@3m	MARGIN dB	ANT. POL.
49.41	27.40	0.25	10.98	38.63	1.37	V	
98.82	22.10	0.80	8.80	31.70	11.80	V	
148.23	12.30	0.80	16.90	30.00	13.50	V	
197.64	8.50	0.90	12.85	22.25	21.25	V	
247.05	19.70	1.20	13.29	34.19	11.81	V	

SAMPLE CALCULATION:  $FSdBuV/m = MR(dBuV) + ACFdB.$

TEST PROCEDURE: ANSI STANDARD C63.4-1992 using a Hewlett Packard Model 8566B spectrum analyzer, a Hewlett Packard Model 85685A Preselector, a Hewlett Packard Model 85650A Quasi-Peak adapter, Electro-Metric Dipole kits, models TDA, TDS-25-1, TDS-25-2, and an Eaton Model 94455-1 Biconical Antenna. The bandwidth of spectrum analyzer was 100 kHz with an appropriate sweep speed. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported.

PERFORMED BY: S. S. SANDERS DATE: 7/4/98

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APPLICANT: GMT INDUSTRIAL LTD.

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NAME OF TEST: Occupied Bandwidth

RULES PART NO.: 15.235

REQUIREMENTS: The field strength of any emissions appearing between the band edges and up to 10 kHz above and below the band edges shall be attenuated at least 26 dB below the level of the unmodulated carrier or to the general limits of 15.209, whichever permits the higher emission levels.

THE GRAPH IN EXHIBITS 12-15 REPRESENT THE EMISSIONS TAKEN FOR THE DEVICE.

METHOD OF MEASUREMENT: A small sample of the transmitter output was fed into the spectrum analyzer and the above photo was taken. The vertical scale is set to -10 dBm per division. The horizontal scale is set to 5 kHz per division.

TEST RESULTS: The unit DOES meet the FCC requirements.

PERFORMED BY: S. S. SANDERS 7/4/98

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