

ETL TESTING LABORATORIES, INC.
4317-A Park Drive, NW
Norcross, GA 30093

VERIFICATION

Fairchild IPC, Inc.
3920 West Point Blvd.
Winston Salem, NC 27102

August 7, 1995

NOT TRANSFERABLE

Verification is hereby issued to the named GRANTEE and is VALID ONLY for the equipment identified hereon for use under the rules and regulations listed below.

Name of Grantee:	Fairchild IPC, Inc.
Model or FCC Identifier:	Model TEI5200-4 and TT6000-91 Electro-pneumatic Transducers
Applicable Regulation:	89/336/EEC EN50082-2
Note(s):	(1) See attached Report dated July 21, 1995 for details and/or conditions of this Verification. (2) Test methods employed conform to the Standard Operating Procedures of ETL Testing Laboratories, Inc.

Accredited by the National Institute of Standards and Technology
for Emissions and Telecommunications Testing
Approved by the Canadian Department of Communications for Telecom Testing

In correspondence concerning this Verification,
please refer to the date, Grantee Name and Model No.

Originator's Report Number: 551643

July 21, 1995

Test Report
for
Fairchild IPC, Inc.
on the
Model TEI5200-4 and Model TT6000-91
Electro-pneumatic Transducers



SINCE 1896

ETL Testing Laboratories, Inc.

ETL is an independent testing and certification organization.



Inchcape Testing Services

ETL Testing Laboratories

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 4317-A Park Drive, N.W.
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Originator's Report Number: 551643

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Model TEI5200-4 and Model TT6000-91
Electro-pneumatic Transducers

Test Performed by:

Inchcape Testing Services
 4317-A Park Dr., NW
 Norcross, GA 30093

Test Authorized by:

Fairchild IPC, Inc.
 3920 West Point Blvd.
 Winston-Salem, NC 27102

Test Initiated										May 25, 1995
Test Completed										July 21, 1995
Test Engineer	<i>David C. Dennis</i>									David C. Dennis
Team Leader	<i>Jeffrey W. Whitmire</i>									Jeffrey W. Whitmire

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Inchcape Testing Services

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Inchcape Testing Services

1.0 **Introduction**

1.1 **Scope**

This report covers testing performed on the Model TEI5200-4 and Model TT6000-91 electro-pneumatic transducers manufactured by Fairchild IPC, Inc..

1.2 **Purpose**

Testing was performed to evaluate the Model TEI5200-4 and Model TT6000-91 electro-pneumatic transducers for susceptibility to ESD, radiated RFI, conducted RFI, electrical fast transients/bursts, and power frequency magnetic fields in accordance EN50082-2 .

1.3 **Summary**

The Model TEI5200-4 and Model TT6000-91 electro-pneumatic transducers were found to be immune to ESD, radiated RFI, conducted RFI, electrical fast transients/bursts, and power frequency magnetic fields in accordance with EN50082-2 when tested as received.

1.4 **Testing Requirements**

Testing was performed using procedures and criteria contained in IEC1000-4-2, IEC1000-4-4, IEC1000-4-6, IEC1000-4-8, ENV50140 and EN50082-2. Table 1.4-1 contains specifics pertaining to testing parameters.

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Table 1.3-1 Results Summary/Modifications

IEC 1000-4-2	
Results	Modifications
Passes ± 6 kV Contact Discharge Passes ± 8 kV Air Discharge	None

ENV 50140	
Results	Modifications
Passes 10V/m, 80% Amplitude Modulated w/1kHz sinewave from 80 to 1000 MHz Passes 10 V/m pulse modulated at 200 Hz to 50% duty cycle at 900 ± 5 MHz	None

IEC 1000-4-4	
Results	Modifications
Passes at ± 2 kV	None

IEC 1000-4-6	
Results	Modifications
Passes $10 V_{rms}$ (80% AM w/ 1 kHz sinewave) on all power and signal lines	None

IEC 1000-4-8	
Results	Modifications
Passes $30 A_{rms}/m$ (continuous), 50 Hz magnetic field	None

TS200
T6000

Table 1.4-1 Test Parameters/Compliance Criteria

- ✓ IEC 1000-4-2, Electrostatic Discharge Susceptibility
± 6 kV contact discharge, ± 8 kV air discharge
Category B Compliance per EN50082-2:1994 ✓

- ✓ ENV50140, Radiated Electromagnetic Field Susceptibility
10 V/m, 80 to 1000 MHz (80% Amplitude Modulated w/1kHz sinewave)
900±5 MHz, 10 V/m pulse modulated at 200 Hz to 50% duty cycle
Category A Compliance per EN50082-2:1994

- ✓ IEC 1000-4-4, Electrical Fast Transient/Burst Susceptibility
± 2 kV on all power and signal lines
Category B Compliance per EN50082-2:1994

- ✓ IEC 1000-4-6, Conducted RF Disturbance Susceptibility
10 V_{rms} (80% AM w/ 1 kHz sinewave) on all power and signal lines
Category A Compliance per EN50082-2:1994

- ✓ IEC 1000-4-8, Power Frequency Magnetic Field Susceptibility
30 A_{rms}/m (continuous) at 50 Hz
Category A Compliance per EN50082-2:1994

2.0 Test Environment

2.1 Test Sample Description

The Equipment Under Test (EUT) consisted of the Models TEI5200-4 and TT6000-91 electro-pneumatic transducers. The Model T5200 and Model T6000 Series of electro-pneumatic transducers are designed to transmit a pneumatic signal which is linearly proportional to a DC current or DC voltage input from electronic control devices. The TEI5200-4 was tested with the supply current set to 12 mA, and the TT6000-91 was tested with the supply current adjusted to yield a 5 VDC drop across a 249 ohm resistor between the + and - terminals. The input air pressure was regulated to 20 psi. This configuration resulted in a pneumatic pressure of approximately 9 psi at the output ports of each transducer. This pneumatic pressure was monitored during all EMC testing and was the criterion for performance degradation. A failure occurred if any disturbance caused the output pressure to vary more than ± 0.06 psi.

The test samples were received into the EMC test facility on May 25, 1995.

2.2 Test Facility

The test facility, Inchcape Testing Services, is located at 4317-A Park Dr., Norcross, Georgia. EMC Test Site #2 is located in this building. EMC Test Site is located in the lower level of the free standing EMI site and consists of a shielded room (12' x 24' x 10'). Ambient temperature is maintained between 65 and 75°F, with an approximate relative humidity of 45%.

2.3 Test Equipment

Table 2.3-1 contains a list of the test equipment used during the testing.

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Table 2.3-1 Test Equipment

IEC 1000-4-2		
Model No.	Serial No.	Description
Key-Tek MZ15	731865	ESD Simulator

ENV50140		
Model No.	Serial No.	Description
LCF 1200-10-10-35R	049406	RF Amplifier
ENI 5100L	490	RF Amplifier
Fluke 6071A	3685018	Signal Generator
EMCO 3143	9404-1031	Biconilog Antenna
AR FM2000	13609	Isotropic Field Monitor
AR FP2000	14055	Isotropic Field Probe
AR 888	12584	Gated Leveling Pre-Amp

IEC 801-4		
Model No.	Serial No.	Description
VELONEX V-3300	16509	Fast Transient/Burst Generator

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Table 2.3-1 (Continued)

IEC 1000-4-6		
Model No.	Serial No.	Description
Tektronix 465 Marconi 2022C AH Systems BCP-200/511 LCF 1200-10-10-35R ENI 240-L	B262681 119095/008 498 049406 369	Oscilloscope Signal Generator Current Injection Probe RF Amplifier RF Amplifier

IEC 1000-4-8		
Model No.	Serial No.	Description
Elgar 5162000-01 Rev. 05 ETL 1000-4-8-1 AH Systems SAS-200/560	213 N.A. 575	AC Power Source Induction Coil Magnetic Loop Antenna

3.0 IEC 1000-4-2, Electrostatic Discharge Susceptibility

3.0.1 Test Description

IEC Publication 1000-4-2:1991, Electromagnetic Compatibility Part 4: Testing and Measurement Techniques-Section 2: Electrostatic Discharge Immunity Test, Basic EMC Publication was the guiding document for this test. This test evaluates the test sample's response to electrostatic discharge events that occur to the body of the test sample at ± 8 kV discharged through air and ± 6 kV contact discharge.

3.0.2 Test Procedure

The ESD test level is set and discharges are applied to the conductive surface under the test sample, the conductive surface vertical to the test sample, and along all seams and control surfaces on the test sample. If a discharge occurs and an error is caused, the type of error, discharge level and location is recorded.

3.0.3 Test Results

Testing showed that the Model TEI5200-4 and Model TT6000-91 transducers are immune to ESD up to and including ± 8 kV air discharge, and up to and including ± 6 kV contact discharge when tested as received.

3.0.4 Test Configuration Photograph

Figure 3.0-1 shows the testing configuration used.

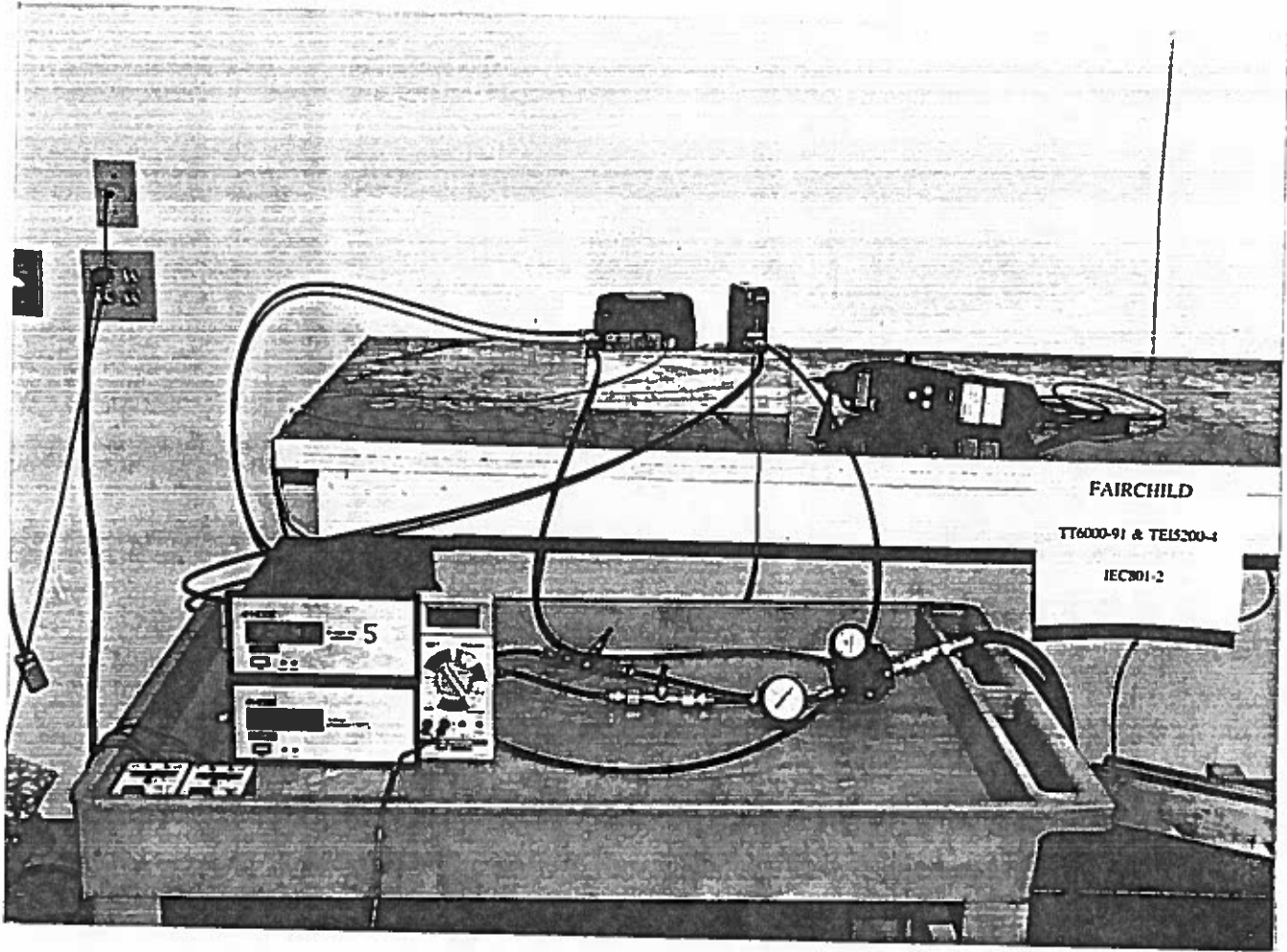


Figure 3.0-1 Test Configuration Photograph

3.1 ENV50140, Radiated Susceptibility-Electric Field

3.1.1 Test Description

CENELEC Publication ENV50140:1993, Electromagnetic Compatibility, Basic Immunity Standard for radiated, radio frequency electromagnetic field immunity, was the guiding document for this test. This test evaluates the test sample's response to radiated electric fields and was performed from 80 to 1000 MHz at a level of 10 V/m, 80% Amplitude Modulated w/ 1 kHz sinewave. The test was also performed at 900 ± 5 MHz at an immunity level of 10 V/m pulse modulated at 200 Hz to 50% duty cycle.

3.1.2 Test Procedures

The test sample is set into operation and was monitored for variations in performance. The test signal is set for frequency, modulation level, and field strength. The procedure is performed by adjusting the transmitting antenna so that the electromagnetic field is vertically polarized while sweeping through the appropriate frequency range and maintaining the necessary field strength. This procedure is then repeated with the transmitting antenna adjusted to the horizontal polarization position. If an error is detected, the field strength is reduced until the error corrects, then increased until the error begins to occur. This threshold level, the frequency and the error created are noted before continuing.

3.1.3 Test Results

The Model TEI5200-4 and Model TT6000-91 transducers were found to be immune to RFI at 10 V/m from 80 to 1000 MHz, 80% Amplitude Modulated w/ 1 kHz sinewave, in both antenna polarizations, when tested as received.

The test samples were also found to be immune to RFI at 900 ± 5 MHz at an immunity level of 10 V/m pulse modulated at 200 Hz to 50% duty cycle when tested as received.

3.1.4 Test Configuration Photograph

Figure 3.1-1 shows the testing configuration used.

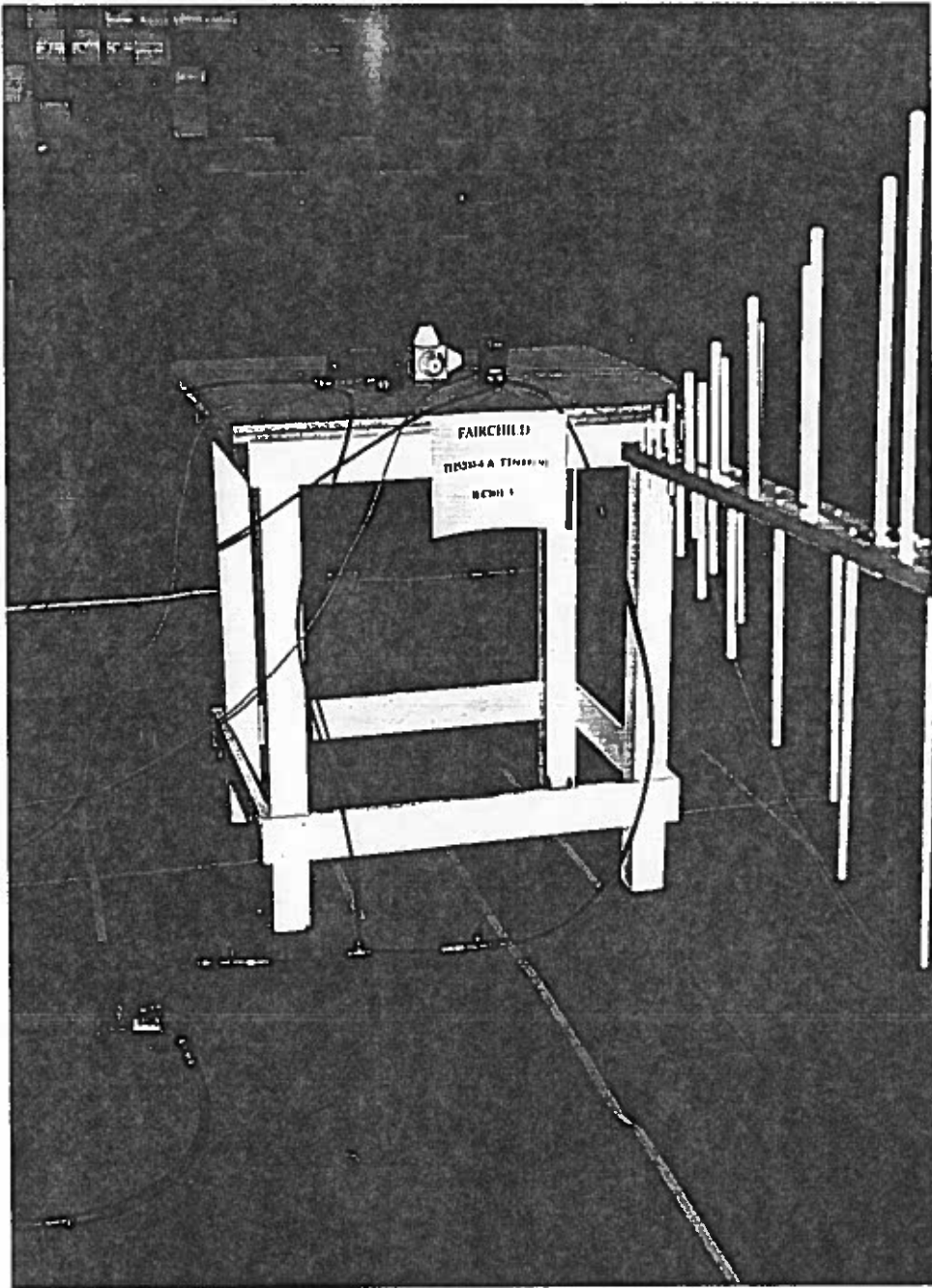


Figure 3.1-1 Test Configuration Photograph

3.2 IEC 1000-4-4, Electrical Fast Transients/Bursts Susceptibility

3.2.1 Test Description

IEC Publication 1000-4-4:1988, Electromagnetic Compatibility Part 4: Testing and Measurement Techniques-Section 4: Electrical Fast Transient/Burst Immunity Test was the guiding document for this test. This test evaluates the test sample's response to burst interference transients conducted on the power supply lines and signal lines to the EUT. A test signal of ± 2.0 kV was applied to all power and signal lines to the EUT.

3.2.2 Test Procedure

The test sample was connected to the test equipment, as shown in Figure 3.2-1, and monitored for performance. Using a capacitive coupling clamp as called out in IEC1000-4-4, the transients were capacitively coupled onto power and signal lines to the test samples. This coupling clamp provides the ability of coupling the fast transients/bursts to the circuit under test without any galvanic connection to the terminals of the circuits, shielding of the cables or any other part of the EUT. The equipment was monitored during testing for any degradation in performance. When an error or any degradation occurs, the test level is reduced until the condition corrects and then increased until the immunity threshold is reached. This threshold level and the error conditions are noted before continuing.

3.2.3 Test Results

Testing showed that the Model TE15200-4 and Model TT6000-91 are immune to conducted transients of up to ± 2.0 kV on power and signal lines when tested as received.

3.2.4 Test Configuration Photograph

Figure 3.2-1 shows the testing configuration used.

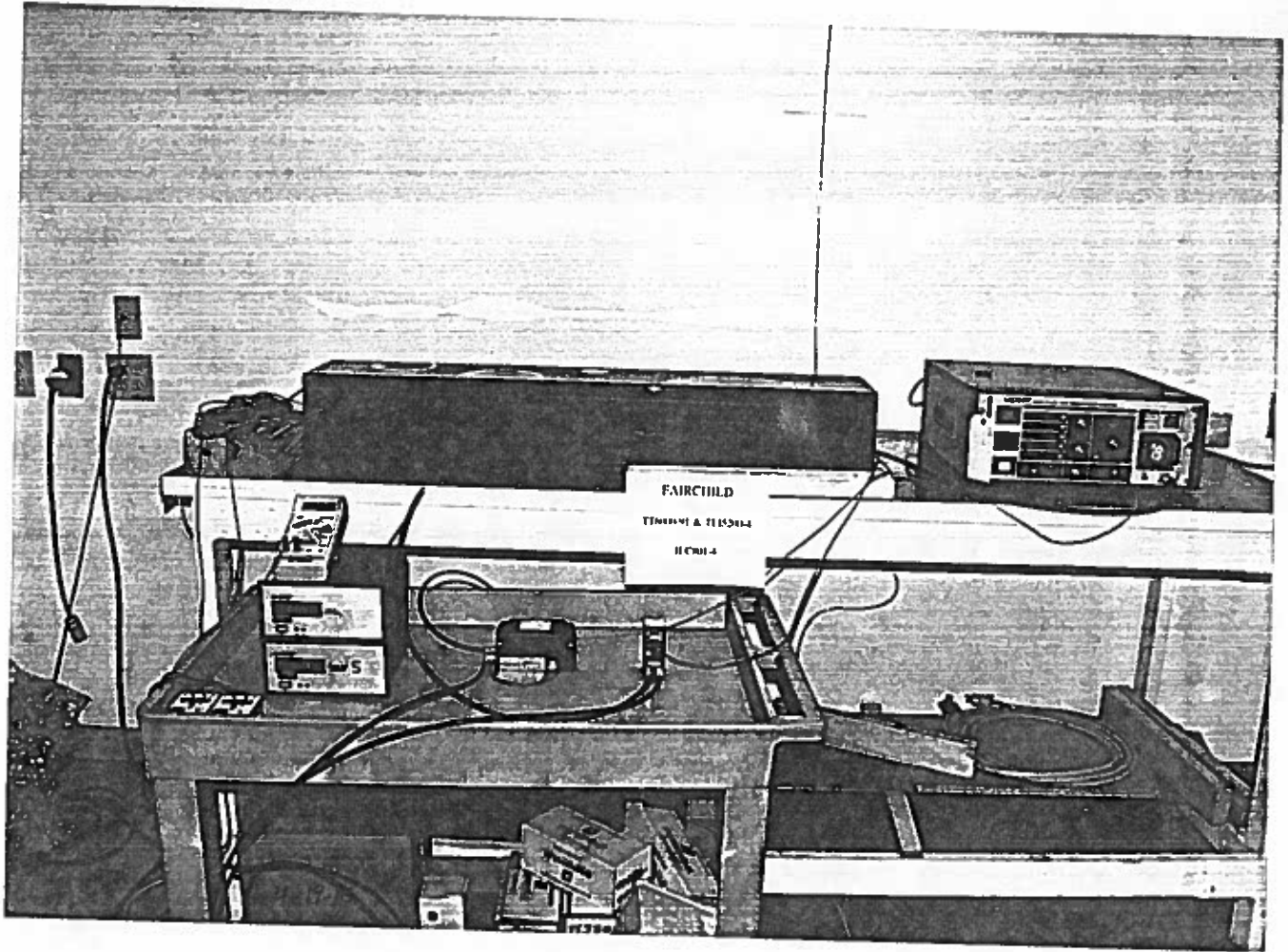


Figure 3.2-1 Test Configuration Photograph

3.3 IEC 1000-4-6, Conducted RFI Susceptibility

3.3.1 Test Description

IEC Publication 1000-4-6:1993, Electromagnetic Compatibility for Electrical and Electronic Equipment, Part 6: Immunity to Conducted Disturbances Induced by Radio Frequency Fields was the guiding document for this test. This test evaluates the test sample's response to conducted RF disturbances on power and signal lines.

3.3.2 Test Procedure

The test sample was connected to the test equipment, as shown in Figure 3.3-1, and monitored for performance. A current injection probe was used to inject the RF interference onto each of the power and signal lines to the test sample for a continuous sweep of the frequencies 150 kHz to 80 MHz. The test signal was set at $10 V_{rms}$ and amplitude modulated 80% with a 1 kHz sinewave. The test was performed in differential and common mode.

3.3.3 Test Results

The Model TEI5200-4 and Model TT6000-91 transducers were found to be immune to conducted RFI from 150 kHz to 80 MHz at $10 V_{rms}$ (80% AM w/ 1 kHz sinewave) when tested as received.

3.3.4 Test Configuration Photograph

Figure 3.3-1 shows the testing configuration used.

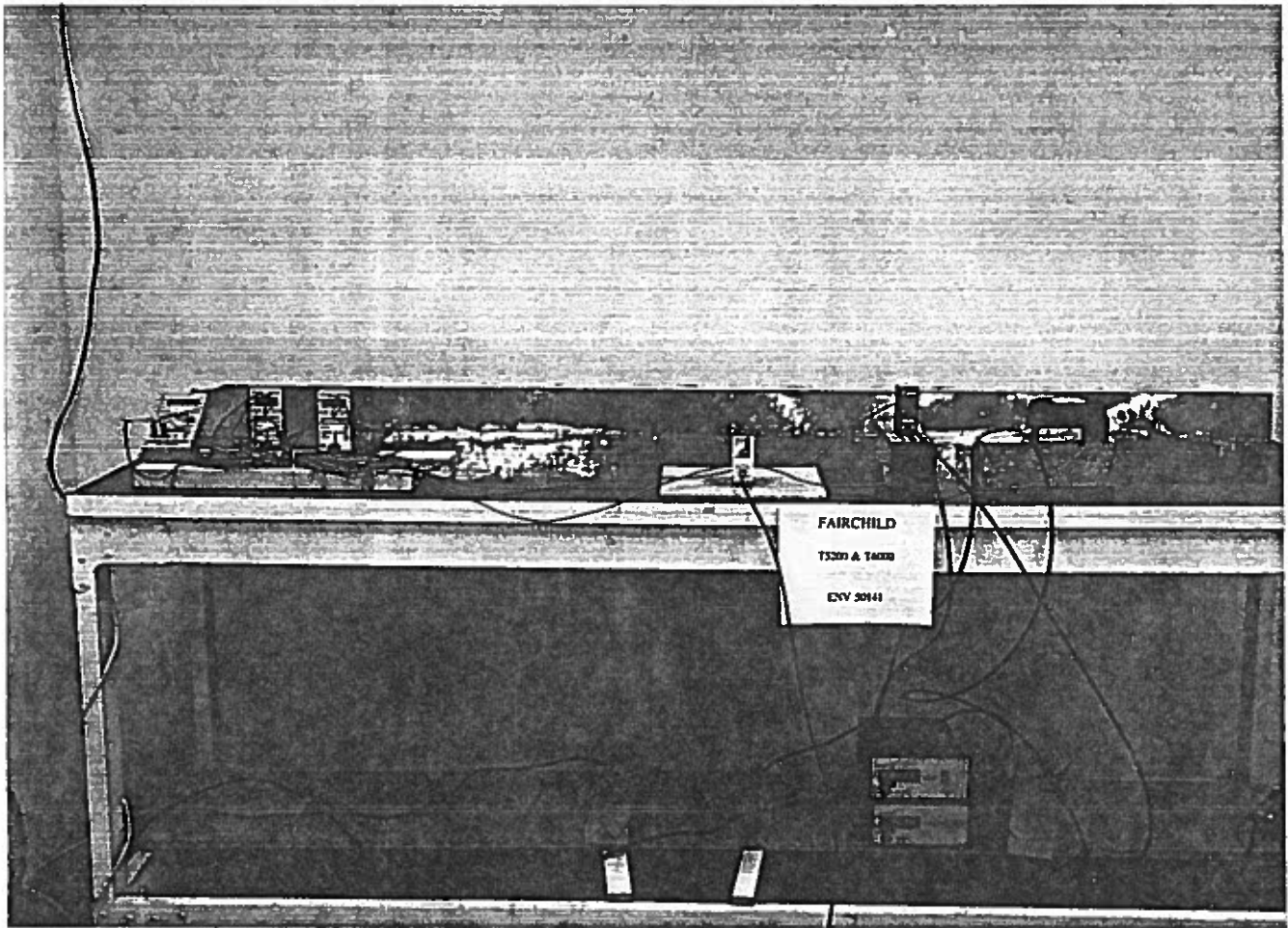


Figure 3.3-1 Test Configuration Photograph

3.4 IEC 1000-4-8, Power Frequency Magnetic Field Susceptibility

3.4.1 Test Description

IEC Publication 1000-4-8:1993, Electromagnetic Compatibility Part 4: Testing and Measurement Techniques Section 8: Power Frequency Magnetic Field Immunity Test was the guiding document for this test. This test evaluates the test sample's response to power frequency magnetic disturbances and was performed at a level of 30 A_{rms}/m (continuous).

3.4.2 Test Procedure

The test sample was connected to the test equipment, as shown in Figure 3.4-1, and monitored for performance. A standard square induction coil (1 meter side) as called out in IEC1000-4-8 was used to apply a magnetic field to the test sample using the immersion method. The induction coil was positioned in three separate orthogonal positions for application of the magnetic field around the EUT. The power source was set to 50 Hz and voltage was applied to the induction coil until the magnetic field strength at the equipment under test reached 30 A_{rms}/m. The magnetic field was applied to the EUT at the specified immunity level for one minute. The test samples were monitored for any degradation in performance. If any degradation of performance occurred, the immunity threshold and error conditions were noted.

3.4.3 Test Results

The Model TEI5200-4 and Model TT6000-91 transducers were found to be immune to power frequency magnetic disturbances at a level of 30 A_{rms}/m (continuous) when tested as received.

3.4.4 Test Configuration Photograph

Figure 3.4-1 shows the testing configuration used.



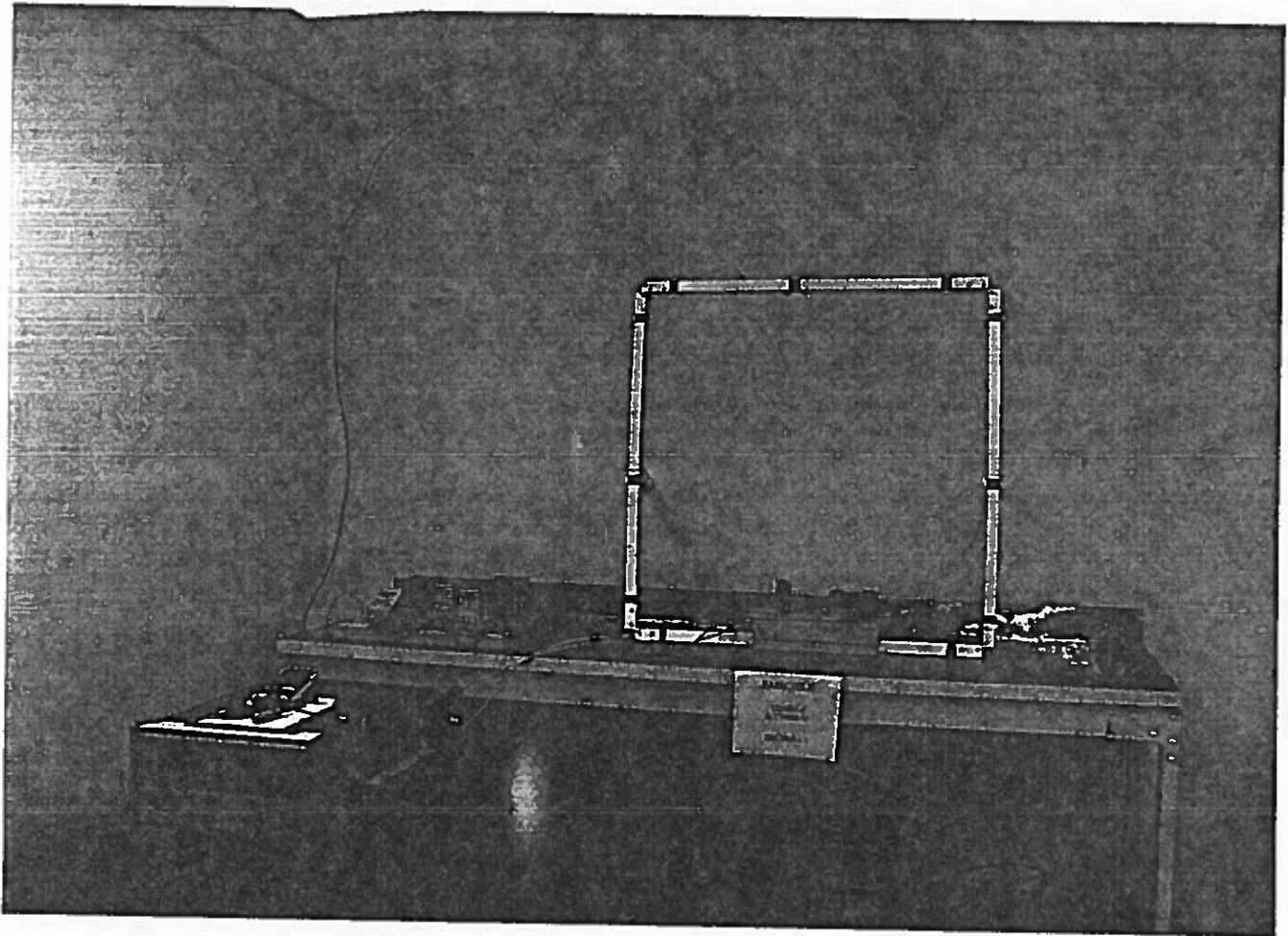


Figure 3.4-1 Test Configuration Photograph

TT6000
TS200

Inchcape Testing Services

4.0 Conclusions

4.1 IEC 1000-4-2, ESD Susceptibility

The Model TEI5200-4 and Model TT6000-91, manufactured by Fairchild IPC, Inc., were found to be immune to ESD up to and including 6 kV contact discharge and 8 kV air discharge when tested as received.

4.2 ENV50140, Radiated Susceptibility - Electric Field

The Model TEI5200-4 and Model TT6000-91, manufactured by Fairchild IPC, Inc., were found to be immune to RFI at 10 V/m from 80 to 1000 MHz (80% Amplitude Modulated w/ 1kHz sinewave), in either antenna polarization when tested as received.

The Model TEI5200-4 and Model TT6000-91, manufactured by Fairchild IPC, Inc., were found to be immune to RFI at 900 ± 5 MHz at an immunity level of 10 V/m pulse modulated at 200 Hz to 50% duty cycle when tested as received.

4.3 IEC 1000-4-4, Electrical Fast Transients/Bursts Susceptibility

The Model TEI5200-4 and Model TT6000-91, manufactured by Fairchild IPC, Inc., were found to be immune to ± 2.0 kV transients on all power and signal lines when tested as received.

4.4 IEC 1000-4-6, Conducted RFI Susceptibility

The Model TEI5200-4 and Model TT6000-91, manufactured by Fairchild IPC, Inc., were found to be immune to conducted RFI at $10 V_{rms}$ from 150 kHz to 80 MHz (80% AM w/ 1 kHz sinewave) when tested as received.

4.4 IEC 1000-4-8, Power Frequency Magnetic Field Susceptibility

The Model TEI5200-4 and Model TT6000-91, manufactured by Fairchild IPC, Inc., were found to be immune to power frequency magnetic fields at $30 A_{rms}/m$ (continuous) when tested as received.

4.2 EN50082-2, Generic Immunity Standard, Part 2: Industrial Environment

The Model TEI5200-4 and Model TT6000-91, manufactured by Fairchild IPC, Inc., comply with the immunity requirements of EN50082-2 when tested as received.

Enclosure (4)

Table 5 Fairchild IPC Model Evaluation for EMC Compatibility

5/16/95

Model	Top Assemblies	Input	PCAs	Schematics	Coil	Description	Sales Lit	IOMs	Notes
T5200-1 T5200-4 T5200-5 T5200-9 (CSA/CEN) (CSA/CEN) (CSA/CEN)	13939 15654 13994	1-mA 4-20mA 1-5V 1-9V 4-20mA 1-5V 1-9V	13744 13745 13746 14639 13746 15483 15488 15640 15639	13744 13745 14639 13746 15488 15640 15639	10841-1 10841-3 10841-3 10841-4 10841-3 10841-3 10841-4	Std, N4, FM, CSA Cenelec Approved XP	X	X	T5200: Notes 1.0
T5700-4 T5700-9	15271	4-20mA 1-5/1-9V	15237 15238	19153 19154	10841-1 10841-1		X	X	T5700: Notes 2.0
TT6000-41 TA6000-41 TD6000-41 T_6000-41 T_6000-3 T_6000-5 T_6000-7 T_6000-9 T_6000-0	16752 18092	4-20mA 4-20mA 4-20mA 4-20mA 10-50mA 1-5V 0-5V 1-9V 0-10V	16786 16973 18352 " 16797 " " "	16787 16974 16974 " 16793 " " "	16982-1 16982-1 16982-1 16982-1 16982-1 16982-1 16982-1 16982-1 16982-1	TEI	X	X	T6000: Notes 3.0
TT7800-401 TA7800-401 TD7800-401 TT7800-501 TA7800-501 TA7800-7 TA7800-9 T78000-0	18800	4-20mA 4-20mA 1-5V 1-5V 0-5V 1-9V 0-10V	044-IPI-070-1 044-IPI-072-2 044-IPI-074 " " " " " 18912	907-IPI-042(I) 907-IPI-045(V) 907-IPI-043	N/A	Signal Conditioning PCA " Power Supply PCA '070 + '072 mated Filter Ass'y TT & TD Units	X	X	T7800: Notes 4.0
TX7800-401	19000	4-20mA	044-IPI-077 044-IPI-079 044-IPI-081	907-IPI-047 907-IPI-049		'077 & '079 mated		X	T7800: Notes 4.0
TT8000-411000 TT8000-411000 TA8000-411000 T_8000-3 T_8000-5 T_8000-6 T_8000-7	ED-18033	3-15PSIG 3-15PSIG 3-15PSIG 0-5PSIG 0-30PSIG 0-60PSIG 0-100PSIG	18048 18046 18292 18874 18884	907-IPI-037	N/A	'048 & '046 mated Filter Ass'y TT Filter Ass'y TD	X	X	T8000: Notes 5.0

Comparison

Table 6 Coil & Magnet Group Current & Voltage Input Versions Circuit Component

Model	PCA	Schematic	Coil Res/Ind	Pot	Resistor	TC Resistor	Thermistor	Zener Diodes
T5200/5220	13744 1-5mA	13744	2430/60mH	20K	1K	1K	900 @ 25°C	
	13745 4-20mA	13745	150/19mH	2K	100	75	50 @ 25°C	
	14639 1-5V	14639	150/19mH	500		75	50 @ 25°C	
	13746 1-9V	13746	1766/225mH	2K		511	500 @ 25°C	
CSA/CEN	15483 4-20mA	15488	150/19mH	2K	100	75	50 @ 25°C	
" "	15640 1-5V	15640	150/19mH	500		75	50 @ 25°C	
" "	15639 1-9V	15639	1766/225mH	2K		511	500 @ 25°C	
T5700	15237 4-20mA	19153	150/19mH	500	649	100	100 @ 25°C	
	15238 1-5/1-9V	19154	150/19mH	1K		121	100 @ 25°C	
T6000	16786 4-20mA	16787	285/13.5mH	1K	71.5	221	250 @ 25°C	
	16973 4-20mA	16974	285/13.5mH	1K	71.5	221	250 @ 25°C	5.6V (4)
CEN	18352 4-20mA	16974	285/13.5mH	1K	71.5	221	250 @ 25°C	5.6V (4)
	16797 V all	16793	285/13.5mH	1K	0 to 1K	221	250 @ 25°C	

Notes:

1 Coil & Magnet Group includes T5200, T5700, & T6000 Families.

Fairchild Industrial Products Testing and Technical Construction File Information

Coil and Magnet Group - Test TT6000-91, 1-9V unit and TEI5200-4, 4-20 mA unit as representative of the group listed below. Test to EN50082-2, 1994 Immunity Standard. Emissions Standard, EM50081-2 is not applicable.

T5200:

- 1.1. No Frequency generating source (components). No emissions and therefore no testing is proposed.
- 1.2. Ports - Enclosure, Signal & Ground.
- 1.3. T5200 versions electrically identical to T5220, TXP5200/5220, TN5200/5220 versions.
- 1.4. Member of the Coil and Magnet group as are T6000 & T5700.
- 1.5. Conduit Connection only.
- 1.6 Agency Approvals. TEI 5200-1, -4, -5, -9 Intrinsic Safety approval to CENELEC Standards to EEx ia IIC T4.
- 1.7 Gasket, EB-16483 Rev. A, inserted into TEI5200-4 to create worst case gap for testing.

T5700:

- 2.1. No Frequency generating source (components). No emissions and therefore no testing is proposed.
- 2.2. Ports - Enclosure, Signal & Ground.
- 2.3. No Frequency generating components therefore no emissions.
- 2.4. Member of the Coil and Magnet group as are T5200 & T6000.
- 2.5. Coil and magnet are same for both current and voltage inputs and identical to 4-20 mA input T5200-4.
- 2.6. Conduit Connection only.

T6000:

- 3.1. No Frequency generating source (components). No emissions and therefore no testing is proposed.
- 3.2. Ports - Enclosure, Signal & Ground.
- 3.3. Same coil used in all versions.
- 3.4. Member of the Coil and Magnet group as are T5200 & T5700.
- 3.5. There are no filters or gaskets for EMI protection. Enclosure and electrical connections are not important to susceptibility of unit.
- 3.6. TT and TA6000 have passed EMI/RFI susceptibility testing at R & B Enterprises.
- 3.7. Current inputs are 2 wire, voltage inputs are 3 wire devices.
- 3.8. Conduit, Terminal Block, and DIN Connector electrical connections.

- 3.9. Electromagnetic susceptibility testing of TA and TT versions of T6000 conducted by R&B Enterprise. Refer to report 912926 dated 11/13/91.
- 3.10. TEI 6000-401 Intrinsic Safety approval to CENELEC Stds. to EEx ia IIC T4.