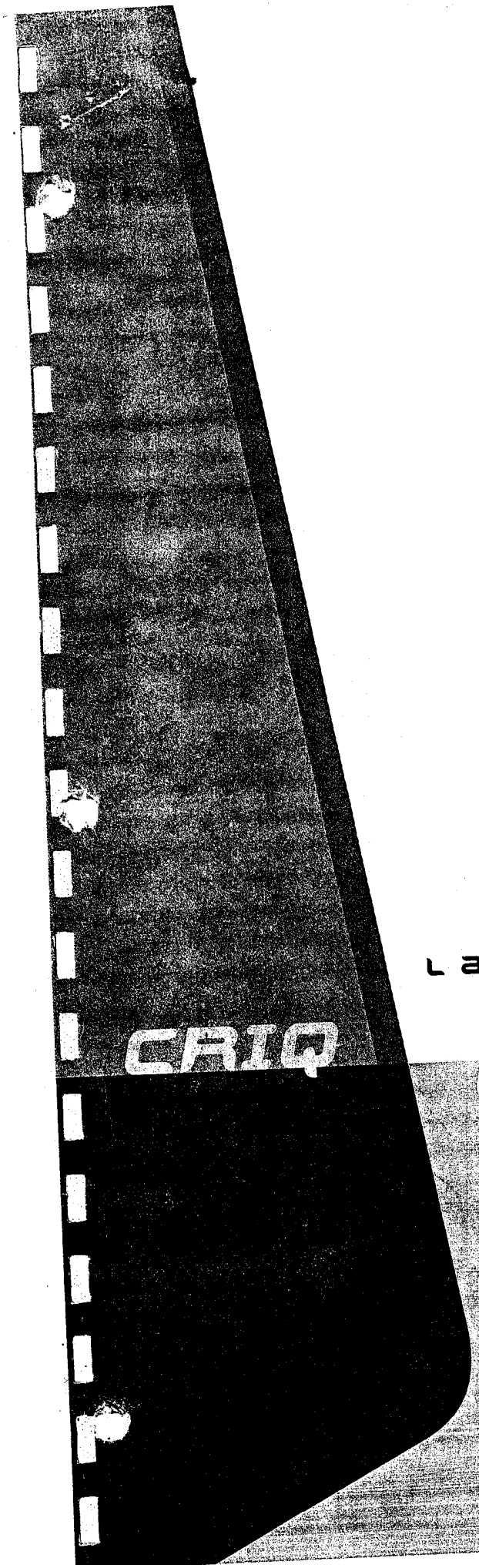

Laboratoire d'essais

Centre de recherche industrielle Québec

Translation

EMC TEST REPORT –

Tests on a speed regulator

CRIQ file 670-29739

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MONTRÉAL, OCTOBER 28, 2003

Centre de recherche industrielle
Québec

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8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234

Translation

CRIQ DECLARATION

Samples of the products mentioned herein were received at the CRIQ on September 2, 2003. Testing began the next day.

Testing was completed and supervised by the undersigned; they attest to the accuracy of the results.

Performed by: Alain Cocozza — Date: 2003/11/03

Performed by: Brayan Barrios — Date: 2003/11/05

Performed by: Marc Poulin, T.P. — Date: 2003-11-03

ORDRE DES TECHNOLOGUES PROFESSIONNELS DU QUÉBEC
MARC POULIN
T.P.
11077

Supervised by: Christian Ferget, P.Eng. — Date: 2003/11/03

Une version française de ce rapport est également disponible.

No specific tolerances apply to the data presented in this report.

Total number of pages: 48, including 29 pages in appendix.

The results presented in this report refer only to the product(s) described in section 1.2.

The equipment and instrumentation used during this test were verified and/or calibrated. The calibration certificates are retraceable to the National Research Council of Canada (CNRC) and/or to the American National Institute of Standards and Technology (NIST) standards and can be provided on request.

CRIQ is registered ISO 9001, certificate no. 008999. The Tests Division is also accredited by the National Council of Canada, certificate no. 138.

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Translation

1. INTRODUCTION

1.1 Object

The object of this project is to perform tests in compliance with the SN-62.1008d standardized technical specifications issued by Hydro-Québec on a speed regulator as part of the requirements leading to its qualification.

1.2 Description of equipment under test

The equipment under test (EUT) is a speed regulator designed to be used in hydraulic units.

This table identifies the EUT.

Model	Type	Manufacturer	Serial no.	CRIQ no.
M420390-QUAL	Speed regulator	L&S Electric	None	E016193

1.3 Field of application

All tests are performed on a sample of the product in compliance with the standards listed in the table of Section 1.4. Test methods comply with the methods prescribed by the latter standards.

1.4 Results

This table summarizes the results of the tests described in this report.

Standard	Test name	Equipment under test	Para. no.	Result
CISPR 22: 1997	Measurement of radiated emissions, Class A	E016193	2	Fail
IEC 61000-4-3: 1995	Radiated electromagnetic field immunity – radio frequencies	E016193	3	See notes Section 3
IEC 61000-4-6: 1996	Conducted immunity	E016193	4	See notes Section 4
IEC 61000-4-2: 1995	Electrostatic discharge immunity	E016193	5	See notes Section 5
IEC 61000-4-4: 1995	Electrical fast transient immunity	E016193	6	See notes Section 6
IEC 60255-5: 1977	Dielectric rigidity	E016193	7	Pass
IEC 60255-5: 1977	Impulse voltage withstand	E016193	8	Pass

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1.5 List of test equipment

The test equipment used for the purpose of these tests is described in the table below:

Equipment	Manufacturer; model	Serial no.	Expiry of calibration (y-m-d)
Spectrum analyser	Anritsu; MS2601A	MT88348	2004-01-30
Bilog antenna	Chase EMC; CBL6140A	1219	2003-10-25
20 Hz to 26.5 GHz receiver	Rohde & Schwarz; ESMI	829179/004	2003-09-19
Preamplifier	Rohde & Schwarz; ESMI-Z7	825529/010	N/A
Discharge generator	Keytek; MZ-15/EC	9205390	2003-10-29
RF power amplifier	A.R.; 100W1000M1	20455	N/A
Power meter	H.P.; 437B	3125U23453	2003-12-26
Power probe	H.P.; 8482A	3318A29122	2003-12-30
Power meter	H.P.; 437B	3125U24381	2003-12-26
Power probe	H.P.; 8482A	2652A15665	2003-12-30
Signal generator	Marconi; 2023	112229/038	2004-01-02
Hygrometer/Thermometer	Omega; RH-411	HO103037	2004-06-24
Hygrometer/Thermometer	Omega; RH-411	HO100828	2003-10-23
Directional coupler	Werlatone; C3910	5410	2004-01-04
Directional coupler	Werlatone; C5091	10899	2004-01-04
EFT generator	Keytek; E420	9401198	2004-04-22
Capacitive coupling clamp	Keytek; CCL-801	9401199	2004-04-21
EM coupling clamp	Chase EMC; C1C-8100	282	2004-01-14
RF current probe	Chase EMC; CSP-8441	154	2004-01-15
Attenuator	JFW; 50FH-006-100	N/A	N/A
Safety analyzer	Associated Research; 7504SA	A150049	2003-12-02
Impulse voltage generator	Schaffner; NSG 504	317	2003-10-06

1.6 Test configuration

The configuration of the system under test is featured on photographs presented in appendix.

1.7 Technical comments applicable to all tests

No particular component or method was used to improve the electromagnetic performance of the EUT during testing.

Test specifications were not altered in any way.

1.8 Definition of performance criteria

Section 8.5 of the SN-62.1008d standardized technical specifications presents a four-level scale, from N1 to N4, in view of assessing the performance of the apparatus during some immunity tests.

Failure level	Performance criteria
N1	Normal performance within specifications. No command relay operation. No false alarm or signal indication. No significant fluctuation in a reading or a signal generated.
N2	Temporary degradation or loss of function or performance is allowed provided no loss of data occurs and that it is followed by automatic recovery. One or a number of the following events are allowed: a) Fluctuation of a reading or a signal generated that could lead to exceeding a monitoring threshold, such as the trigger of an alarm, the activation of an automatic function or other. b) Brief interruption of normal unit operation (reset or operational freeze) during the application of the disturbance, immediately followed by automatic recovery of all normal operating features.
N3	Temporary degradation or loss of function or performance that requires operator intervention or a manual reset of the system is allowed provided no loss of data occurs. False alarm indications are allowed.
N4	Permanent degradation of features or unrecoverable loss of function due to a material (component) or software defect, or loss of data.

2. RADIATED EMISSIONS

Test performed by: Marc Poulin

Date: September 3, 2003

Equipment under test: **E016193**

Test: CISPR 22: 1997, Class A
Radiated emissions

Test conditions

Temperature and humidity: Ambient

Supply voltage: 24 VDC

CISPR 22, Class A limits

(Extrapolated to 3 m)

Frequency [MHz]	Max. level, quasi-peak [dBµV/m]
30-230	50.5
230-1,000	57.5

Test results

The radiated emission level exceeds CISPR 22 limits for Class A equipment.

The worst emission level recorded was 57.3 dBµV/m, at a frequency of 127.980 MHz, which is 6.7 dB above the specified limit. Detailed results are presented in Appendix A.

Results data

See Appendix A for charts of the results and test setup photographs.

Test method

The EUT is installed inside the CRIQ's anechoic room. A Rohde & Schwarz receiver model ESMI is used to perform this test, with its resolution bandwidth set from 120 kHz up to 1 GHz. A scan from 30 MHz to 1 GHz is performed using a peak detector. All emissions that are greater than the limit or within 10 dB of the specified limit are recorded. A list of these frequencies and their respective emission level is compiled. Maximum level for each value is measured with a CISPR quasi-peak detector.

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3. RADIATED ELECTROMAGNETIC FIELD IMMUNITY

Test performed by:	Marc Poulin Alain Cocozza
Date:	September 3, 2003
Equipment under test:	**E016193**
Test:	IEC 61000-4-3:1995 Radiated electromagnetic field immunity – radio frequencies

Test conditions

Temperature and humidity:	23°C and 36%
Supply voltage:	24 VDC
Field intensity:	10 V/m
Sweep:	80 MHz to 1 GHz

Acceptance criteria

The acceptable failure level called for by this test for Class C-III material is N1.

Test results

It is noted that exposure to the fields affects the performance of the EUT in some frequency ranges. More specifically, the gate position signal indicates a variation reaching 0.18 pu. The apparatus always resumes normal operation at the end of the test.

Table 3.1 summarizes the comments compiled during the test. The interpretation, classification and acceptance of the results are subject to an agreement between the manufacturer and Hydro-Québec.

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Location	Polarization, modulation	Results or comments
Front	H, 1 kHz	0.04 pu variation between 800 and 1,000 MHz
Front	V, 1 kHz	0.06 pu variation between 210 and 380 MHz 0.18 pu variation between 504 and 573 MHz 0.09 pu variation between 650 and 1,000 MHz
Right side	V, 1 kHz	0.03 pu variation between 150 and 250 MHz 0.01 pu variation between 360 and 380 MHz 0.04 pu variation between 474 and 520 MHz 0.02 pu variation between 535 and 610 MHz
Right side	H, 1 kHz	0.02 pu variation between 84 and 89 MHz 0.02 pu variation between 155 and 182 MHz 0.03 pu variation between 210 and 250 MHz 0.10 pu variation between 310et 397 MHz 0.06 pu variation between 450 and 597 MHz 0.02 pu variation between 646 and 796 MHz
Rear	H, 1 kHz	0.01 pu variation between 86 and 89 MHz 0.02 pu variation between 180 and 256 MHz 0.02 pu variation between 318 and 360 MHz 0.01 pu variation between 479 and 499 MHz 0.01 pu variation between 529 and 640 MHz 0.01 pu variation between 693 and 774 MHz
Rear	V, 1 kHz	0.01 pu variation between 150 and 270 MHz 0.01 pu variation between 735 and 796 MHz
Left side	V, 1 kHz	0.01 pu variation between 150 and 240 MHz 0.02 pu variation between 303 and 340 MHz 0.01 pu variation between 514 and 573 MHz 0.01 pu variation between 765 and 845 MHz
Left side	H, 1 kHz	0.02 pu variation between 84 and 89 MHz 0.03 pu variation between 172 and 250 MHz 0.08 pu variation between 285 and 360 MHz 0.02 pu variation between 479 and 650 MHz 0.01 pu variation between 728 and 760 MHz 0.02 pu variation between 920 and 1,000 MHz

Note: The variations listed correspond to the gate position signal.

Table 3.1 RF immunity test results

Test data

See Appendix B for test photographs.

Test method

This test is performed in the CRIQ's anechoic room with support equipment setup in an adjoining shielded room. Frequency span is swept from 80 MHz to 1,000 MHz with an amplitude-modulated signal of specified level. A pre-calibrated field is used for this test. Four (4) faces of the EUT are sequentially exposed, in horizontal and vertical polarization modes.

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4. CONDUCTED IMMUNITY

Test performed by: Marc Poulin

Date: September 4, 2003

Equipment under test: **E016193**

Test: IEC 61000-4-6: 1996
Conducted immunity

Test conditions

Temperature and humidity: 23°C and 39%
Supply voltage: 24 VDC
Intensity level: 140 dBµV (10 V)
Sweep: 150 kHz to 80 MHz

Acceptance criteria

The acceptable failure level called for by this test for Class C-III material is N1.

Test results

It is noted that the application of conducted disturbances on the cables can affect the performance of the apparatus in some frequency ranges. In one case, a manual intervention was necessary for the apparatus to resume normal operation.

Table 4.1 summarizes the comments compiled during the test and presents the cables under test as well as the coupling/decoupling devices used to test them. The interpretation, classification and acceptance of the results are subject to an agreement between the manufacturer and Hydro-Québec.

Coupling device	Cable(s)	Results or comments
EM clamp	Power supply, analog inputs/outputs, FREQ1, FREQ2, series, Ethernet	Brief loss or disturbance of speed signals from 220 to 325 kHz Variation of gate location signal between 1.1 and 44 MHz Loss of Ethernet communications around 44 MHz, manual intervention necessary for recovery
EM clamp	discrete inputs/outputs, FREQ1	Brief loss or disturbance of speed signals from 150 to 316 kHz Variation of gate location signal between 2.6 and 80 MHz Loss of Modbus series Ethernet communications around 4.85 and from 41 to 45 MHz

Table 4.1 Conducted immunity test results

Test data

See Appendix C for photographs and a printout of the actual disturbance level recorded during the test.

Test method

This test is performed in the CRIQ's anechoic room with support equipment setup in an adjoining shielded room. Frequency span is swept from 150 kHz to 80 MHz with an amplitude-modulated signal of specified level. The test is repeated for each cable connected to the EUT, using the appropriate coupling and decoupling (CDN) network.

Note: The voltage level used during this test was adjusted so that the current injected by the EM clamp would not exceed 96.48 dBμA.

5. ELECTROSTATIC DISCHARGE IMMUNITY

Test performed by: Brayan Barrios

Date: September 5, 2003

Equipment under test: **E016193**

Test: IEC 61000-4-2: 1995
Electrostatic discharge immunity

Test conditions

Temperature and humidity:	21°C and 49%
Atmospheric pressure:	101.4 kPa (Dorval)
Supply voltage:	24 VDC
Test voltages:	±6 kV contact
	±8 kV air

Acceptance criteria

The acceptable failure level called for by this test for Class C-III material is N1.

Test results

It is noted that the application of electrostatic discharges on some test points disrupts the equipment under test. In some cases, an intervention is necessary to reset the system.

Table 5.1 summarizes the comments compiled during this test. The interpretation, classification and acceptance of the results are subject to an agreement between the manufacturer and Hydro-Québec.

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Discharge application points	Polarity, Level [kV]	Type of discharge [air or contact]	Coupling plane [H/V]	Result or comment
F1, F2, F3, RR1, RR2, RR3	±2, ±4, ±6	Contact	V	Normal performance
L1, L2, L3, RT1, RT2, RT3	±2, ±4, ±6	Contact	V	Normal performance
1	±2, ±4, ±6	Contact		Normal performance
2	±2, ±4, ±6	Contact		Temporary degradation[1]
3	±2, ±4, ±6	Contact		Temporary degradation[2]
4	±2, ±4, ±6	Contact		Self-recoverable degradation[3]
5, 6	±2, ±4, ±6	Contact		Normal performance
7	±2, ±4, ±6	Contact		Temporary degradation[4]
8	±2, ±4, ±6	Contact		Normal performance
9, 10, 11	±2, ±4, ±6	Contact		Normal performance[5]
12	±2, ±4, ±6	Contact		No discharge
13	±2, ±4, ±6	Contact		Temporary degradation[6]
14, 15	±2, ±4, ±6	Contact		Normal performance
16	±2, ±4, ±6	Contact		Temporary degradation[7]
17, 18	±2, ±4, ±6	Contact		Temporary degradation[8]
19, 20, 21	±2, ±4, ±6	Contact		Normal performance
22, 23, 24 , 25	±2, ±4, ±8	Air		Normal performance

Note 1: Loss of speed signal no. 2. Communications interrupted on *Base1*. CPU reset required for system recovery (+4kV, ±6 kV).

Note 2: Relay activation at –4 kV. Loss of speed signal no. 1. Communications interrupted on *Base2*. CPU reset required for system recovery (-4kV, -6 kV).

Note 3: Low-speed no. 2 signal alarm. Self-recovery.

Note 4: Automatic reset of CPU module or power supply (±4 kV, ±6 kV).

Note 5: No discharge at ±2 kV or ±4 kV.

Note 6: Loss of *Analog Input1* circuit. CPU reset required for system recovery (-6 kV).

Note 7: Variation in gate position circuit and disruption of communications with support computer. CPU reset required for system recovery (±6 kV).

Note 8: Reset of CPU or power supply. Requires manual reset (+4 kV, ±6 kV).

Table 5.1 Electrostatic discharge immunity test results

Test data

See Appendix D for photographs and Table 5.1 for test results. The location of the discharge application points is indicated on photographs presented in Appendix D.

Test method

A voltage level of 6 kV must be applied to the EUT using contact discharge on all accessible conductive parts and with the vertical and horizontal planes. A voltage level of 8 kV must be applied to all accessible non-conductive parts using air discharge. Number of discharges is 10 positive and 10 negative on each selected test point, including all lower levels. Absence of arcing can result in a smaller number of discharges to be applied for air discharges.

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6. ELECTRICAL FAST TRANSIENT IMMUNITY

Test performed by: Marc Poulin

Date: September 8, 2003

Equipment under test: ***E016193***

Test: IEC 61000-4-4: 1995
Electrical fast transient immunity

Test conditions

Temperature and humidity: 22°C and 38%
Atmospheric pressure: 102.3 kPa (Dorval)
Supply voltage: 24 VDC
Test voltages: ±4 kV *on power lines*
±2 kV on signal and data lines

Acceptance criteria

The acceptable failure level called for by this test for Class C-III material is N1.

Test results

It is noted that the application of electrical fast transients on the cables affects the *performance of the apparatus. In one case, a manual intervention is required for the* system to resume normal operation.

Table 6.1 summarizes the comments compiled during the test and presents the cables under test as well as the coupling mode used to test them. The interpretation, classification and acceptance of the results are subject to an agreement between the manufacturer and Hydro-Québec.

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Line under test	Coupling mode	Polarity, Level [kV]	Result or comment
24 V supply	Capacitive clamp	±2.0	Self-recoverable degradation[1]
AI analog input	Capacitive clamp	±2.0	Self-recoverable degradation[2]
AO analog output	Capacitive clamp	±2.0	Self-recoverable degradation[1,3]
FREQ1	Capacitive clamp	±2.0	Self-recoverable degradation[2,3]
FREQ2	Capacitive clamp	±2.0	Self-recoverable degradation[4]
Discrete inputs and outputs	Capacitive clamp	±2.0	Self-recoverable degradation[4]
Series	Capacitive clamp	±2.0	Temporary degradation[5]
Ethernet	Capacitive clamp	±2.0	Temporary degradation[3,5]

Note 1: Detection of low-speed signal alarm (no. 2).

Note 2: Disruption of speed signals 1 and 2.

Note 3: Disruption of gate location signal.

Note 4: Brief disruption and loss of speed signal no. 2 and gate location signal.

Note 5: Loss of Ethernet communications. Intervention required on support equipment.

Table 6.1 EFT immunity test results

Test data

See Appendix E for test setup photographs.

Test method

Transients are applied in common mode using a capacitive coupling clamp. In both cases, transients are successively applied at the specified voltage level for one (1) minute, in positive and negative polarities.

7. DIELECTRIC RIGIDITY

Test performed by:	Marc Poulin
Date:	September 8, 2003
Equipment under test:	**E016193**
Test:	IEC 60255-5: 1977 Dielectric rigidity

Test conditions

Temperature and humidity:	21°C and 36%
Atmospheric pressure:	102.3 kPa (Dorval)
Test voltages:	500 Vac, 60 Hz 1,500 Vac, 60 Hz 2,000 Vac, 60 Hz
Ramp:	1 second
Duration of application:	60 seconds
Leakage current:	maximum 100 mA

Acceptance criteria

No breakdowns must occur during the test and leakage current must remain within specified tolerances.

Test results

The EUT complies with the requirements of IEC 60255-5: 1977. No breakdowns are noticed during the application of the test voltage.

Test data

See Appendix F for test photographs. The work sheet filled out during the test is also presented in appendix in order to identify the circuits tested. Circuits are defined in L&S test plan.

Test method

Test generator voltage of specified level is applied for one (1) minute. Ramp time is set to 1 second. Groups, circuits or terminals which are not subjected to the test voltage are grounded if applicable or connected together.

The equipment is not energized during this test.

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8. IMPULSE VOLTAGE WITHSTAND

Test performed by: Marc Poulin

Date: 9 septembre 2003

Equipment under test: E016193

Test: IEC 60255-5: 1977
Impulse voltage withstand

Test conditions

Temperature and humidity:	21°C and 37%
Atmospheric pressure:	103.0 kPa (Dorval)
Test voltage:	5 kV
Source energy:	0.5 J
Number of pulses:	3+/3-
Break between pulses:	5 s

Acceptance criteria

The application of impulse voltages must not damage the EUT.

Test results

The EUT complies with the requirements of IEC 60255-5: 1977. The EUT passed the functional tests performed before and after the application.

Test data

See Appendix G for test photographs. The work sheet filled out during the test is also presented in appendix in order to identify the circuits tested. Circuits are defined in L&S test plan.

Test method

The test is performed between each independent circuit and the ground. Groups, circuits or terminals which are not subjected to the test voltage are grounded if applicable or connected together.

The equipment is not energized during this test.

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APPENDIX A

RADIATED EMISSIONS

8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234

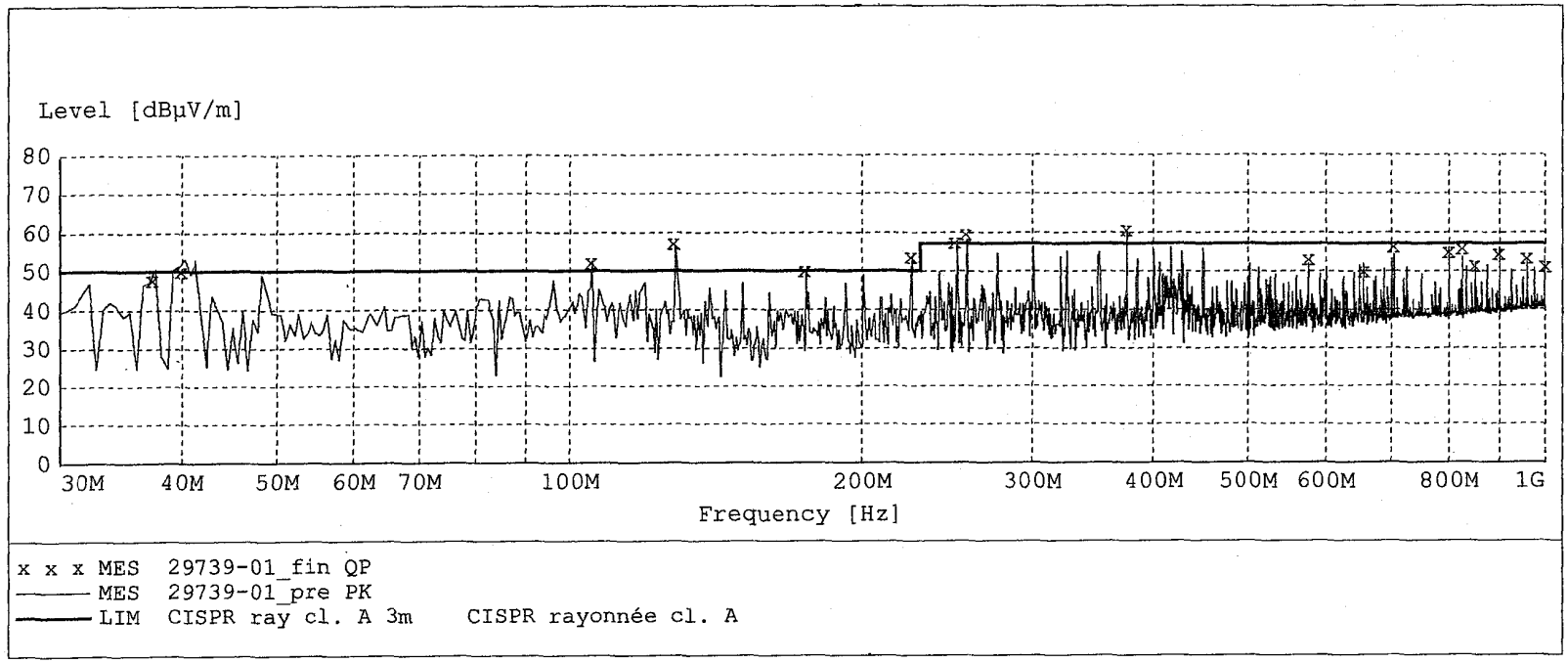
Laboratoire CEM - CRIQ
29739/R.P.:C.Forget

E.S.T.: Régulateur de vitesse (E016193)
Client: L & S Electric
Conditions d'opér.: 24 Vcc
Site d'essai: Chambre anéchoïque
Opérateur: Marc Poulin
Norme référée: CISPR 22 classe A
Commentaires:
Start of Test: 03/09/03 / 10:26:04

SCAN TABLE: "Rayonné MF CISPR"

Short Description: Émissions rayonnées

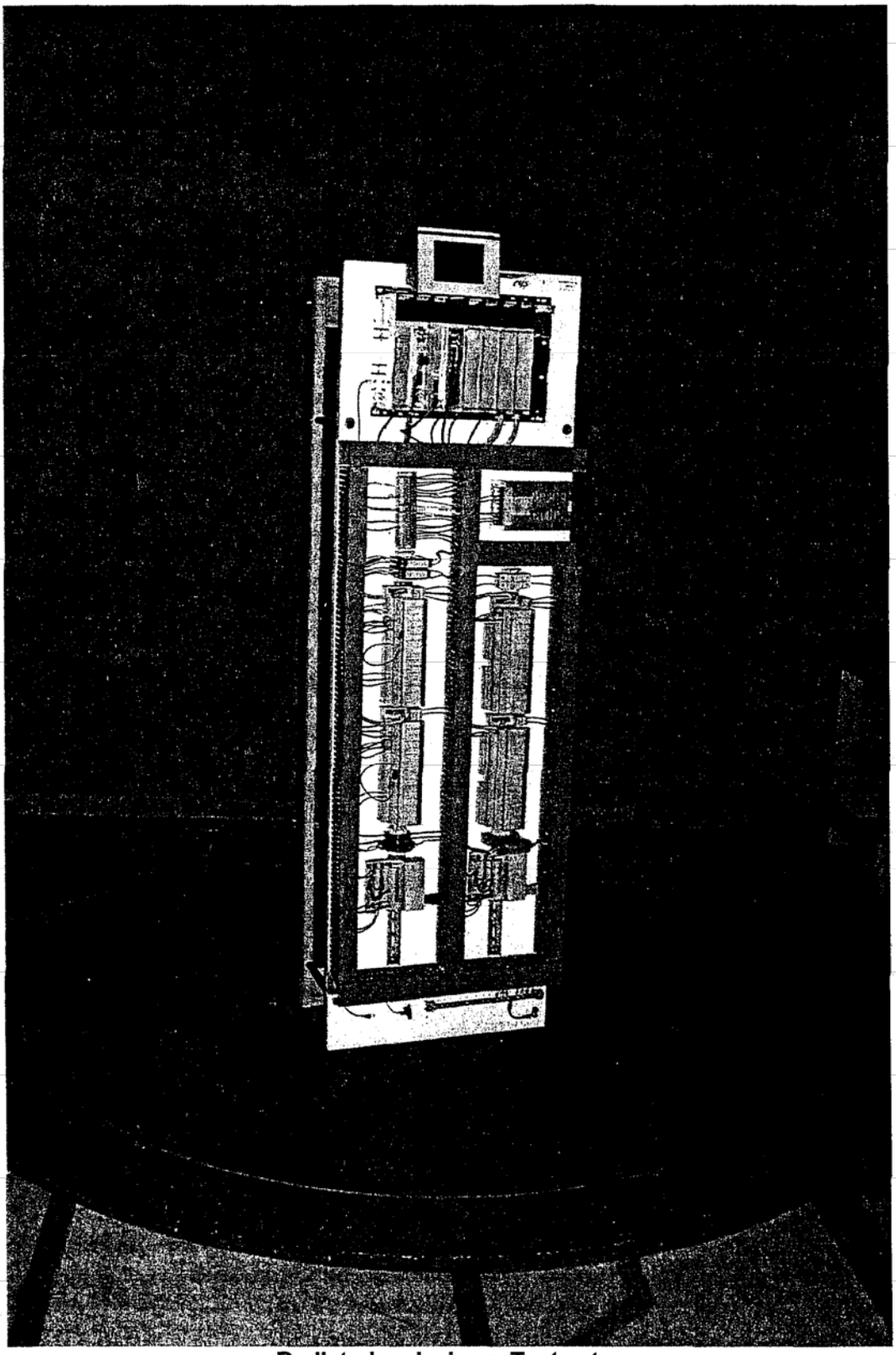
Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	60.0 kHz	MaxPeak	20.0 ms	120 kHz	Schaf-CBL6140A-3m



A-2

MEASUREMENT RESULT: "29739-01_fin QP"
03/09/03 12:46

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
37.320000	48.00	-0.4	50.5	2.5	100.0	357.00	VERTICAL
39.960000	50.20	0.0	50.5	0.3	147.0	336.00	VERTICAL
105.120000	52.40	-1.0	50.5	-1.8	174.0	64.00	HORIZONTAL
127.980000	57.30	-1.2	50.5	-6.7	252.0	358.00	VERTICAL
174.960000	50.20	0.1	50.5	0.3	100.0	42.00	HORIZONTAL
225.000000	53.70	2.8	50.5	-3.1	100.0	21.00	HORIZONTAL
249.960000	57.40	3.8	57.5	0.1	191.0	337.00	HORIZONTAL
255.960000	59.70	3.8	57.5	-2.1	132.0	66.00	VERTICAL
375.000000	60.70	6.5	57.5	-3.1	128.0	54.00	HORIZONTAL
576.000000	53.10	10.4	57.5	4.4	115.0	294.00	HORIZONTAL
655.980000	50.00	12.0	57.5	7.5	100.0	1.00	HORIZONTAL
703.980000	56.40	12.2	57.5	1.1	100.0	337.00	HORIZONTAL
799.980000	55.10	13.1	57.5	2.4	166.0	1.00	HORIZONTAL
825.000000	55.90	13.6	57.5	1.6	119.0	1.00	HORIZONTAL
849.960000	51.40	14.0	57.5	6.1	109.0	358.00	HORIZONTAL
900.000000	54.60	14.5	57.5	3.0	103.0	340.00	HORIZONTAL
960.000000	53.50	15.7	57.5	4.0	100.0	1.00	HORIZONTAL
999.960000	51.30	16.3	57.5	6.2	220.0	358.00	HORIZONTAL



Radiated emissions: Test setup

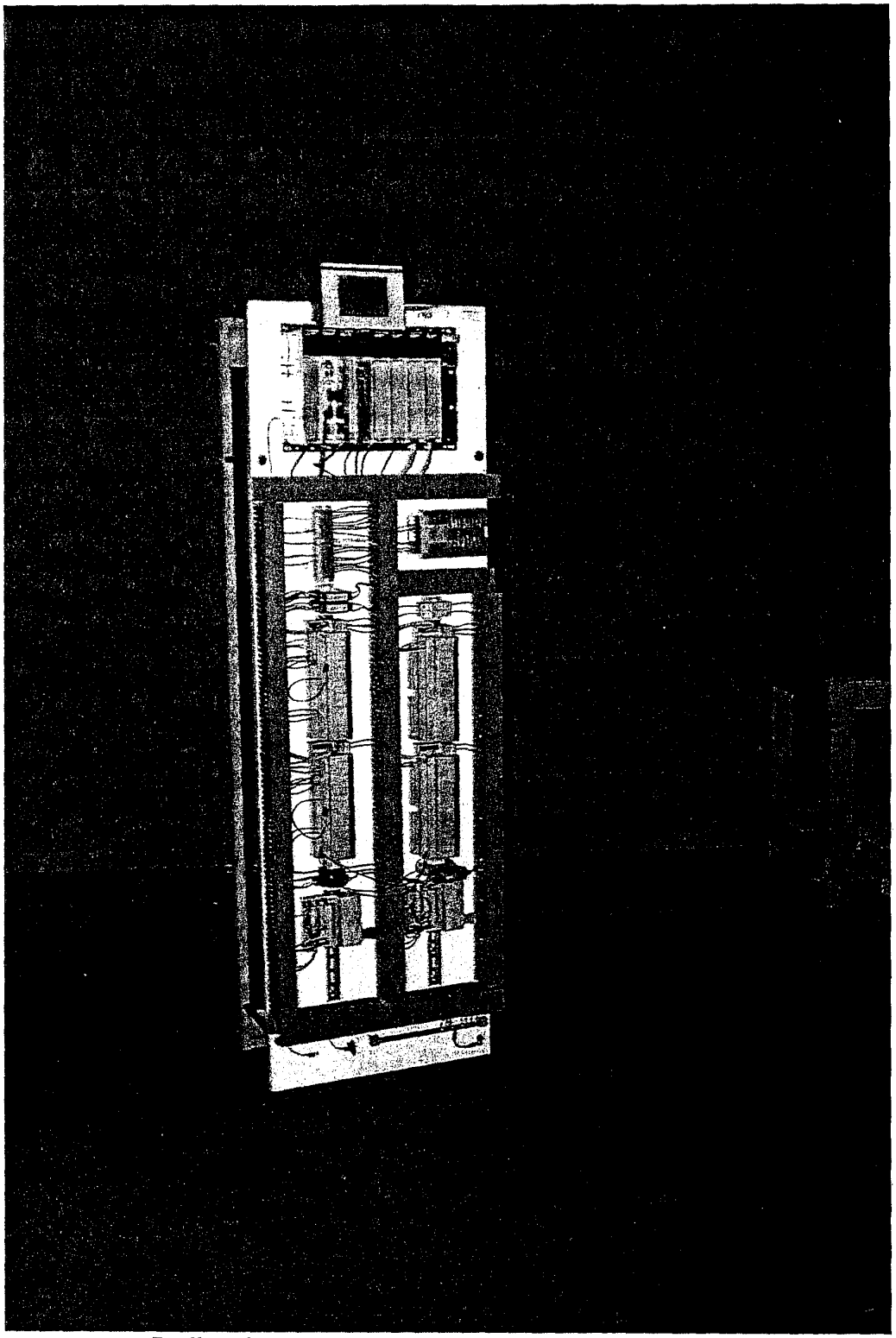
8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234

APPENDIX B

RADIATED ELECTROMAGNETIC FIELD IMMUNITY

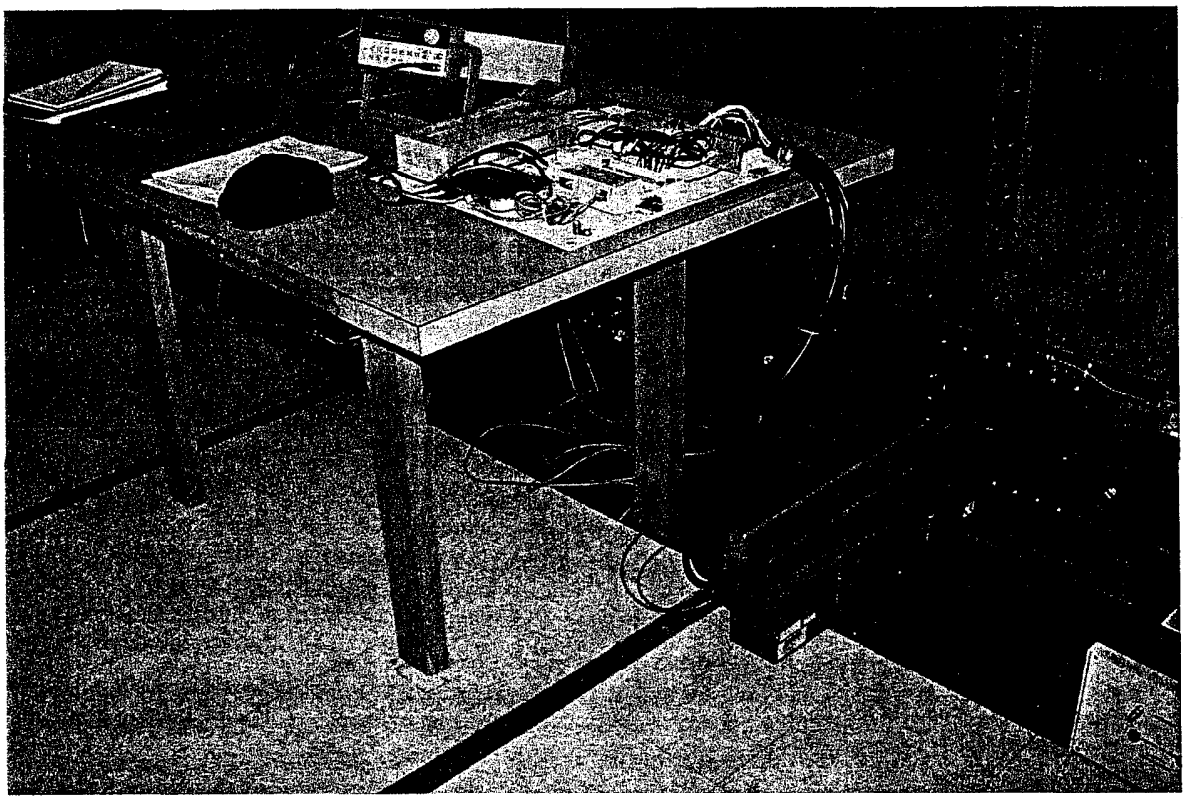
8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234

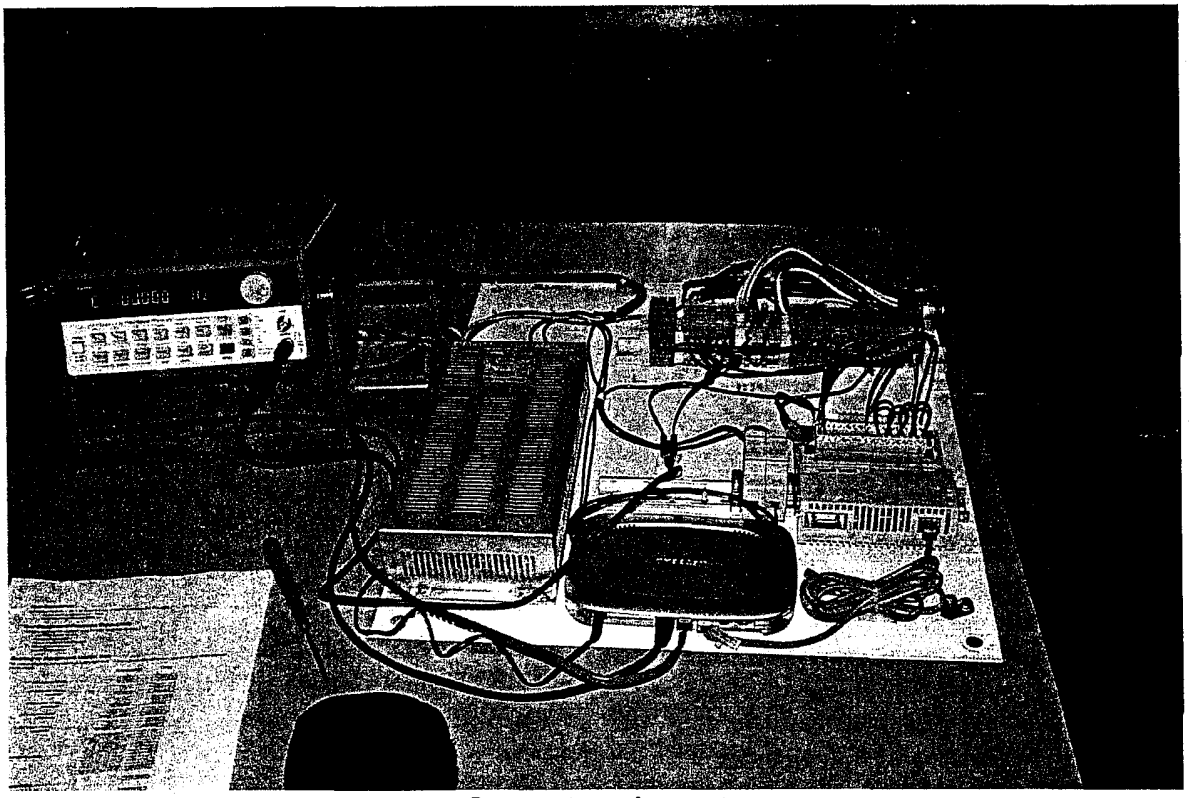
Translation



Radiated electromagnetic field immunity: Test setup

8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234





Support equipment

8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234

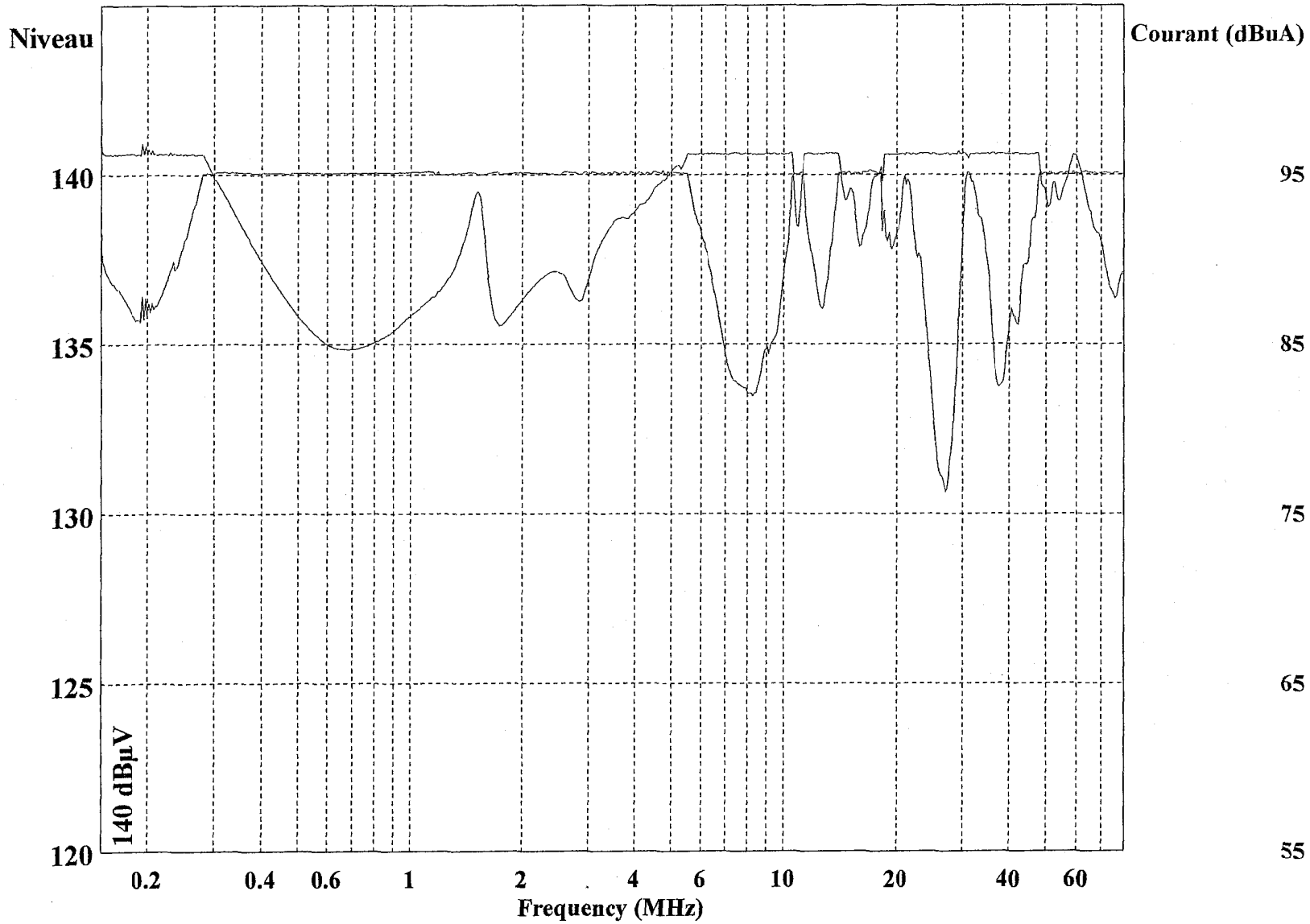
APPENDIX C

CONDUCTED IMMUNITY

8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234

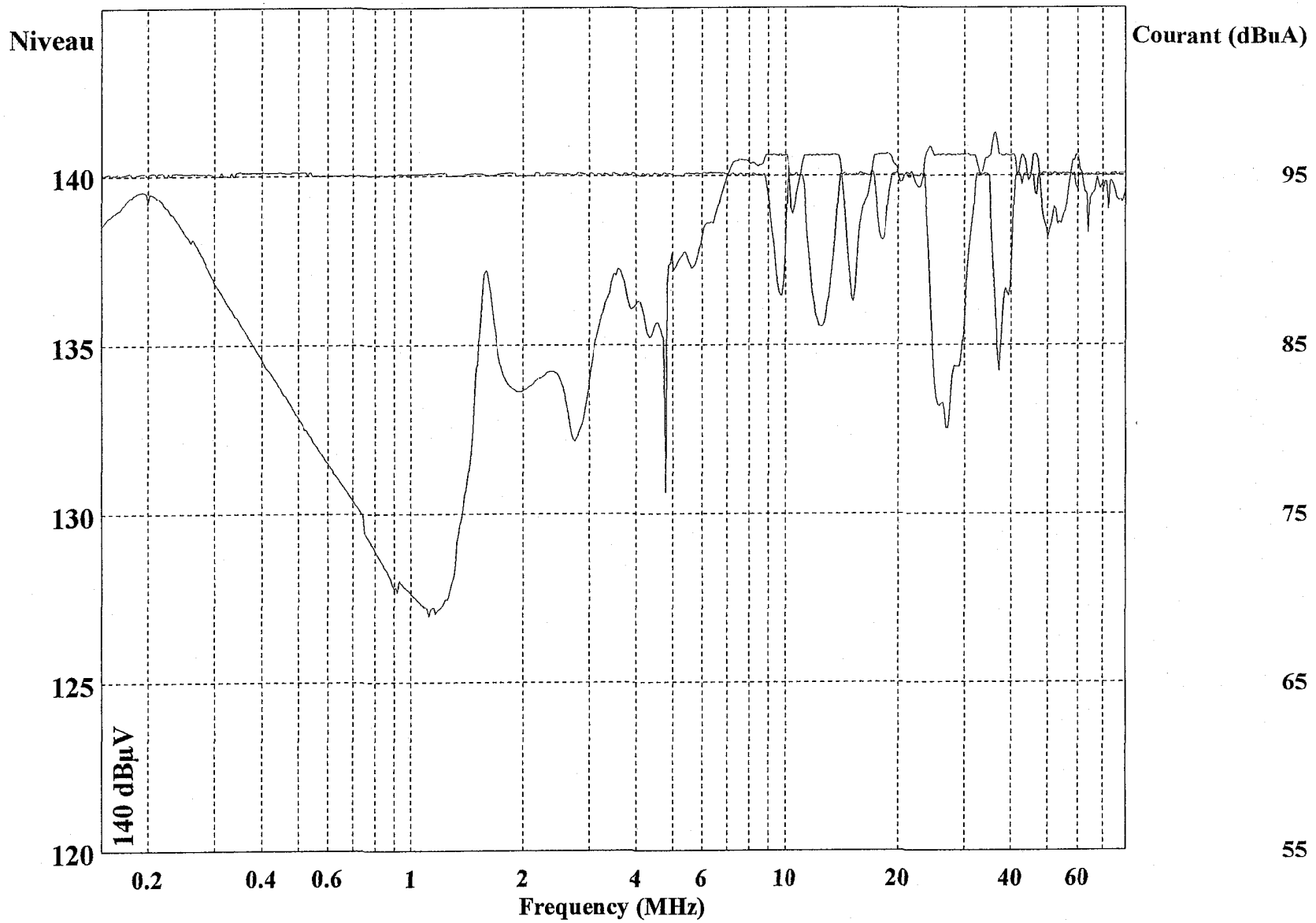
Schaffner-Chase RF Immunity Test System V4.32 Run on 03-09-04 09:13

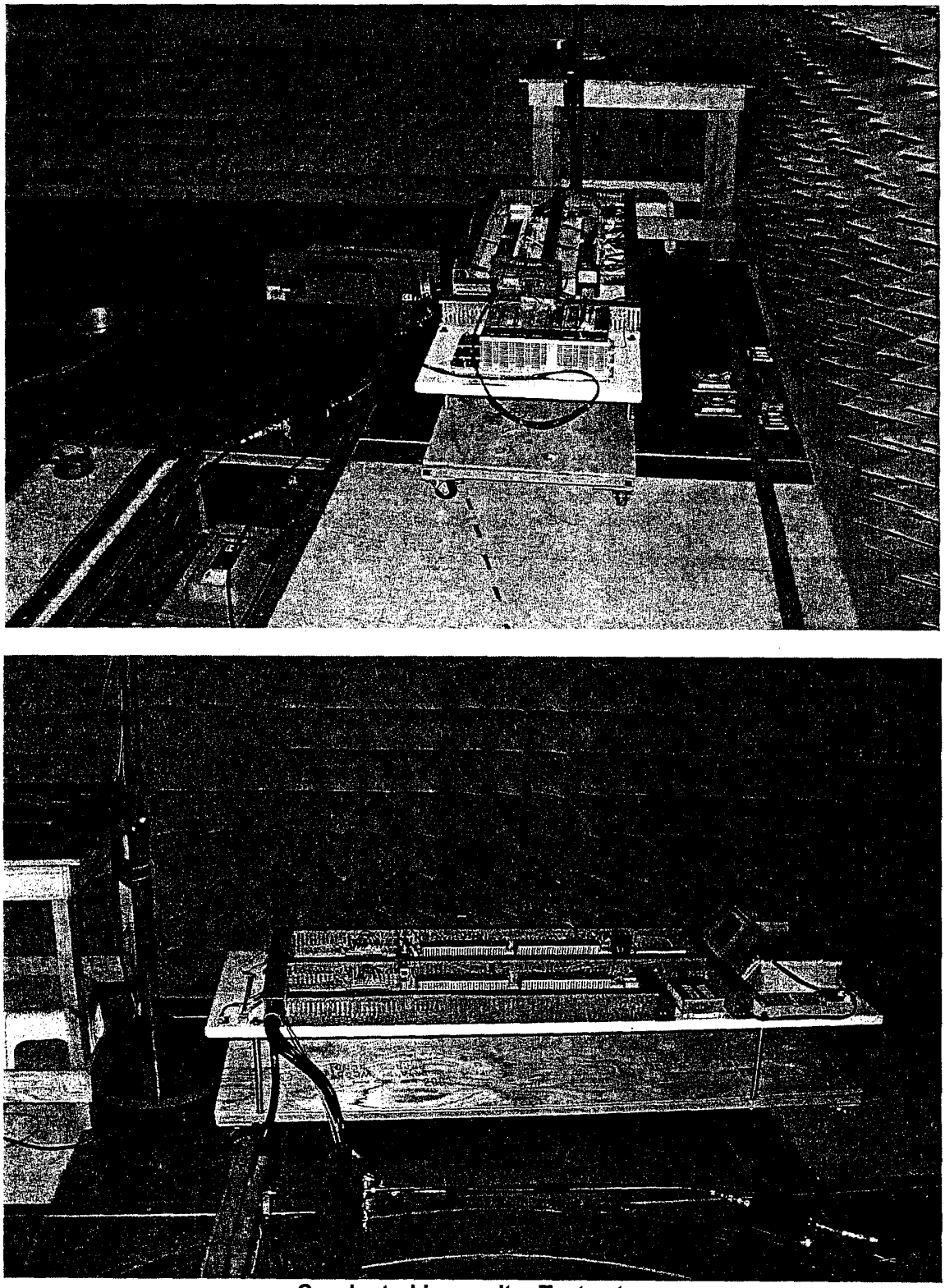
Results : g:\pres\cem\resultat\chase\29739\e016193_.res - L & S Electric,PE29739,Câbles 1,2,3,4,5,7,8 E016193,M.P. 03/09/04 P1 de 2



Schaffner-Chase RF Immunity Test System V4.32 Run on 03-09-04 11:50

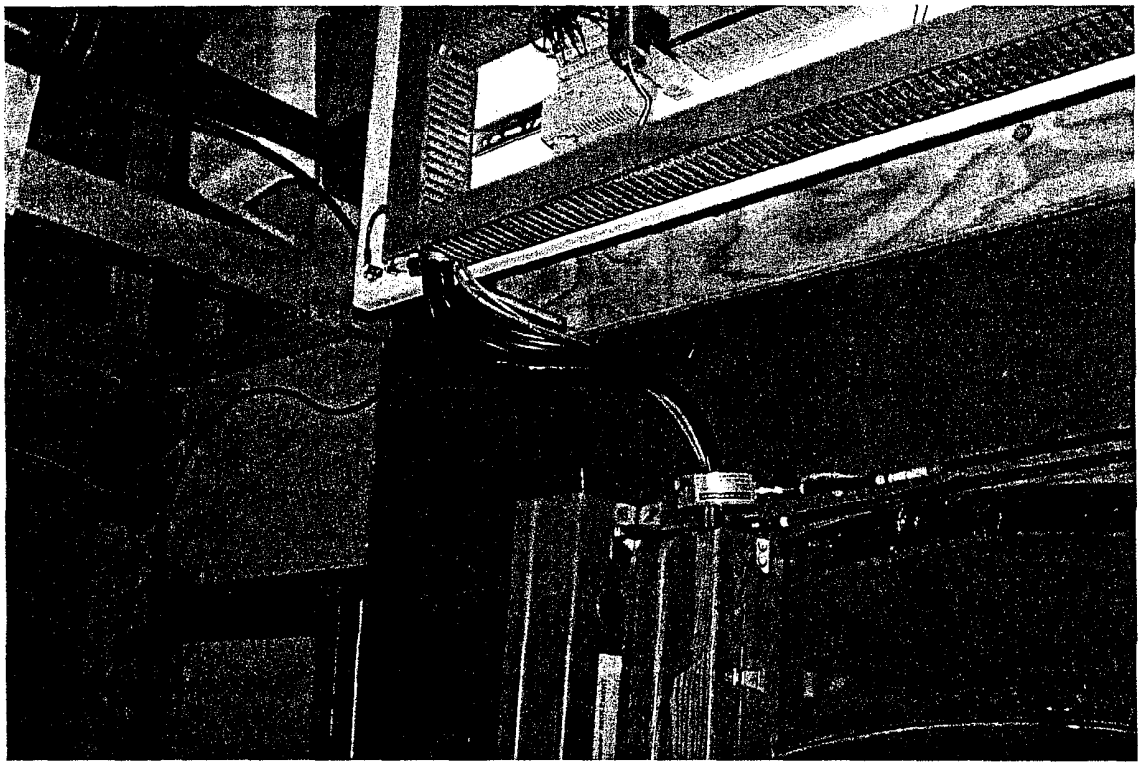
Results : g:\pres\cem\resultat\chase\29739\e016193b.res - L & S Electric,PE29739,Câbles 4 et 6 E016193,M.P. 03/09/04 P 2 de 2

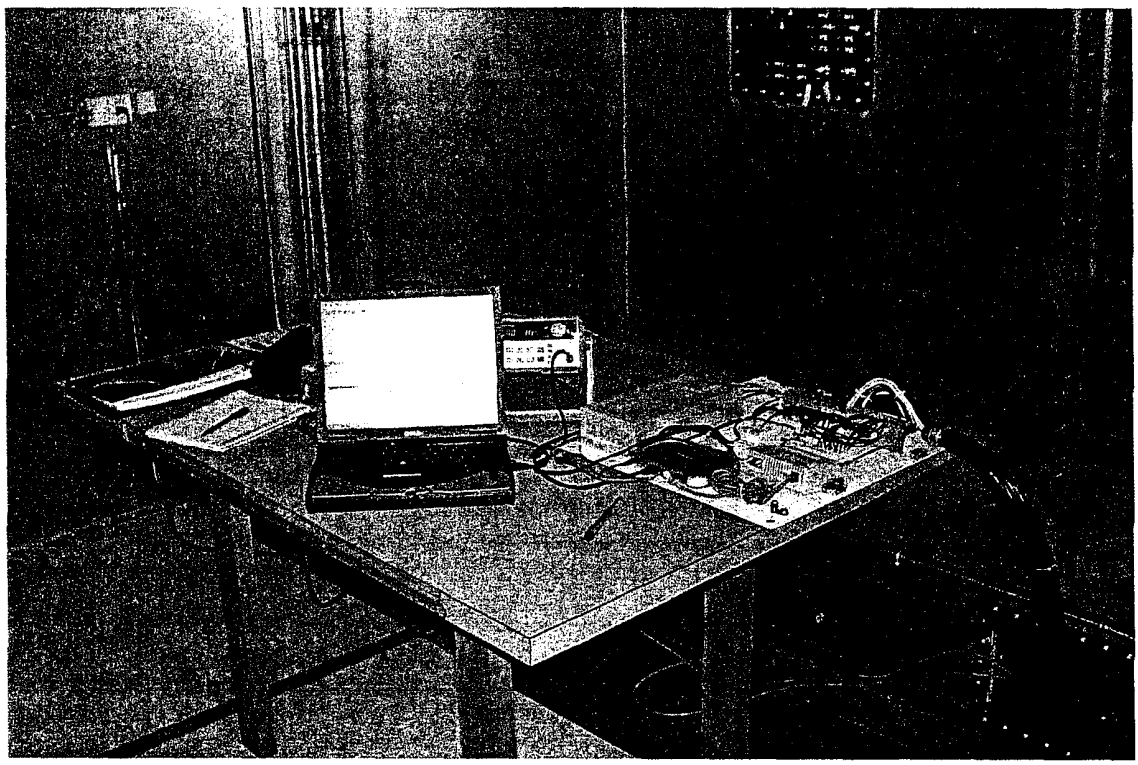




Conducted immunity: Test setup

8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234





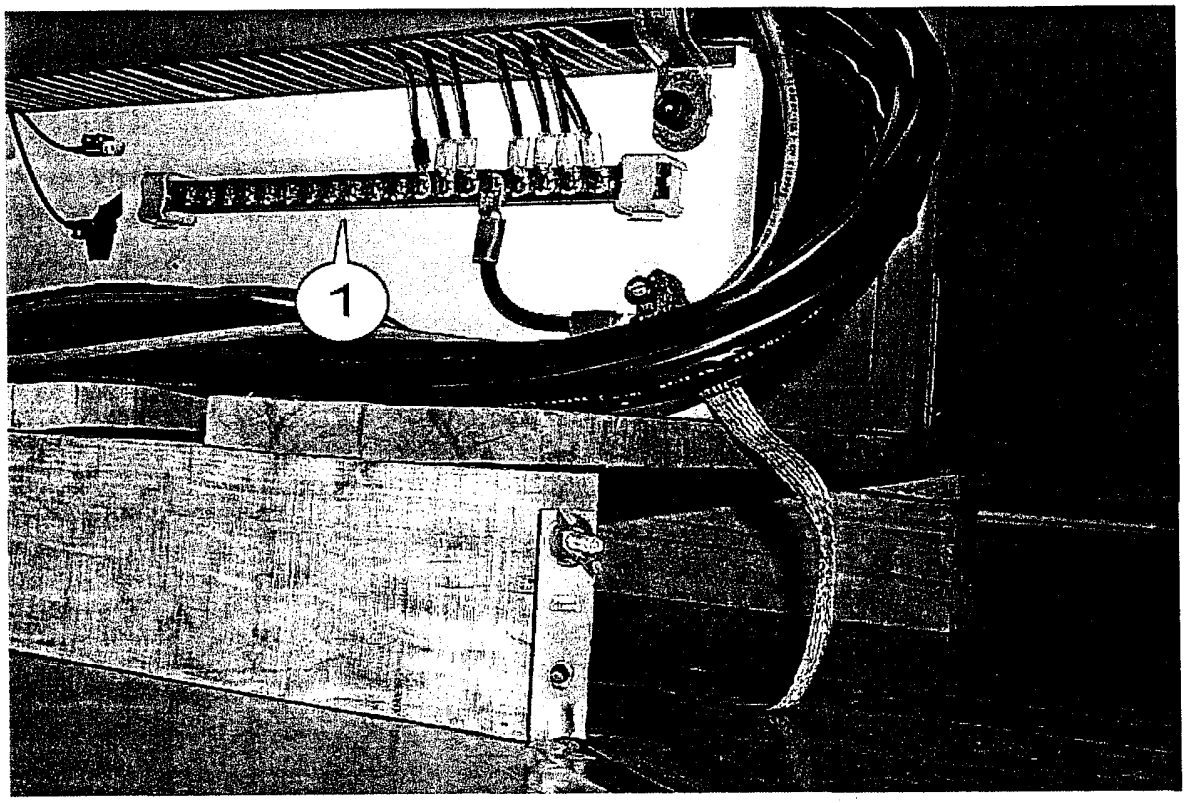
Conducted immunity: Test setup

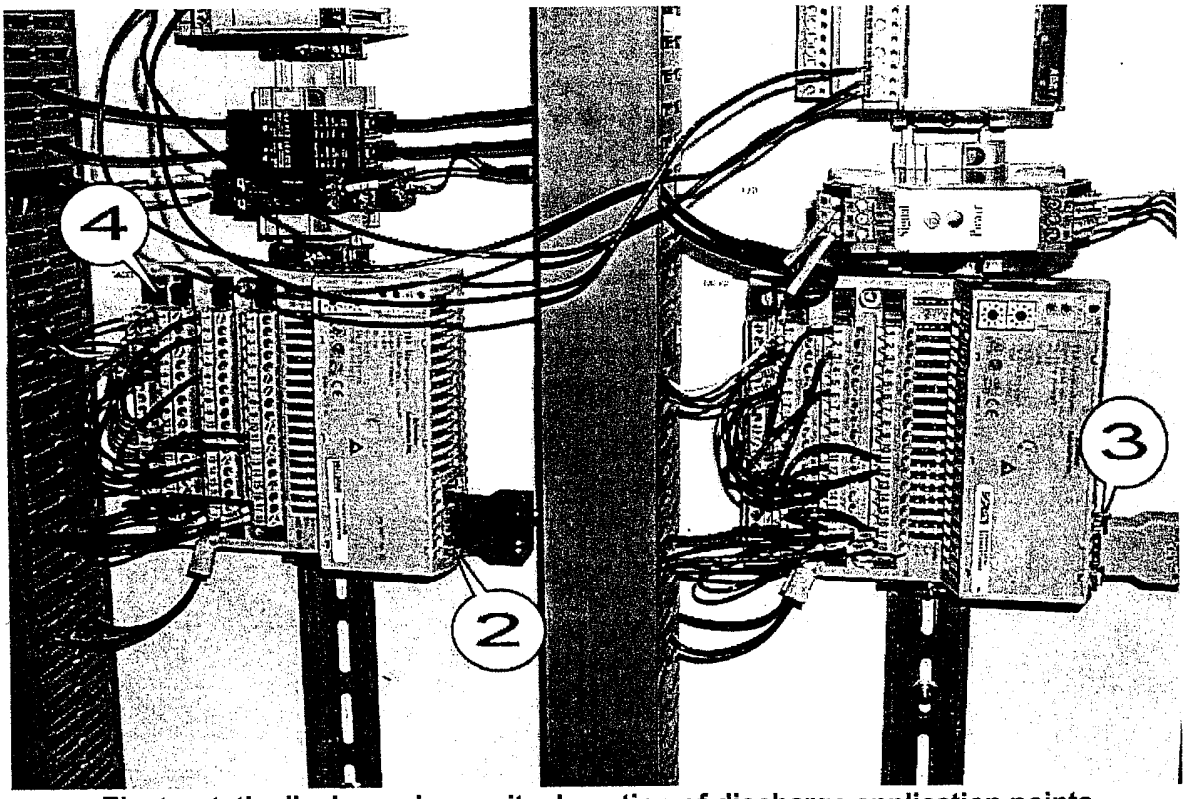
8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234

APPENDIX D

ELECTROSTATIC DISCHARGE IMMUNITY

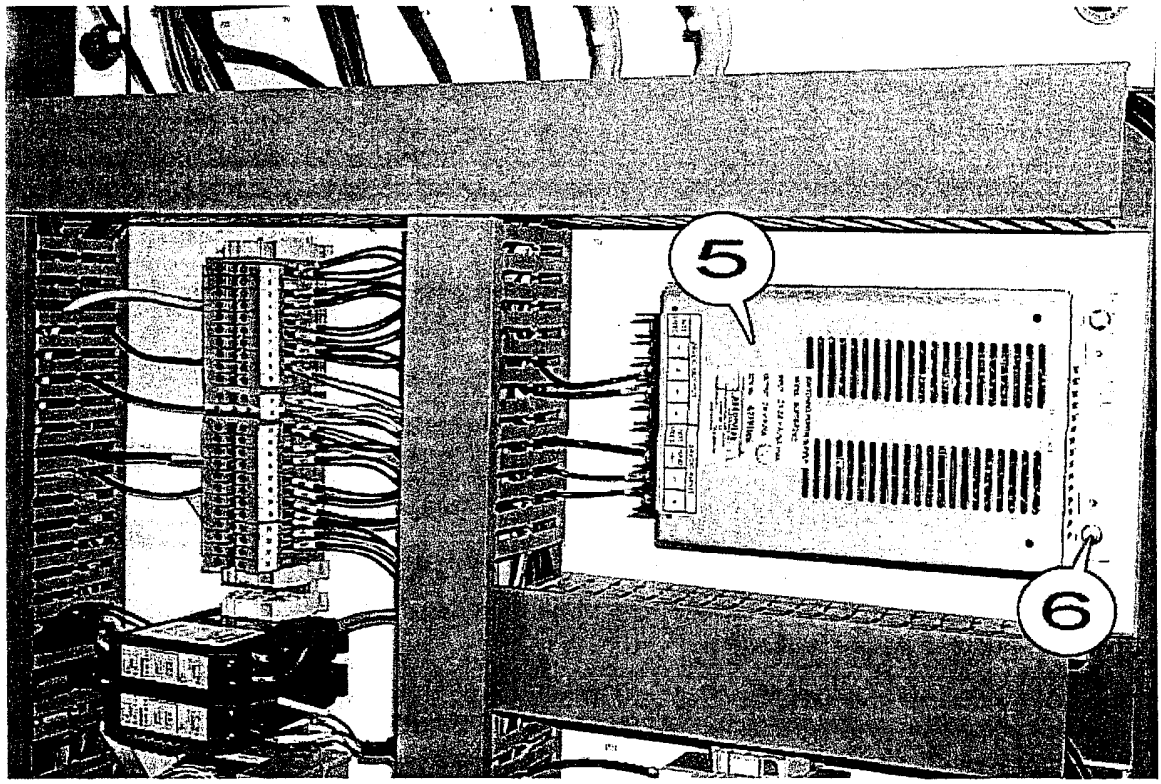
8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234

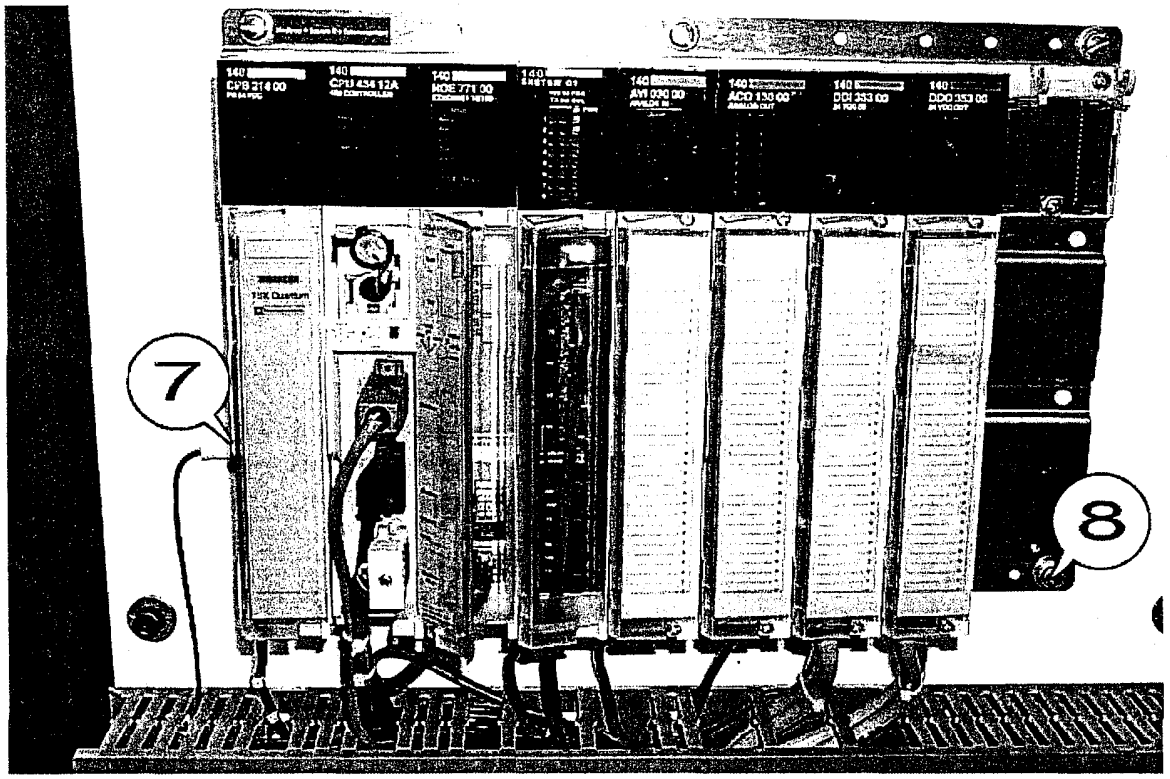




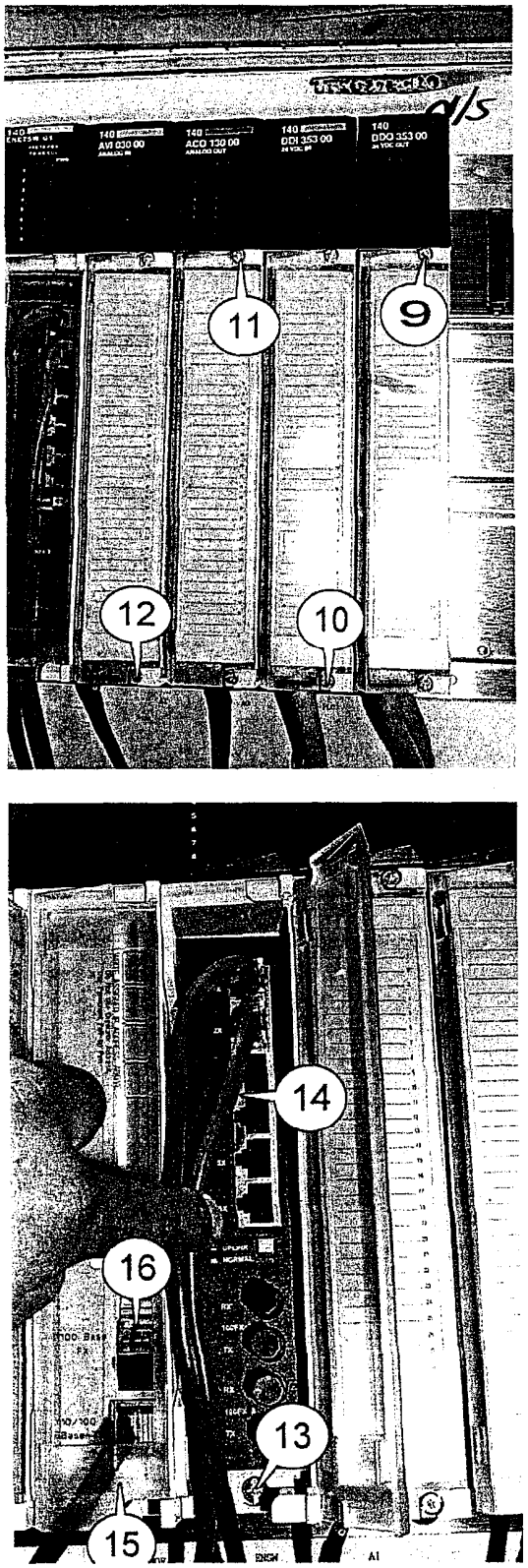
Electrostatic discharge immunity: Location of discharge application points

8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234

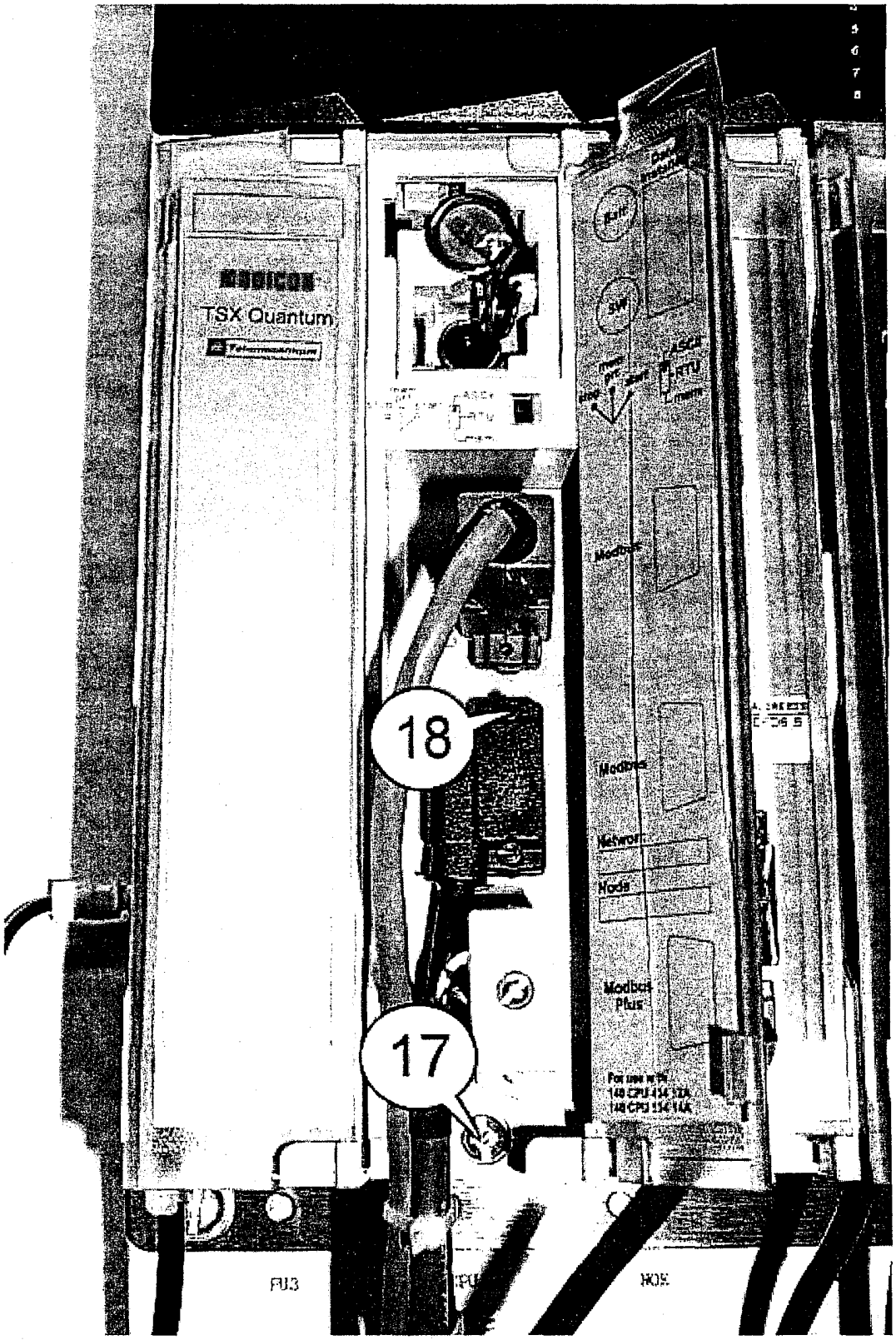




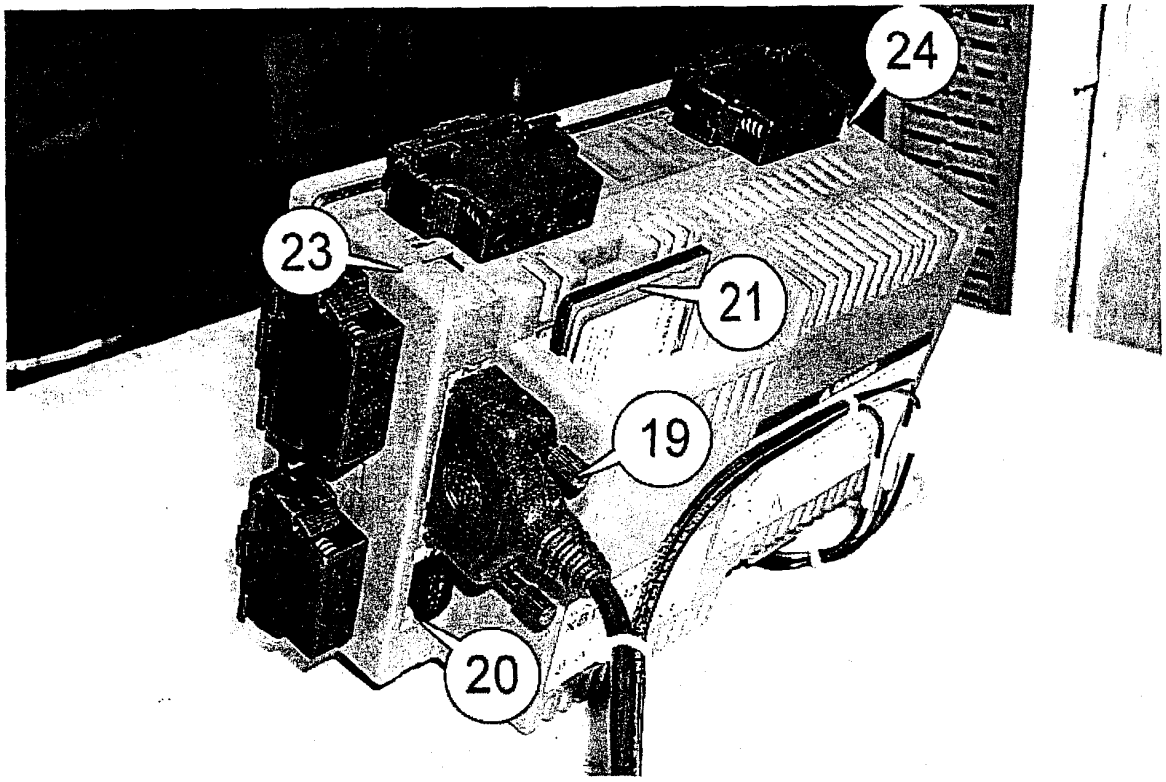
Electrostatic discharge immunity: Location of discharge application points

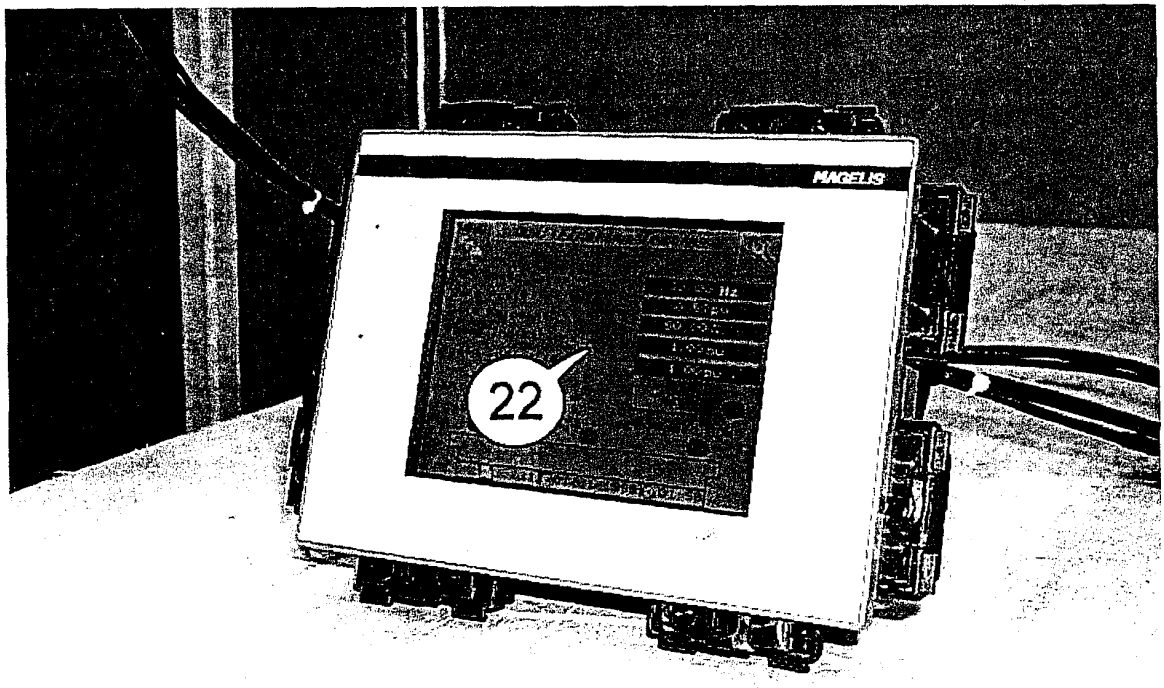


Electrostatic discharge immunity: Location of discharge application points

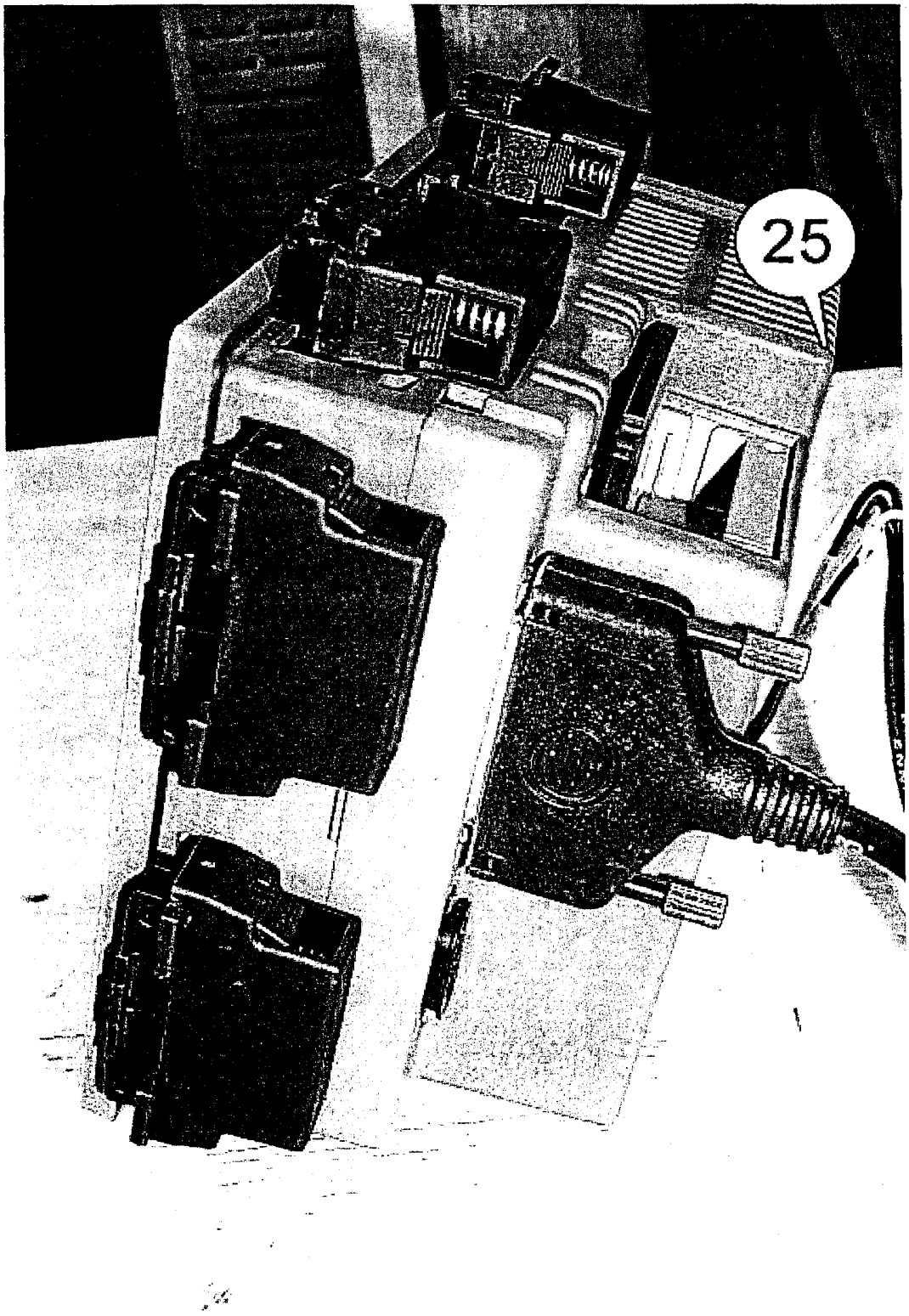


Electrostatic discharge immunity: Location of discharge application points



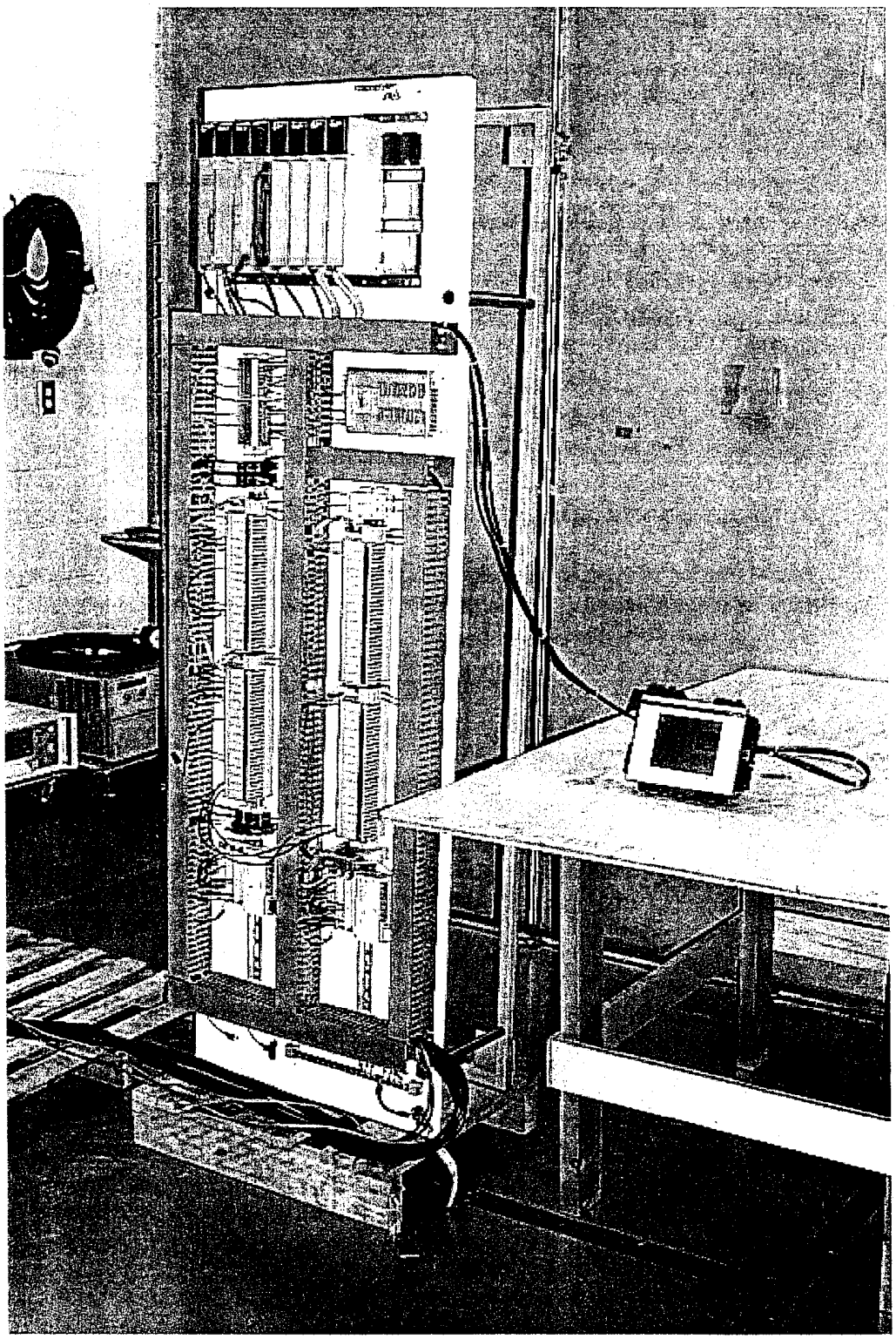


Electrostatic discharge immunity: Location of discharge application points



Electrostatic discharge immunity: Location of discharge application points

8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234



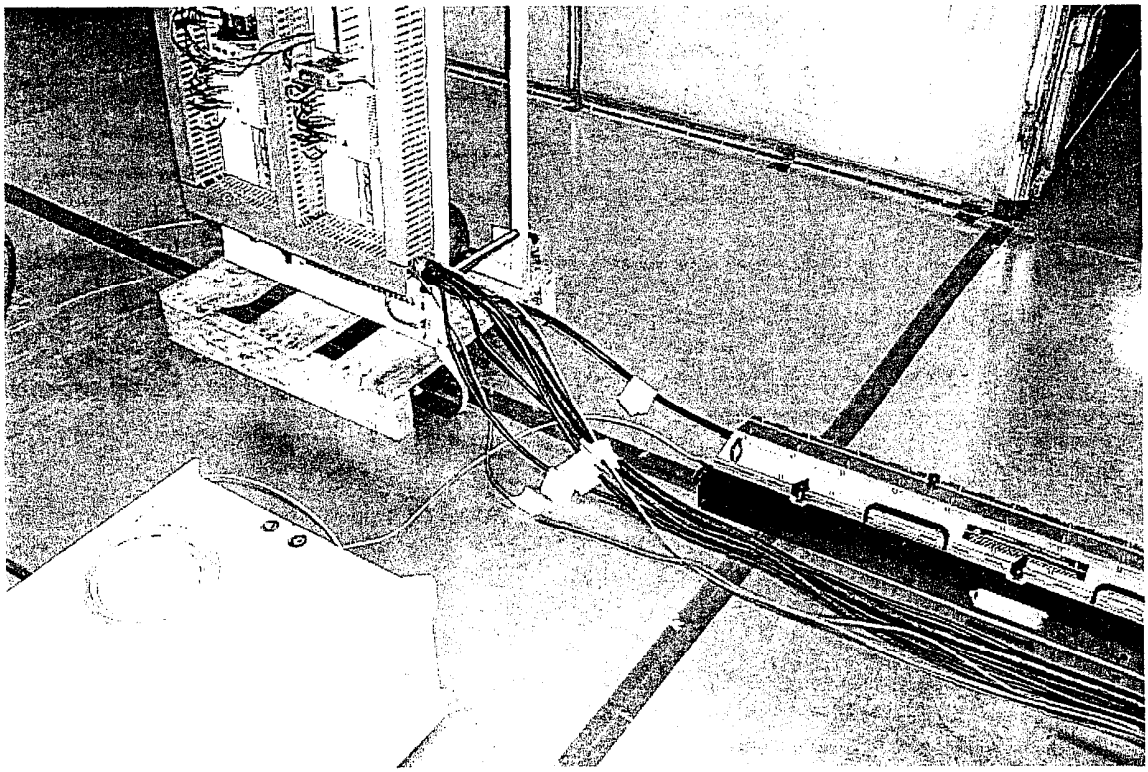
Electrostatic discharge immunity: Test setup

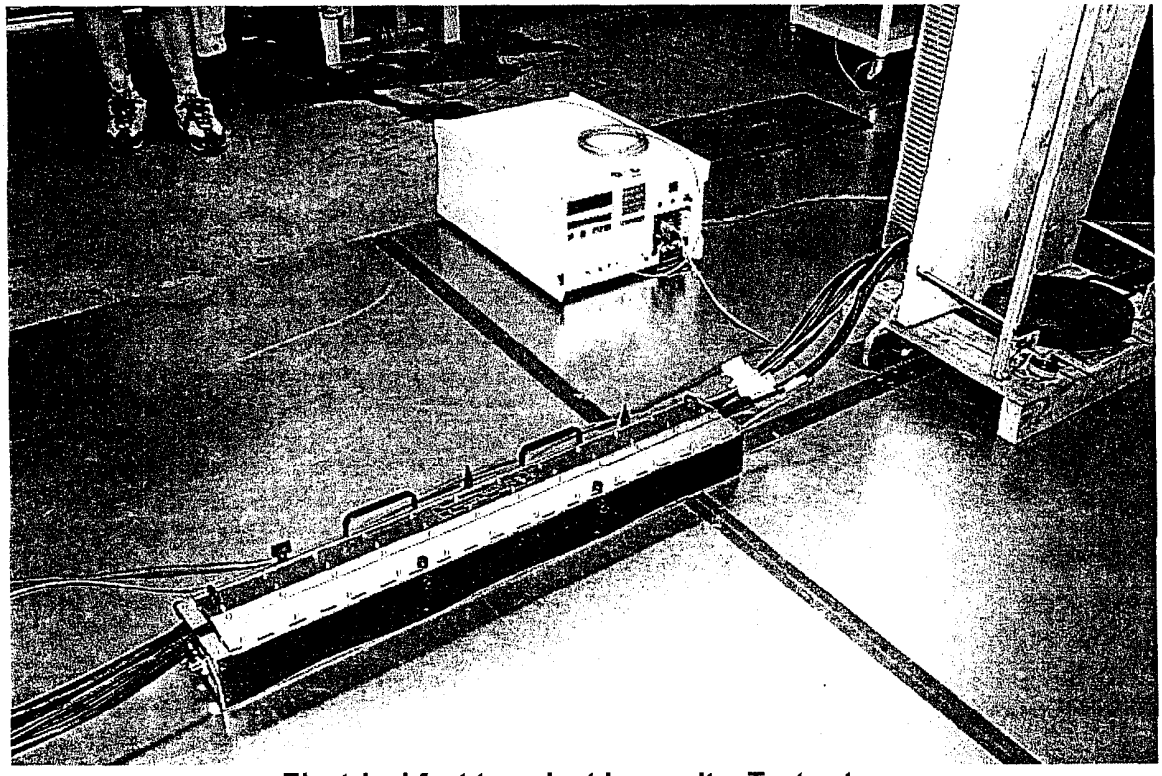
8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234

APPENDIX E

ELECTRICAL FAST TRANSIENT IMMUNITY

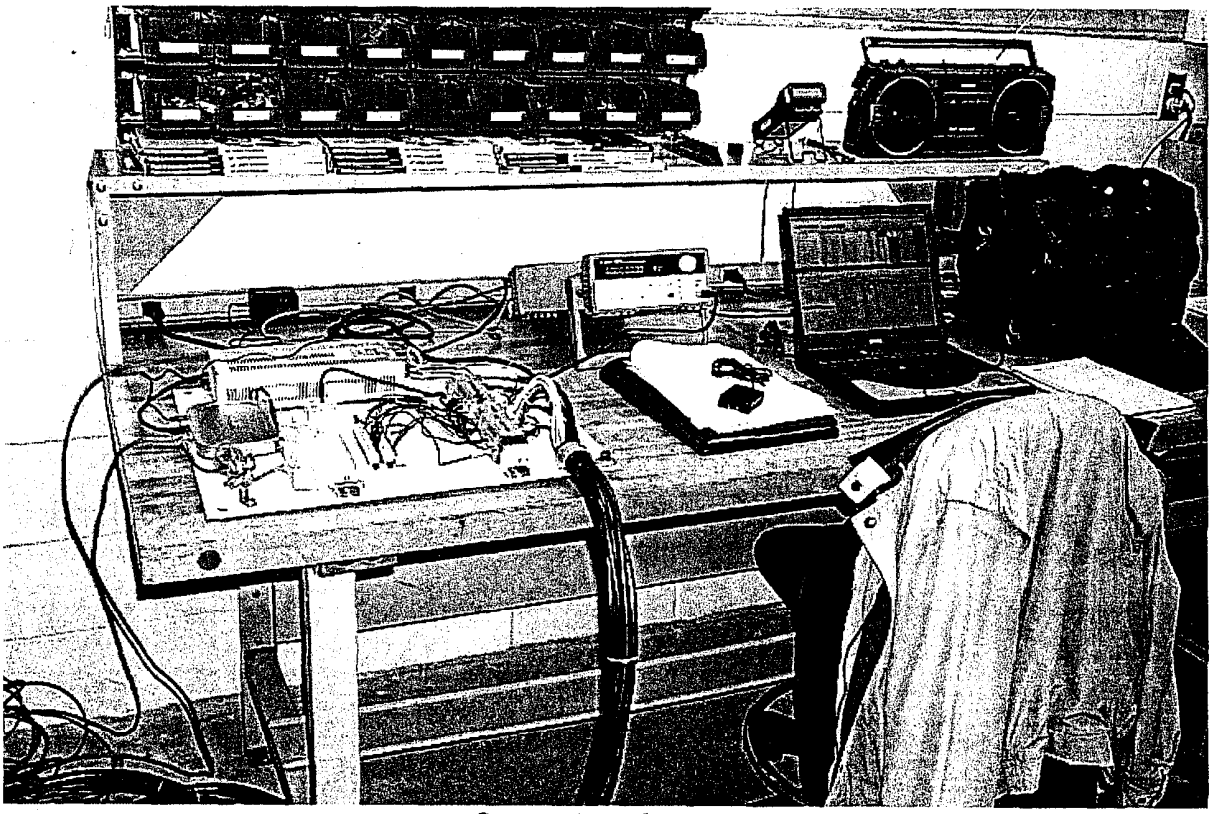
8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234





Electrical fast transient immunity: Test setup

8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234



Support equipment

8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234

APPENDIX F

DIELECTRIC RIGIDITY

8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234

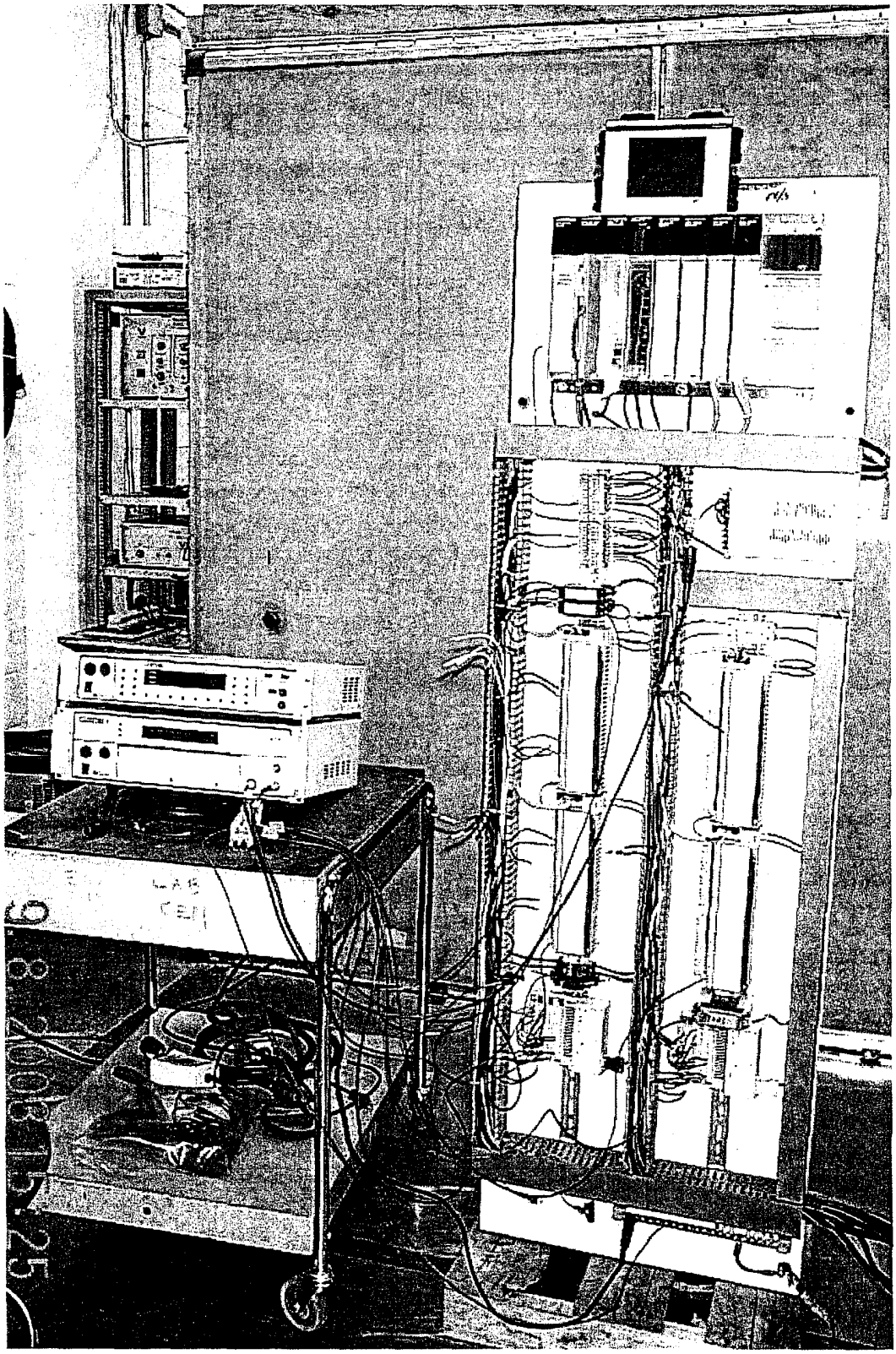
LABORATOIRE DE COMPATIBILITÉ ÉLECTROMAGNÉTIQUE
FICHE DE ROUTE
Tenue diélectrique

R. P. : C.Forget	Client : L & S Electric	Page : 1 de 1
Signature :	Projet : PE 29739	Date : 2003 / 09 / 08

N° d'échantillon : E016193

Tension (kV)	ca cc	Groupe Entre	Groupe Et	Déclenchement (oui/non)	Courant de fuite[1] (mA)
0,5	ca	Power Supply	M.A.L.T.	NON	0,784
1,5	ca	Analog Input	M.A.L.T.	NON	0,028
1,5	ca	Analog Output	M.A.L.T.	NON	0,028
1,5	ca	Discrete Input	M.A.L.T.	NON	0,027
1,5	ca	Discrete Output	M.A.L.T.	NON	0,035
0	ca	Communication	M.A.L.T.	À la demande du client ce groupe n'est pas testé	
1,5	ca	Speed Signal	M.A.L.T.	NON	0,030
1,5	ca	Speed Input	M.A.L.T.	NON	0,031
2,0	ca	Potential Transformer	M.A.L.T.	NON	0,031

[1] Optionnel



Dielectric rigidity: Test setup

8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234

LABORATOIRE DE COMPATIBILITÉ ÉLECTROMAGNÉTIQUE

FICHE DE ROUTE

Tension de choc

R. P. : C.Forget	Client : L & S Electric	Page : 1 de 1
Signature :	Projet : PE 29739	Date : 2003 / 09 / 08

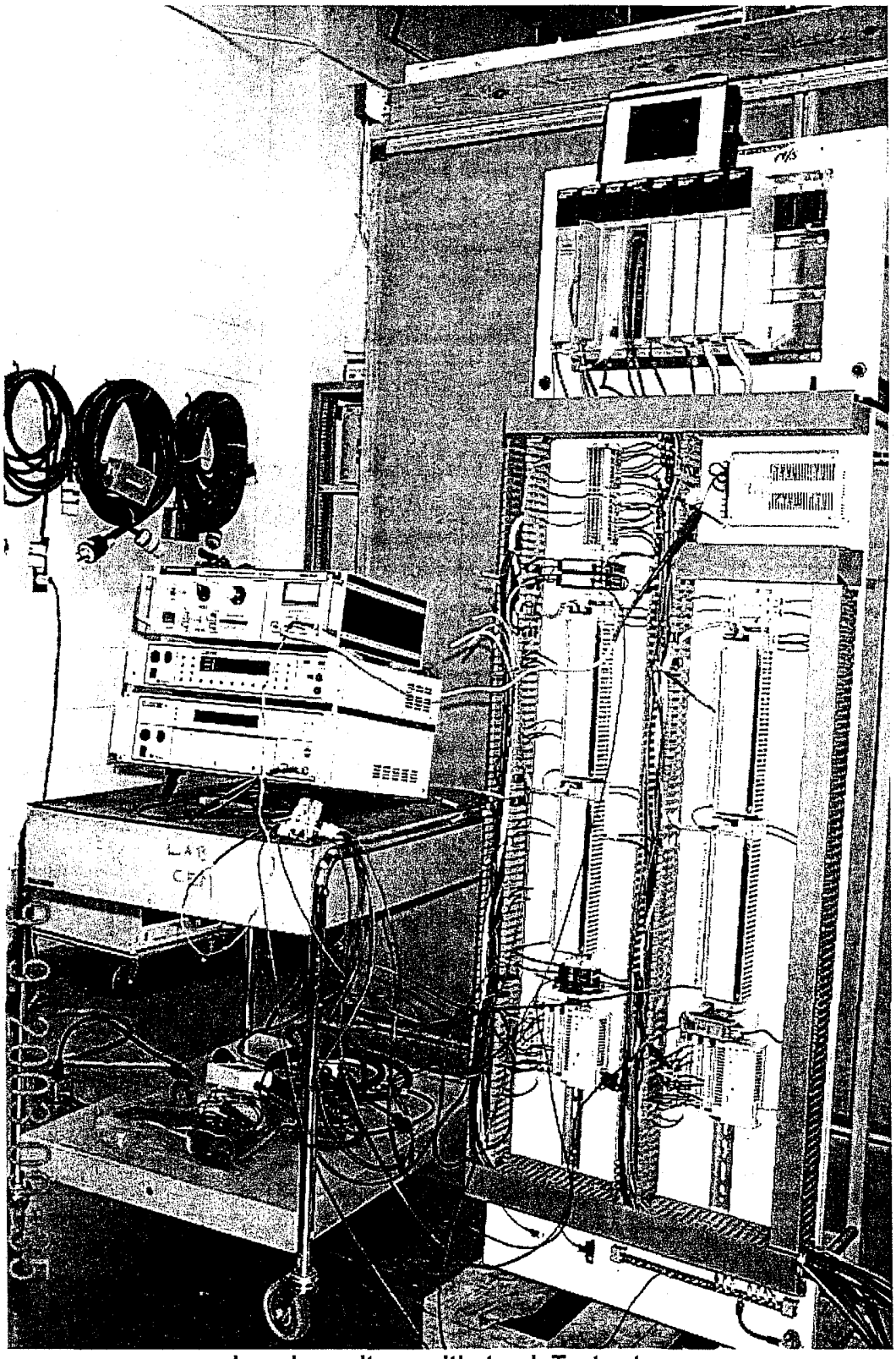
N° d'échantillon : E016193

Tension d'essai (kV)	Groupe		Fait (✓)	
	Entre	Et	Positif	Négatif
5	Power Supply	M.A.L.T.	✓	✓
5	Analog Input	M.A.L.T.	✓	✓
5	Analog Output	M.A.L.T.	✓	✓
5	Discrete Input	M.A.L.T.	✓	✓
5	Discrete Output	M.A.L.T.	✓	✓
5	Communication	M.A.L.T.	À la demande du client ce groupe n'est pas testé	
5	Speed Signal	M.A.L.T.	✓	✓
5	Speed Input	M.A.L.T.	✓	✓
5	Potential Transformer	M.A.L.T.	✓	✓

APPENDIX G

IMPULSE VOLTAGE WITHSTAND

8475 Christophe-Colomb Avenue, Montréal, Québec, Canada H2M 2N9
(514) 383-1550, 1-800-667-4570, Fax: (514) 383-3234



Impulse voltage withstand: Test setup

(514) 383-3210
ou 1 800 667-4570 poste 3210

8475, avenue christophe-colomb
montréal (québec)
H2M 2N3 CANADA
www.criq.qc.ca

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du CRIQ est enregistré
ISO 9001 et ISO 17025

Centre de recherche
industrielle
Québec