

Certification Test Report

For an

Identification System

Manufacturer:

Pepperl + Fuchs, Inc.
1600 Enterprise Drive
Twinsburg, OH 44087

Testing Facility:


F-Squared Laboratories
10880 Moxley Road
Damascus, MD 20872

The Ident-M System V, consisting of models MVH2000-F15, MVC-60-64K, MVI-D2-2HRX and OJ500-M1K-E01, has been tested and found to comply with the requirements of the Federal Communications Commission outlined in the Federal Register CFR 47, Part 15 subpart C of section 15.209 and section 15.249 for Class B Equipment. The product was received on October 30, 2001 and the testing was completed on October 30, 2001.

Evaluation Conducted by:


Shi-Lun Chau
Senior EMC Engineer

Report Reviewed by:


Robert Pellizze
Vice President



F-Squared Laboratories
9890 Main Street
Damascus, MD 20872
(301) 253-4500
Fax (301) 253-5179

This report shall not be duplicated except in full without the written approval of F-Squared Laboratories.

EMC006 Rev. 0

Client: Pepperl + Fuchs, Inc
FCCID: IREMVI
Model: MVH2000-F15, MVC-60-64K, MVI-D2-2HRX and OJ500-M1K-E01

Report #: CLE081501-02
Date: December 11, 2001

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Exhibit I

Engineering Statement

This report has been prepared on behalf of Pepperl + Fuchs, Inc to provide documentation for the testing described herein. This equipment has been tested and found to comply with Part 15 subpart C of the FCC Rules and under the regulation section 15.249 and section 15.209 procedure, using ANSI C63.4 1992 standards. The test results found in this report relate only to the items tested.

EQUIPMENT UNDER TEST: **Ident-M System V**
Trade Name: Pepperl + Fuchs, Inc
FCC ID: IREMVI
Model #: MVH2000-F15, MVC-60-64K, MVI-D2-2HRX and OJ500-M1K-E01
Power Supply: 24VDC

APPLICABLE RULES: CFR 47 Part 15 subpart C of section 15.209 and section 15.249

EQUIPMENT CATEGORY: IDENTIFICATION SYSTEM

MEASUREMENT LOCATION: F-Squared Laboratories in Damascus, MD. Site description and attenuation data are on file with the FCC's Sampling and Measurement Branch at the FCC Laboratory in Columbia, MD.

MEASUREMENT PROCEDURE: All measurements were performed according to the 1992 version of ANSI C63.4. A list of the measurement equipment can be found in Exhibit II.

A2LA STATEMENT: This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with the laboratory's terms of accreditation unless stated otherwise in the report.

A2LA CERTIFICATE NUMBER: 793.01

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UNCERTAINTY BUDGET:

- Radiated Emission
Combined Uncertainty (+ or -) 2.24 dB
Expanded Uncertainty (+ or -) 4.48 dB
- Conducted Emission
Combined Uncertainty (+ or -) 1.13 dB
Expanded Uncertainty (+ or -) 2.26 dB

ENGINEERING STATEMENT:

I hereby state that: The measurements shown in this application were made in accordance with the procedures indicated and the energy emitted by this equipment was found to be within the limits. I assume full responsibility for the accuracy and completeness of these measurements.

I further state that: On the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 15 of the FCC Rules under normal use and maintenance.

Certified by: _____
Robert Pellizze, Vice President

Client: Pepperl + Fuchs, Inc
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Exhibit II

List of Measurement Instrumentation

Equipment Type	Manufacturer	Model #	Serial #	Calibration Due Date
Receiver System	Rohde & Schwarz	ESMI	DE23119	2/16/2002
LISN #1	Solar	8012-50-R-24-BNC	910488	12/19/2001
LISN #2	Solar	8012-50-R-24-BNC	933201	12/19/2001
Biconical Antenna	Compliance Design, Inc.	B100	643	12/28/2001
Biconical Antenna	Compliance Design, Inc.	B200	292	12/28/2001
Biconical Antenna	Compliance Design, Inc.	B300	318	12/28/2001
Horn Antenna	Antenna Research Associates	DRG-118/A	1105	1/2/2002
Antenna Mast	Compliance Design, Inc.	M100	NA	NA
Amplifier	HP	8447F	3113A04704	8/23/2002
Turntable	F-Squared Laboratories	Site 1	NA	NA
Spectrum Analyzer	HP	8391A	3149A07546	2/16/2002

Exhibit III

Equipment Under Test Information and Data

- TEST ITEM CONDITION:** The equipment to be tested was received in good condition.
- TESTING ALGORITHM:** The EUT power on up and continuous to transmit and receiver during the test. The fundamental emission, 10th harmonic emissions and the other worst emissions are recorded in the data tables.
- RADIATED EMISSION TESTING:** The EUT was tested at a distance of 3 meters. The emissions were maximized by rotating the table and raising/lowering the antenna mounted on a 4 meter mast. Both horizontal and vertical field components were measured. The output of the antenna was connected through a pre-amplifier, to the input of the receiver and emissions were measured in the range 30 MHz to 1 GHz. The values up to 1 GHz with a resolution bandwidth of 120 kHz are quasi-peak reading made at 3 meters. The measurements above 1 GHz up to 24.5 GHz with a resolution bandwidth of 1 MHz are peak reading at a distance of 3 meters. All data for radiated emissions is found in Exhibit VI.
- CALCULATION OF DATA:** RADIATED EMISSIONS – The antenna factors (included cable losses) of the biconical antennas used, and the pre-amplifier gain, are input into the memory of the receiver. The receiver then corrects the reading for amplitude automatically. The field strength reading can then be taken directly from the receiver and compared to the FCC limits in dBuV/m. The following equation is used to convert to uV/m:

$${}^E uV/m = \text{antilog}({}^E \text{dBuV}/m^{/20})$$

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SAMPLE OF FIELD STRENGTH CALCULATION:

$$E_a = V_a + AF + A_e + (-AG)$$

Where E_a = Field Strength(dBuV/m)
 $V_a = 20 \times \log_{10}$ (measure RF voltage, uV)
 A_e = Cable Loss Factor, dB
 AG = Amplifier Gain, dB
 AF = Antenna Factor dB(m-1)

i.e. if the reading is 57.0 dBuV, the antenna factor 8.0 dB, cable loss factor 1.0 dB and Amplifier gain is 25.0 dB, so the field strength will be:

$$\begin{aligned} E_a(\text{dBuV/m}) &= 57 + 8 + 1 + (-25) \\ &= 41 \text{ dBuV/m} \end{aligned}$$

OR

$$\begin{aligned} E_a(\text{uV/m}) &= 10^{(41/20)} \\ &= 112.20 \text{ uV/m} \end{aligned}$$

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Exhibit IV

EUT Configuration and Cables

EUT:

Device	Manufacturer	Model #	FCC ID
Ident-M System V	Pepperl + Fuchs, Inc	MVH2000-F15	IREMVI
Ident-M System V	Pepperl + Fuchs, Inc	MVC-60-64K	IREMVI
Ident-M System V	Pepperl + Fuchs, Inc	MVI-D2-2HRX	IREMVI

Accessories (Support Equipment):

Device	Manufacturer	Model #/Serial #	FCC ID/DoC
Power Supply	AAK Corp.	CM24.4-T	N/A
Ident-M System V	Pepperl & Fuchs, Inc.	OJ500-MIK-E01	IREMVI

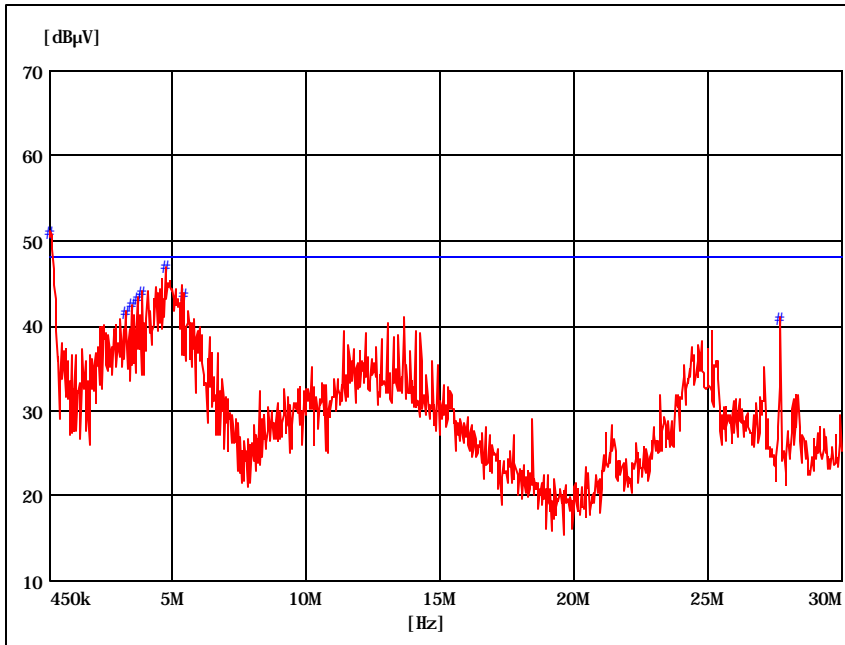
Cable: All one meter or greater in length – bundled according to ANSI C63.4 – 1992

MVK-5: Data - Shielded 5 meters

RS 232/422: Data - Shielded 2 meters

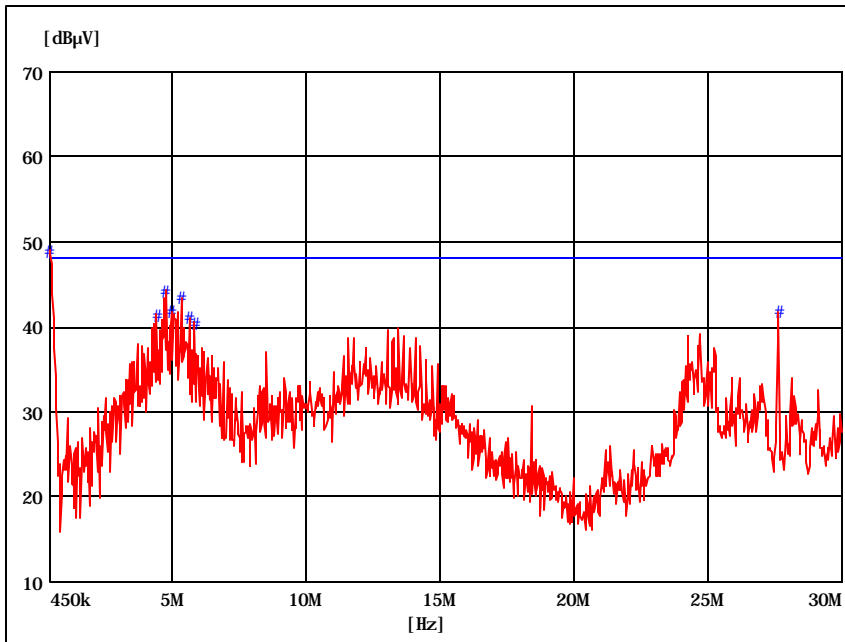
Exhibit V

Conducted Test Line: L1



Peak Detected Value	
Frequency MHz	Level dBµV
0.48	51.20
3.27	41.63
3.50	42.56
3.73	43.38
3.93	44.09
4.78	47.01
5.44	43.86
27.73	40.96

Conducted Test Line: L2

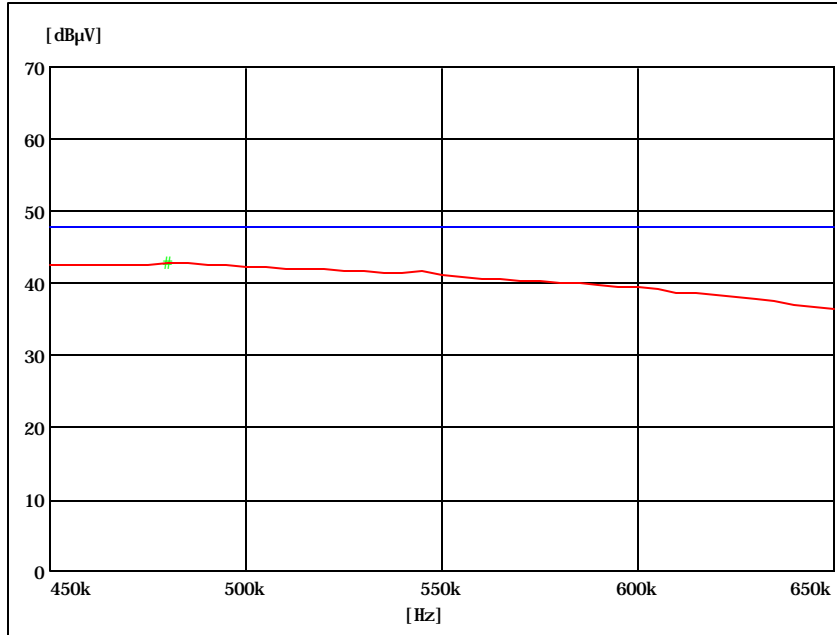


Peak Detected Value	
Frequency MHz	Level dBµV
0.45	48.99
4.46	41.53
4.82	44.27
5.01	41.85
5.38	43.49
5.67	41.12
5.87	40.46
27.67	41.85

Client: Pepperl + Fuchs, Inc
FCCID: IREMV1
Model: MVH2000-F15, MVC-60-64K, MVI-D2-2HRX and OJ500-M1K-E01

Report #: CLE081501-02
Date: December 11, 2001

Conducted Test Line: L1



QP Detected Value	
Frequency MHz	Level dBµV
0.48	42.98

Exhibit VI

RADIATED DATA

Test Date:	10/30/2001	Test Engineer:	Shi-Lun Chau
Limit:	Class B	Air Temperature:	24 °C
Distance:	3 Meters	Barometric Pressure:	1007 mB
Frequency Range For Tested:	30.0 MHz ~ 25.0 GHz	Relative Humidity:	33 %

Frequency (MHz)	Antenna Position		Turntable	Cable Loss (dB)	Antenna Factor (dB)	Reading (dBuV)/m	Emission (dBuV)/m	FCC Limits (dBuV)/m	Margins (dBuV/m)
	Polarization	Height (m)	Azimuth (Degrees)						
33.71	H	3.10	89	1.44	11.20	15.35	27.99	40.00	-12.01
33.71	V	1.30	180	1.44	10.60	17.62	29.66	40.00	-10.34
116.64	H	2.50	315	1.71	11.40	24.90	38.01	43.50	-5.49
116.64	V	1.25	90	1.71	12.00	23.25	36.96	43.50	-6.54
135.04	H	1.10	35	1.74	11.15	26.75	39.64	43.50	-3.86
135.04	V	1.25	180	1.74	11.50	24.09	37.33	43.50	-6.17
144.33	H	1.50	35	1.76	11.70	26.21	39.67	43.50	-3.83
144.33	V	1.20	195	1.76	12.40	24.50	38.66	43.50	-4.84
154.05	H	1.80	30	1.83	12.60	25.63	40.06	43.50	-3.44
154.05	V	1.30	35	1.83	14.30	20.46	36.59	43.50	-6.91
156.63	H	1.50	45	1.74	13.20	24.52	39.46	43.50	-4.04
156.63	V	1.30	195	1.74	14.50	22.87	39.11	43.50	-4.39
202.63	H	1.00	92	2.06	15.70	21.30	39.06	43.50	-4.44
202.63	V	1.10	180	2.06	15.90	18.91	36.87	43.50	-6.63

Frequency (MHz)	Antenna Position		Turntable	Cable Loss (dB)	Antenna Factor (dB)	Reading (dBuV)/m	Emission (dBuV)/m	FCC Limits (dBuV)/m	Margins (dBuV/m)
	Polarization	Height (m)	Azimuth (Degrees)						
2449.89	H	1.70	270	3.77	30.50	51.49	85.76	94.00	-8.24
2449.89	V	1.30	260	3.77	30.50	58.52	92.79	94.00	-1.21
4899.94	H	1.60	87	5.86	35.30	6.31	47.47	54.00	-6.53
4899.94	V	1.30	90	5.86	35.00	3.75	44.61	54.00	-9.39

Remark: We have tested a 2449.89 MHz fundamental frequency. However, above the second harmonics up to 24.5 GHz radiated emissions were too small to measure and under the noise floor of receiver system. (Receiver System noise floor at 20 dBuV)

PASS

FAIL

Client: Pepperl + Fuchs, Inc
FCCID: IREMV1
Model: MVH2000-F15, MVC-60-64K, MVI-D2-2HRX and OJ500-M1K-E01

Report #: CLE081501-02
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Exhibit VII



TEST SET-UP

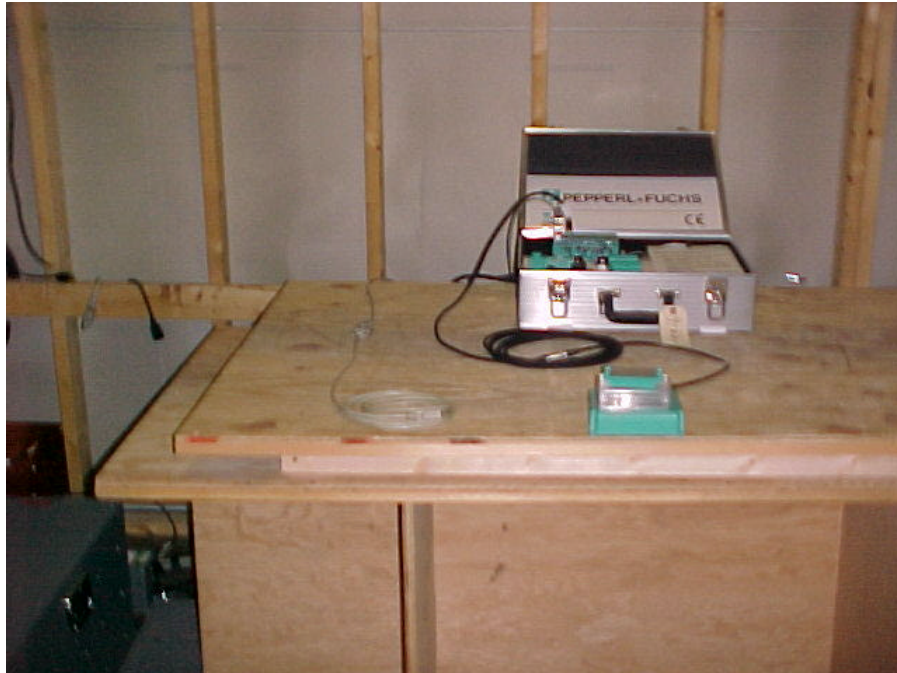
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EUT PHOTOS

Client: Pepperl + Fuchs, Inc
FCCID: IREMVI
Model: MVH2000-F15, MVC-60-64K, MVI-D2-2HRX and OJ500-M1K-E01

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CONDUCTED TEST – Front view



CONDUCTED TEST – Back view



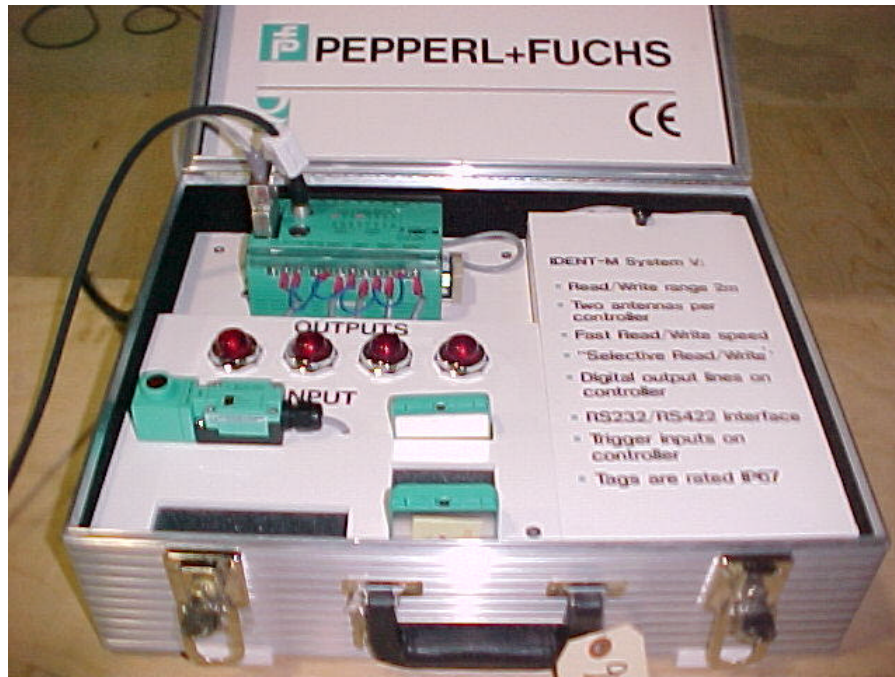
RADIATED TEST – Front view



RADIATED TEST – Back view



PHOTOGRAPH OF EUT – Whole View



PHOTOGRAPH OF EUT - Top view



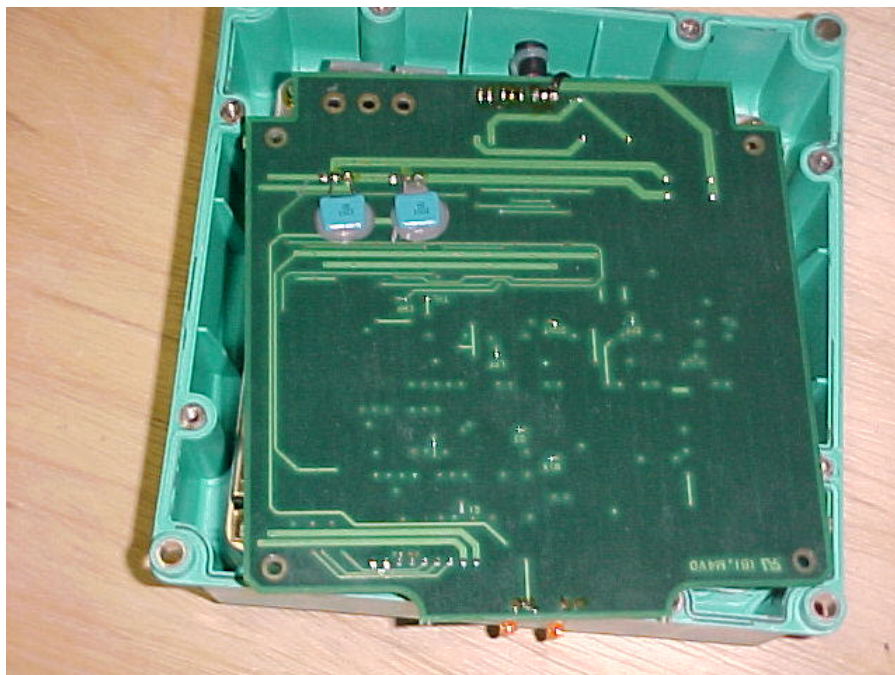
Client: Pepperl + Fuchs, Inc
FCCID: IREMV1
Model: MVH2000-F15, MVC-60-64K, MVI-D2-2HRX and OJ500-M1K-E01

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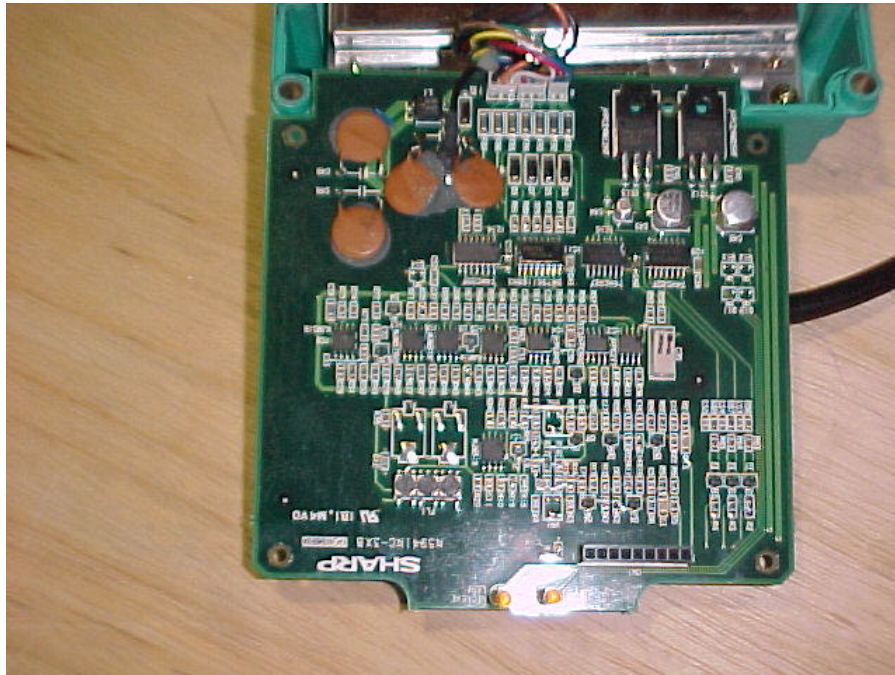
PHOTOGRAPH OF EUT - Bottom view



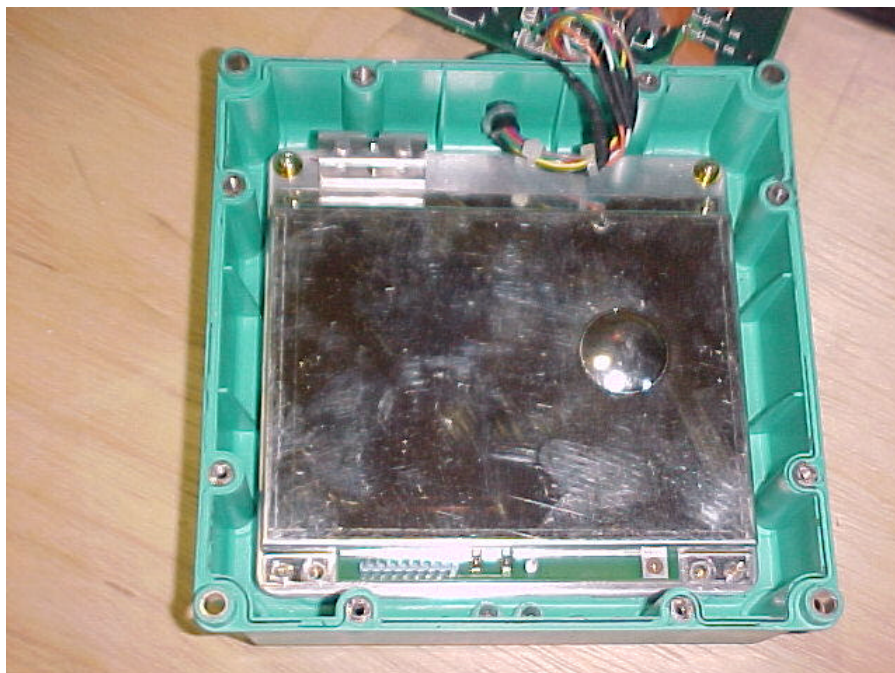
PHOTOGRAPH OF EUT – MVH 2000-F15 Solder Side view



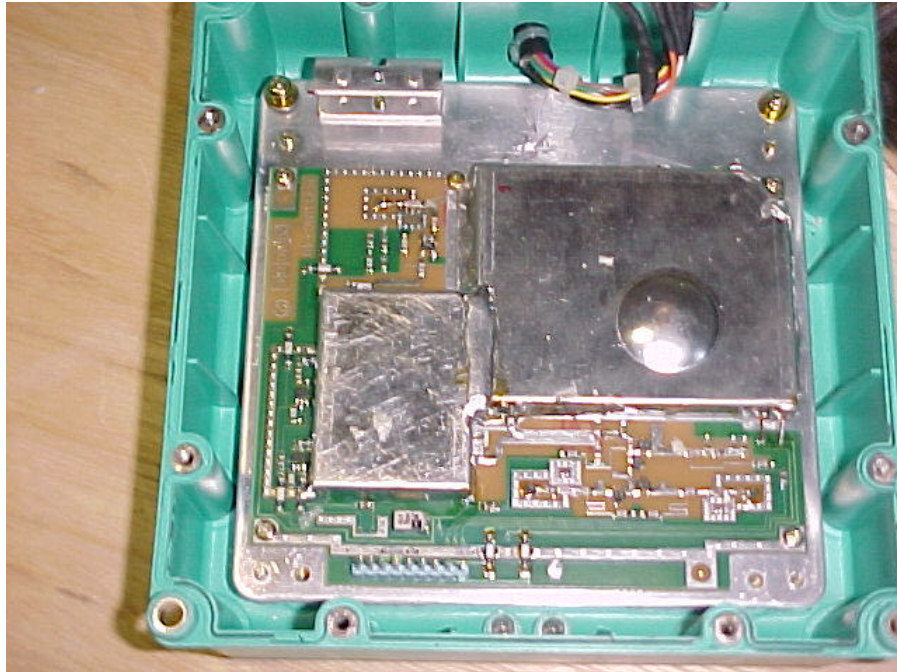
PHOTOGRAPH OF EUT – MVH 2000-F15 Component Side view



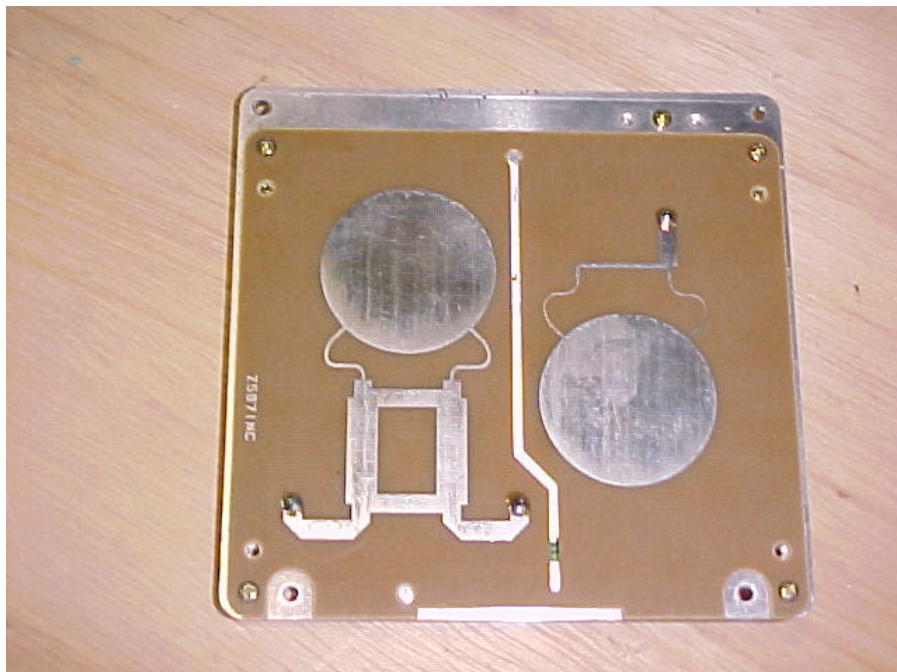
PHOTOGRAPH OF EUT – MVH 2000-F15 Inside view



PHOTOGRAPH OF EUT – MVH 2000-F15 Solder Side view



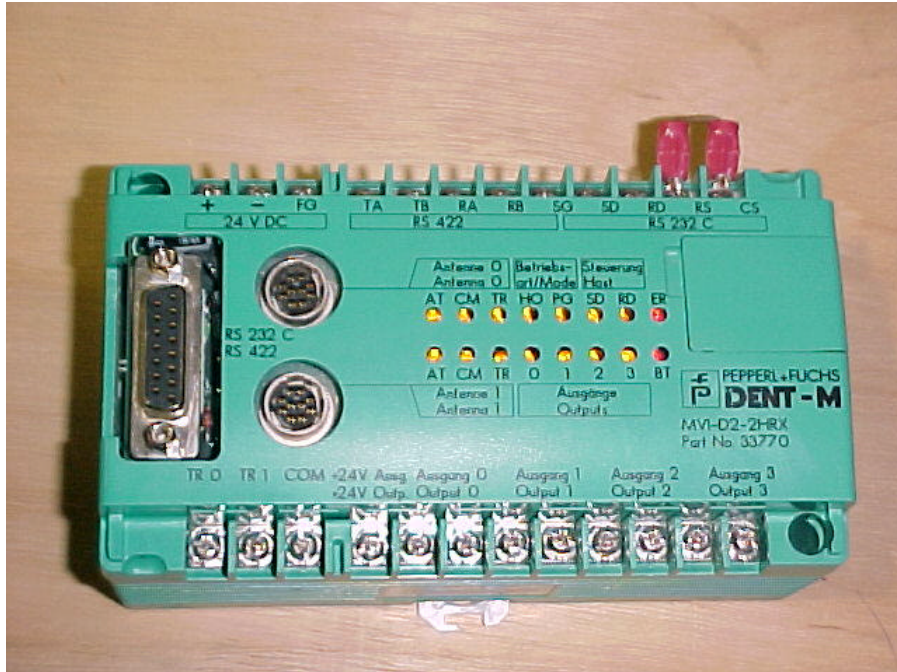
PHOTOGRAPH OF EUT – MVH 2000-F15 Solder Side view



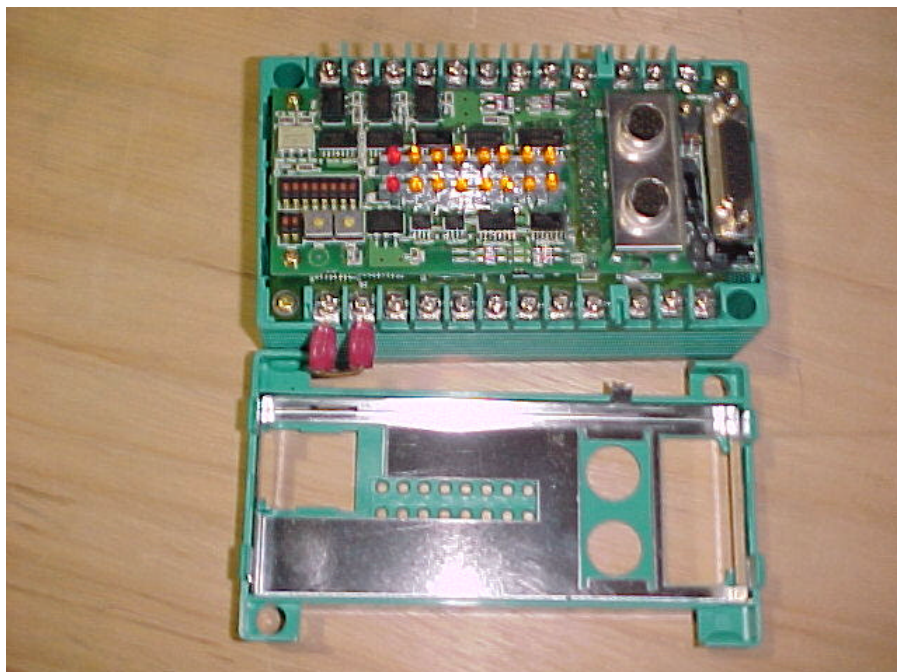
Client: Pepperl + Fuchs, Inc
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PHOTOGRAPH OF EUT – MVI-D2-2HRX Whole view



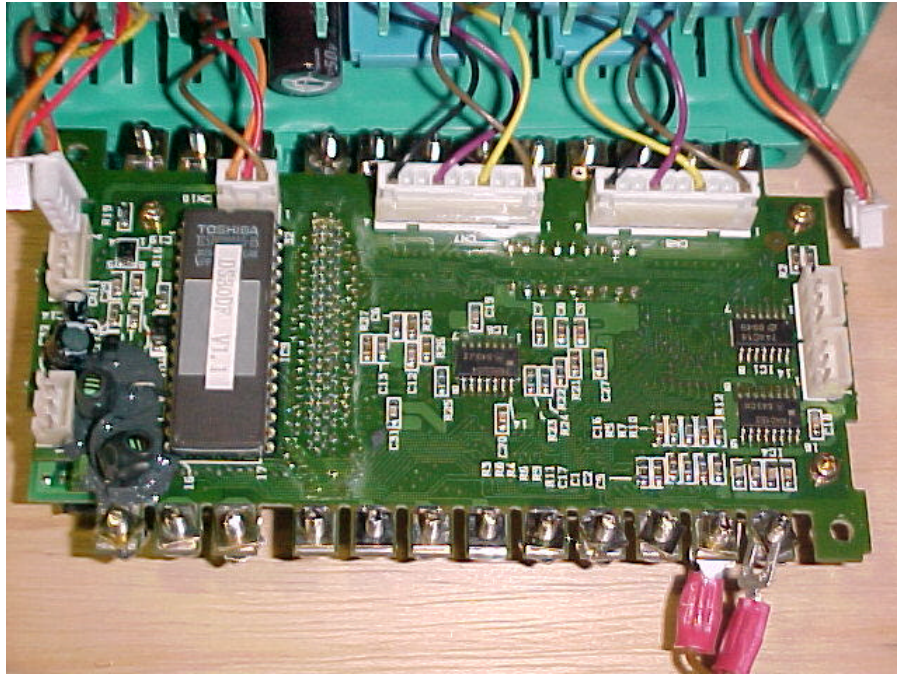
PHOTOGRAPH OF EUT – MVI-D2-2HRX Component Side view



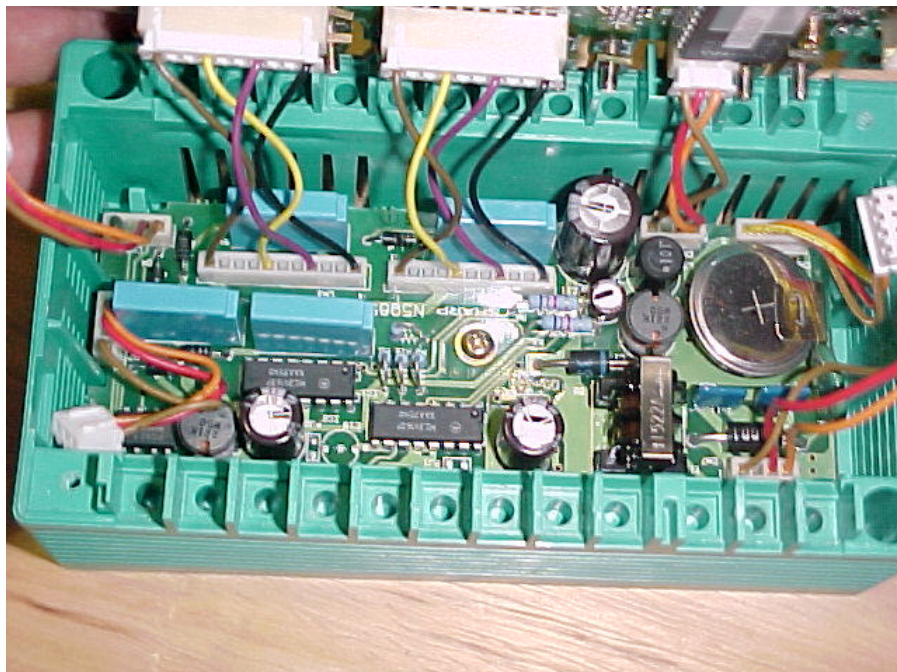
Client: Pepperl + Fuchs, Inc
FCCID: IREMV1
Model: MVH2000-F15, MVC-60-64K, MVI-D2-2HRX and OJ500-M1K-E01

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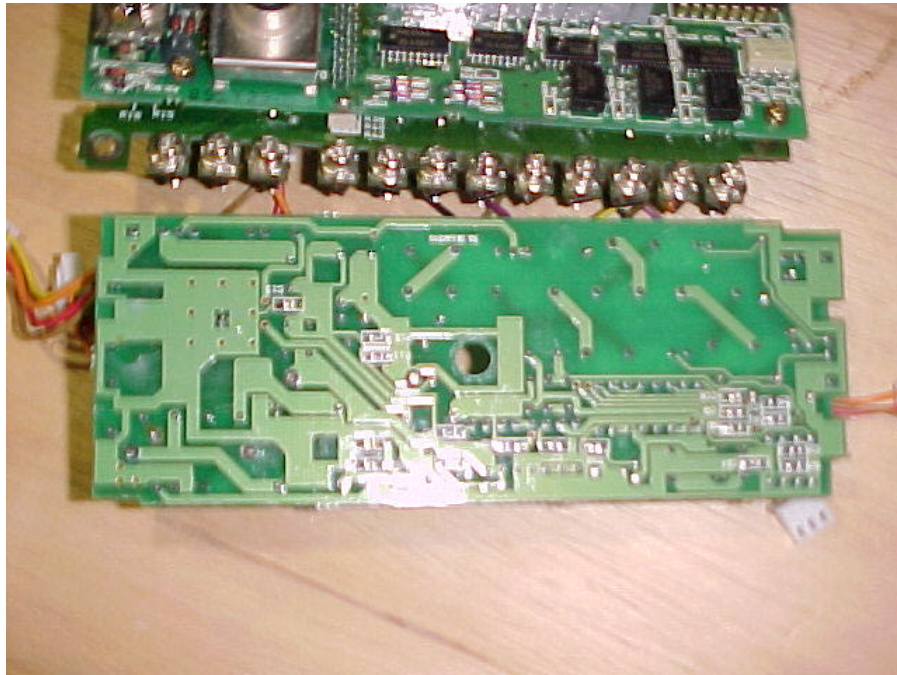
PHOTOGRAPH OF EUT – MVI-D2-2HRX Component Side view



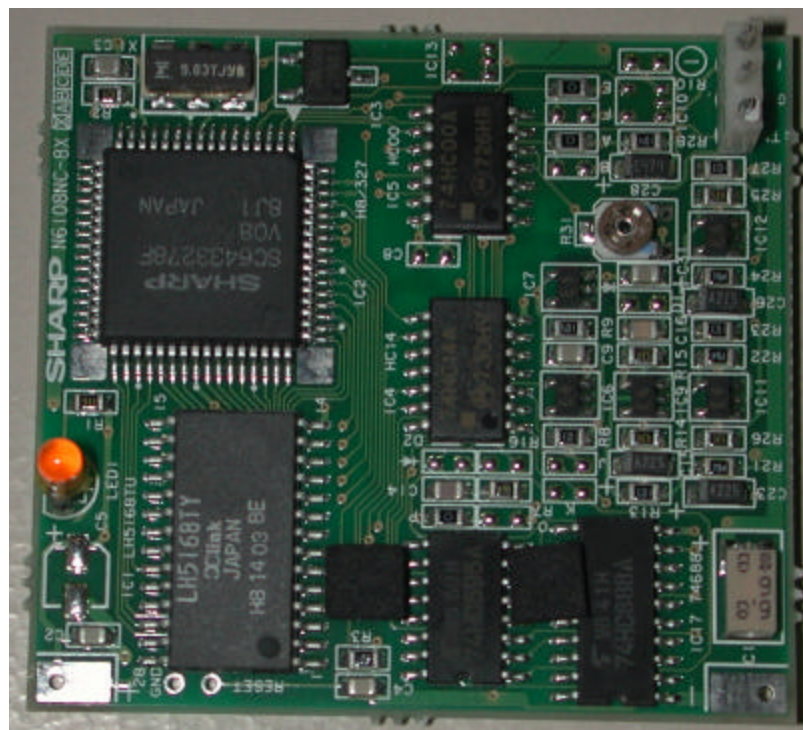
PHOTOGRAPH OF EUT – MVI-D2-2HRX Component Side view



PHOTOGRAPH OF EUT – MVI-D2-2HRX Solder Side view



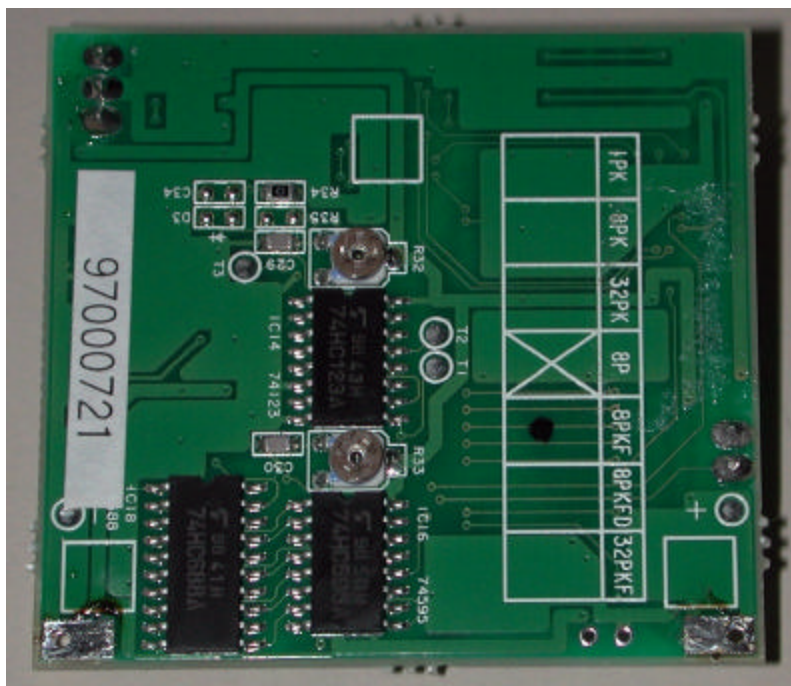
PHOTOGRAPH OF EUT – MVC-60-64K Component Side view



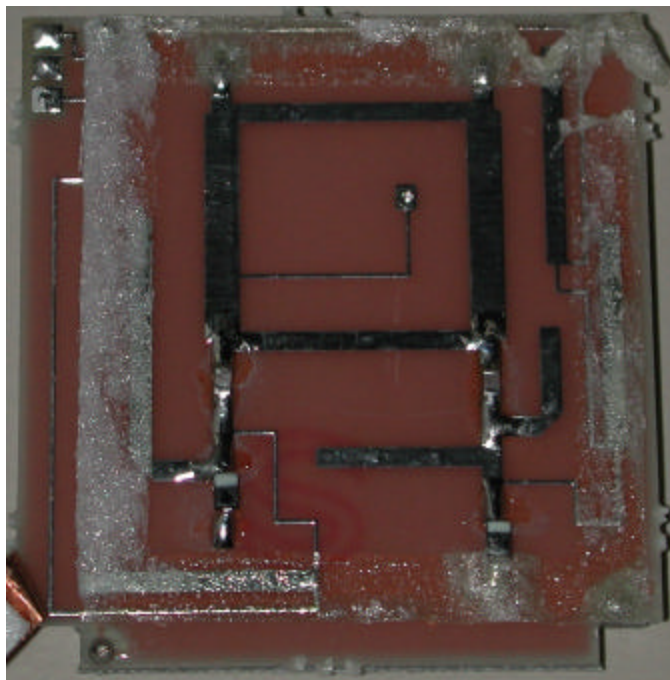
Client: Pepperl + Fuchs, Inc
FCCID: IREMV1
Model: MVH2000-F15, MVC-60-64K, MVI-D2-2HRX and OJ500-M1K-E01

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PHOTOGRAPH OF EUT – MVC-60-64K Component Side view



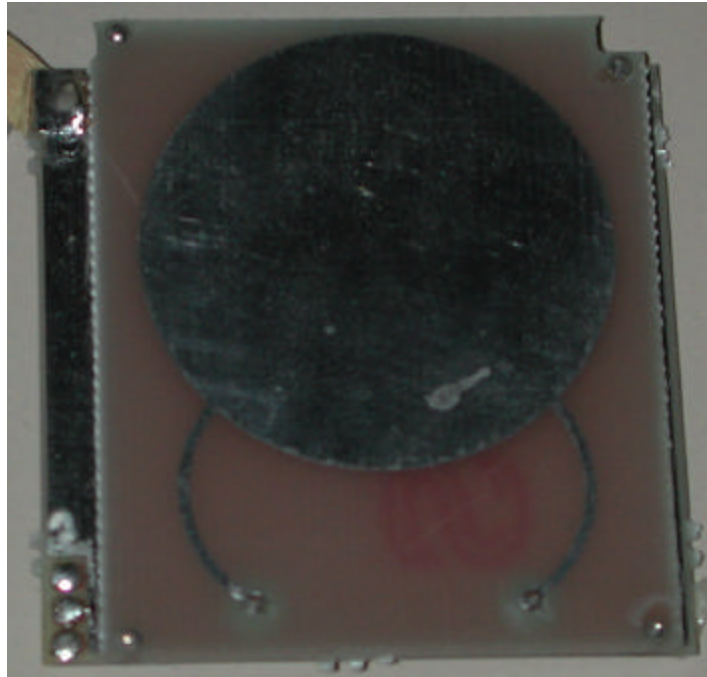
PHOTOGRAPH OF EUT – MVC-60-64K Solder Side view



Client: Pepperl + Fuchs, Inc
FCCID: IREMVI
Model: MVH2000-F15, MVC-60-64K, MVI-D2-2HRX and OJ500-M1K-E01

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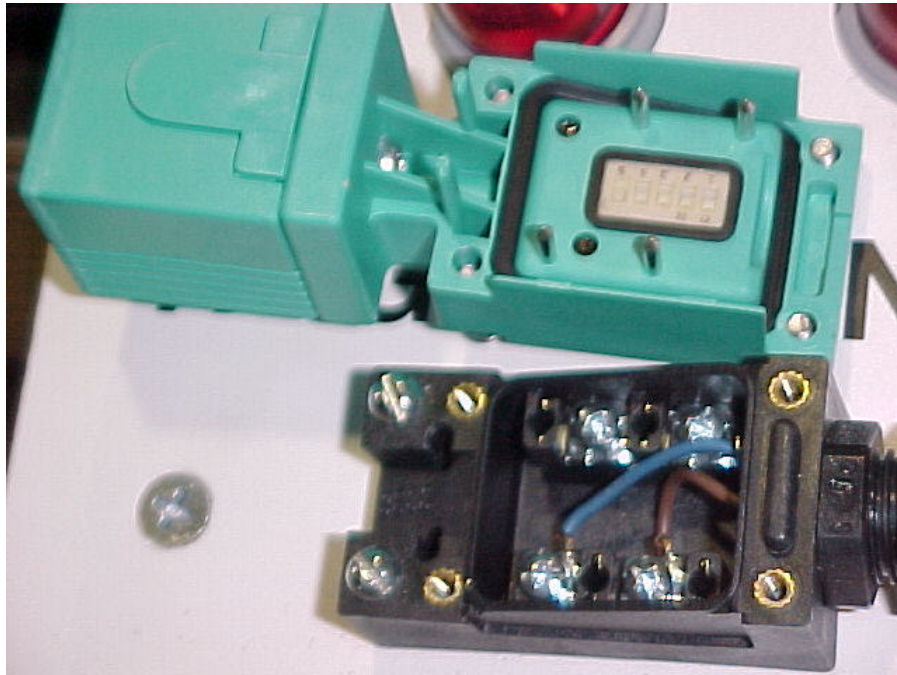
PHOTOGRAPH OF EUT – MVC-60-64K Solder Side view



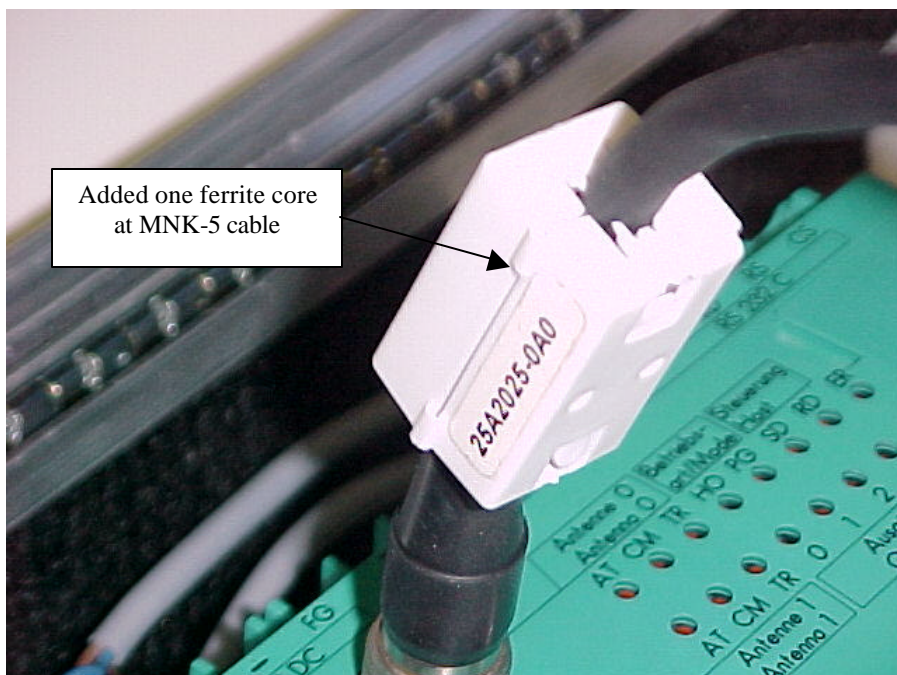
PHOTOGRAPH OF EUT – OJ500-M1K-E01 Whole view



PHOTOGRAPH OF EUT – OJ500-M1K-E01 Inside view



PHOTOGRAPH OF EUT With Modification



Client: Pepperl + Fuchs, Inc
FCCID: IREMVI
Model: MVH2000-F15, MVC-60-64K, MVI-D2-2HRX and OJ500-M1K-E01

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Exhibit VIII

Modifications

EUT COMPLIES

WITH MODIFICATIONS

1. Added one ferrite core at MVK-5 data cable near to MVI-D2-2HRX module.
(See photo on page 24). Manufacturer: Steward, P/N 25A2025-0A0

Exhibit IX

Compliance Information

The following statement, or equivalent, is required to be in the user's manual.

FCC COMPLIANCE STATEMENT

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, as well as the instructions of any peripheral and accessories to be attached to this device, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

Notice:

- To meet FCC requirements, shielded AC power cord and shielded interface cables are required to connect the device to a personal computer peripheral, or other Class B device.
- Any peripheral and/or accessories that will be attached to this equipment must also be compliant to Part 15 of the FCC Rules.

Warning to the User:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.