

Test Report No.8112315700 Rev.1

For Eldar Shany Technologies

Equipment Under Test:

Agricultural Controller

Name: Galileo

Model: Galileo

From The Standards Institution Of Israel Industry Division Telematics Laboratory EMC Section



Certificate No. 1487-01

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<u>Title:</u> Test on Agricultural Controller <u>Name:</u> Galileo <u>Model:</u> Galileo

Order placed by: Eldar Shany Technologies

Address: Yad-Mordehay, D.N.Hof Ashkelon 79145 Israel

Sample for test selected by: The orderer

The date of test: 9/05/2002, 12/05/2002

Description of Equipment

Under Test (EUT): Agricultural Controller

Name: Galileo
Model: Galileo
Serial Number: 112188

Manufactured by: Eldar Shany Technologies

Reference Documents:

CFR 47 FCC: "Rules and Regulations"; Part 15. "Radio frequency devices";

Subpart B: "Unintentional radiators" (1999).

<u>Test Results:</u> The EUT conforms to the requirements of FCC Part 15 Subpart B class A

This Test Report contains 19 pages
and may be used only in full.

This Test Report applies only to the specimen tested and may not be applied to other specimens of the same product.

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Title: Test on Agricultural Controller Name: Galileo Model: Galileo

1. EUT Description and operation

1.1. General description *:

Description of Equipment Under Test (EUT): Agricultural Controller

Name: Galileo
Model: Galileo
Serial Number: 112188

Manufactured by: Eldar Shany Technologies

Galileo is a high performance controller based on the Intel 80188 processor for agriculture usage. The EUT consist of build-in user interface for fully stand-alone operation, along with standard RS232 communication port for PC conducted network

The EUT's dimensions are: 15.0 (L) x 34.1 (W) x 24.5 (H) (cm) approx.

The EUT's power source: 24 VAC 80 W.

The EUT's block diagram is shown in Figure 1.the external view is shown in Figure 2.

The information is provided by the manufacturer.

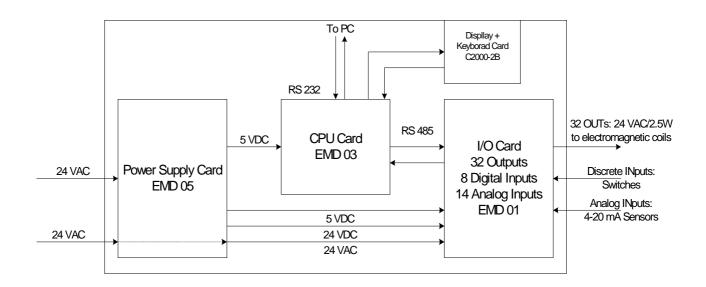


Figure 1 Galileo Block Diagram

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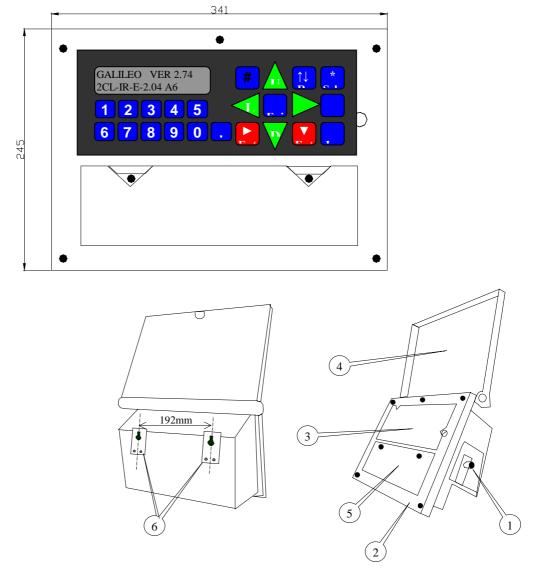


Figure 2 Galileo Front panel and enclosure

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1.2. EUT's sub-assemblies list:

EUT's sub-assemblies list is detailed in Table 1.

Table 1. Sub-assemblies list

Function	Marking/Serial No./ Model
Main card (CPU card)	EMD 03
I/O Card (32 outputs, 8 digital inputs, 14 analog inputs)	EMD 01
Power supply card	EMD 05
Display + keyboard card	C2000-2B

1. EUT connector list *:

A list of the EUT's connectors is detailed in Table 2.

Table 2. Connector list

No.	Description	Connector's type	Type of Cable	Length (m)	Location	No. of identical connectors
1	24VAC mains	4 pin CPC	unshielded	2.0	24V AC Power supply from external transformer	2
2	Outputs	Phoenix IDC	shielded	3.0	24V AC /2.5W Electromagnetic coils	32
3	Discrete inputs	Phoenix IDC	shielded	3.0	Dry switches	8
4	RS 232	RJ 45	shielded	1.5	To PC	1
5	Analog inputs	Phoenix IDC	shielded	3.0	4-20mA Sensors	14

^{*} Information is provided by the manufacturer.

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1.3. Potential emission sources *:

The potential emission sources are detailed in Table 3.

Table 3. Potential emission sources

Frequency	Location	Remarks
(MHz)		
22	EMD03	
6	EMD 03 to C2000-2B	Communication between EMD 03 & C2000-2B
0.0192	Communication to PC	
0.0192	Communication to expansion	
0.0192	Internal communication between modules	
3.686	EMD01	

1.4. Auxiliary equipment used *:

Table 4. Auxiliary equipment used

Name	MFR	Model	Ser. No.	Remarks
8 relay cards	Eldar-Shany	C6000-1	0801119	8 mini relays 24V mfr Takamisawa
PT100 sensor	Eldar-Shany	PT100	N/A	PT100 temperature probe with 4- 20 mA adapter
OPTN	Eldar-Shany	N/A	N/A	Terminal block + lightning protection. Connected to outputs.
Dual transformer	Eldar-Shany	N/A	009279	115V to 24V dual transformers for stand-alone controllers.
PC Laptop	-	-	-	For immunity tests only

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1.5. EUT setup and operation:

During the tests the EUT was configured as shown in Figure 3. The EUT was operated to reading and collection data from the sensors, open/close relays.

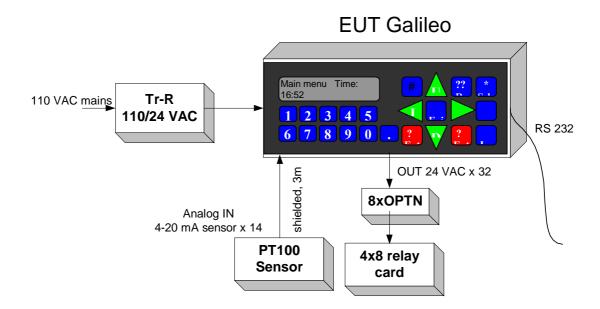


Figure 3 EUT test setup

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2. Test specification, Methods and Procedures

Test Specification:

CFR 47 FCC: "Rules and Regulations"; Part 15. "Radio frequency devices"; Subpart B: "Unintentional radiators" (1999).

Methods and Procedures:

 ANSI "American National Standard for Methods of Measurement of Radio-Noise Emissions from C63/4/1992: Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz".

3. Additional deviations or exclusions from the test specifications Not applicable.

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4. Measurements, examinations and derived results

4.1. Location of the Test Site:

Conducted emission tests were conducted at the EMC laboratory of the Standards Institution of Israel in Tel-Aviv.

Radiated emission tests were conducted in an Open Area Test Site located at Kibbutz Native Halamed Hai in Emek HaEla, Israel.

4.2. Test condition:

Temperature: 21 °C Humidity: 53 %

4.3. Emission tests:

- * For both radiated and conducted measurements, initial scans were made using a peak detector but still using the appropriate CISPR 16 (Quasi-Peak) detector IF bandwidth.
- * For conducted emissions, a tolerance limit was set 6 dB below the specification limit. Levels above the tolerance limit were retested using the Quasi-Peak detector or an average detector.
- * For radiated emissions, a tolerance limit was set 10 dB below the specification limit. Levels above the tolerance limit were retested using the Quasi-Peak detector.
- * If the result with a Quasi-Peak detector exceeds the specification limit, it is marked with "Fails" in the margin, if it is within the measurement uncertainty, it is marked with a "*".

4.4. Initial visual check and functional test:

Initial visual check of the EUT was performed before testing. No external damages were found.

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4.5. Conducted emission tests:

4.5.1. Test configuration:

The EUT was placed on a non-metallic table in a shielded chamber at a height of 80 cm from the floor and at 40 cm distance from the nearest wall of the chamber.

4.5.2. Test procedure:

The EUT was operated according to clause 1.5. Test was performed on AC mains input. First, initial scan were performed. Final measurements were performed for emission, which exceeded the tolerance limit.

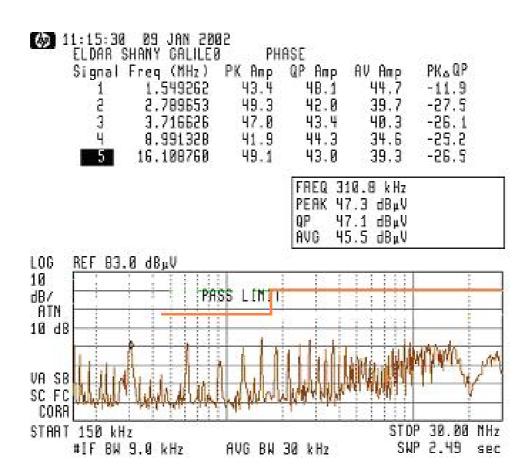
Test equipment (EMI receiver) setup was as follow:

Initial scan:		Measurements:			
Detector type	Peak	Detector type	Quasi-peak (CISPR)		
Mode	Max hold	Bandwidth	9 kHz		
Bandwidth	9 kHz	Measurement time	200 seconds/MHz		
Step size	Continuous sweep	Observation	>15 seconds		
Sweep time	>100 msec				

4.5.3. Test results:

Conducted emission measured with peak detector was found 11.9 dB at least below class A. Test results are shown in the plots #1, #2.

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Plot # 1.

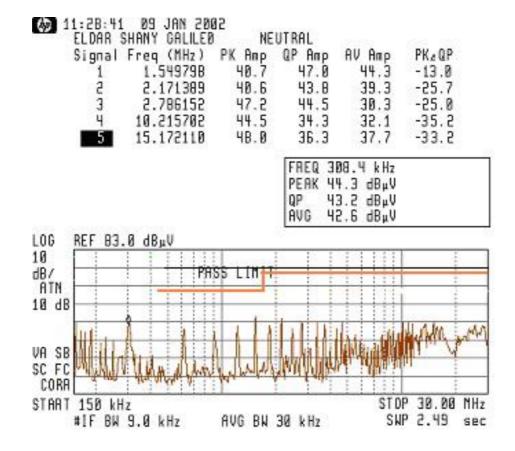
Scan of conducted emission

Specified limit: FCC Part 15 Class A

Tested line: PHASE

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Plot # 2.

Scan of conducted emission

Specified limit: EN 55011 Group 1 Class A

Tested line: NEUTRAL

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4.6. Radiated emission test:

4.6.1. Preliminary radiated emission tests:

Preliminary radiated measurements were performed in a semi-anechoic chamber at a distance of 3 meters. The EUT was setup in its typical configuration and operated in its various modes. For each mode of operation the frequency spectrum was monitored. EUT configuration, cable configuration and mode of operation, which produced the maximum level of emission, were documented. A list of frequencies to be tested was prepared.

4.6.2. Final measurements:

The final radiated measurements were performed at the Open Area Test Site.

The EUT was installed on a non-metallic table 0.8 m height placed on the turn-table.

All measurements at the Open Area Test Site were performed at a 10 m measurement distance.

The Bilog 30 MHz-2 GHz antenna was used.

The EUT's configuration and mode of operation, which produced the maximum level of emissions, were selected.

The Frequency range from 30 to 2000 MHz was investigated.

The measurements were performed at each frequency found previously and at frequencies at which the signal was 10 dB below the limit or less.

All measurements at the Open Area Test Site were performed at a 10 m measurement distance from the EUT.

The levels were maximized by initially rotating turntable through 360°, varying the antenna height between 1 m and 4 m, rerouting EUT cables and changing antenna-to-EUT polarization from vertical to horizontal.

Unless stated otherwise, the measuring equipment settings were:

Initial scan:		Measurements:			
Detector type	Peak	Detector type	Quasi-peak (CISPR)		
Mode	Max hold	Bandwidth	120 kHz		
Bandwidth	120 kHz	Measurement time	20 seconds/MHz		
Step size	Continuous sweep	Observation	>15 seconds		
Sweep time	>1 seconds/MHz				

The EUT was operated as described in clause 1.5.

4.6.3. Radiated emission test results:

Test results are presented in Table 4.



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Table 4. Radiated emission test results Ref. standard: FCC Pat 15 Class A

Frequency	Turn- table Angle	Antenna Polariz.	Antenna Height	Emission Level @ 10 m	Limit @ 10 m	Margin	Results
(MHz)	(°)		(m)	(dB _μ V/m)	(dB _µ V/m)	(dB)	
38.13	360	V	1.4	23.3	39	15.7	Complies
71.86	229	V	2.8	36.4	39	2.6	Complies
74.66	0	V	1.6	33.1	39	5.9	Complies
76.07	38	V	2.1	30.1	39	8.9	Complies
78.78	352	V	1.6	33.5	39	5.5	Complies
81.56	264	V	2.2	27.3	39	11.7	Complies
82.96	41	V	1.5	34.1	39	4.9	Complies
85.73	146	Н	3.5	30.5	39	8.5	Complies
110.58	65	V	2.5	27.4	43.5	16.1	Complies
160.30	347	Н	3.6	31.6	43.5	11.9	Complies
317.90	30	Н	2.7	31.7	46.5	14.8	Complies

Note: Emission level = E Reading (dB μ V) + Cable loss (dB) + Antenna Factor (dB/m)

where:

For Cable Loss and Antenna Factor refer to Appendix 2.

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5. Compliance with specification

Test	Standard	Test result
Conducted emission on mains terminal Frequencies range of 450 kHz to 30 MHz	FCC Part 15 class A	Complies
Radiated emission Frequencies range of 30-1000 MHz	FCC Part 15 class A	Complies

Telematics Laboratory August 29, 2002

Name: Albert Herzenshtein

Position: Testing Engineer

Name: Eng. Yuri Rozenberg Position: Head of EMC Branch Test Report No.: 8112315700-1 Page 16 of 19 Pages

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6. Appendix 1: Test equipment used

All measurements equipment is on SII calibration schedule with a recalibration interval not

exceeding one year.

Instrument	Manufac- turer	Model	Serial No.	Last calibration date	Next calibration date
EMI Receiver	HP	8546A+85460A	SII 4068	11/01	11/02
LISN 9 kHz – 30 MHz	FCC	LISN- 50/250-32-4-16	SII 5023	05/02	05/03
Transient limiter 0.009-200 MHz	HP	11947A	31074A3105	05/02	05/03
Antenna Bilog 30 – 2000 MHz	Schaffner- Chase	CBL6112B	S/N 2714 SII 5119	12/01	12/02
Antenna Mast	R&S	HCM	100002	N/A	N/A
Metallic turntable	R&S	HCT12	100001	N/A	N/A
Positioning controller	R&S	HCC	100002	N/A	N/A

7. Appendix 2: Antenna Factor and Cable Loss

Cable Loss (10m cable + Mast)

Point	Frequency (MHz)	Cable Loss (dB)	Point	Frequency (MHz)	Cable Loss (dB)	
1	30	0.53	21	1000	3.68	
2	50	0.75	22	1100	3.82	
3	100	1.08	23	1200	4.07	
4	150	1.39	24	1300	4.24	
5	200	1.61	25	1400	4.43	
6	250	1.752	26	1500	4.6	
7	300	2.00	27	1600	4.7	
8	350	2.15	28	1700	4.85	
9	400	2.26	29	1800	4.98	
10	450	2.383	30	1900	5.19	
11	500	2.52	31	2000	5.34	
12	550	2.606	32	2100	5.51	
13	600	2.75	33	2200	5.69	
14	650	2.856	34	2300	5.89	
15	700	3.06	35	2400	6.07	
16	750	3.201	36	2500	6.22	
17	800	3.27	37	2600	6.28	
18	850	3.38	38	2700	6.41	
19	900	3.46	39	2800	6.53	
20	950	3.55	40	2900	6.84	

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Antenna Factor Antenna Bilog mfr Schaffner Chase EMC Ltd. Model CBL6112B S/N 2714

Frequency (MHz)	Antenna Factor (dB/m)								
30	18.00	125	11.35	350	14.30	750	20.00	1300	23.10
32	16.90	130	11.00	360	14.50	760	20.00	1320	23.10
34	15.80	135	10.65	370	14.70	770	20.00	1340	23.30
36	14.80	140	10.40	380	14.80	780	20.00	1360	23.40
38	13.70	145	10.15	390	15.15	790	19.90	1380	23.80
40	12.60	150	9.70	400	15.70	800	19.90	1400	24.10
42	11.60	155	9.35	410	16.40	810	19.95	1420	24.40
44	10.60	160	9.10	420	16.70	820	20.20	1440	24.50
46	9.60	165	8.90	430	16.40	830	20.35	1460	24.70
48	8.80	170	8.80	440	16.30	840	20.40	1480	24.70
50	7.90	175	8.75	450	16.35	850	20.40	1500	25.00
52	7.20	180	8.60	460	16.70	860	20.30	1520	25.10
54	6.60	185	8.50	470	17.00	870	20.30	1540	25.10
56	6.00	190	8.40	480	17.20	880	20.30	1560	25.20
58	5.60	185	8.50	490	17.35	890	20.30	1580	25.20
60	5.20	200	8.70	500	17.40	900	20.30	1600	25.20
62	5.00	205	8.95	510	17.45	910	20.35	1620	25.30
64	4.80	210	8.80	520	17.50	920	20.40	1640	25.50
66	4.80	215	8.55	530	17.95	930	20.40	1660	25.70
68	4.90	220	8.90	540	18.80	940	20.60	1680	25.90
70	5.00	225	9.30	550	19.05	950	20.60	1700	25.90
72	5.30	230	9.80	560	18.80	960	20.60	1720	26.00
74	5.60	235	10.40	570	18.70	970	20.60	1740	25.90
76	6.10	240	10.90	580	18.60	980	20.70	1760	25.90
78	6.40	245	11.25	590	18.60	990	20.80	1780	25.70
80	6.90	250	11.70	600	18.80	1000	20.90	1800	25.80
82	7.30	255	12.20	610	19.10	1020	21.30	1820	25.90
84	7.60	260	12.80	620	19.20	1040	21.50	1840	26.10
86	8.00	265	12.80	630	19.20	1060	21.70	1860	26.30
88	8.40	270	12.40	640	19.20	1080	21.90	1880	26.50
90	8.80	275	12.30	650	19.10	1100	21.90	1900	26.80
92	9.20	280	12.30	660	19.10	1120	22.00	1920	27.00
94	9.60	285	12.35	670	19.00	1140	22.20	1940	27.00
96	9.90	290	12.40	680	18.90	1160	22.30	1960	27.10
98	10.40	295	12.60	690	18.95	1180	22.40	1980	27.20
100	10.70	300	12.70	700	19.10	1200	22.50	2000	27.30
105	11.15	310	13.15	710	19.35	1220	22.70		
110	11.40	320	13.50	720	19.60	1240	22.90		
115	11.50	330	13.60	730	19.90	1260	23.00		
120	11.50	340	13.80	740	20.00	1280	12.80		



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8. Appendix 3: Test configuration illustrations



Photo 1.
Radiated emission test setup



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Photo 2. Radiated emission test setup