



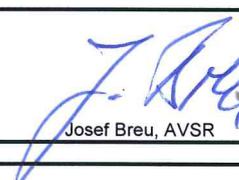
Installation Manual

ETSO-H Part 3

Form N°: FO ETSO-900
Date of issue: 01.09.2015
Revision level: 00

INSTALLATION MANUAL
FOR
MFI02

P/N°: AS01-MFI0200-00
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Document Information

I. Revision History

Rev.	Description	Pages changed	Date of issue	Changed by
A	Initial release	all	2017-03-08	PL
B	§ 4.2 limitations for use added	15	2017-04-07	PL
C	§ 3.2 added missing figure	9	2017-04-11	PL
	§ 4.1 and § 4.2 corrected and updated	15		
	Typos corrected	all		
D	Added Part Number	1	2017-04-18	PL
	§ 2.1 revision updated	8		
	§ 3.2 Part Number updated	10		
	§ 3.4 Part Number updated	12		
	§ 3.4 table 4 added	13		
	§ 7.2 label drawing updated	20		
	§ 11 revision updated	21		
E	Deleted Part Number	1	2017-04-18	PL
	List of Contents updated	3-4		
	§ 2.1, table 1 revision updated	9		
	§ 3.2 updated	10-11		
	§ 3.4 “legend” changed in “symbol”	13		
	§ 3.4 table 4 updated	14		
	§ 3.4 table 5 updated	14		
	§ 3.4 table 6 updated	14		
	§ 7.2, figure 8: label drawing updated in “example label drawing”	21		
	§ 11 revision updated	22		
F	Table of Contents updated	3-4	2017-04-20	PL
	§ 2.1, table 1 updated	9		
	§ 3.4, NOTE updated	13		
	§ 11, revision updated	22		

II. Glossary

N/A

III. List of Abbreviations

Abbreviation	Description
ARINC	Aeronautical Radio Incorporated
ASR, AVSR	AVIONIK STRAUBING Entwicklungs GmbH
AWG	American Wire Gauge
C.S.	Certifying Staff
CVE	Compliance Verification Engineer
DAL	Design Assurance Level
DE	Design Engineer
DO	Document
DRW	Drawing
EI	Entwicklungsingenieur
EMI	Electromagnetic Interference
ESD	Electrostatic Discharge
ETSO	European Technical Standard Order
ft	feet
GND	Ground
HoA	Head of Airworthiness
HoD	Head of Design
ICD	Interface Control Document
IMA	Installation Manual
L HS	Leiter Herstellung
L MPL	Leiter Musterprüfleitstelle
LBL	Label
LED	Light Emitting Diode
LNAV	Lateral Navigation
LPV	Localizer Performance with Vertical guidance
MDL	Master Documents List
MFI	Multifunction Indicator
MMA	Maintenance Manual
MPI	Musterprüfingenieur
N/A	Not Applicable
OBS	Omni Bearing Selector
OEM	Original Equipment Manufacturer
OMA	Operating Manual
P/N	Part number
PHAC	Plan for Hardware Aspects of Certification



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Abbreviation	Description
QM	Quality Management
QTR	Qualification Test Report
REQ	Requirement
RTCA	Radio Technical Commission for Aeronautics
SDI	Source Destination Identifier
SRD	System Requirements Document
SSM	Signal Status Matrix
SUB	Subminiature
TSO	Technical Standard Order
UNC	Unified Thread Standard
VDC	Volts Direct Current
VNAV	Vertical Navigation
WPT	Way Point



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1 Introduction

1.1 Purpose

This installation manual provides instructions on how to install and configure the MFI02 in an aircraft. It also provides a system overview including the technical specification of the MFI02 as well as information about the certification of hardware.

1.2 Scope

This manual is only applicable for installation for the MFI02 with the P/N configuration listed in section 3.4.

2 Applicable and Referenced Documents

2.1 Applicable Documents

The declaration () serves as a placeholder for the revision level.

The current revision levels of the documents are stated in the Master Documents List (/MDL/).

Identifier	Doc. N°	Document title
/MDL/	ASR_1097_MFI02_000_MDL_()	Master Documents List, in latest revision
/SRD/	ASR_1097_MFI02_001_SRD_B	System Requirements Document, revision B
/ICD/	ASR_1097_MFI02_005_ICD_A	Interface Control Document, revision A
/QTR/	ASR_1097_MFI02_007_QTR_A	Qualification Test Report, revision A
/PHAC/	ASR_1097_MFI02_400_PHAC_A	Plan for Hardware Aspects of Certification, revision A
/MMA/	ASR_1097_MFI02_901_MMA_A	Maintenance Manual, revision A
/OMA/	ASR_1097_MFI02_902_OMA_D	Operating Manual, revision D
/DRW/	ASR_1097_MFI02_081_DRW_C	Installation Drawing, revision C
/DRW/	ASR_1097_MFI02_082_DRW_C	Installation Drawing Panel, revision C
/LBL/	ASR_1097_MFI02_065_LBL_B	Label drawing, revision B

table 1: applicable documents

2.2 Referenced documents

Identifier	Doc. N°	Document title
/DO-160G/	RTCA DO-160G	Environmental Conditions and Test Procedures for Airborne Equipment, Issue G, 2010-12-08
/DO-178C/	RTCA DO-178C	Software Considerations in Airborne Systems and Equipment Certification, Issue C, 2011-12-13
/DO-254/	RTCA DO-254	Design Assurance Guidance for Airborne Electronic Hardware, Issue B, 2000-04-19

table 2: referenced documents

3 General Description

3.1 Definitions

Expression	Definition
display field #1	left LED field
display field #2	right LED field
F1A	first quadrant of left LED field
F1B	second quadrant of left LED field
F1C	third quadrant of left LED field
F1D	fourth quadrant of left LED field
F2A	first quadrant of right LED field
F2B	second quadrant of right LED field
F2C	third quadrant of right LED field
F2D	fourth quadrant of right LED field

table 3: frequently used expressions and their definitions

3.2 Introduction

The MF102 is designed to be a multifunctional indicator, which indicates several messages transmitted via ARINC429 and/or discrete inputs.

The block diagram of the full-featured MF102 is shown in figure 2.

Two LED fields, one on the left-hand side (display field #1) and one on the right-hand side (display field #2) illuminates the indicator panel. Each field is separated in four quadrants (F1A ... F1D, F2A ... F2D), which can be independently activated. A combination of adjacent quadrants are possible to realize larger fields. The two display fields with its four quadrants each, is shown in figure 1.

The block diagram shows two independent ARINC429 channels. There is an assembly option to use either ARINC429 channels, only channel 1 or no ARINC429 channel (discrete input only). If only channel 1 is used, the pins for the second channel can be used as discrete inputs.

There are two dimming options available. Those are continuous dimming and day/night dimming. The polarity (active low or active high), the level and the hysteresis of all discrete inputs can be configured according to the customer specification by assembling different resistor values on the input pin.

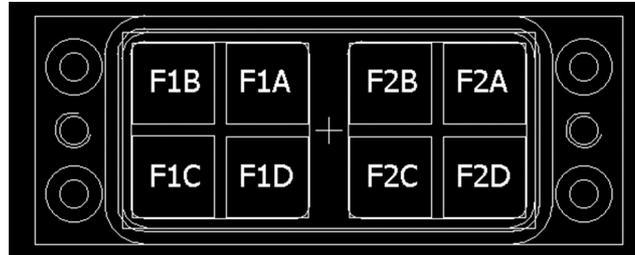


figure 1: multifunction indicator display

The MFI02 provides a day/night dimming input to switch between two brightness levels. The chromaticity of the indicator fields are stable during the dimming states as well as during ambient temperature changes.

3.3 General System Overview

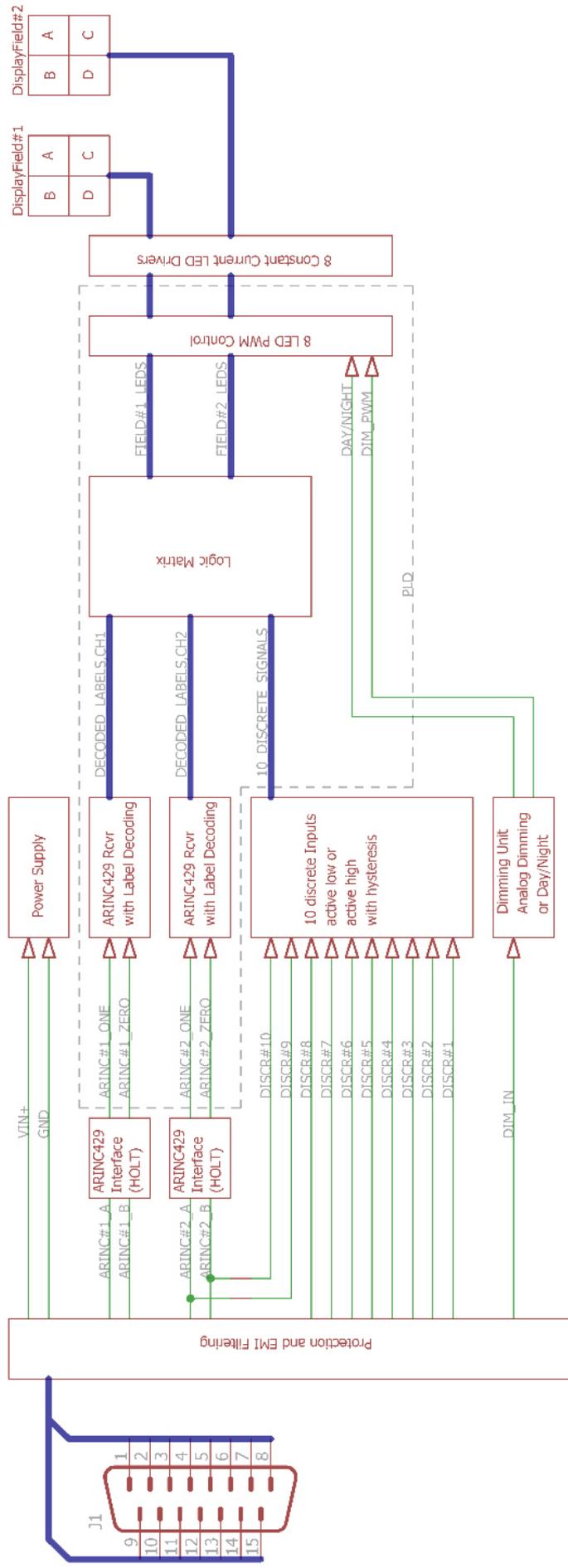
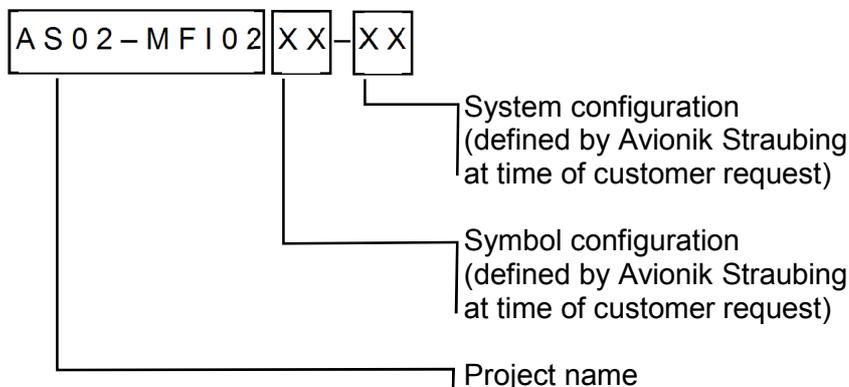


figure 2: general system overview

3.4 Configuration



An example implementation of the display layout for the MFI02 multifunctional indicator is shown in figure 3. Only one ARINC429 input channel (channel 1) is populated in this example.

On display field #1 the quadrants F1A and F1B are connected to one field, showing L/VNAV in green color. Quadrant F1C shows LNAV in green color and F1D shows LPV in green color. On display field #2 quadrant F2A shows TERM in green color, F2B shows WPT in amber color and F2C and F2D are connected to one field, showing OBS in green color.



figure 3: an example implementation for MFI02

All possible configurations are listed in table 5 and 6.

NOTE: The symbols in the quadrants of field 1 (the left field) will only be displayed if the bit combination in the ARINC429 data word is exactly as defined in table 5 and 6.

No symbol is displayed for all other bit combinations in the ARINC429 word.

If the ARINC429 data word is missing or invalid for three or more seconds then the symbols will no longer be displayed.

The symbols in the quadrants of field 2 (the right field) will only be displayed if the associated discrete input pin is activated.

All discrete inputs are low active and have a threshold of 3V/5V except the dimming input which has a threshold of 20/21V.

During the activation of the “test” input all symbols of all fields are being displayed.

Part Number	Description																					
AS01-MFI0200-00	 <table border="1"> <thead> <tr> <th>Field / Quadrant</th> <th>Color</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>F1A & F1B</td> <td>Green</td> <td>L/VNAV</td> </tr> <tr> <td>F1C</td> <td>Green</td> <td>LNAV</td> </tr> <tr> <td>F1D</td> <td>Green</td> <td>LPV</td> </tr> <tr> <td>F2A</td> <td>Green</td> <td>TERM</td> </tr> <tr> <td>F2B</td> <td>Amber</td> <td>WPT</td> </tr> <tr> <td>F2C & F2D</td> <td>Green</td> <td>OBS</td> </tr> </tbody> </table>	Field / Quadrant	Color	Symbol	F1A & F1B	Green	L/VNAV	F1C	Green	LNAV	F1D	Green	LPV	F2A	Green	TERM	F2B	Amber	WPT	F2C & F2D	Green	OBS
Field / Quadrant	Color	Symbol																				
F1A & F1B	Green	L/VNAV																				
F1C	Green	LNAV																				
F1D	Green	LPV																				
F2A	Green	TERM																				
F2B	Amber	WPT																				
F2C & F2D	Green	OBS																				

table 4: possible unit configurations

Quadrant	Function	
	ModeSel = open	ModeSel = GND
F1A	Lbl261G Bits: 19(0) AND 18(1) AND 17(0)	Lbl261G Bits: 19(0) AND 18(1) AND 17(0)
F1B	Lbl261G Bits: 19(0) AND 18(1) AND 17(0)	Lbl261G Bits: (19(0) AND 18(1) AND 17(0)) OR (19(0) AND 18(0) AND 17(1))
F1C	Lbl261G Bits: 19(0) AND 18(0) AND 17(1)	Lbl261G Bits: 19(1) AND 18(0) AND 17(0)
F1D	Lbl261G Bits: 19(1) AND 18(0) AND 17(1)	Lbl261G Bits: 19(1) AND 18(0) AND 17(1)
F2A	discrete in, active low	
F2B	discrete in, active low	
F2C	discrete in, active low	
F2D	discrete in, active low	

table 5: possible display field configurations

ARINC429 RX:	
Speed	high or low speed, depending on strapping of pin 12
Label	only 261G, (no further ARINC labels are acceptable)
SDI	ignore value
SSM	SSM = 11 or SSM = 00, depending on strapping of pin 13
Repeat rate	1s

table 6: ARINC429 configuration

3.5 Technical Specification

Physical characteristics

Unit connector:	D-SUB, 15-pol., male, male type
Unit weight:	0.0574 kg
Dimensions:	
• Height:	18.0 mm
• Width:	46.0 mm
• Depth:	58.0 mm
Mounting:	Panel mounting, 2 x 4/40 UNC
Cooling:	No external cooling is required

Supply Input:

Supply Voltage Range:	10.0 to 32.0 VDC, nominal 14.0VDC or 28.0VDC
Current Consumption:	max. 0.12A (@ 28 VDC), max. 0.24A @ 14.0VDC

Signal Input:

- ARINC429, label 261G
- DIM_IN
- Up to 10 discrete input

3.6 Environmental Qualification

The system has been qualified according to RTCA DO-160G:

Section	Description	Procedure	Category	Remarks
04	Temperature and Altitude	4.0 4.5.1 4.5.2 4.5.2 4.5.4 4.6.1	D2	
05	Temperature Variation	5.0	B	
06	Humidity	6.0	B	
07	Operational Shocks and Crash Safety	7.0	B	
08	Vibration	8.0	[R(C/C1)U2]	
09	Explosive Atmosphere	9.0	X	
10	Waterproofness	10.0	Y	
11	Fluids Susceptibility	11.0	X	
12	Sand and Dust	12.0	X	
13	Fungus Resistance	13.0	F	
14	Salt Fog	14.0	X	
15	Magnetic Effect	15.0	Z	
16	Power Input	16.0	B	
17	Voltage Spike	17.0	A	
18	Audio Frequency Conducted Susceptibility - Power Inputs	18.0	R	
19	Induced Signal Susceptibility	19.0	ZC	
20	Radio Frequency Susceptibility	20.0	Y	
21	Emission of Radio Frequency Energy	21.0	M	
22	Lightning Induced Transient Susceptibility	22.0	A3J3L3	
23	Lightning Direct Effects	23.0	X	
24	Icing	24.0	X	
25	Electrostatic Discharge (ESD)	25.0	A	
26	Fire, Flammability	26.0	C	

table 7: environmental qualification

3.7 Hardware Qualification

The system is qualified according to DO-254, DAL B.

4 Limitations

4.1 Installation Limitations

- For environmental limitations refer to table 7.

Extraction of the selected mode from the ARINC bus for display is a non ETSO function.

4.2 Limitations for Use

N/A

4.3 Interface Limitations

N/A

4.4 Recommendations

N/A

5 Installation

5.1 Installation Requirements

By using the ARINC429 interface, the aircraft must supply the following ARINC429 label:

Label 261G:	
Speed	high or low speed
SDI	ignore value
SSM	SSM = 11 or SSM = 00
Repeat rate	1s

table 8: required ARINC 429 data stream, Label 261G

5.2 Installation Considerations

Fabrication of a wiring harness is required. Some mechanical and electrical methods and practices are required for installation of the MFI02. Ensure that routing of the wiring does not come in contact with sources of heat, RF or EMI interference. Check that there is ample space for the cabling and mating connectors. Avoid sharp bends in cabling and routing near aircraft control cables.

For input protection, a 0.5A trip-free circuit breaker shall be installed.

5.3 Locations of Installation

The MFI02 must be installed in a Panel (shown in figure 4 and figure 5).

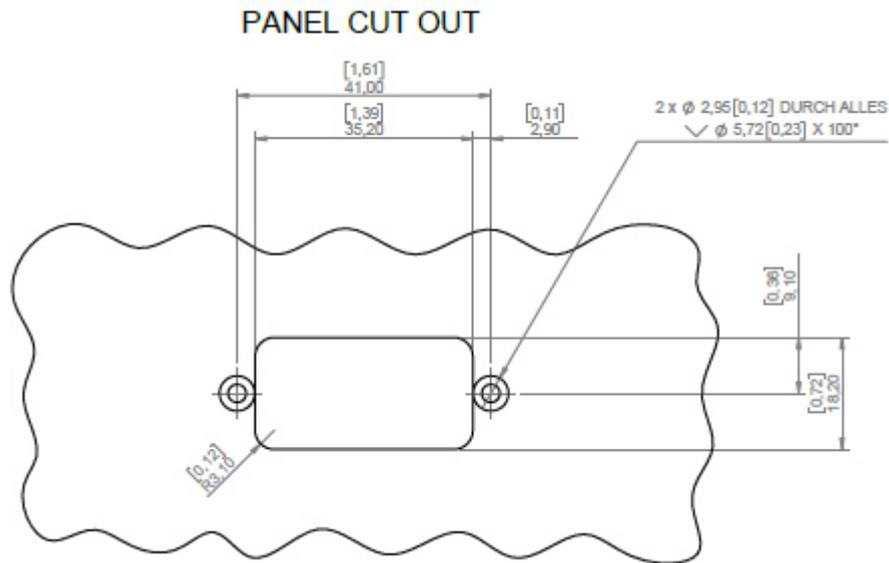


figure 4: drawing, panel cut out

2x BLACK BRASS SCREW
100° COUNTERSUNK FLAT HEAD
THREAD 4-40
LENGTH 0.375 INCH IF PANEL THICKNESS
0.098 - 0.120 INCH (2.5 - 3.0 MM)

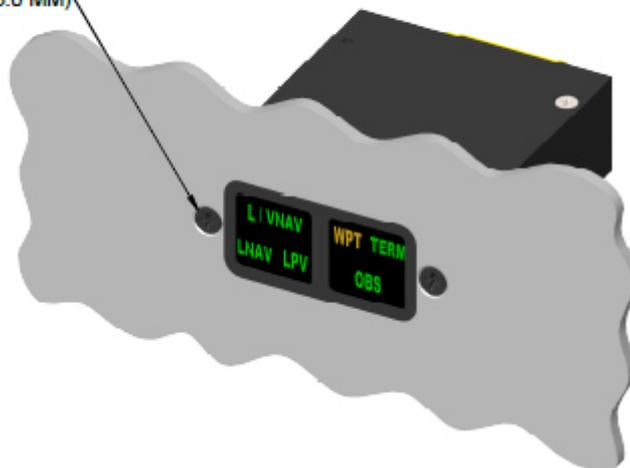


figure 5: drawing, panel mounting

5.4 Wiring Harness Installation

Allow adequate space for installation of cables and connectors. The installer shall supply and fabricate all of the cables. All electrical connections are made through a 15 pin D-SUB, male type. Section 6 defines the electrical characteristics of all input and output signals. The use of shielded AWG-24 wires is recommended for correct signal interface at the ARINC429 lines.

6 System Interface

6.1 Pin Function List

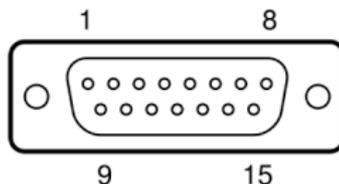


figure 6: view of J1 connector in front of the unit

Connector			J1		
Pin	Declaration	Description	Levels		I/O
			Active	Inactive	
1	VIN	+14.0VDC to +28.0VDC			input
2	F2A	discrete input, active low	< 3.0V	> 5V	input
3	F2B	discrete input, active low	< 3.0V	> 5V	input
4	F2C	discrete input, active low	< 3.0V	> 5V	input
5	F2D	discrete input, active low	< 3.0V	> 5V	input
6	Dim	day = +28VDC night = +14VDC	< 20.0V	> 22V	input
7	reserved	do not connect			
8	ArincB	ARINC429 RX B			input
9	GND	GND			input
10	LampTest	lamp test	< 3.0V	> 5V	input
11	ModeSel	ARINC429 decode mode	< 3.0V	> 5V	input
12	ArincSpeed	ARINC429 speed OPEN: LOW SPEED GND: HIGH SPEED	< 3.0V	> 5V	input
13	SSMsel	SSMsel OPEN: SSM=11 GND: SSM=00	< 3.0V	> 5V	input
14	reserved	reserved	do not connect		
15	ARINC	ARINC429 RX A			input

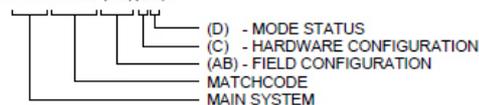
table 9: pin assignment

7.2 Label drawing



CAPTION:

P/N: AS01-MFI02-(AB)(CD)



S/N: 1097(Y Y)(M M)(X X X)

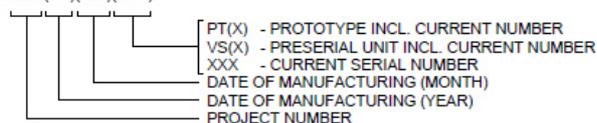


figure 8: example label drawing

8 Installation Procedure

Use Installation Kit (P/N: AS02-MFI02KIT-00), consisting of:

- Connector 15 pin D-SUB, female type
- Crimp socket
- Shell D-Sub

→ Consider personal electrostatic discharge protection!

- Remove the protection caps of connectors
- Mount the unit on suitable position according to section 5.3 into the aircraft
- Manufacture a cable harness according to requirements of Section 5.2 and Section 5.4 and adapt it in accordance with aircraft wiring
- Connect cable harness to unit (J1)
- Perform Functional Test

9 Functional Test

The functional test procedure as described below is intended for the installation of the MFI02

- Provide electrical Power to the Aircraft
- Activate lamp test input and check all fields illuminated
- Check dimming according to pin levels (table 6)
- Check the field illumination by ARINC429 interface according to field configuration (table 3)
- Check illumination by discrete input according to field configuration (table 3) and pin levels (table 6)
- When all fields activated pull the circuit breaker of the MFI02:
 - Check all fields OFF
- When all fields activated push the circuit breaker of the MFI02:
 - Check all fields ON

10 Troubleshooting

For troubleshooting see MFI02 Maintenance Manual (Doc.-N°: ASR_1097_MFI02_901_MMA_()), in latest revision) or call AVIONIK STRAUBING GmbH.

11 Operating instructions

For operating instructions and functions of the Avionik Straubing MFI02 refer to Operating Manual (Doc.-N°: ASR_1097_MFI02_902_OMA_D).

12 Limited Warranty

The MFI02 is warranted to be free from defects in materials or workmanship for two years from date of purchase. This warrant does not cover failures due to abuse, misuse, accident or unauthorized alterations or repairs.

IN NO EVENT, AVIONIK STRAUBING GMBH WILL BE LIABLE FOR ANY INCIDENTAL, SPECIAL INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM USE, MISUSE OR INABILITY TO USE THIS PRODUCT OR DEFECTS IN THE PRODUCT.

AVIONIK STRAUBING GmbH retains exclusive right to repair or replace the unit or offer a full refund of the purchase price at its sole discretion. This shall be a sole and exclusive remedy for any breach of warranty.

To obtain warranty service contact AVIONIK STRAUBING GmbH or the aircraft Manufacturer (OEM).

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