TRA-100B Mode S Transponder (TRA-100B) Honeywell

Installation Manual (IM)

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1. GENERAL

1.1 TRA-100B MODE S TRANSPONDER - LIST OF ABBREVIATIONS

Table 1-1 - List of Abbreviations

Symbol	Instruction
AC	Alternate Current
AD, A/D	Analogue to Digital
BIT	Built In Test
BITE	Built In Test Equipment
CBIT	Continuous Built In Test
DC	Direct Current
GND	GrouND
HF	High Frequency
IBIT	Interruptive Built In Test
LRU	Line Replaceable Unit
MT	Mounting Tray
NSN	NATO Stock Number
PBIT	Power-on Built In Test
RF	Radio Frequency
RX	Receiver
TX	Transmitter

1.2 TRA-100B MODE S TRANSPONDER – CONFIGURATION

This manual is applicable to the following TRA-100B Mode S Transponder Part Numbers (Table 1-2):

Table 1-2 – TRA-100B - Configuration Data

Description	Part Number	Qty
TRA-100B Mode S Transponder	TAC-6001/03 TAC-6003/03 TAC-6004/03	1

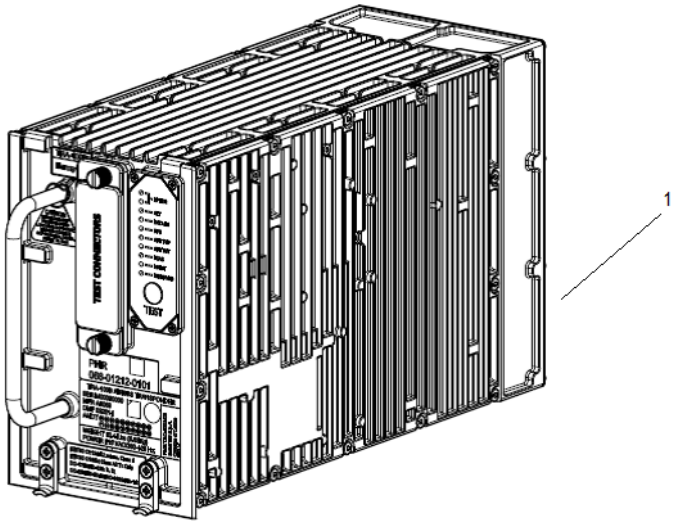

Figure 1-1 – TRA-100B Mode S Transponder - Configuration

1.3 TRA-100B Mode S TRANSPONDER – INTRODUCTION

The TRA-100B Mode S Transponder is a remote mounted avionics device which provides the Mode S Transponder function required by Technical Standard Order (ETSO-C112d).

The XPDR also provides Extended Squitter ADS-B Out function required by ETSO-C166b.

The TRA-100B Modes S Transponder is designed to be a Level 2 transponder.
It includes the capabilities of a Level 1 Transponder:

- Mode A identity and Mode C pressure-altitude reporting,
- Air Traffic Control Radar Beacon System (ATCRBS)/Mode-S and Mode S all-call transactions,
- Addressed surveillance altitude and identity transaction,
- Lockout protocols,
- Basic data protocols except data link capability reporting, and
- Air-to-air service and squitter transactions.

The TRA-100B includes the capabilities of a Level 2 Transponder:

- Bi-directional air-to-air information exchange
- Ground-to-air data uplink, Comm-A
- Air-to-ground data downlink, Comm-B
- Multisite message protocol
- Data link capability reporting
- Aircraft identification reporting
- Traffic Alert and Collision Avoidance System (TCAS)/Airborne Collision Avoidance System (ACAS) crosslink capability
- Overlay Command Capability

In addition, the Transponder contains the following optional additional features:

- TCAS Compatibility (a)
- Antenna Diversity (d)
- Extended Squitter (e)
- Enhanced Surveillance (including Elementary Surveillance) (n)
- Surveillance Identifier Code (s)

1.4 TRA-100B Mode S TRANSPONDER - SCHEMATIC DIAGRAM

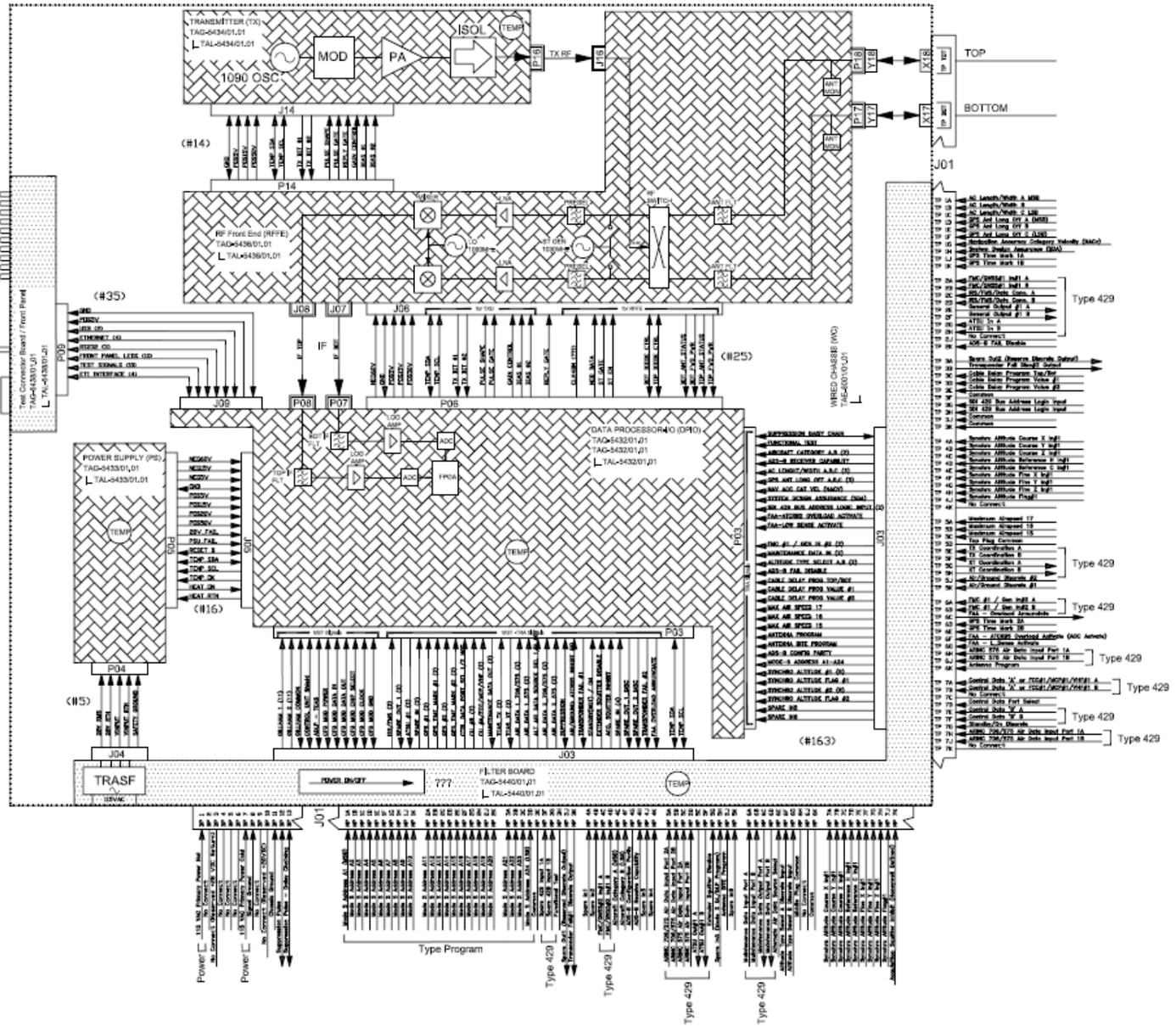

Figure 1-2 – TRA-100B Mode S Transponder - Schematic Diagram

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1.5 TRA-100B MODE S TRANSPONDER – GENERAL WARNINGS AND CAUTIONS AND RELATED SAFETY DATA

1.5.1 General Safety

- Before you do maintenance procedures on the Unit make sure that you know the necessary safety data.
- Before you work on the Unit, make sure that the electrical power supply is removed from the Unit. Energized circuits can cause injury to persons.
- Before you work on the Unit, make sure that you have the correct personal safety equipment. You must use or wear the correct personal safety equipment to prevent injuries.
- Handle all the equipment carefully. This will help to prevent damage to it.

1.5.2 List of Warnings and Cautions

Table 1-3 - General Warnings, Cautions And Related Safety Data

Symbol	Message
	WARNING Make sure that the equipment is disconnected from all electrical power sources before you do any maintenance work.
	WARNING The internal components use high voltages that can cause injury or death to personnel.
	WARNING Perform task in ventilated area and use protective clothing.
	WARNING Denatured Alcohol, Electro Contact Cleaner and Conductive Anti-seizure Compound are dangerous materials. Make sure that you know the safety precautions and the first aid instructions.

	CAUTION The internal components of the equipment are Electro-Static Discharge (ESD) sensitive devices. Do not touch the pins of the electrical connectors. Electrostatic discharge can cause damage to these components. Install protective caps on all electrical connectors immediately after you disconnect them to prevent the ingress of dirt.
	WARNING Always handle the equipment with care to prevent damage.

2. TECHNICAL DATA

2.1 TRA-100B MODE S TRANSPONDER – TECHNICAL DATA

2.1.1 General Technical Data

Table 2-1 – TRA-100B - Technical data – General

Data	Value
Manufacturers Part Numbers	TAC-6001/03 TAC-6003/03 TAC-6004/03
Weight (Total mass)	< 7 Kg.
Dimensions	194 mm x 124 x 318 (Height x Width x Depth)
Output power	400W ± 100 W
Operating temperature	-55°C +70°C
Storage Conditions	-55°C +70°C

2.1.2 Labels Data

The TRA-100B provide three different labels (ref. Figure 2-1):

- Leonardo Finmeccanica Id. Label (1)
- Honeywell Id. Label (2)
- Certifications Label (3)

The Leonardo Finmeccanica Id. Label contains the following info:

Data	Value
Manufacturers Part Numbers	TAC-6001/03 TAC-6003/03 TAC-6004/03
Manufacturer	Leonardo Finmeccanica
Manufacturing Site	Montevarchi
Manufacturing Country	Italy
SER.	Serial Number
MFR.	Manufacturer SNS (A0610)
DMF	Date of Manufacturing (mmyyy)
AMDT	Amendement
Weight (Total mass)	14.5 Lbs. (6.58 Kg)
Power	115 VAC/380-420 Hz.

The Honeywell Id. Label contains the following info:

Data	Value
Owner	HONEYWELL, International
Owner Part Number	PNR 066-01212-0101 PNR 066-01212-0301 PNR 066-01212-0301
Amendement	-

The Certification Label contains the following info:

Data	Value
ETSO/TSO Certification	ETSO C112d: L2 adens, Class 1 ETSO C166b: Class A2 Tx only
DO/ED	178B/12B B: D 254/80 B 160/14G

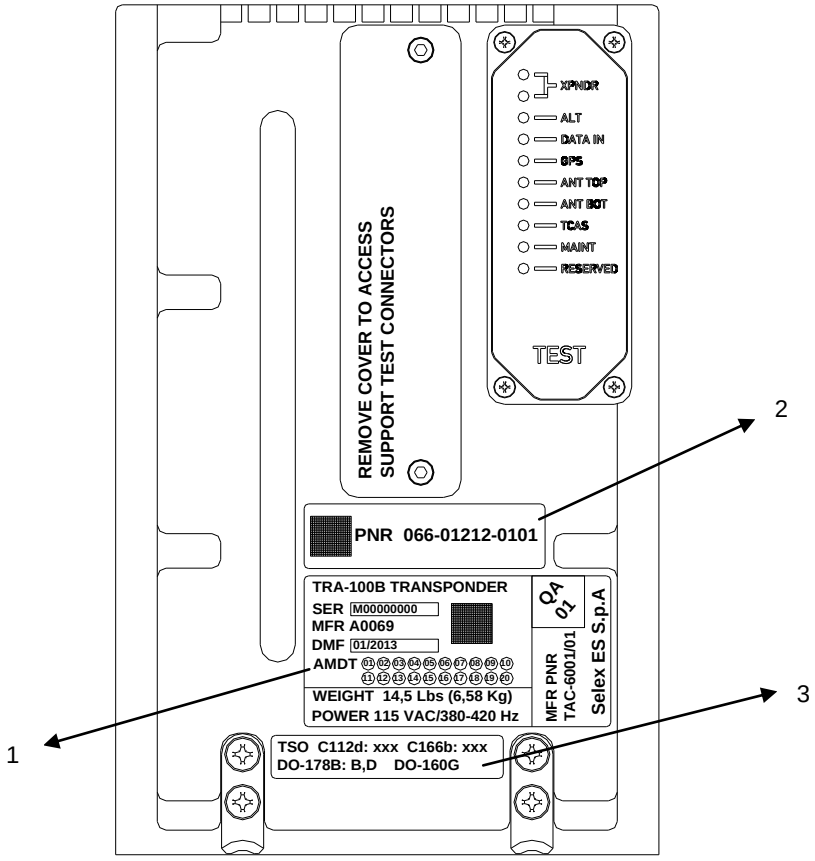

Figure 2-1 – TRA-100B Mode S Transponder – Labels Layout

Table 2-2 – TRA-100B - Technical data – Connectors

Ref. Figure 2-2	**Connector**	**Function**
1	Main Connector	Data and Control I/O
2	Test Connector	Maintenance Retrieval

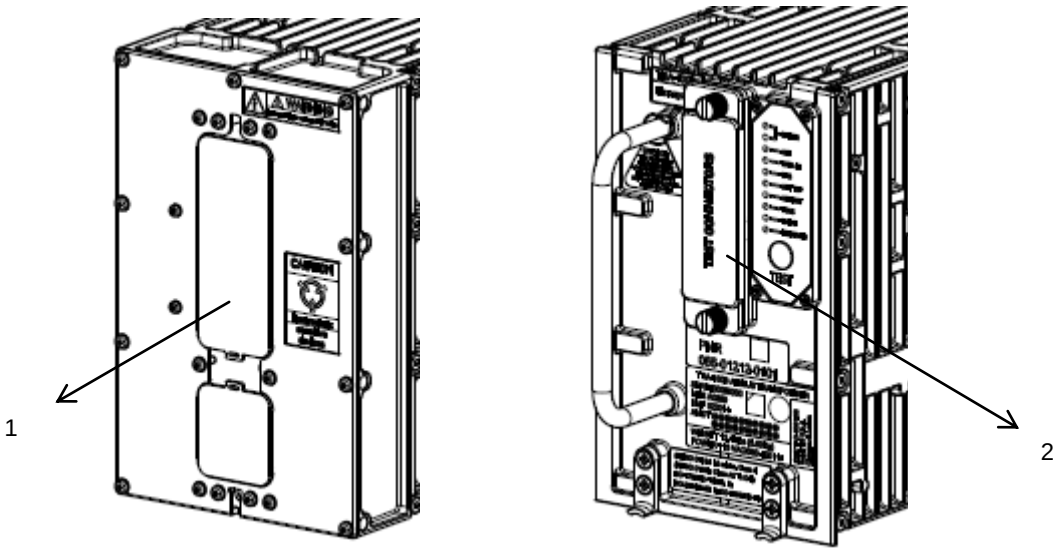

Figure 2-2 – TRA-100B Mode S Transponder – Connectors

Table 2-3 – TRA-100B - Technical data – Main Connectors Pin Mapping

TP Section			
Pin	**I/O**	**Type**	**Description**
TP 1A	Input	Program	AC Length/Width A MSB
TP 1B	Input	Program Strobed	AC Length/Width B
TP 1C	Input	Program Strobed	AC Length/Width C LSB
TP 1D	Input	Program Strobed	GPS Ant Long Off A (MSB)
TP 1E	Input	Program Strobed	GPS Ant Long Off B
TP 1F	Input	Program Strobed	GPS Ant Long Off C (LSB)
TP 1G	Input	Program Strobed	Navigation Accuracy Category Velocity (NAC_V)
TP 1H	Input	Program Strobed	System Design Assurance (SDA)
TP 1J	Input	Differential	GPS Time Mark 1A
TP 1K	Input	Differential	GPS Time Mark 1B
TP 2A	Input	429	FMC/GNSS #1 In #1 A
TP 2B	Input	429	FMC/GNSS #1 In #1 B
TP 2C	Input	429	IRS/FMS/Data Conc. A
TP 2D	Input	429	IRS/FMS/Data Conc. B
TP 2E	Output	429	General Output #1 A
TP 2F	Output	429	General Output #1 B
TP 2G	Input	429	ATSU In A
TP 2H	Input	429	ATSU In B
TP 2J	Input	Discrete	Data Load Enable
TP 2K	Input	Program	ADS-B FAIL Disable
TP 3A	Output	Discrete	ADS-B Fail Disc Out
TP 3B	Output	Discrete	Transponder fail #2 Disc output
TP 3C	Input	Program	Cable Delay Program Top/Bot
TP 3D	Input	Program	Cable Delay Program Value #1
TP 3E	Input	Program	Cable Delay Program Value #2
TP 3F	Common	Common	Common
TP 3G	Input	Discrete	SDI 429 Bus Address Logic Input
TP 3H	Input	Discrete	SDI 429 Bus Address Logic Input
TP 3J	Common	Common	Common
TP 3K	Common	Common	Common
TP 4A	N/A	N/A	No Connect
TP 4B	N/A	N/A	No Connect
TP 4C	N/A	N/A	No Connect
TP 4D	N/A	N/A	No Connect
TP 4E	N/A	N/A	No Connect
TP 4F	N/A	N/A	No Connect
TP 4G	N/A	N/A	No Connect
TP 4H	N/A	N/A	No Connect
TP 4J	N/A	N/A	No Connect
TP 4K	N/A	N/A	No Connect
TP 5A	Input	Program	Maximum Airspeed 17
TP 5B	Input	Program	Maximum Airspeed 16
TP 5C	Input	Program	Maximum Airspeed 15
TP 5D	Common	Common	Top Plug Common
TP 5E	Input	429	TX Coordination A

TP Section			
Pin	**I/O**	**Type**	**Description**
TP 5F	Input	429	TX Coordination B
TP 5G	Output	429	XT Coordination A
TP 5H	Output	429	XT Coordination B
TP 5J	Input	Discrete	Air/Ground Discrete #2
TP 5K	Input	Discrete	Air/Ground Discrete #1
TP 6A	Input	429	FMC #1 / Gen In #2 A
TP 6B	Input	429	FMC #1 / Gen In #2 B
TP 6C	Output	Discrete	Reserved
TP 6D	Input	Discrete	GPS Time Mark 2A
TP 6E	Input	Discrete	GPS Time Mark 2B
TP 6F	Input	Discrete	Reserved
TP 6G	Input	Discrete	Reserved (-0101/-0301); FAA - L_Sense Activate (-0201)
TP 6H	N/A	N/A	No Connect
TP 6J	N/A	N/A	No Connect
TP 6K	Input	Program	Antenna Program
TP 7A	Input	429	Control Data 'A' or FCC #1/MCP #1/VHF #1 A
TP 7B	Input	429	Control Data 'A' or FCC #1/MCP #1/VHF #1 B
TP 7C	N/A	N/A	No Connect
TP 7D	Input	Discrete	Control Data Port Select
TP 7E	Input	429	Control Data 'B' A
TP 7F	Input	429	Control Data 'B' B
TP 7G	Input	Discrete	Standby/On Discrete
TP 7H	Input	429	ARINC 706/575 Air Data Input Port 1A
TP 7J	Input	429	ARINC 706/575 Air Data Input Port 1B
TP 7K	N/A	N/A	No Connect

MP Section			
Pin	**I/O**	**Type**	**Description**
MP 1A	Input	Program	Mode S Address A1 (MSB)
MP 1B	Input	Program	Mode S Address A2
MP 1C	Input	Program	Mode S Address A3
MP 1D	Input	Program	Mode S Address A4
MP 1E	Input	Program	Mode S Address A5
MP 1F	Input	Program	Mode S Address A6
MP 1G	Input	Program	Mode S Address A7
MP 1H	Input	Program	Mode S Address A8
MP 1J	Input	Program	Mode S Address A9
MP 1K	Input	Program	Mode S Address A10
MP 2A	Input	Program	Mode S Address A11
MP 2B	Input	Program	Mode S Address A12
MP 2C	Input	Program	Mode S Address A13
MP 2D	Input	Program	Mode S Address A14
MP 2E	Input	Program	Mode S Address A15
MP 2F	Input	Program	Mode S Address A16
MP 2G	Input	Program	Mode S Address A17
MP 2H	Input	Program	Mode S Address A18
MP 2J	Input	Program	Mode S Address A19
MP 2K	Input	Program	Mode S Address A20

MP Section			
Pin	**I/O**	**Type**	**Description**
MP 3A	Input	Program	Mode S Address A21
MP 3B	Input	Program	Mode S Address A22
MP 3C	Input	Program	Mode S Address A23
MP 3D	Input	Program	Mode S Address A24 (LSB)
MP 3E	Common	Common	Common
MP 3F	Input	429	Spare 429 Input 1A
MP 3G	Input	429	Spare 429 Input 1B
MP 3H	Input	Discrete	Functional Test
MP 3J	Output	Discrete	Out Spare 1
MP 3K	Output	Discrete	Transponder Fail # 1 discrete output
MP 4A	Input	Discrete	Spare In1
MP 4B	Input	Discrete	Spare In2
MP 4C	Input	429	FMC/GNSS #2 In #1 A
MP 4D	Input	429	FMC/GNSS #2 In #1 B
MP 4E	Input	Program Strobed	Aircraft Category A (MSB)
MP 4F	Input	Program Strobed	Aircraft Category B (LSB)
MP 4G	Input	Program	ADS-B Configuration Parity
MP 4H	Input	Program Strobed	ADS-B Receive Capability
MP 4J	Input	Discrete	Spare In3
MP 4K	Input	Discrete	Spare In4
MP 5A	Input	429	ARINC 706/575 Air Data Input Port 2A
MP 5B	Input	429	ARINC 706/575 Air Data Input Port 2B
MP 5C	N/A	N/A	No Connect
MP 5D	N/A	N/A	No Connect
MP 5E	Output	429	ATSU Out #1 A
MP 5F	Output	429	ATSU Out #1 B
MP 5G	Input	Discrete	Extended Squitter Disable
MP 5H	Input	Discrete	Spare In5 (Mode S DL/DLP Program)
MP 5J	Input	Program	Antenna BITE Program
MP 5K	Input	Discrete	Spare In6
MP 6A	Input	429	Maintenance Data Input Port A
MP 6B	Input	429	Maintenance Data Input Port B
MP 6C	Output	429	Maintenance Data Output Port A
MP 6D	Output	429	Maintenance Data Output Port B
MP 6E	Input	Discrete	Alternate Air Data Source Select
MP 6F	Input	Program	Altitude Type Select A Discrete Input
MP 6G	Input	Program	Altitude Type Select B Discrete Input
MP 6H	Common	Common	Middle Plug Common
MP 6J	N/A	N/A	No Connect
MP 6K	Common	Common	Common
MP 7A	N/A	N/A	No Connect
MP 7B	N/A	N/A	No Connect
MP 7C	N/A	N/A	No Connect
MP 7D	N/A	N/A	No Connect
MP 7E	N/A	N/A	No Connect
MP 7F	N/A	N/A	No Connect
MP 7G	N/A	N/A	No Connect

MP Section			
Pin	**I/O**	**Type**	**Description**
MP 7H	N/A	N/A	No Connect
MP 7J	N/A	N/A	No Connect
MP 7K	Input	Discrete	Acquisition Squitter Inhibit (Honeywell Defined)

BP Section			
Pin	**I/O**	**Type**	**Description**
BP 1	Input	Power	115 VAC Primary Power Hot
BP 2	N/A	N/A	No Connect
BP 3	N/A	N/A	No Connect
BP 4	N/A	N/A	No Connect
BP 5	N/A	N/A	No Connect
BP 6	N/A	N/A	No Connect
BP 7	Input	Power	115 VAC Primary Power Cold
BP 8	Input	Ground	Signal Ground
BP 9	N/A	N/A	No Connect
BP 10	N/A	N/A	No Connect
BP 11	Input	Ground	Chassis Ground
BP 12	Input/Output	Suppression	Suppression Pulse
BP 13	Input/Output	Suppression	Suppression Pulse - Daisy Chaining

Table 2-4 – TRA-100B - Technical data – Test Connectors Pin Mapping

Test Connector				
Pin	**Signal Name**	**I/O**	**Type**	**Description**
1	SWITCH_ETH		Discrete In 1	Switch Ethernet
2	TEST_RESET	Out	Test Point	Test Point
3	GND		Power GND	
4	UP_HRESET	Out	Test Point	Test Point
5	VID_ENV_TOP_TP	Out	Test Point	Test Point
6	TEST_DG18			Internal Purpose Only
7	ST_GATE	Out	Test Point	Test Point
8	TEST_DG19			Internal Purpose Only
9	TEST_DG20			Internal Purpose Only
10	TEST_DG21			Internal Purpose Only
11	TEST_DG22			Internal Purpose Only
12	ACQ_SQ_INH_EN	In	Discrete In 1	Acquisition Squitter Inhibit Enable
13	PULSE_GATE	Out	Test Point	Test Point
14	OP_MAINT_1	In	Discrete In 1	Maintanance Mode Selection
15	OP_MAINT_0	In	Discrete In 1	Maintanance Mode Selection
16	VID_ENV_BOT_TP	Out	Test Point	Test Point
17	FPGA _SIN			Internal Purpose Only
18	FPGA _SOUT			Internal Purpose Only
19	DG_INT_PWRFL	Out	Test Point	Test Point
20	SUPP_TP	Out	Test Point	Test Point
21	E2C_SCL_PN	In	Service I2C Bus Ctrl/Clk In	Service I2C Bus Serial Clock
22	E2C_SDA_PN	Bdir	Service I2C Bus Data	Service I2C Bus Serial Data
23	WR_UNPROTECT	In	Service I2C Bus Ctrl/Clk In	Service I2C Bus Control Signal
24	GND_EXT		Service I2C Bus Supply In	Service I2C Bus Power Supply Ground
25	5V_EXT	In	Service I2C Bus Supply In	Power Supply Source for Service I2C Bus

3. INSTALLATION

3.1 TRA-100B MODE S TRANSPONDER – REPLACE PROCEDURES

Standard Equipment		
Description	***Identification Nr.***	***Qty***
None		

Materials		
Description	***Identification Nr.***	***Qty***
None		

Spares		
Description	***Identification Nr.***	***Qty***
TRA-100B Mode S Transponder	TAC-6001/03 TAC-6003/03 TAC-6004/03	1

Safety Precautions

WARNING

MAKE SURE THAT THE EQUIPMENT IS DISCONNECTED FROM ALL ELECTRICAL POWER SOURCES BEFORE YOU DO ANY MAINTENANCE WORK.

Preliminary Operations

1. Make sure the platform is safe for maintenance

Procedure

1. Removal Procedure
   1.1. Loosen by hand the two hold-down screws on the front of Mounting Tray (1)
   1.2. Pull the Transceiver by the handle
   1.3. Carefully slide the Transponder from the Mounting Tray

2. Install Procedure
   2.1. Carefully put the TRA-100 B Modes S Transponder into the Mounting Tray, aligning the TRA-100B connector guide pins with the platform connector.
   2.2. Tighten by hand the two hold-down screws (1) on the front of Mounting Tray

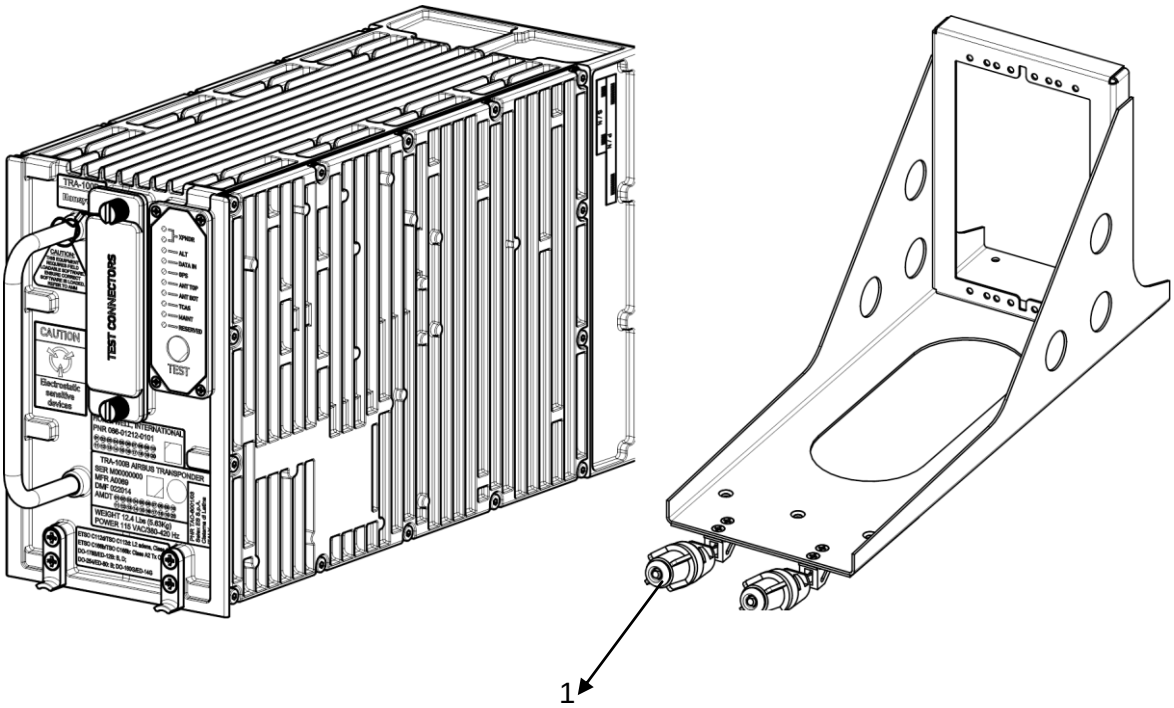

Figure 3-1 – TRA-100B Mode S Transponder - Replace Procedures

Close up

1) Removal all the tools, the materials and the equipment from your work area.