Reason RT412

Technical Manual

Optical Transceiver

Platform Hardware Version: A
Publication Reference: RT412-TM-EN-2

ALSTOM

Contents

PREFACE

Products developed by Alstom are continuously improved. The information this document contains reflects this improvement, and for this Alstom it is subject to change without notice. Please make sure that this is latest version of this document before proceeding. All specifications are subject to changes without prior notice.

Certification to the the ISO 9001:2008 quality standard is an example of this commitment. We encourage and appreciate any feedback and will use it to improve our products and services.

ACRONYMS AND ABBREVIATIONS

AC - Alternating Current;

ACEB NEMEA - Acronyms and Abbreviations;

ASCII - American Standard Code for Information Interchange;

BMC - Best Master Clock;

BNC - Bayonet Neil Concelman connector;

Bps – Bytes per second;

bps - Bits per second;

CAT5 - Network Cable;

CF - Federal Constitution;

PLC – Programmable Logic Controller;

CMOS - Complementary Metal-Oxide-Semiconductor;

CR2032 - Lithium battery model;

DB9 - Conector do tipo D-subminiature;

DC - Direct Current;

DCF77 - Time synchronism protocol Deutschland LORAN-C (Long Range Navigation - C) Frankfurt 77 (77,5 kHz);

DNS - Domain Name System;

DTE - Data Terminal Equipment;

E2E - End-to-end;

ETH - Abbreviation of the term Ethernet;

FW - Abbreviation of the term Firmware;

GND - Abbreviation of the term Ground;

GPS - Global Positioning System;

GPZDA - Serial Datagram format;

HTTP - Hypertext Transfer Protocol;

HTTPS - Hypertext Transfer Protocol Secure;

IEC - International Electrotechnical Commission;

IED - Intelligent Electronic Devices;

IEEE - Institute of Electric and Electronic Engineers;

IHM - Human-Machine Interface;

IP - Internet Protocol;

IP40 - Degree of protection 40;

IRIG-B - Time synchronism protocol Inter Range Instrumentation Group (Rate Designation B);

LCD - Liquid Crystal Display;

MAC - Media Access Control;

NTP - Network Time Protocol;

OUT - Abbreviation of the term Output;

P2P - Peer-to-peer;

PLC- Programmable Logic Controller;

PPM - Pulse per minute;

PPS - Pulso por Segundo;

PPX - Pulso por X s;

PTP - Precision Time Protocol;

RFC - Data formatting specification RFC 1951, DEFLATE; RJ45 - Conector para rede Ethernet com 8 condutores;

RS232/485 - Serial port levels;

RT - Temporal Recorder (Alstom's Temporal Synchronism Equipment);

RX - Receiving data;

SNMP - Simple Network Management Protocol;

SNTP - Simple Network Time Protocol;

ST - Bayonet-lock connector;

TCP - Transmission Control Protocol;

TMARK - Daily pulses with programmable time;

TTL - Transitor-to-Transitor logic;

TX - Data transmission;

UDP - User Datagram Protocol;

UTC - Universal Time Coordinate.

1. DESCRIPTION

1.1 Introduction

RT412 - Optical Transceiver is an electrical-optical and optical-electrical converter. It converts signals into pulsed signals for time synchronism. Also, the features allow multiplying the outputs of GPS clocks. The equipment has optical or electrical input, selectable by the user. Also, it has two TTL-level electrical outputs and an optical output. It accepts IRIG-B signals or any other frequency signal (1PPS, 100PPS, 1PPM,inter alia).

The power supply is full range integrated.

The delay of the output signal in relation to the input is under 100 ns.

This User Manual is structured as follows:

Chapter 1 presents RT412 descriptions, its applications, technical specifications, and how the manual is presented.

Chapter 2 presents how RT412 should be installed, considering power supply, cables connections, synchronism

outputs,inter alia.

1.2 Foreword

This technical manual provides a functional and technical description of Alstom Grid's RT412, as well as a comprehensive set of instructions for using the device. We have attempted to make this manual as accurate, comprehensive and user-friendly as possible. However we cannot guarantee that it is free from errors. Nor can we state that it cannot be improved. We would therefore be very pleased to hear from you if you discover any errors, or have any suggestions for improvement. All feedback should be sent to our contact centre via the following URL:

http://www.alstom.com/grid/contactcentre/

1.3 Key Features

- 100 ns accuracy;

- Integrated optical-electrical and electrical-optical converter;
- ST connector optical Input;
- Time signals in IRIG-B00x format;
- Pulses: 100 pulses-per-second, 1 pulse-per-second, 1 pulse-per-minute and low frequency pulses;
- 2 electrical outputs with screw connector with an individual supply capacity up to 100 mA;
- 1 optical output with ST connector and multimode fiber.
- Indicators for monitoring the input signal of time synchronism and the presence of primary supply;
- DIN rail mounting;
- AC or DC power supply sources.

1.4 Front and Side View

The front panel of the RT412 presents its identification, model, and a label with Serial Number and Part Number. Figure 1 shows the front view of the equipment.

FIGURE 1: RT412 FRONT VIEW

Figure 2 shows the components of the side panel

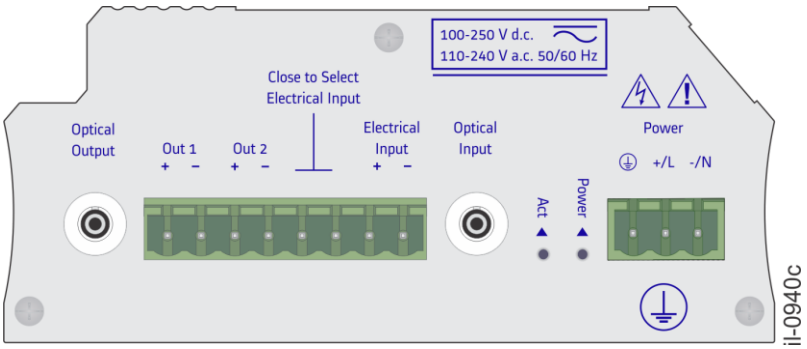


FIGURE 2: RT412 SIDE VIEW

The side panel of the RT412 comprises one feeding input, AC or DC; two electrical outputs with TTL-level screw connector; an electrical input; a jumper to select the input type; an optical input and output; synchronism signal and power supply indicators.

For information on installing the unit, see Chapter 2.

1.5 Power Supply

TABLE 1.1: POWER SUPPLY SPECIFICATIONS

Operating voltage range	80–275 V d.c., 88–264 V a.c.
Frequency	50/60 Hz _3 Hz
Consumption	< 3 VA

1.6 Electrical Input

TABLE 1.2: ELECTRICAL INPUT SPECIFICATIONS

Connectors (2)	Screw
High Level	4.2 V
Low Level	9.8 V
Impedance	> 500

1.7 Optical Input

TABLE 1.3: OPTICAL INPUT SPECIFICATION

Wave Length	820 nm
Fiber Type	multimode 50/125 µm, 62.5/125 µm 100/140 µm or 200 µm HCS
Connector	ST
Sensibility	-24 dBm

1.8 Electrical Outputs

TABLE 1.3: ELECTRICAL OUTPUTS SPECIFICATIONS

Conectors (4)	Screw (2 outputs)
High Level 1	> 4 V d.c.
Low Level 2	< 0.2 V d.c.

Impedance	> 500
Current	100 mA (for 2 outputs)

1.9 Optical Outputs

TABLE 1.3: OPTICAL OUTPUTS SPECIFICATIONS

Wave Length	820 nm
Fiber Type	50/125 µm, 62.5/125 µm, 100/140 µm or 200 µm HCS multimode.
Connector	ST
Transmission Powere	-17.8 dBm (50/125 µm) -14.0 dBm (62.5/125 µm) -8.5 dBm (100/140 µm) -5.7 dBm (200 µm HCS)

1.10 Environment

TABLE 1.6 ENVIRONMENT SPECIFICATIONS

Operating temperature	+5 . . . +55 °C
Enclosure protection	IP40
Relative humidity	5 . . .95% (noncondensing)
Maximum Altitude	2000 m (6560 ft)

1.11 Weight and Dimensions

TABLE 1.6 WEIGHT AND DIMENSIONS SPECIFICATIONS

Height	117 mm
Width	51 mm
Depth	95 mm
Weight	1 Kg

RT412 dimensions are shown in Figure 3.

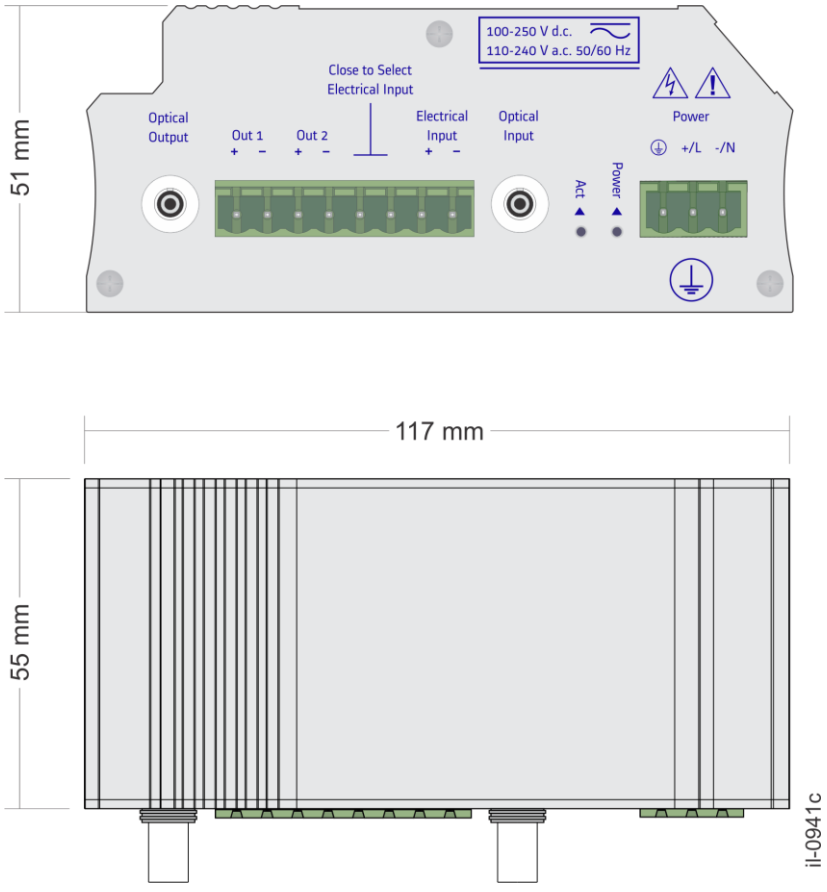


FIGURE 3: RT412 DIMENSIONS

2. INSTALLATION

2.1 Unpacking

Unpack the unit carefully and make sure all the accessories and cables are put aside so they will not be lost.

Check the contents against the packing list that goes with the product. If any of the content listed are missing, please contact Alstom (see contact information at the beginning of this manual).

Examine the unit for any shipping damage. If the unit is damaged or fails to operate, notify the shipping company without delay. Only the consignee (the person or company receiving the unity) can file a claim against the carrier for shipping damage.

We recommend you keep the original packing materials for eventual future transport.

2.2 External Indications

The serial number and part number are shown on a label fixed on the side of the unit, as shown in figure 4.

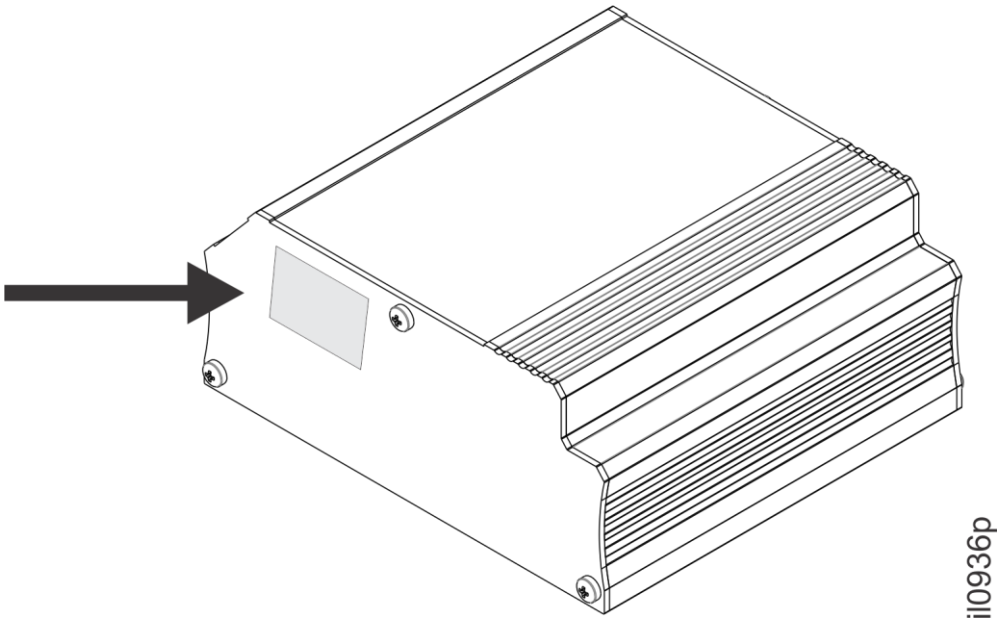


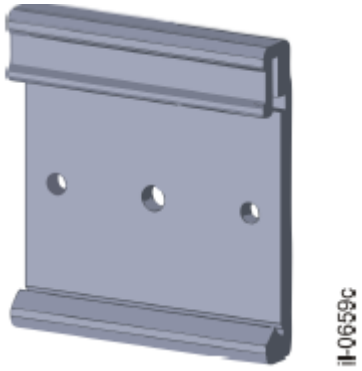
Figure 4: Location of Serial number and Part Number

2.3 Environment

Temperature and relative humidity should not exceed the limits stated in Chapter 1. We recommend providing appropriate heating or cooling measures to ensure that these limits are respected at all times.

2.4 Mounting

RT412 has been designed to be mounted on DIN rails. A support bracket, must be used.



Support bracket to assemble the unit on DIN rails

For more information about dimensions of the unit, see Chapter 1.

2.5 Connectors

Components and connectors of RT412's rear panel are shown in figure 5.

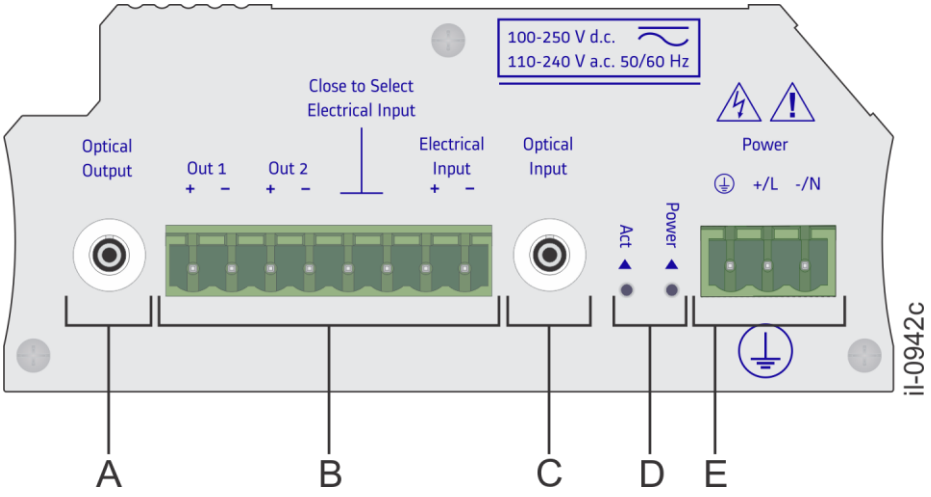


Figure 5: Rear panel connectors

TABLE 2.1: Connectors on the rear panel of the equipment..

Indicator	Description
A	Optical output;
B	2 screw connector electrical outputs for synchronism; a jumper to select the type of input; an electrical input for synchronism;
C	Optical input;
D	The ACT indicator will light upas soon as signal of one of the synchronism inputs is detected. The POWER indicator will light up if a primary power supply is connected to the unit.
E	AC or DC inputs;

2.6 Power Supply

RT412 has been designed to be mounted in a standard 19-inch rack using four M6x15 screws to affix. Allow adequate clearance for all connections.

All power connections should use insulated flameproof flexible cable (BWF type) with a 1.5 mm^2 cross section, 70°C thermal class, and 750V insulation voltage.

To reduce the risk of electrical shock, pre-insulated tubular pin terminals should be used on the ends of the power connections.

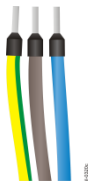


Figure 6: Pre-insulated tubular pin terminals

The pin terminals should be completely inserted into the connector supplied with the unity so that no metallic parts are exposed, according to the figure 7.

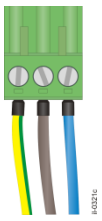


Figure 7:Supply connector assembly

A 1.5 mm^2 ground lead shall be connected to the terminal marked with the protective earth symbol for safety.

For optimal electromagnetic compatibility, ground the unit by using a 10mm wide grounding strap to connect the rear panel of the unit to a good ground point on the mounting rack.

2.6.1 AC Power Connection

Positive should be applied to terminal +/L, negative to terminal -/N in each of the supply terminals identified as Power 1 and Power 2 as shown in figure 8.

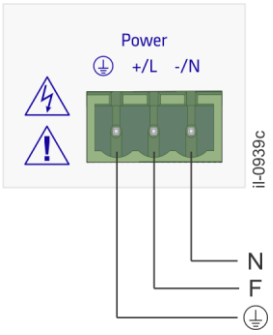


Figure 8: AC power connection

Installation of an external 10 A, category C, bipolar circuit breaker near the unit is recommended. The circuit breaker should have an interruption capacity of at least 25 kA and comply with IEC 60947-2 standard.

2.6.2 DC Power Connection

Positive should be applied to terminal +/L, negative to terminal -/N in each of the supply terminals identified as Power 1 and Power 2 as shown in figure 9.

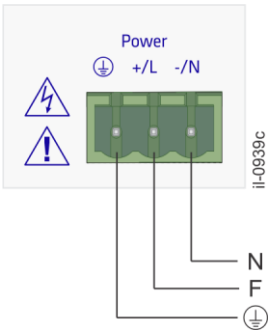


Figure 9: DC power connection

Installation of an external 10 A, category C, bipolar circuit breaker near the unit is recommended. The circuit breaker should have an interruption capacity of at least 25 kA and comply with IEC 60947-2 standard.

2.7 Powering Up

- Before energizing the unit, be familiarized with all the risk and attention indicators in the equipment frame;
- Connect the power supply (including the ground lead) to the appropriate terminals.
- The unit performs a self-test procedure, and the ALARM indicator will remain lit.
- At the end of the self-test, the equipment will perform initialization of the GPS receiver. At the end of approximately one minute the ALARM indicator will go out and information will be shown in the equipment's display.
- To turn off the unit, disconnect the power supply (including the ground lead) from the terminals. The unit will record the time, date, satellite orbits parameters, and internal oscillators drift estimates in non-volatile memory to improve accuracy and reduce the time to synchronize with satellites in the next energizing process. Also, all front panel indicators will turn off.

In case the unit does not behave in a way here described, carefully check all power and signal connections. See chapter 6 for additional suggestion for problem diagnosis.

2.8 Electrical Input

RT412 has an electrical input with screw connector, to be used as electrical-optical converter, identified as ELECTRICAL SIGNAL INPUT, as shown in Figure;

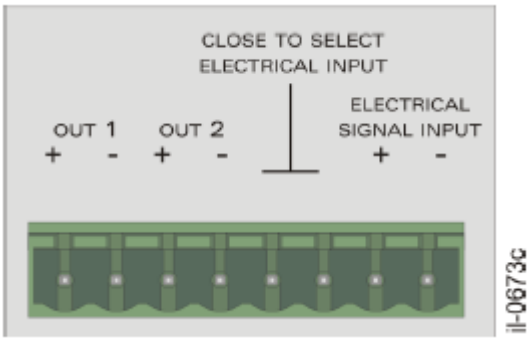


Figure 10: TTL level electrical input

The input accepts demodulated IRIG signals, 1PPS, 1PPM, 100PPS, or low frequency pulses. The signal inserted in the selected input is sent to the electrical and optical outputs.

2.9 Optical Output

RT412 has an optical input with BNC connector, to be used as optical-electrical converter, identified as OPTICAL INPUT, as shown in figure 13.

Figure 11: Optical Input

The input accepts demodulated IRIG signals, 1PPS, 1PPM, 100PPS, or low frequency pulses. The signal inserted in the selected input is sent to the electrical and optical outputs. Connection Diagrams of the Synchronism Inputs

2.10 Jumper to Select Input

RT412 can be used with an optical or electrical input. To select the type of input desired, the following logic must be used as shown in figure 18.

Table 2.1: Jumper to select the input

Closed Jumper	Electrical Input
Open Jumper	Optical Input

The jumper to select the input is identified as CLOSE TO SELECT ELECTRICAL INPUT.

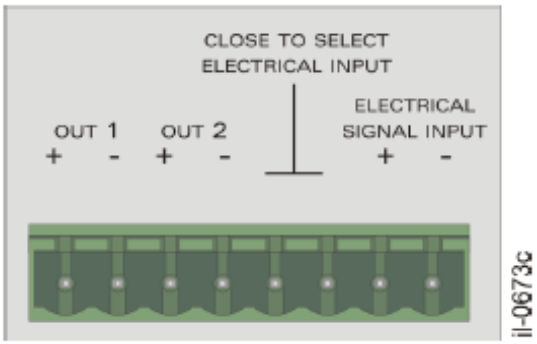


Figure 12: Jumper to select the input

2.1 Electrical Outputs

RT412 has 2 screw connector electrical outputs, identified as OUT 1 and OUT 2,

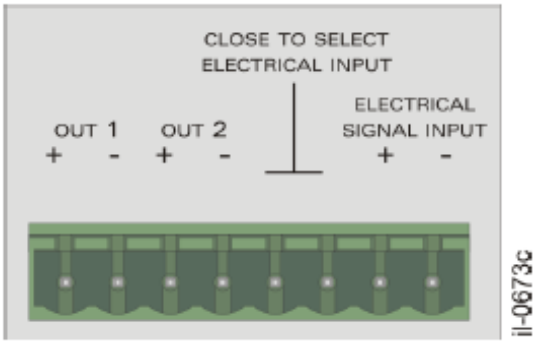


Figure 14: TTL Level electrical outputs

The synchronism signal inserted in the selected input is sent to the electrical and optical outputs.

2.2 Optical Output

RT412 has 1 BNC connector optical output, identified as OPTICAL OUTPUT;

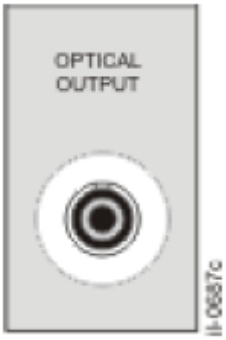


Figure 15: Optical output

The synchronism signal inserted in the selected input is sent to the electrical and optical outputs.

2.3 Status Indicators

RT412 has status indicators for monitoring the presence of primary supply and data flow between the synchronism input and output,

Figure 16: RT412 Status Indicators

The POWER indicator will light up as soon a primary power supply is connected to the unit. In case the power supply is interrupted, the indicator will turn off. The ACT indicator, when lit, indicates data flow between the input and output.

3. MAINTENANCE

3.1 Synchronism Failure

When the unit is operating without data flow between the input and output, the ACT indicator will remain off. Every time synchronism failure is detected, the following actions are recommended:

- Make sure the unit is turned on.
- Make sure the electrical or optical-fiber cables are connected properly.
- Make sure the receipt and transmission connectors are not changed.
- Make sure the input configuration (Jumper) is correct.
- Make sure the electrical or optical-fiber cables are in good conditions.
- If possible, do the test using another electrical or optical-fiber cable.
- Make sure the optical-fiber cable is according to the specifications established.
- Make sure the power supply terminal is connected properly;
- Make sure there is voltage at the terminals.

3.1.1 Power Supply Failure

If there is no power supply, the POWER indicator will remain off. When there is voltage failure, the following actions are recommended:

- Make sure the terminals 1, 2 and Ground are connected properly.
- Make sure there is voltage in the power supply terminal.

3.1.1 Cleaning Instructions

Before cleaning the equipment, make sure that the primary voltage is removed. If it is necessary cleaning the exterior of the equipment, use only a dry cloth. Internally it is not required any cleaning.

3.1.2 Returning a Unit

In case repair service is needed, contact Alstom to check out the shipment options and receive a technical assistance reference code. To contact Alstom, see the Contact section of this manual. The equipment shall be packed in its original package or a suitable package to protect against impacts and moisture.

Identify the package with the technical assistance code and send it to the address supplied.

APPENDIX A - CORTEC

Variants	Order Number			
	1-5	6	7	8
Model Type				
RT412 Optical Transceiver	RT412			
Power Supply				
110-250 Vdc / 100-240 Vac		3		
Customization / Regionalisation				
Default			A	
Reason branding			B	
Hardware Design Suffix				
Initial release				A

APPENDIX B - IRIG-B STANDARD SUMMARY

IRIG-B004 and IRIG-B124 Content

Table A.1: IRIG-B standard summary.

0	P_r	reference bit (P_r)	
1	P_r + 10 ms	seconds 1	seconds (0 ... 59 or 60)
2	P_r + 20 ms	seconds 2	
3	P_r + 30 ms	seconds 4	
4	P_r + 40 ms	seconds 8	
5	P_r + 50 ms	index bit (0)	
6	P_r + 60 ms	seconds 10	
7	P_r + 70 ms	seconds 20	
8	P_r + 80 ms	seconds 40	
9	P_r + 90 ms	position identifier 1 (P_1)	
10	P_r + 100 ms	minutes 1	minutes (0 ... 59)
11	P_r + 110 ms	minutes 2	
12	P_r + 120 ms	minutes 4	
13	P_r + 130 ms	minutes 8	
14	P_r + 140 ms	index bit (0)	

15	P_r + 150 ms	minutes 10	
16	P_r + 160 ms	minutes 20	
17	P_r + 170 ms	minutes 40	
18	P_r + 180 ms	index bit (0)	
19	P_r + 190 ms	position identifier 2 (P_2)	
20	P_r + 200 ms	hours 1	hours (0 ... 23)
21	P_r + 210 ms	hours 2	
22	P_r + 220 ms	hours 4	
23	P_r + 230 ms	hours 8	
24	P_r + 240 ms	index bit (0)	
25	P_r + 250 ms	hours 10	
26	P_r + 260 ms	hours 20	
27	P_r + 270 ms	index bit (0)	
28	P_r + 280 ms	index bit (0)	
29	P_r + 290 ms	position identifier 3 (P_3)	
30	P_r + 300 ms	days 1	day of the year (1 ... 365 or 366)
31	P_r + 310 ms	days 2	
32	P_r + 320 ms	days 4	
33	P_r + 330 ms	days 8	

34	P_r + 340 ms	index bit (0)	
35	P_r + 350 ms	days 10	
36	P_r + 360 ms	days 20	
37	P_r + 370 ms	days 40	
38	P_r + 380 ms	days 80	
39	P_r + 390 ms	position identifier 4 (P_4)	
40	P_r + 400 ms	days 100	
41	P_r + 410 ms	days 200	
42	P_r + 420 ms	index bit (0)	
43	P_r + 430 ms	index bit (0)	
44	P_r + 440 ms	index bit (0)	
45	P_r + 450 ms	index bit (0)	
46	P_r + 460 ms	index bit (0)	
47	P_r + 470 ms	index bit (0)	
48	P_r + 480 ms	index bit (0)	
49	P_r + 490 ms	position identifier 5 (P_5)	
50	P_r + 500 ms	year 1	The last 2 digits of the year (00 ... 99)
51	P_r + 510 ms	year 2	
52	P_r + 520 ms	year 4	

53	P_r + 530 ms	year 8	
54	P_r + 540 ms	index bit (0)	
55	P_r + 550 ms	year 10	
56	P_r + 560 ms	year 20	
57	P_r + 570 ms	year 40	
58	P_r + 580 ms	year 80	
59	P_r + 590 ms	position identifier 6 (P_6)	
60	P_r + 600 ms	index bit (0)	
61	P_r + 610 ms	index bit (0)	
62	P_r + 620 ms	Daylight Saving Pending (DSP)	1 during the minute before
			beginning or end of DST
63	P_r + 630 ms	Daylight Saving Time (DST)	1 during DST
64	P_r + 640 ms	Time Offset Sign (0=+, 1=-)	difference between local time and UTC (negative for West Greenwich)
65	P_r + 650 ms	Time Offset 1	difference between local time and UTC
66	P_r + 660 ms	Time Offset 2	(-12 ... +12)
67	P_r + 670 ms	Time Offset 4	
68	P_r + 680 ms	Time Offset 8	
69	P_r + 690 ms	position identifier 7 (P_7)	
70	P_r + 700 ms	Time Offset /2	

71	P_r + 710 ms	Time Quality	0000 (0) : locked
72	P_r + 720 ms	Time Quality	1111 (F) : no-time
73	P_r + 730 ms	Time Quality	1011 (B) : never locked
74	P_r + 740 ms	Time Quality	0100 (4) : free-wheeling
75	P_r + 750 ms	Parity (odd)	Módulo 2 of the sum of the data bits 0 a 74 (Bits 75-99 not included in the sum)
76	P_r + 760 ms	index bit (0)	
77	P_r + 770 ms	index bit (0)	
78	P_r + 780 ms	index bit (0)	
79	P_r + 790 ms	position identifier 8 (P_8)	
80	P_r + 800 ms	time-of-day 1	seconds of the year
81	P_r + 810 ms	time-of-day 2	(0 ... 86399 or 86400)
82	P_r + 820 ms	time-of-day 4	
83	P_r + 830 ms	time-of-day 8	
84	P_r + 840 ms	time-of-day 16	
85	P_r + 850 ms	time-of-day 32	
86	P_r + 860 ms	time-of-day 64	
87	P_r + 870 ms	time-of-day 128	
88	P_r + 880 ms	time-of-day 256	
89	P_r + 890 ms	position identifier 9 (P_9)	

90	P_r + 900 ms	time-of-day 512	
91	P_r + 910 ms	time-of-day 1024	
92	P_r + 920 ms	time-of-day 2048	
93	P_r + 930 ms	time-of-day 4096	
94	P_r + 940 ms	time-of-day 8192	
95	P_r + 950 ms	time-of-day 16384	
96	P_r + 960 ms	time-of-day 32768	
97	P_r + 970 ms	time-of-day 65536	
98	P_r + 980 ms	index bit (0)	
99	P_r + 990 ms	position identifier 0 (P_0)	

Alstom Grid

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