

Time Synchronization

GPS Time Synchronization Unit – 7XV5664-1

Description

The GPS time synchronization unit 7XV5664-1 (time signal receiver) provides a complete solution, with the additional components of the mini star coupler 7XV5450, sync transceiver 7XV5654, and pre-assembled cables and adaptors, for the time synchronization of any number of SIPROTEC protection devices.

Optical fiber can be used to transmit time signals (telegrams or pulses) without interference even over greater distances and in electromagnetically polluted environments. In this case, the optical signals are converted in the sync transceiver into electrical signals on the bus (< 200 ns later). The output of different protocols such as IRIG-B or DCF77 makes it also possible to synchronize other devices such as SIMEAS R/R PMU or the SICAM Q80 V3 besides synchronizing SIPROTEC devices.

The GPS antenna is mounted to an exterior wall or on a roof without obstructions towards the sky. The lightning protection should be mounted near the antenna and is looped into the antenna line. The GPS time synchronization unit is supplied with auxiliary voltage from the alternating current power system or the station battery.

Simple PC software makes it possible to set the GPS time synchronization unit via an RS232 interface.

Benefits

- Time receiver with an integrated, high-precision clock and high-grade free running behavior. Accuracy: ± 250 ns
- Special hardware and firmware developed and adapted specifically for the high-precision synchronization of SIPROTEC and SIMEAS devices Type test according to 2004/108/EC, 2006/95/EC, 93/68/EEC and EN61010-1:2010, CAT II, Poll.2
- 3 programmable optical outputs with ST connector for 50/125 or 62.5/125 μm , 850 nm multimode optical fiber for interference-free transmission of the signals/telegrams
- Telegram selection (even simultaneously): IRIG-B (B003+4, B006+7, IEE1344, AFNOR, C37.118). DCF77 in UTC or local time (daylight saving time). DCF77 modified for SIMEAS R V3. Second and minute pulse (high-precision)
- GPS outdoor antenna with wall-mounting holder and 50 m RG58 cable (BNC/N connector)
- Lightning protection with 5 m RG58 cable (N connector)
- Alarm relay (1 change-over contact, SIPROTEC standard)
- Auxiliary voltage, DC/AC 100 V to 240 V (50/60 Hz)
- Operating program with connecting cable, 3 m, PC interface RS232 (9-pole D-sub connector)
- Aluminum housing for DIN rail mounting.

Optional Scope of Delivery

- 7XV5654-0BA00
Sync transceiver:
2 x optical-fiber input for 62.5/125 μm with ST connectors to
2 x electrical, DC 24 V/maximum 50 mA per channel
- 7XV5104-xAAxx
Bus cable system for synchronization of clock time



[ph_gps_1, ...]

Figure 11.3/1 GPS Time Synchronization Unit 7XV5664-1

- 7XV5105-xAAxx
Bus cable system for synchronization using a second pulse
- 7KE6000-8AK or -8AL
SIMEAS sync transceiver:
1 x optical-fiber input for 62.5/125 μm with ST connectors to
1 x electrical, DC 24 V/maximum 20 mA to a terminal

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[Time_sync_comp_1, ...]

Figure 11.3/2 Components in the 7XV5664-1 Scope of Delivery

Application Examples

Time synchronization of the SIPROTEC 4 and SIPROTEC 5 protection devices

The internal time of all connected protection devices is synchronized using the GPS time synchronization unit 7XV5664-1. The internal clock of the protection devices is

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updated using the standardized telegram (IRIG-B, DCF77). IRIG-B C37.118 should be preferred for use with SIPROTEC 5.

The SIPROTEC 4 and SIPROTEC 5 protection devices have special interfaces for time synchronization as standard: SIPROTEC 4 port A, SIPROTEC 5 port G.

The time telegrams or synchronization pulses are transmitted without interference from the three optical outputs to the protection devices distributed within the system using optical fibers.

The optical star structure can be extended using mini star couplers 7XV5450. Sync transceivers 7XV5654 are used to

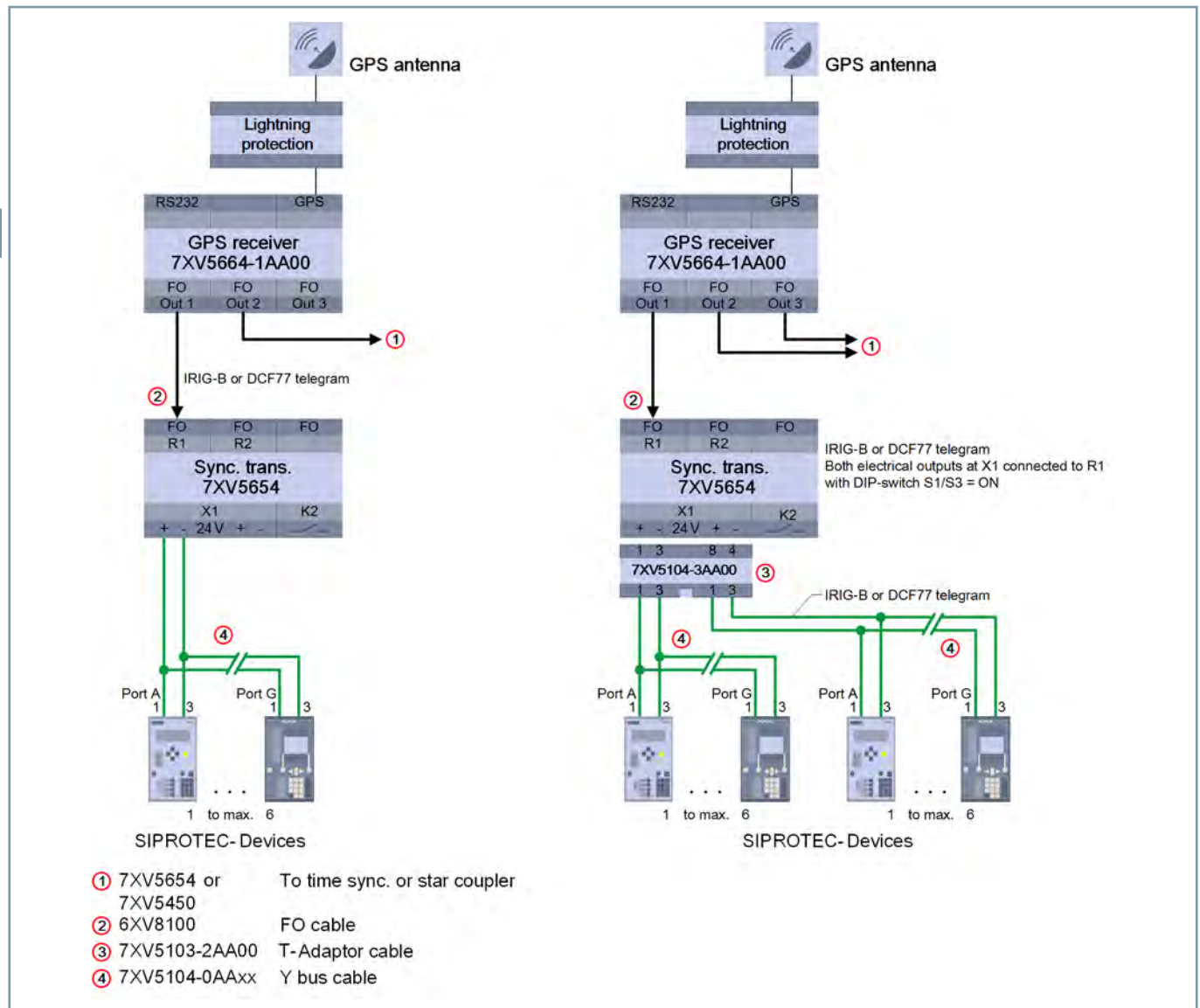
convert the light signals into 24 VDC signals for the SIPROTEC time synchronization interfaces.

You can find detailed application examples in the manual of the sync transceiver 7XV5654.

The SIPROTEC 4 and SIPROTEC 5 protection devices are connected to the sync transceiver 7XV5654 using the specially pre-assembled bus cable system 7XV5104 (see [Figure 11.3/3](#)).

Note: In this case, no bus load resistor is needed.

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[dw_SIP4/5-devices_with_IRIG-B_or_DCF77_time-synchro_3_en_US]

Figure 11.3/3 SIPROTEC 4/5 Protection Device with IRIG-B or DCF77 Time Synchronization

Joint Time Synchronization of SIPROTEC Protection Devices, 7KE85, SIMEAS R-PMU, SICAM Q80 V3

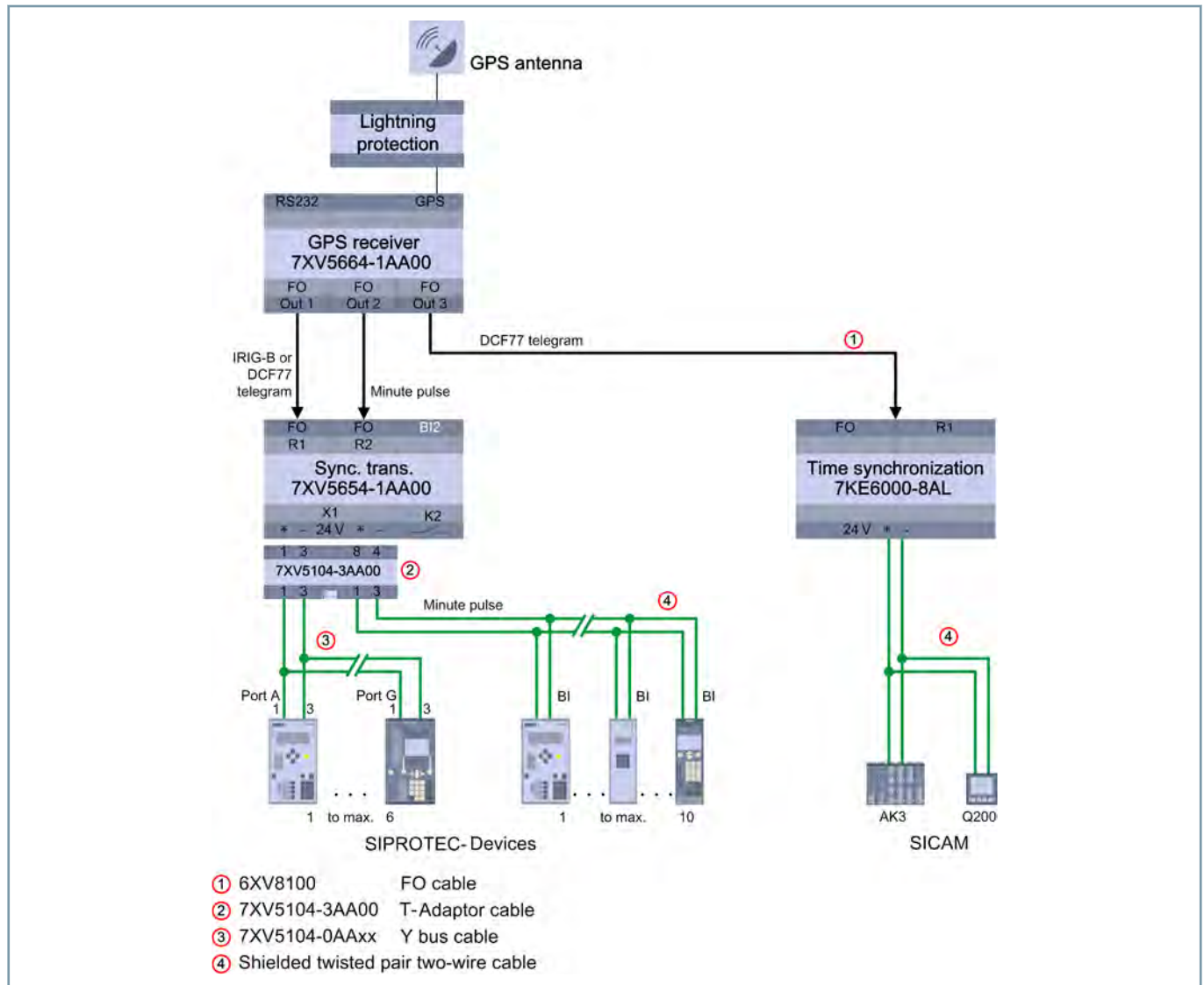


Figure 11.3/4 Joint Time Synchronization of SIPROTEC Protection Devices 3/4/5/PMU, 7KE85, SIMEAS R-PMU, SICAM Q80 V3 Using Different Time Signals

If stored indications, measured values and fault records with a time stamp from different devices are to be compared, time synchronization of all devices is absolutely necessary. This can be ensured only by using a central clock that can synchronize, with high precision, all the devices installed in the system with different synchronization interfaces. The GPS time synchronization unit 7XV5664-1 can handle these requirements. The GPS time synchronization unit can output 3 different telegrams or pulses for the time synchronization of devices, even in parallel, using its 3 optical channels. The connection of the various device models to the system is shown in [Figure 11.3/4](#).

Properties

Many clocks available on the market do offer signals/protocols such as IRIG-B Signal C37.118. However, these usually do not have the required high-precision properties with regard to the

transmission behavior for time. The GPS clock 7XV5664-1, with its special hardware and firmware, has been especially developed and adapted for the high-precision synchronization of SIPROTEC and SIMEAS devices.

The SIPROTEC 4 and SIPROTEC 5 devices are synchronized at port A or D-sub 9, respectively, via the optical output Out 1 of the GPS receiver, channel R1 of the sync transceiver, the T adaptor, and the bus cable system 7XV5104. Here, a choice can be made between the IRIG-B or DCF77 telegrams. Both telegrams can be used for the time synchronization of devices.

If the PMU function (Phasor Measurement Unit) is used in the SIPROTEC 5 devices or the SIPROTEC 5 fault recorder 7KE85, the device are also connected via the 2-wire cable 7XV5104. The PMU function is only synchronized using the IRIG-B C37.118 telegram.

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The GPS time synchronization unit 7XV5664-1 outputs this IRIG-B C37.118 telegram with a higher quality because of its high-precision properties and this forms a basis for the PMU applications of SIPROTEC and SIMEAS.

You can find more detailed information on the applications in the device manuals and application documentation.

The SIMEAS R-PMU V4 (Phasor Measurement Unit) is synchronized using the high-precision rising edge of the DCF77 telegram at the optical output (for example, FO Out 3). The sync transceiver 7XV5654 or the converter 7KE6000-8AK/L is used to convert the optical signals into electrical signals.

The SIMEAS R V3 is synchronized using the modified DCF77 telegram. A synchronization box (7KE6000-8HA*) is not needed when using the GPS clock 7XV5664-1. The sync transceiver 7XV5654 or the converter 7KE6000-8AK/L is used to convert the optical signals into electrical signals.

The SICAM Q80 V3 is synchronized using the rising edge of the DCF77 telegram at the optical output (for example, FO Out 3). The converter 7KE6000-8AK/L is used to convert the optical signals into electrical signals.

You can find a more detailed application description in the Power Quality & Measurements downloads in the document

entitled: "Application description, time synchronization SIMEAS R/SIMEAS R-PMU."

All SIPROTEC protection devices with an internal clock (for example, SIPROTEC V3 and SIPROTEC Compact) can be synchronized using a binary input and the minute pulse from the GPS time synchronization unit. To do this, the internal clock of the protection device is set exactly to the start of the new minute at every complete minute. A condition for this method is that the internal clock of the protection device was properly set once and the auxiliary voltage is buffered against outage. If the clock update does not occur for a longer period of time, the difference between the internal clock of the protection device and the current time of day must be less than one minute. The change between daylight saving and standard time must be performed manually (if desired).

The protection devices are equipped with a binary input that detects the minute pulses by applying appropriate voltage (24 to 60 V or, for the wide range, 24 to 250 VDC) and then provides these pulses to the internal clock. The pulse is distributed to the protection devices via a 2-wire bus to be implemented using shielded twisted cables. All devices must be connected to a grounding system, the cable shields are connected at both ends to the housing.

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Selection and Ordering Data

Description	Order no.															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
GPS time synchronization unit	7	X	V	5	6	6	4	-	1	A	A	□	0			
											▲					
Auxiliary voltage, DC/AC 100 V to 240 V (50/60 Hz)											0					
Auxiliary voltage DC 19 to 72 V											1					
Especially for precise synchronization of SIMEAS R-PMU V4, differential protection applications, SIPROTEC 5 PMU and 7KE85 as well as for time synchronization of SIPROTEC 3/4/5 and PQ devices such as SICAM Q80 V3 and SIMEAS R (sync unit replacement).																
Time receiver with high-precision, integrated clock, with GPS antenna, lightning protection and 50 m (+5 m) RG58 cable. 3 programmable optical outputs (high-precision pulse, IRIG-B, DCF77) with ST connector for 50/125 µm or 62.5/125 µm, 850 nm multimode fiber.																
With alarm relay, DIN rail mounting, parameterization software and cable																