



Fig. 13/126 GPS Time Synchronization Unit 7XV5664-1

### Description

The GPS time synchronization unit (receiver) 7XV5664-1, together with additional components like mini-star coupler 7XV5450, Sync-Transceiver 7XV5654 and prepared cable with plugs, is a comprehensive solution for time synchronization of any number of SIPROTEC protection devices.

The transmission of the time signals (telegram or impulse) takes place, immune to disturbances and over long distances, via a FO cable to the protection cubicles. A sync-transceiver converts the optical signals into electrical signals (< 200 ns delay). The 7XV5664-1 supports protocols like IRIG-B or DCF77 which can be used for the synchronization of further devices, e.g. SIMEAS R, SIMEAS R-PMU or PQ devices like SIMEAS Q80 V3.

The GPS-antenna has to be mounted with a free view to the whole sky, on the top of a roof or an outside wall. Within the antenna cable, the surge protector has to be mounted close to the antenna. The GPS time synchronization unit can be connected to usual AC supply or a station battery.

A simple PC-Software (included in the shipment) facilitates the setting of the receiver via an RS232 interface.

### Features/shipment

- Time receiver with integrated high precision clock, as well as accurate hold over behavior. Accuracy  $\pm 250$  ns.
- Special hard- and firmware, specially designed for the highly precise synchronizing of SIPROTEC and SIMEAS devices. Type test according to 2004/108/EG, 2006/95/EG, 93/68/EWG and EN 61010-1:2010, CAT II, Poll.2.
- 3 variable programmable optical outputs with ST-plugs for 50/125  $\mu\text{m}$  or 62.5/125  $\mu\text{m}$ , 850 nm multi-mode fiber, for disturbance-free transmission of the signals/telegrams.
- Supported telegrams (parallel possible): IRIG-B (B003+4, B006+7, AFNOR, C37.118). DCF77 for UTC or local time (summer time). DCF77 modified for SIMEAS R V3. Highly precise second or minute pulse.
- GPS outdoor antenna with wall mounting, and 50 m RG58 cable (BNC- and N-plug)
- Lightning protection with 5 m RG58 cable (N-plug).
- Auxiliary voltage DC/AC 100–240V (50/60 Hz).
- Fail-safe relay (change-over contact, SIPROTEC Standard).
- Operating program and 3 m connection cable, PC-input RS232 (9-pol. Sub-D plug).
- Aluminum housing for DIN rail mounting.

### Additional components: optional

- **7XV5654-0BA00**  
Sync-Transceiver:  
2 x FO-Input for 62.5/125  $\mu\text{m}$  with ST-plug  
2 x electrical output, DC 24 V / max. 50 mA per channel
- **7XV5104-xAAxx**  
Bus cable system for time synchronization (2 core)
- **7XV5105-xAAxx**  
Bus cable system for precise synchronization (4 core)  
(for synchronization using also highly precise pulse per second)
- **7KE6000-8AK or -8AL**  
SIMEAS Sync-Transceiver:  
1 x FO-Input for 62.5/125  $\mu\text{m}$ , ST-plug  
1 x electrical output, DC 24 V / max. 20 mA, screw-type terminal



Fig. 13/127 Additional components

# Accessories/7XV5664-1

## GPS Time Synchronization Unit 7XV5664-1

### Application

#### Standard Application, Time Synchronization of SIPROTEC 4/5

Using the GPS Time Synchronization Unit 7XV5664-1, the internal time of all connected protection devices can be synchronized. In this way, the internal clock of the protection devices is synchronized by a standardized telegram, e.g. IRIG-B or DCF77. IRIG-B C37.118 is the preferred telegram for SIPROTEC 5.

For this purpose the protection devices SIPROTEC 4 and SIPROTEC 5 provide suitable interfaces for time synchronizing, e.g. SIPROTEC 4 provides Port A, SIPROTEC 5 Port G.

The transmission of the time telegrams or synchronizing impulses takes place via the three optical outputs, immune to interference with FO cable to the protection devices, distributed in the substation. An extension of the optical star structure can be implemented with a mini star coupler 7XV5450.

For the conversion of the FO signals to 24 V signals as required by the SIPROTEC time synchronization interfaces, Sync-Transceivers 7XV5654 are implemented.

Detailed application examples can be found in the manual of the Sync-Transceivers 7XV5654.

The SIPROTEC 4 and SIPROTEC 5 protection devices are connected to the Sync-Transceiver 7XV5654 using the specially designed bus cable system 7XV5104 (see figure 13/128).

**Note:** No bus termination resistance is required here.

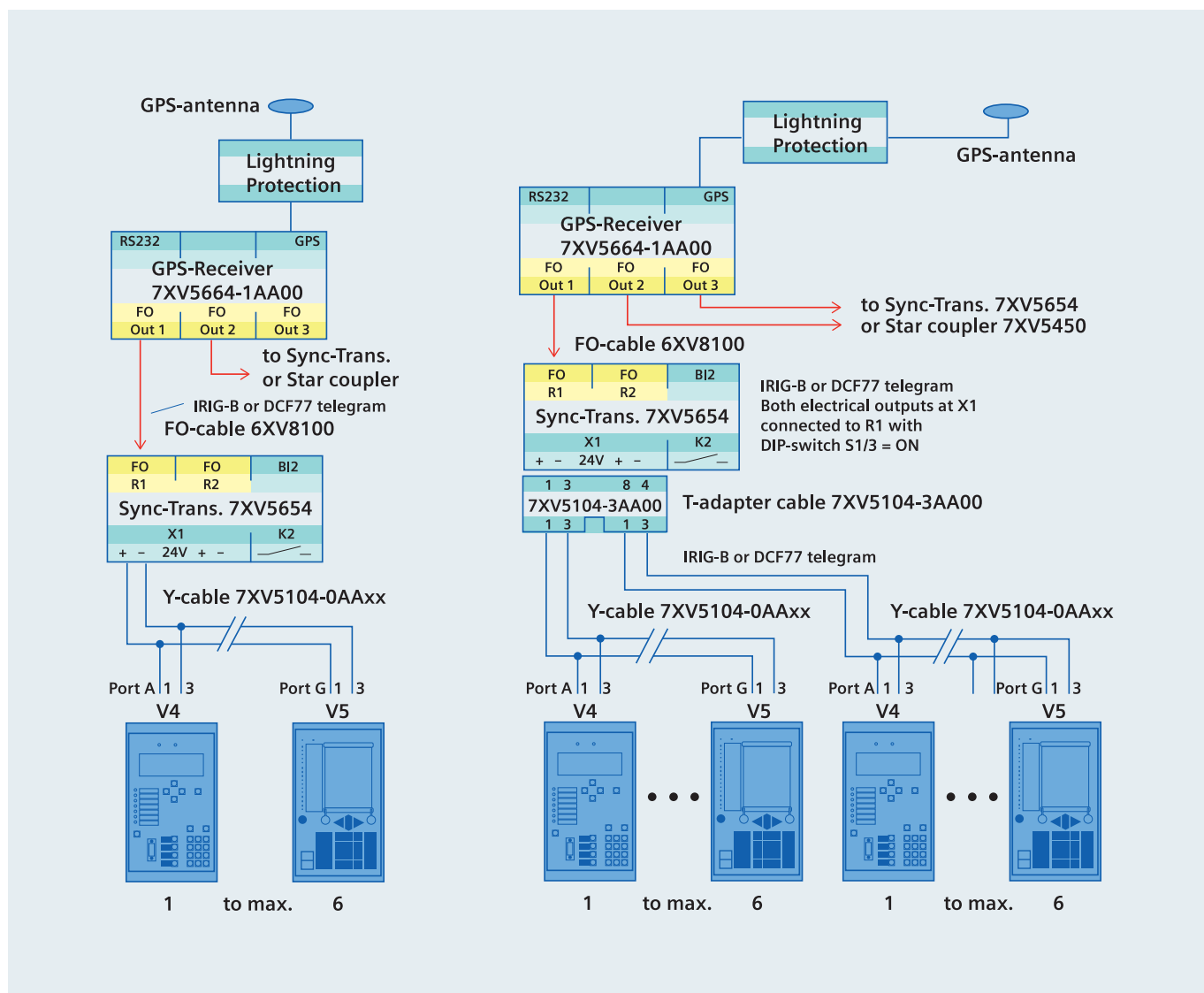
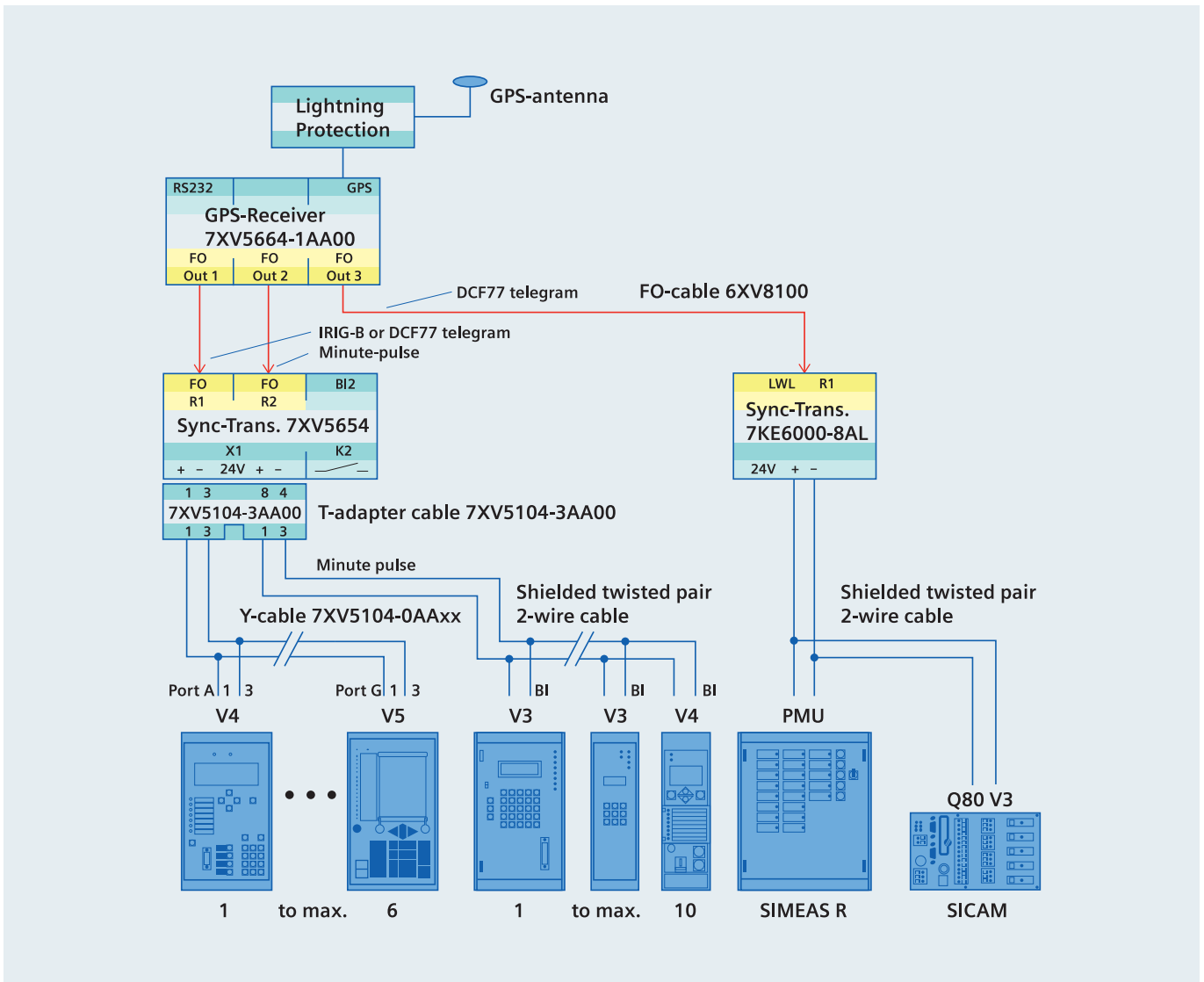


Fig. 13/128 SIPROTEC 4/5 protection devices with IRIG-B or DCF77 time synchronization

### Overall Time Synchronization of SIPROTEC 3 / 4 / 5 / PMU, 7KE85, SIMEAS R-PMU and SICAM Q80 V3

**Note:** Often it is useful to synchronize all devices in a substation from the same source. E.g. to compare recordings of different devices, a synchronized time stamp of different devices can help. To achieve this aim, it is useful only to use one clock, e.g. 7XV5664-1, centrally for all devices.

The GPS Time Synchronization Unit 7XV5664-1 is able to supply three different time signals/telegrams at the same time in parallel on its three optical outputs. The connection to different devices is shown in the figure 13/129.



**Fig. 13/129** Overall time synchronization of SIPROTEC 3 / 4 / 5 / PMU, 7KE85, SIMEAS R-PMU V4 and SICAM Q80 V3. Parallel use of different time signals / telegrams.

# Accessories/7XV5664-1

## GPS Time Synchronization Unit 7XV5664-1

Devices of type SIPROTEC 4 (port A) and SIPROTEC 5 (port G) are connected to optical port "Out 1" of the GPS time synchronization unit, using channel R1 of the Sync-Transceiver, via T-plug and bus cable system 7XV5104. IRIG-B or DCF77 telegrams are used. Detailed information for both telegrams can be found in the manual of the devices.

The GPS Time Synchronization Unit 7XV5664-1 has special hardware and firmware, and is specially designed for the highly precise synchronizing of SIPROTEC and SIMEAS devices.

Due to its highly precise abilities, the 7XV5664-1 is able to send the IRIG-B C37.118 telegram in an extended high quality, which is a requirement for the PMU applications of SIPROTEC and SIMEAS.

If the PMU-function (Phasor Measurement Unit) is used, the devices SIPROTEC 5/PMU/7KE85 are connected via a 2-core cable 7XV5104. IRIG-B C37.118 is used to synchronize the PMU-function. Detailed information can be found in the application descriptions and manuals of the PMU devices.

SIMEAS R-PMU V4 is synchronized using the highly precise rising edge of the signal in the DCF77-telegram at optical output, e.g. FO Out 3. The 7KE6000-8AK/L converts the optical signals into electrical signals.

SIMEAS R V3 is synchronized using the modified DCF77-telegram. The Sync-Box is not necessary if the 7XV5664-1 is used.

SICAM Q80 V3 is synchronized using the rising edge of the signal in the DCF77-telegram at optical output, e.g. FO Out 3. The 7KE6000-8AK/L converts the optical signals into electrical signals.

Detailed application description can be found in Downloads Power Quality, within document:

"SIMEAS R and SIMEAS R-PMU Time Synchronization Application Note".

All SIPROTEC Protection Devices with internal clock (e.g. SIPROTEC V3 and SIPROTEC Compact) can be synchronized using minute impulse from the GPS receiver via a binary input. For this purpose the internal clock of the protection device is set at each full minute to the exact beginning of the new minute. A precondition for this method is that the internal clock of the protection device is set correctly once, and the auxiliary voltage is buffered against failure. If the time tracking fails for a longer period, the difference between the internal clock of the protection device and the actual time has to be smaller than one minute. Summer and winter time have to be set manually, if desired.

Protection devices are fitted with a binary input, which captures the minute impulse using a corresponding voltage (24-60 or wide range 24-250 VDC) and provides this to the internal clock. The distribution of the impulse to the protection devices takes place via a 2-wire bus, which has to consist of a screened twisted pair. All devices must be located in the same grounded system, the cable screens must be connected to the housing on both sides.

Description	Order No.
<b>GPS time synchronization unit (receiver)</b>	7XV5664-1AA00
Specific GPS time synchronization unit specific for precise synchronizing of SIMEAS R/R-PMU V4, SIPROTEC 5-PMU and 7KE85 and also for the normal SIPROTEC and PQ time synchronizing, e.g. SICAM Q80 V3. Time receiver with 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-plugs for 50/125 µm or 62.5/125 µm, 850 nm multi-mode fiber. Auxiliary voltage DC/AC 100–240 V (50/60 Hz). With fail-safe relay, change-over contact. DIN rail mounting. Parameterization-SW and -cable.	
<b>Additional Accessories for Time Synchronization</b>	
<b>Sync-Transceiver</b>	7XV5654-0BA00
Sync-Transceiver for conversion of 2 optical timing signals to DC 24 V for the time synchronizing interface of SIPROTEC 4/5. 2 optical inputs with ST-plugs and 2 electrical outputs. Minute or second impulse for special applications is also supported.	
<b>Y-bus cable for time synchronizing SIPROTEC 4/5 (2-core)</b>	7XV5104-0AA <input type="checkbox"/> <input type="checkbox"/>
Y-bus cable 2-core screened with 9-pole sub-D connector and metallic housing for clock synchronization SIPROTEC 4/5 Length 1 m	0 1
Length 3 m	0 3
Length 5 m	0 5
Length 10 m	1 0
<b>Bus length extension cable (2-core)</b>	
Cable for bus length extension. Copper cable with 2-wires, shielded with 9-pole sub-D plugs. Length 10 m	7XV5104-1AA10
<b>Adapter cable to Sync.-Transceiver 7KE6000-8 (2-core)</b>	
Adapter cable to Sync.-Transceiver 7KE6000-8Ax. Length 0.3 m. Shielded, 2-wires with crimp lugs to 9-pole sub-D plug (female)	7XV5104-2AA00
<b>Adapter cable for 2 Busses (2 times 2-core)</b>	
Adapter cable 2-core screened for Sync-Transceiver 7XV5654-0BA00 for distribution with 2 busses for max. 6 SIPROTEC 4/5 relays.	7XV5104-3AA00
<b>Y-bus cable (4-core, with second pulse) for precise synchronizing of SIPROTEC 4/5 Diff.-Protection</b>	7XV5105-0AA <input type="checkbox"/> <input type="checkbox"/>
Y-bus cable 4-core screened with 9-pole sub-D connector and metallic housing for clock synchronization of SIPROTEC 4/5, e.g. 7SD Length 1 m	0 1
Length 3 m	0 3
Length 5 m	0 5
Length 10 m	1 0
<b>Bus length extension cable (4-core, with pulse per second) for precise synchronizing of SIPROTEC 4/5 Diff.-Protection</b>	
Cable for bus length extension. Copper cable with 4-core, shielded with 9-pole sub-D plugs. Length 10 m.	7XV5105-1AA10
<b>SIMEAS Sync-Transceiver (for SICAM/SIMEAS devices)</b>	7KE6000-8AL
Sync-Transceiver for connection to interface of SICAM/SIMEAS devices. 1 x FO-Input for 62.5/125 µm, ST-plug 1 x electrical output, DC 24 V / max. 20 mA, screw-type terminal.	