

SIEMENS



www.siemens.com/protection

SIPROTEC 5 Application Note

SIP5-APN-004:
Sync Check with multiple voltage sources

SIPROTEC 5 - Application:

SIP5-APN-004

Sync Check with multiple voltage sources

Content

| | | |
|-----|--|---|
| 1 | Sync Check with multiple voltage sources | 3 |
| 1.1 | Summary | 3 |
| 1.2 | Introduction | 3 |
| 1.3 | Definitions: | 4 |
| 1.4 | Device Configuration | 4 |
| 1.5 | Selection Logic | 5 |
| 1.6 | Implementation of Selection Logic | 8 |

1 Sync Check with multiple voltage sources

1.1 Summary

This application describes how to use multiple voltage sources for Synch Check within SIPROTEC 5 devices.

1.2 Introduction

For the breaker-and-a-half configuration the sync check function must select the voltage depending on the switching state of the primary plant. The following schematic diagram is used to define the selection logic:

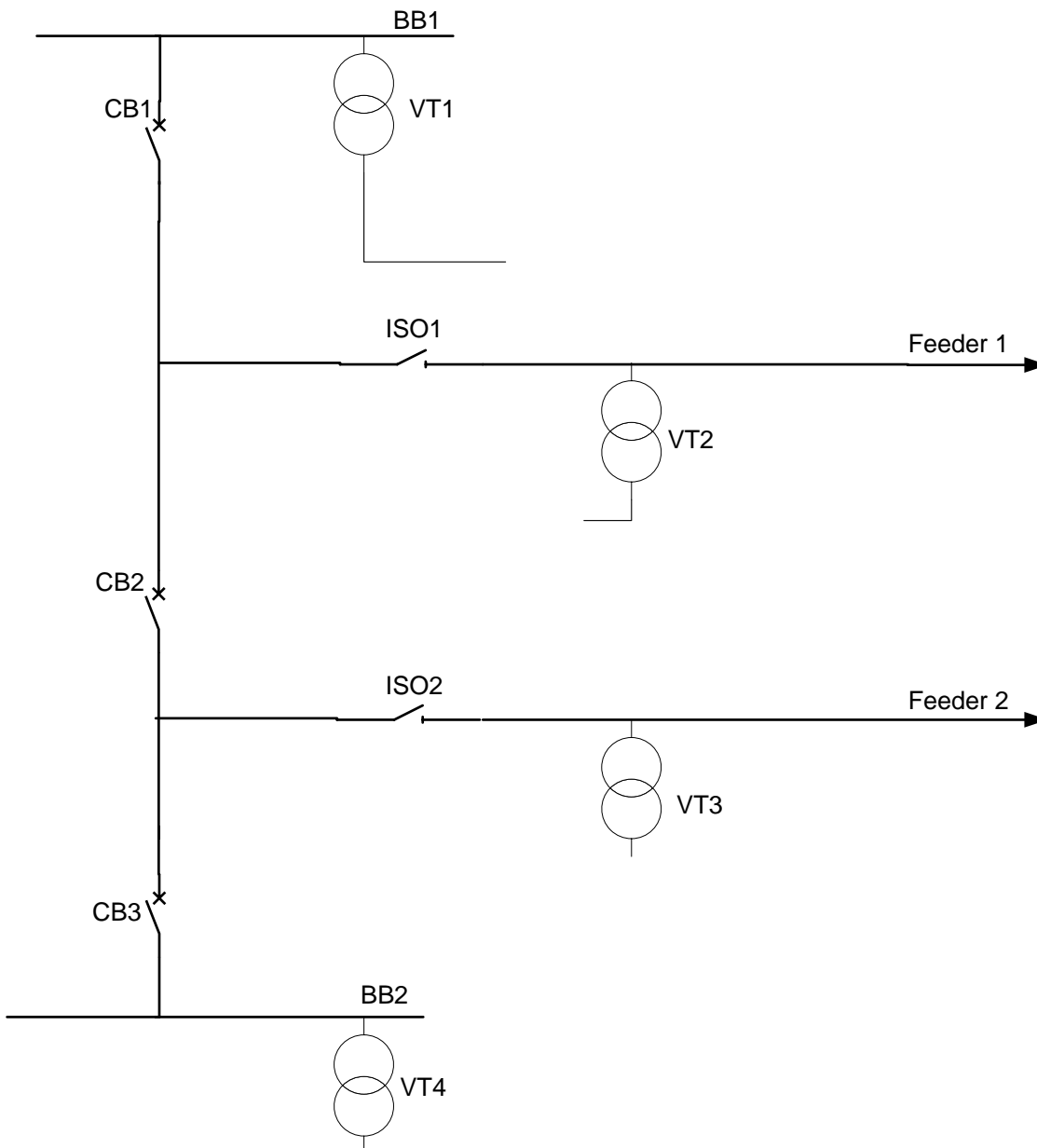


Figure 1: schematic diagram of breaker-and-a-half

As a typical physical device will only contain the breaker groups for two circuit breakers the selection logic is defined for CB1 and CB2. The selection for CB3 can be done in an analogous manner.

SIPROTEC 5 Application

Sync Check with multiple voltage sources

1.3 Definitions:

Switching State:

The switching state a CB includes the associated breaker isolators so that the open state is true when any of the series connections is open.

Measured Voltage:

Each of the voltage measuring points may be a single or three phase measurement type. The single phase measurements must all be of the same type, either Ph-G or Ph-Ph. A mix of Ph-G and Ph-Ph will cause a consistency alarm.

Sync Check Functions:

Each CB will have a dedicated Sync Check function with two voltage measurements (Vsyn1 and Vsyn2). A selection logic to assign any one of the 4 measured voltages is implemented below.

1.4 Device Configuration

Assign the necessary Voltage Measuring Points.

| ▼ Voltage-measuring points | | ▶ Base module | | | | ▶ Expansion module 1 | | | |
|----------------------------|----------------------|---------------|----------|----------|----------|----------------------|----------|----------|----------|
| | | ▶ 1B | | | | ▶ 3B | | | |
| | | 1B1-1B2 | 1B3-1B4 | 1B5-1B6 | 1B7-1B8 | 3B1-3B2 | 3B3-3B4 | 3B5-3B6 | 3B7-3B8 |
| Measuring point | Connection type | V1 | V2 | V3 | V4 | V5 | V6 | V7 | V8 |
| (All...) | (All...) | (All...) | (All...) | (All...) | (All...) | (All...) | (All...) | (All...) | (All...) |
| Meas.point V-3ph 1 | 3 ph-to-gnd voltages | V A | V B | V C | | | | | |
| Meas.point V-1ph 1 | | | | | V A | | | | |
| Meas.point V-1ph 2 | | | | | | V A | | | |
| Meas.point V-1ph 3 | | | | | | | V A | | |
| Add new | | | | | | | | | |

Figure 2: Assignment of voltage measuring points

In the above diagram the 3ph-to-gnd measured voltage (V1 – V3) corresponds to VT2, the line side VT on Feeder 1. The three single phase measured voltages (V4, V5 and V6) correspond to the other three VT's.

| VT | Measuring Point | Type | Connection | ID |
|-----|-------------------------|------------|------------|------|
| VT1 | Measuring point V-1ph 1 | VA | V4 | ID 3 |
| VT2 | Measuring point V-3ph 1 | 3ph-to-gnd | V1 – V3 | ID 2 |
| VT3 | Measuring point V-1ph 2 | VA | V5 | ID 4 |
| VT4 | Measuring point V-1ph 3 | VA | V6 | ID 6 |

Figure 3: Identification of measuring points

In the function group connections all these Voltage Measuring Points appear for further selection. The identification tag (ID) assigned to each measuring point must be noted:

| Connect measuring points to function group | | | | | | | | | | | |
|--|----------|------------|----------|-------------------|----------|----------|----------|-------------------|----------|----------|----------|
| Measuring point | Line 1 | | | Circuit breaker 1 | | | | Circuit breaker 2 | | | |
| | V 3ph | I line 3ph | V | I 3ph | V sync1 | V sync2 | V | I 3ph | V sync1 | V sync2 | |
| (All...) | (All...) | (All...) | (All...) | (All...) | (All...) | (All...) | (All...) | (All...) | (All...) | (All...) | (All...) |
| Meas.point I-3ph 1[ID 5] | | x | | x | | | | | | | |
| Meas.point I-3ph 2[ID 1] | | x | | | | | | x | | | |
| Meas.point V-3ph 1[ID 2] | x | | x | | | x | x | | x | | |
| Meas.point V-1ph 1[ID 3] | | | | | x | | | | x | | |
| Meas.point V-1ph 2[ID 4] | | | | | | x | | | | | x |
| Meas.point V-1ph 3[ID 6] | | | | | | x | | | | | x |

Figure 4: Connection of measuring points to function group.

1.5 Selection Logic

The process for this selection is explained in this chapter.

Circuit breaker 1 (CB1):

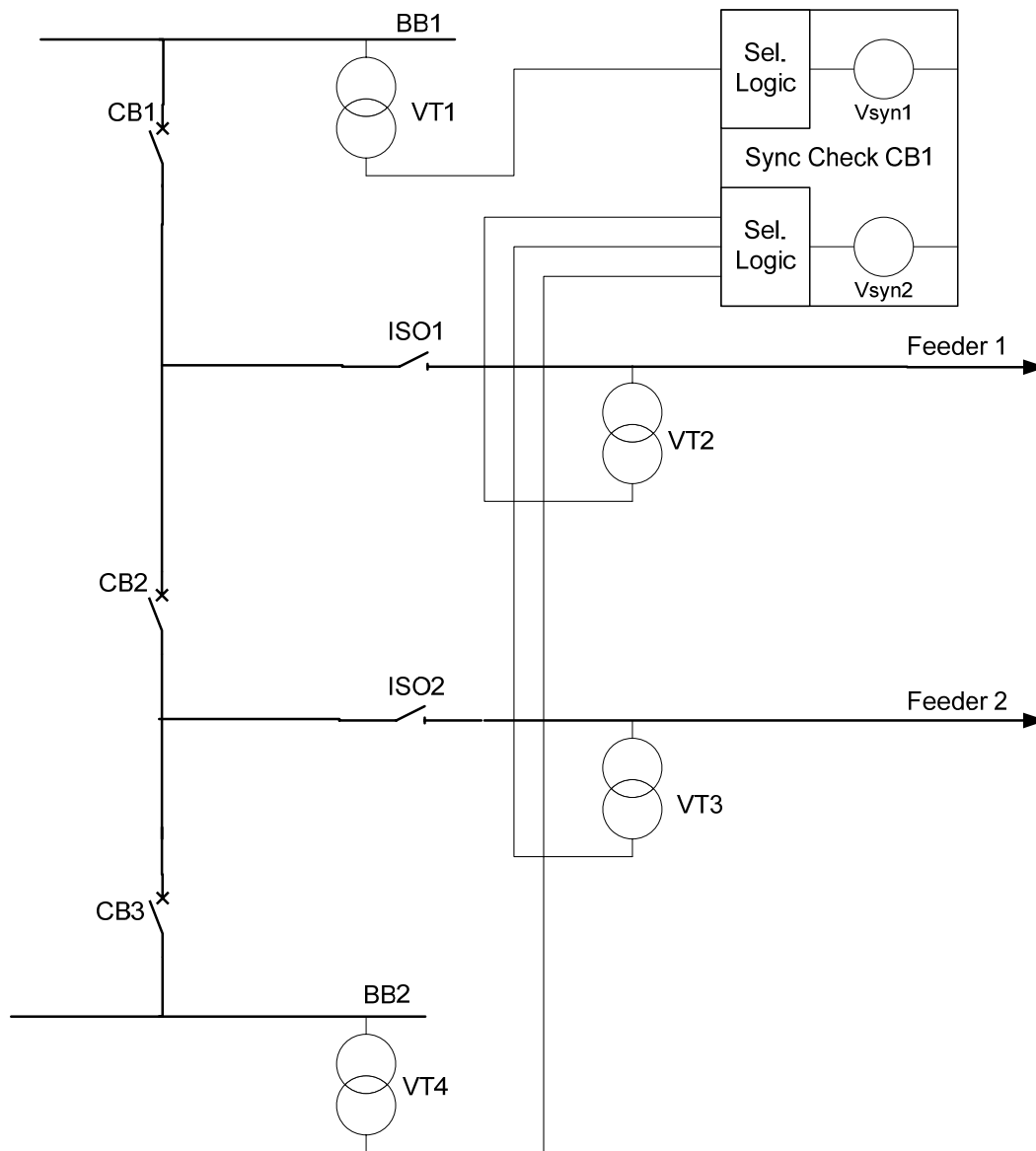


Figure 5: Selection Logic for CB1

SIPROTEC 5 Application

Sync Check with multiple voltage sources

For CB 1 the 4 voltage measurements are routed to the sync check voltage measurement as shown. The selection logic is as follows:

CB1 VSYN1

| VT | ID | Logic [AND] |
|-----|------|-------------|
| VT1 | ID 3 | - |

CB1 VSYN2

| VT | ID | Logic [AND] |
|--------------|------|--|
| VT2 | ID 2 | ISO1 = CLOSED |
| VT3 | ID 4 | ISO1 = OPEN CB2 = CLOSED ISO2 = CLOSED |
| VT4 | ID 6 | ISO1 = OPEN CB2 = CLOSED ISO2 = OPEN CB3 = CLOSED |
| Bypass/Alarm | | ISO1 = OPEN CB2 = OPEN |
| Bypass/Alarm | | ISO1 = OPEN CB2 = CLOSED ISO2 = OPEN CB3 = OPEN |

SIPROTEC 5 Application

Sync Check with multiple voltage sources

For CB 2 the 4 voltage measurements are routed to the sync check voltage measurement as shown. The selection logic is as follows:

CB2 VSYN1

| VT | ID | Logic [AND] |
|--------------|------|-----------------------------|
| VT2 | ID 2 | ISO1 = CLOSED |
| VT1 | ID 3 | ISO1 = OPEN CB1 = CLOSED |
| Bypass/Alarm | | ISO1 = OPEN CB1 = OPEN |

CB2 VSYN2

| VT | ID | Logic [AND] |
|--------------|------|-----------------------------|
| VT3 | ID 4 | ISO2 = CLOSED |
| VT4 | ID 6 | ISO2 = OPEN CB3 = CLOSED |
| Bypass/Alarm | | ISO2 = OPEN CB3 = OPEN |

1.6 Implementation of Selection Logic

For each circuit breaker function group a “Voltage selection” is applied from the Global Library.

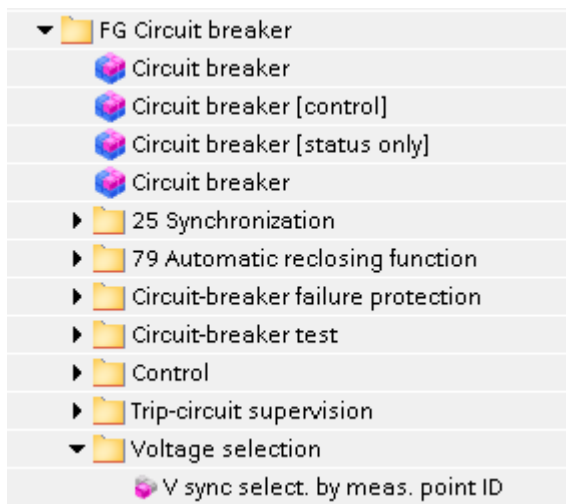


Figure 7: Global Library

The Voltage selection has no settings. It can be found in the Routing Matrix:

| | | | | |
|---|------------------------|---------------|-----|---|
| ▼ | Circuit breaker 1 | 301 | | * |
| ▶ | Trip logic | 301.5341 | | |
| ▶ | Circuit break. | 301.4261 | | * |
| ▶ | Manual close | 301.6541 | | |
| ▶ | Control | 301.4201 | | |
| ▶ | Interlocking | 301.4231 | | |
| ▶ | CB test | 301.6151 | | |
| ▶ | 50BF CB fail.1 | 301.4381 | | * |
| ▼ | V sync select. | 301.10711 | | |
| | ◆ V sync1 | 301.10711.500 | INS | |
| | ◆ V sync2 | 301.10711.501 | INS | |
| | ▶ Health | 301.10711.53 | ENS | |
| | ◆ Sel. V sync1 invalid | 301.10711.300 | SPS | |
| | ◆ Sel. V sync2 invalid | 301.10711.301 | SPS | |
| ▶ | Fundamental | 301.1501 | | |

Figure 8: Routing Matrix

The elements “V sync1” and “V sync2” of type Integer Status must be defined in the CFC based on the selection Logic:

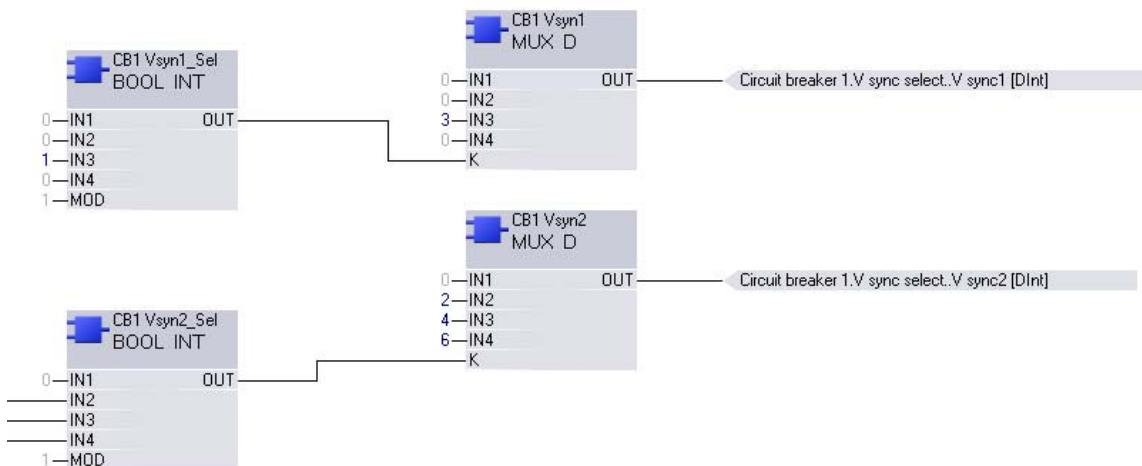


Figure 9: CFC Logic

The ID of the selected VT is routed to “V sync select, V sync1 or 2” with the MUX D gate as shown above. E.g. for CB1 the V sync1 is always VT1 (ID3) – therefore only the value “3” at “IN3” is configured. For Vsync2 the selectable Vt’s are VT2(ID2), VT3(ID4) and VT4(ID6). The values 2, 4 and 6 are therefore configured at IN2, IN3 and IN4 respectively.

The Selection Logic identifies the selected voltage via the BOOL INT gate. For CB1 the selection VT1 (ID3) is fixed to the fixed selection of IN3 = 3. For Vsync2 the selection logic selects the applicable synchronizing voltage via the Boolean inputs IN2 (ID2), IN3 (ID4) and IN4 (ID6) of the BOOL INT gate.

Published by and copyright © 2013:

Siemens AG

Infrastructure & Cities Sector

Smart Grid Division

Humboldtstr. 59

90459 Nuremberg, Germany

Siemens AG

Infrastructure & Cities Sector

Smart Grid Division

Energy Automation

Humboldtstr. 59

90459 Nuremberg, Germany

www.siemens.com/protection

Printed on elementary chlorine-free bleached paper.

All rights reserved.

If not stated otherwise on the individual pages of this catalog, we reserve the right to include modifications, especially regarding the stated values, dimensions and weights. Drawings are not binding.

All product designations used are trademarks or product names of Siemens AG or other suppliers.

If not stated otherwise, all dimensions in this catalog are given in mm.

Subject to change without prior notice.

The information in this document contains general descriptions of the technical options available, which may not apply in all cases. The required technical options should therefore be specified in the contract.

For more information, please contact our Customer Support Center.

Tel.: +49 180 524 8437

Fax: +49 180 524 24 71

(Charges depending on provider)

E-mail: support.ic@siemens.com

Application note: SIP5-APN-004