

S5-135/155U	I/O	U	I	Adapter	S7-1500
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6ES5470-4UA13	8 AO	Strom- / Spannungsmessung current- / voltage metering		6EZ2041-8UG11-0AA0	6ES7532-5HD00-0AB0
6ES5470-4UB13	8 AO	Strom- / Spannungsmessung current- / voltage metering		6EZ2041-8UG11-0AA0	6ES7532-5HD00-0AB0
6ES5470-4UC13	8 AO	Strom- / Spannungsmessung current- / voltage metering		6EZ2041-8UG11-0AA0	6ES7532-5HD00-0AB0
6ES5470-4UA13	8 AO	Strom- / Spannungsmessung current- / voltage metering		6EZ2041-8UG11-1AA0	6ES7532-5HF00-0AB0
6ES5470-4UB13	8 AO	Strom- / Spannungsmessung current- / voltage metering		6EZ2041-8UG11-1AA0	6ES7532-5HF00-0AB0
6ES5470-4UC13	8 AO	Strom- / Spannungsmessung current- / voltage metering		6EZ2041-8UG11-1AA0	6ES7532-5HF00-0AB0

Modulbreite 25mm / width of module 25mm / ET200MP					
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6ES5420-4UA14	32 DI	24 VDC		6EZ2041-8UG21-0DE0	6ES7521-1BL10-0AA0
6ES5430-4UA14	32 DI	24 VDC		6EZ2041-8UG21-0DE0	6ES7521-1BL10-0AA0
6ES5431-4UA12	16 DI	24-60VDC		6EZ2041-8UG21-0DE1	6ES7521-1BH10-0AA0
6ES5431-4UA12	16 DI	24-60VDC		6EZ2041-8UG21-1DE1 Massen gebrückt / ground is bridged	6ES7521-1BH10-0AA0
6ES5432-4UA12	32 DI	24VDC		6EZ2041-8UG21-0DE2	6ES7521-1BL10-0AA0
6ES5432-4UA12	32 DI	24V		6EZ2041-8UG21-1DE2	6ES7521-1BL10-0AA0
6ES5441-4UA14	32 DO	24 VDC	0,5A	6EZ2041-8UG21-0DA0	6ES7522-1BL10-0AA0
6ES5451-4UA14	32 DO	24 VDC	0,5A	6EZ2041-8UG21-0DA0	6ES7522-1BL10-0AA0
6ES5482-4UA11	16DI/16DO	24 VDC	0,5A	6EZ2041-8UG21-0EA0	6ES7523-1BL00-0AA0
6ES5460-4UA13	8 AI	Spannungsmessung / voltage metering		6EZ2041-8UG21-0AE0	6ES7531-7QD00-0AB0
6ES5460-4UA13	8 AI	Strommessung / 4-Draht-Messumformer current metering / 4-wire-transducer		6EZ2041-8UG21-0AE1	6ES7531-7QD00-0AB0
6ES5460-4UA13	8 AI	Strommessung / 2-Draht-Messumformer current- metering / 2-wire-transducer		6EZ2041-8UG21-0AE2	6ES7531-7QD00-0AB0

				6EZ2041-8UG01-0DU1	Klemmenadapter / terminal adapter
				6EZ2041-8UG01-0DU0	offenes Kabelende / openended
Zubehör				6EZ2041-8UG00-0BG0	Montagewinkelset / mounting brackets (set)

Zielbaugruppe 0,5A / S7-1500 module with 0,5A
rangiert auf zwei Baugruppen S7 / switched on 2 S7-modules
max. 24 VDC
Baugruppendaten beachten / observe technical data

9.7 The 470 Analog Output Module

9.7.1 Design

The module is designed as a plug-in PCB for central controllers and expansion units with a backplane connector and with a blade connector to accept a plug-in front connector. You can directly connect the process signal lines to the front connector, which is available separately, with screw or crimp terminals.

Addressing Switch, Mode Switches

Situated on each module is an addressing switch with six rockers to set the module address.

The modules are protected by covers on both sides.

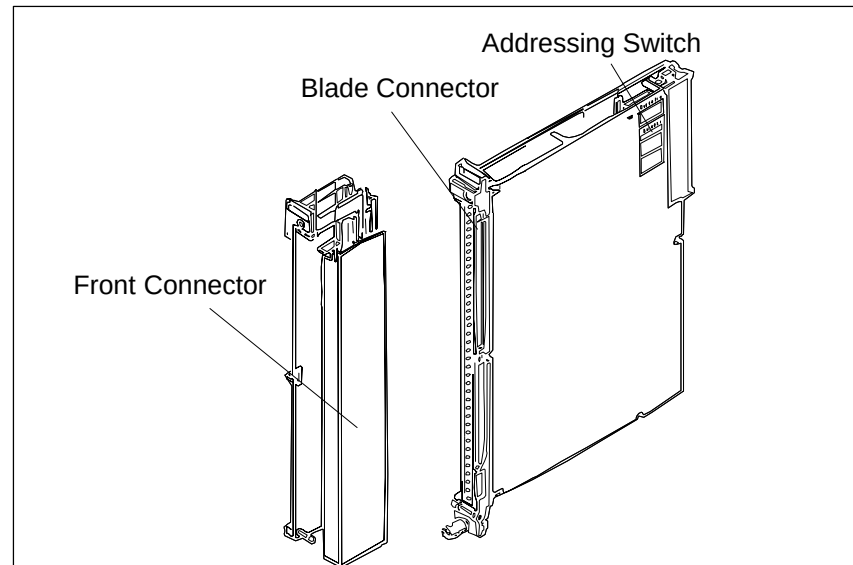


Figure 9-37 Analog Output Module

9.7.2 Function of the Enable Input

The 470 module has an enable circuit. You can use the enable inputs to switch off individual modules whilst the PLC is in operation.

This means that:

- The module can no longer be addressed by the user program.
- On analog output modules, the last analog value to be output is retained.

Modules which are switched off can be removed or inserted during operation. If this is not necessary, operate the module with the enable input switched off.

Enable Input

The enable circuit requires an external 24 V voltage at enable inputs F+/F- in the front connector. If there is no voltage at F+/F-, the modules will not acknowledge.

When the front connector is swivelled away from the front strip of the module, the supply of power to the enable input is interrupted, i.e. the module is switched off and can no longer be addressed by the user program: a timeout (QVZ) occurs in the CC.

Switching Off the Enable Input

The -4Ux12/13-type modules additionally offer the facility for changing the enable mode. The modules have a jumper accessible from above in the vicinity of the addressing switch.

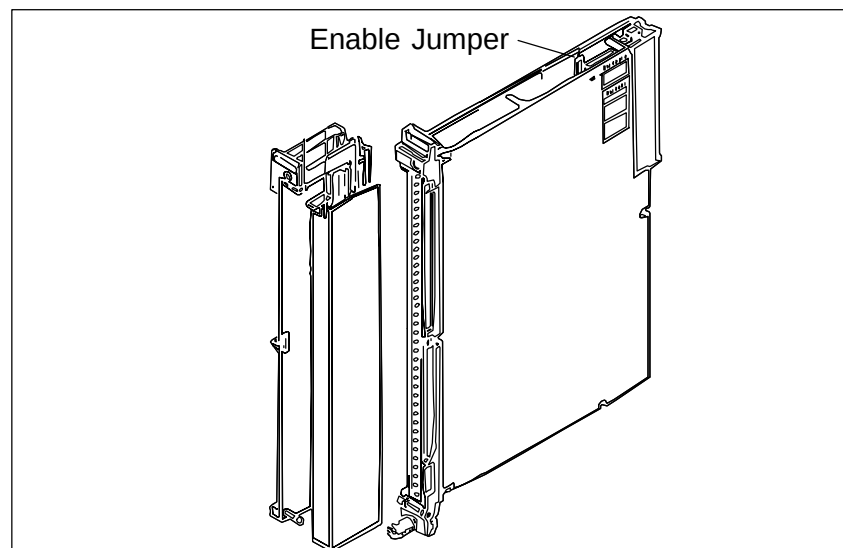


Figure 9-38 Enable Input and Enable Jumper

Jumper inserted: Enable input (F+/F-) active (factory setting)

Jumper open: Enable input (F+/F-) switched off

Examples of functioning of the enable inputs:

- To switch off individual subprocesses, i.e. outputs of various modules can be operated from a common load supply and yet activated separately.
- The load voltage of individual modules can be monitored without additional circuitry. Any reactions to failure of the load voltage can be programmed in the QVZ (timeout) organization block.

**Addressing for
Cyclic/Selective
Sampling**

However, analog input modules and analog output modules may be given the same address with cyclic sampling because they are distinguished by the user program. This is not possible with selective sampling.

For cyclic sampling, you can address the module in the address range from 0 to 255, and for selective sampling from 128 to 255. For selective sampling, you can also use the address range from 0 to 127 after appropriate programming in DB 1 of the user program.

Example:

On an analog output module with 8 outputs with start address 144 (IB 144 = output byte 144), output channel 7 is to be scanned by the program.

Step	Action
1	Affix the self-adhesive label with address 160 on the free field under the addressing switch on the module. ADB 4 and ADB 7 are marked on the label.
2	Press the appropriate rockers of the addressing switch down on the side marked by a dot on the module cover. Set the other rockers to the opposite setting. This sets the start address of the module. ADB 4 and ADB 7 results in $2^4 + 2^7 = 16 + 128 = 144$
3	Enter the address $144 + 7 \times 2 = 158$ in the program for input channel 7.

9.7.8 Connecting Loads to the 470 Analog Output Module

The voltage at the load is measured at a high resistance via the sensor lines (S+/S-) of voltage output QV, so that voltage drops on the load lines do not falsify the load voltages. Lines S+(x) and S-(x) should therefore be directly connected to the load (four-wire circuit). The voltage drops on the lines from QV(x) to the load and from the load to M_{ANA} must not exceed 3 V.

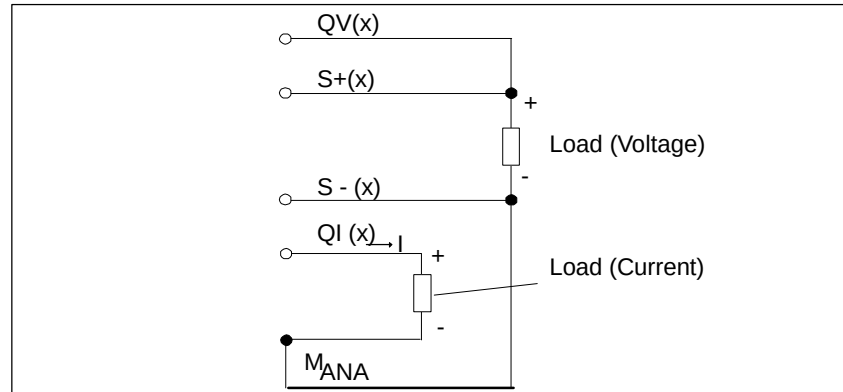


Figure 9-42 Connecting Loads

QV(x)	Voltage output, voltage on Channels 0 to 7
QI(x)	Current output, current on Channels 0 to 7
S+(x)	Sensor line (+) for Channels 0 to 7
S-(x)	Sensor line (-) for Channels 0 to 7
M _{ANA}	Ground terminal for the analog section

Connecting Loads to Current and Voltage Outputs

When current and voltage outputs are used on the 470-4UA/-4UC... analog output modules, connect the loads as follows:

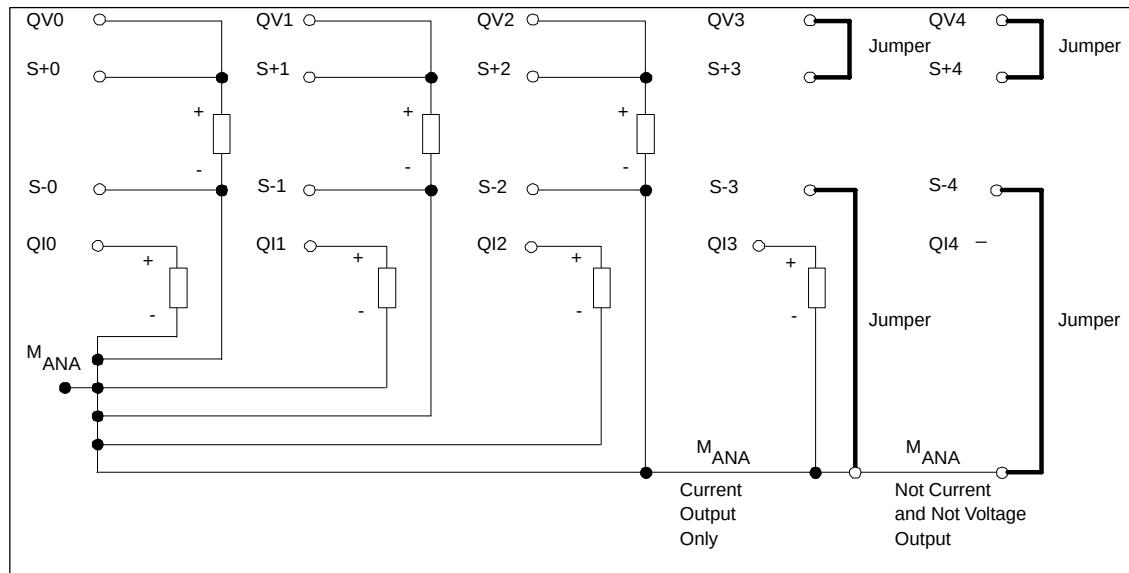


Figure 9-43 Connecting Loads

If, with voltage outputs, an excessively great voltage drop must be expected on the lines to the load, you must route the sensor lines $S+(x)$ and $S-(x)$ to the load.

When voltage outputs are not used, the $S+(x)$ sensor lines in the front connector must be connected to the corresponding voltage output terminals ($QV(x)$) with wire jumpers. The $S-(x)$ sensor lines must be connected to M_{ANA} with wire jumpers.

You must also insert the same jumpers if only current outputs are used. Unused current outputs may remain open.

The maximum load for the current outputs including line resistance, must not exceed 300 ohms.

Connecting Loads to Voltage Outputs

The voltage outputs of the 470 analog output module are wired as follows:

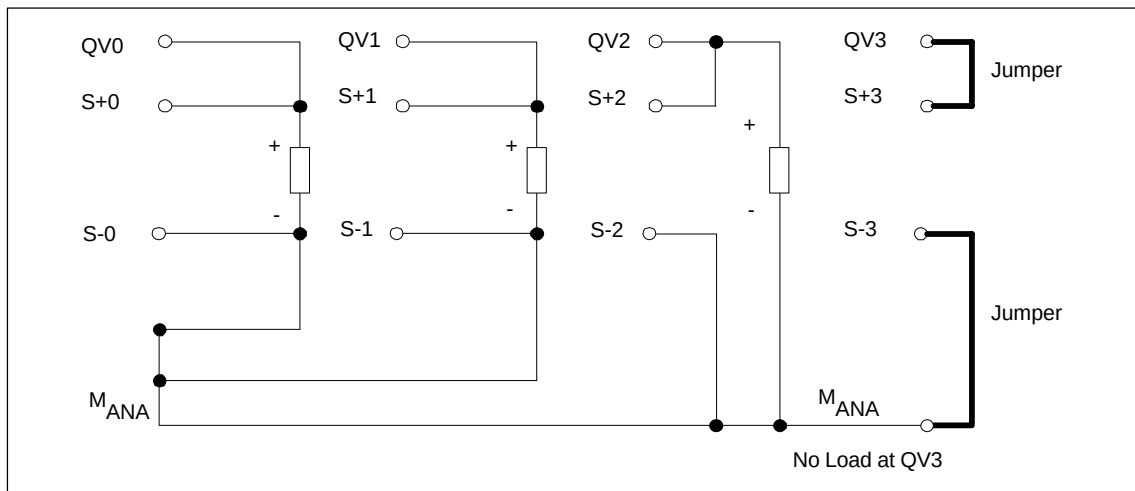


Figure 9-44 Connecting Loads

Four-Wire Circuit

The $S+(x)$ and $S-(x)$ sensor lines must be routed to the load (four-wire circuit) if the voltage drop on the lines to the load is not negligible. The common connection for the voltage outputs is M_{ANA} . If the voltage drop on lines to the load is negligible, you can connect $S+(x)$ to $QV(x)$ and $S-(x)$ to M_{ANA} in the front connector.

When voltage outputs are unused, you must insert jumpers in the front connector, e.g. $QV(3)$ to $S+(3)$ and $S-(3)$ to M_{ANA} for unused voltage output 3 (see previous section).

9.7.9 Measured-Value Representation

Digital Measured-Value Representation as Two's Complement

Units	Output Voltage or Current of the 470 Analog Output Module				Byte 0								Byte 1							
	-4UA/B12/13	-4UA12/13	-4UC12/13		7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
					2 ¹¹	2 ¹⁰	2 ⁹	2 ⁸	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰	x	x	x	x
1280	12.5 V	25.0 mA	6.0 V	24.0 mA	0	1	0	1	0	0	0	0	0	0	0	0	Overrange			
1025	10.0098 V	20.0195mA	5.004 V	20.016 mA	0	1	0	0	0	0	0	0	0	0	0	1				
1024	10.0 V	20.0 mA	5.0 V	20.0 mA	0	1	0	0	0	0	0	0	0	0	0	0	Rated Range			
1023	9.99 V	19.98 mA	4.995 V	19.98 mA	0	0	1	1	1	1	1	1	1	1	1	1				
512	5.0 V	10.0 mA	3.0 V	12.0 mA	0	0	1	0	0	0	0	0	0	0	0	0				
256	2.5 V	5.0 mA	2.0 V	8.0 mA	0	0	0	1	0	0	0	0	0	0	0	0				
128	1.25 V	2.5 mA	1.5 V	6.0 mA	0	0	0	0	1	0	0	0	0	0	0	0				
64	0.625 V	1.25 mA	1.25 V	5.0 mA	0	0	0	0	0	1	0	0	0	0	0	0				
1	9.8 mV	19.5 mA	1.004 V	4.016 mA	0	0	0	0	0	0	0	0	0	0	1	0				
0	0 V	0 mA	1.0 V	4.0 mA	0	0	0	0	0	0	0	0	0	0	0	0				
- 1	- 9.8 mV	0 mA	0.996 V	3.984 mA	1	1	1	1	1	1	1	1	1	1	1	1				
- 64	- 0.625 V	0 mA	0.75 V	3.0 mA	1	1	1	1	1	1	0	0	0	0	0	0				
- 128	- 1.25 V	0 mA	0.5 V	2.0 mA	1	1	1	1	1	0	0	0	0	0	0	0				
- 256	- 2.5 V	0 mA	0 V	0 mA	1	1	1	1	0	0	0	0	0	0	0	0				
- 512	- 5.0 V	0 mA	- 1 V	0 mA	1	1	1	0	0	0	0	0	0	0	0	0				
-1024	- 10.0 V	0 mA	- 3.0 V	0 mA	1	1	0	0	0	0	0	0	0	0	0	0				
-1025	-10.0098V	0 mA	- 3.004V	0 mA	1	0	1	1	1	1	1	1	1	1	1	1	Overrange			
-1280	-12.5 V	0 mA	- 5.0 V	0 mA	1	0	1	1	0	0	0	0	0	0	0	0				

9.7.10 Technical Specifications

6ES5 470-4UA12, 6ES5 470-4UB12 and 6ES5 470-4UC12 Analog Output Modules

Rated output ranges - 6ES5 470-4UA12 (-4UA13) - 6ES5 470-4UB12 (-4UB13) - 6ES5 470-4UC12 (-4UC13)	0 to ± 10 V and 0 to 20 mA parallel for ± 1024 units ± 10 V for ± 1024 units 1 to 5 V and 4 to 20 mA parallel for 0 to 1024 units
Number of outputs	8 voltage and current outputs each, no-load and short-circuit-proof
Isolation	Yes 8 outputs with respect to M_{ext} , M and L+/L-
Measured value representation	12-bit (two's complement)
Linearity in the range of ± 1024 units	± 2 LSB = ± 0.2 %
Operational error limits (0 to 60 °C)	± 0.6 %
Temperature coefficient for voltage and current outputs	$1 \times 10^{-4}/\text{K}$
Permissible overrange	Approx. 25 % (± 1024 to ± 1272 units)
Fault current at voltage output	Approx. 25 mA
No-load voltage at current output	Approx. 18 V
Load impedance - at voltage output - at current output	$\geq 3.3 \text{ k}\Omega$ $\leq 300 \Omega$
Delay between data transfer and analog value output to > 99%	$\leq 5\text{ms}$
Capacitive load including line capacity for -4UA12 from version 03 and for -4UB12 and -4UC12 from version 04:	100 nF max. 1 μF max.
Permissible voltage drop on voltage output lines	± 0.3 V at maximum output voltage
Power supply - Digital section from system bus - Analog section from load voltage - Enabling for module, F+/F-	5 V ± 5 %; approx. 250 mA 24 V; 200 to 400 mA 24 V; approx. 7 mA
Permissible potential difference between reference potential of the load and housing (U_{CM})	25 V AC / 60 V DC max.
Voltage test to VDE 0160	Between outputs and housing tested at 500 V AC

Front Connector Assignments

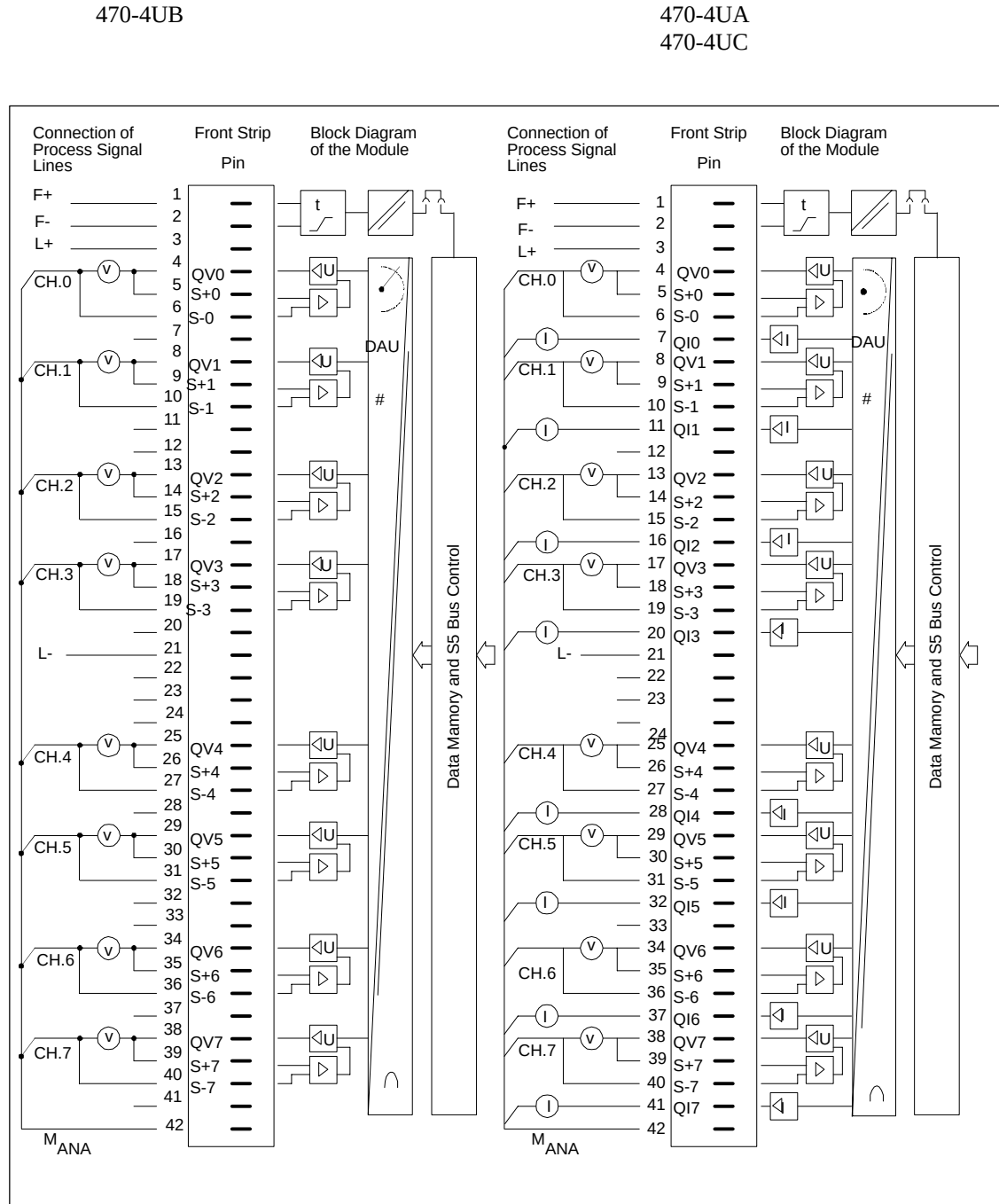


Figure 9-45 Front Connector Assignments