Related Documentation

For complete information on the Thyro-A, Thyro-A eco, Thryo-S, and Thryo-AX unit, see the user manual for the unit.

BASIC BUS MODULE

The Basic Bus Module is an optional accessory for the Thyro-A, Thyro-A eco, Thryo-S, and Thryo-AX series power controllers. It can control up to eight power controllers, and connects to your network using a Thyro Anybus® module, which is available for many bus protocols. The module allows the power controller to be integrated into complex installations via the field network.

With the optional digital Automatic Synchronization for Multiple power controllers feature (dASM), up to 4 Basic Bus Module accessories can be interconnected to optimize the mains load for very large installations.

Figure 1.   *Basic Bus Module*

Related Links

Advanced Energy®

INSTALLING THE ANYBUS MODULE

> ⚠ **DANGER:**
>
> **RISK OF DEATH OR BODILY INJURY. Disconnect and lockout/tagout all sources of input power before working on this unit or anything connected to it.**

> ⚠ **DANGER:**
>
> **RISQUE DE MORT OU DE BLESSURES. Débrancher et verrouiller/étiqueter toutes les sources de puissance d'entrée avant de travailler sur cet appareil ou sur tout élément qui y est raccordé.**

The Anybus module can be shipped separately from the Basic Bus Module accessory.

1. Verify that the unit is disconnected from all power sources.

2. Unpack the bus module at an ESD safe work space.

3. Plug the bus module into the unit.

4. Secure the module with the two TORX® T8 screws provided with the module.

If you need to remove the Anybus module from the unit, loosen the TORX T8 mounting screws three turns, and pry out the module with a small, flat-bladed screwdriver as shown in the following figure.

Figure 2.   *Anybus module removal*

INSTALLATION

> ⚠️ **DANGER:**
>
> RISK OF DEATH OR BODILY INJURY. Disconnect and lockout/tagout all sources of input power before working on this unit or anything connected to it.

> ⚠️ **DANGER:**
>
> RISQUE DE MORT OU DE BLESSURES. Débrancher et verrouiller/étiqueter toutes les sources de puissance d'entrée avant de travailler sur cet appareil ou sur tout élément qui y est raccordé.

> ⚠️ **DANGER:**
>
> Personnel must receive proper training before installing or troubleshooting high-energy electrical equipment. Potentially lethal voltages could cause death, serious personal injury, or damage to the equipment. Ensure that all appropriate safety precautions are taken.

> ⚠ **DANGER:**
>
> Le personnel devra être correctement formé avant de pouvoir installer ou dépanner des équipements électriques à haute énergie. Des tensions potentiellement létales peuvent entraîner le décès, des blessures ou des dommages à l'équipement. Assurez-vous de prendre toutes les précautions de sécurité appropriées.

> ⚠ **WARNING:**
>
> These servicing instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform any servicing other than that specified in the operating instructions.

> ⚠ **AVERTISSEMENT:**
>
> Ces instructions d'entretien sont destinées uniquement à un personnel qualifié. Pour réduire le risque d'électrocution, ne pas effectuer un entretien autre que celui spécifié dans les instructions de fonctionnement.

1. Mount the Basic Bus Module accessory near the Thyro-A, Thyro-A eco, Thryo-S, and Thryo-AX power controller.

   ◦ If you are mounting the unit on a DIN rail, first snap the included DIN-rail clips into the back of the unit.
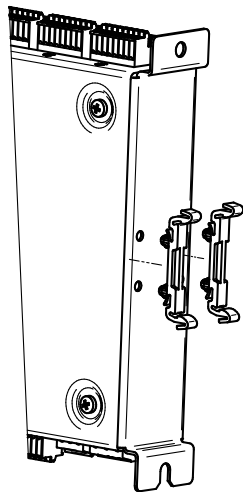
2. Connect **X22** (and **X2** on dASM installations) on each power controller to **X1 - X8** on the accessory using a customer-supplied shielded cable.

   Shielded data cable type 6 x 0.34 (6 x 22 AWG) LiCYC is available from AE. Order part number 2.000.004.015 for 1.5 m (59″) cables, or part 2.000.004.014 for 2.5 m (98″) cables.

   Terminal plugs are optional. If you want terminal plugs, you must order them separately using part number 80000556632 for an FK-MC 0,5/ 8-ST-2,5 plug.

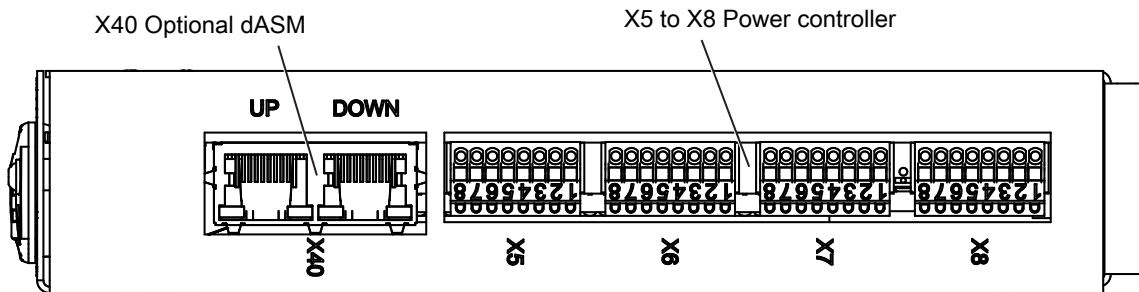3. Connect the customer-supplied 24 VDC, 200 mA power supply to **X11** on the Basic Bus Module accessory.

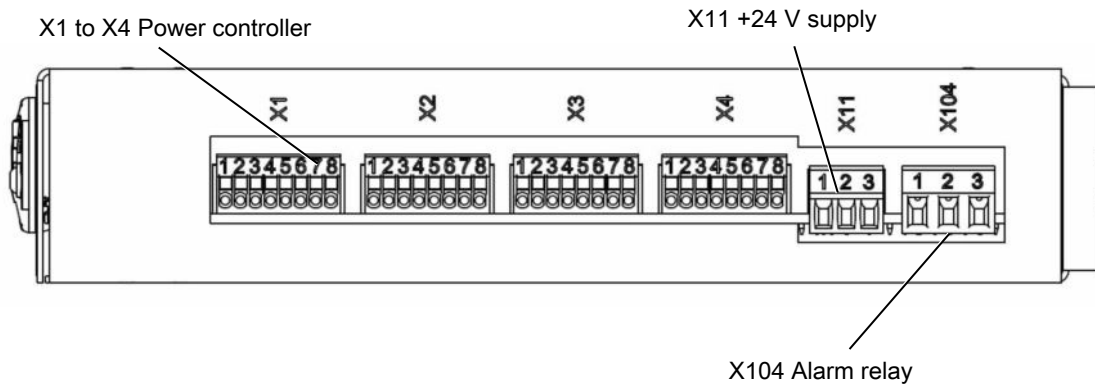*Figure 3.*   *Basic Bus Module top connectors*
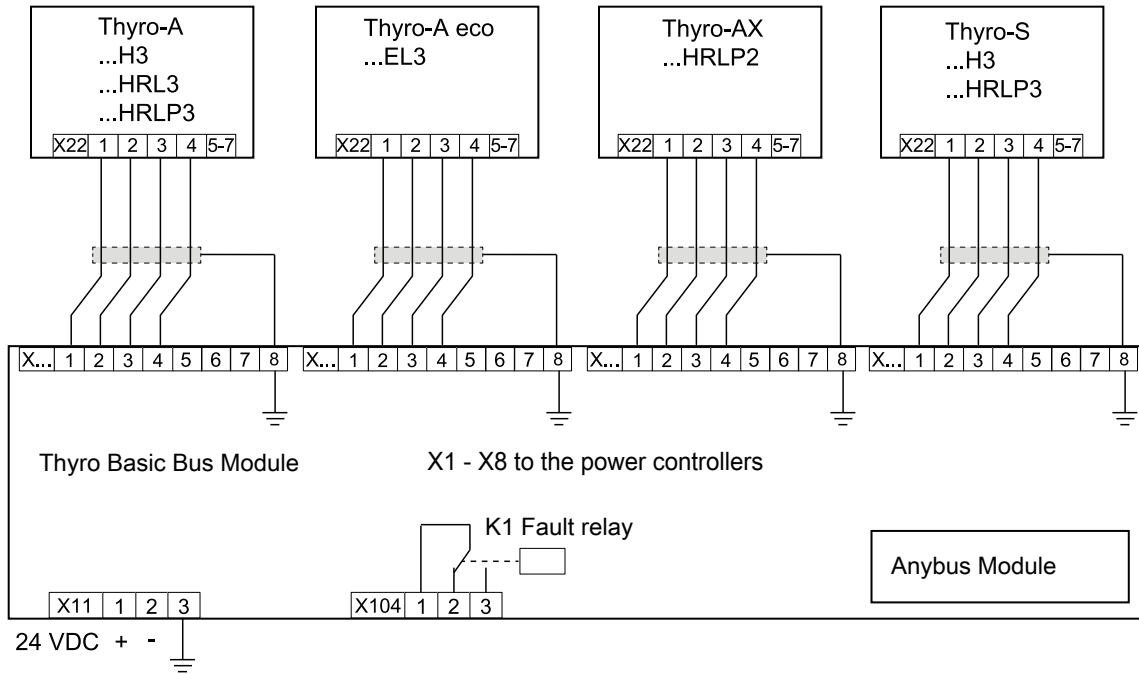

Figure 4.   *Basic Bus Module bottom connectors*

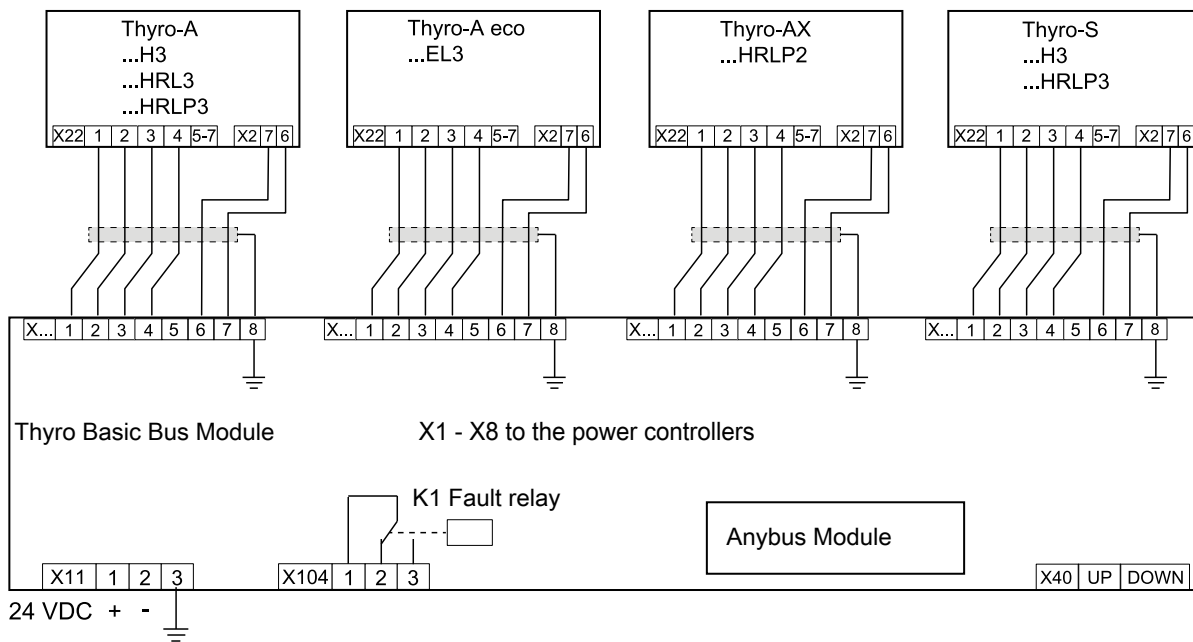**Figure 5.**   *Basic Bus Module wiring diagram without dASM*

Figure 6.   *Basic Bus Module wiring diagram with dASM*
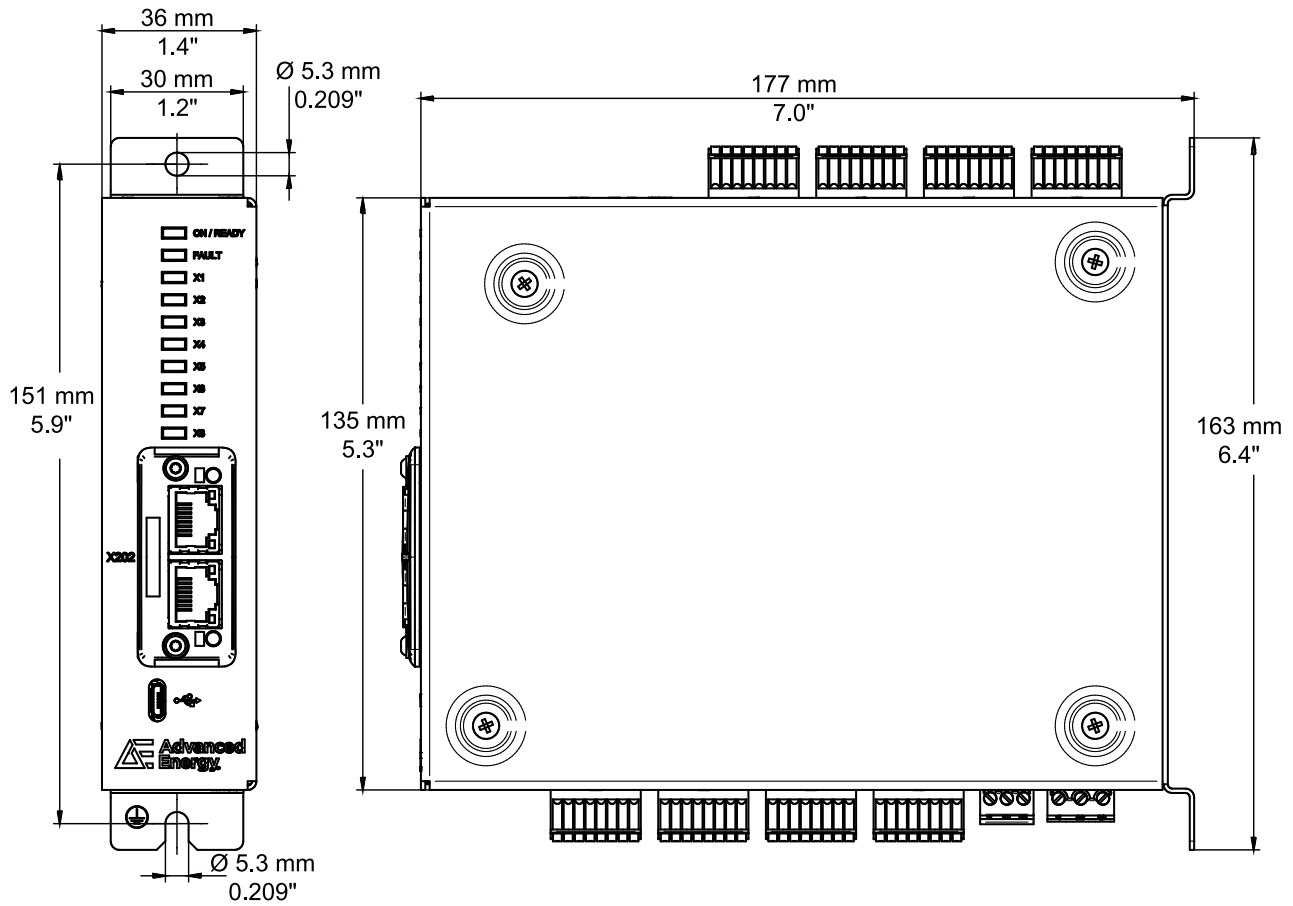
Figure 7.   *Mechanical drawing*

Power Controller I/O Connectors

The following tables show the connector pinouts to connect the Thyro power controller to the Basic Bus Module accessory.

Table 1. *Thyro-A, Thryo-A eco, and Thyro-S Series 3 11-pin analog I/O connector (X2)*

Pin	Function
X2.1	Control ground
X2.2	Pulse lock
X2.3	Control ground
X2.4	Analog setpoint, 10 V maximum or 20 mA maximum
X2.5	Control ground
X2.6	Sync out
X2.7	Sync in
X2.8	+ 5 V
X2.9	Analog output (setpoint potentiometer power, 0 V to 10 V, or 0 (4) mA to 20 mA)

Table 1. Thyro-A, Thryo-A eco, and Thyro-S Series 3 11-pin analog I/O connector (X2) (Continued)

Pin	Function
X2.10	Control cable shield
X2.11	Feedback input 0 (4) mA to 20 mA

Table 2. Thyro-A, Thryo-A eco, and Thyro-S Series 3 7-pin analog I/O connector (X22)

Pin	Function
X22.1	Bus module detection
X22.2	TxD
X22.3	RxD
X22.4	Control ground
X22.5	Slave connection
X22.6	Slave connection
X22.7	Control ground

Table 3. Thyro-AX Series 2 13-pin analog I/O connector (X2)

Pin	Function
X2.1	Control ground
X2.2	Pulse lock
X2.3	Control ground
X2.4	Analog setpoint, 10 V maximum or 20 mA maximum
X2.5	Control ground
X2.6	Sync out
X2.7	Sync in
X2.8	+ 5 V
X2.9	Analog output (setpoint potentiometer power, 0 V to 10 V, or 0 (4) mA to 20 mA)
X2.10	Control cable shield
X2.11	Feedback input 0 (4) mA to 20 mA
X2.12	Analog output 2
X2.13	Control ground

Table 4. Thyro-AX Series 2 13-pin analog I/O connector (X22)

Pin	Function
X22.1	Bus module detection

Table 4. *Thyro-AX Series 2 13-pin analog I/O connector (X22)* *(Continued)*

Pin	Function
X22.2	TxD
X22.3	RxD
X22.4	Control ground
X22.5	Slave connection
X22.6	Slave connection
X22.7	Control ground
X22.8	Analog output 3
X22.9	Multi I/O 1
X22.10	External voltage transducer
X22.11	Control ground
X22.12	External current transducer
X22.13	External current transducer

Table 5. *Basic Bus Module X1 to X8 connection terminals*

| Connector	Pin	Description
X1 to **X8**	1	Commonly switched ground potential
	2	RxD
	3	TxD
	4	Ground
	5	Individually switched ground potential
	6	dASM sync in
	7	dASM sync out
	8	Shield

DIP Switch Settings for dASM

To use the Thyro-A, Thyro-A eco, and Thyro-S power controller units with the Basic Bus Module dASM option, the DIP switch S1 must be set for TAKT operation mode and Thyro-Tool Pro software mode. The Basic Bus Module accessory must be set for long protocol if full bidirectional communication with the power controller is needed.

Thyro-AX power controller units are not configured using a DIP switch.

TO SET THE DIP SWITCHES IN THE THYRO POWER CONTROLLER

1. Switch off mains supply and secure against accidentally being switched back on.

2. Remove the cover of each power controller.

3. Set the configuration of each DIP switch.
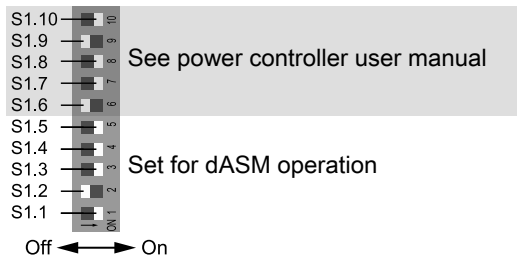
Table 6. Operating and control mode

Type	1	2	3	4	5	6	7	8	9	10	Function
	1	0				x	x	x	x	x $^{[1]}$	TAKT operating mode
			1	1	1	x	x	x	x	x	Thyro-Tool Pro software control mode
^{1} Unchanged, see the power controller manual.											

4. Replace the cover on each power controller unit.

5. If required, set the Basic Bus Module accessory for long protocol.

For all other related TAKT mode settings, please refer to the power controller manual.

Configuration Using Thyro-Tool Pro Software

TO CONFIGURE THE BASIC BUS MODULE ACCESSORY

After installing the Thyro-Tool Pro software, you must manually install a separate driver. After installing the software, you will find the driver in the `C:\ProgramFiles(x86)\Advanced Energy\Thyro-Tool Pro\Driver\Thyro-AX` folder.

1. Connect the Basic Bus Module accessory to the PC using a customer-supplied USB cable.

2. Start the Thyro-Tool Pro software.

3. Select **Hardware**.
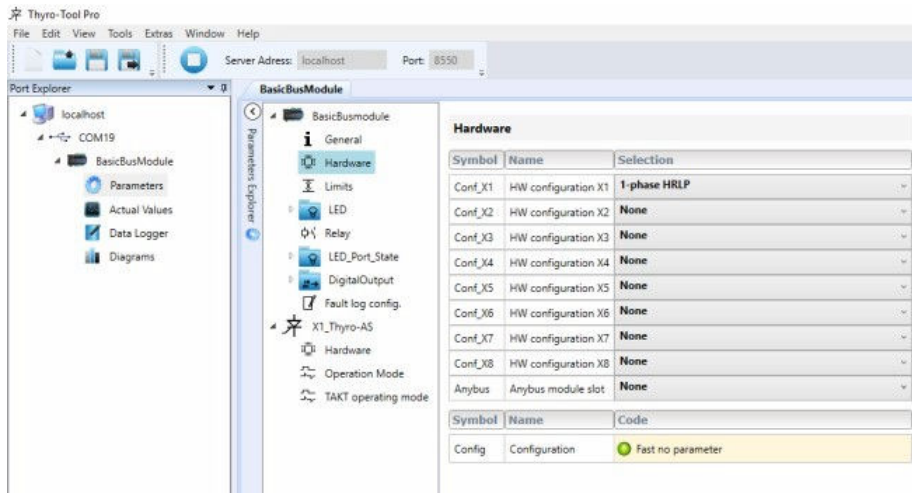
4. Select the unit type from the drop-down menu for each power controller connected to ports **X1** to **X8**. Select **None** if no power controller is connected to the port.

You can select different unit types for each port as applicable. For example, you might have a **1-phase HRL** type connected to port **X1** and **2-phase HRLP** type connected to port **X2**.
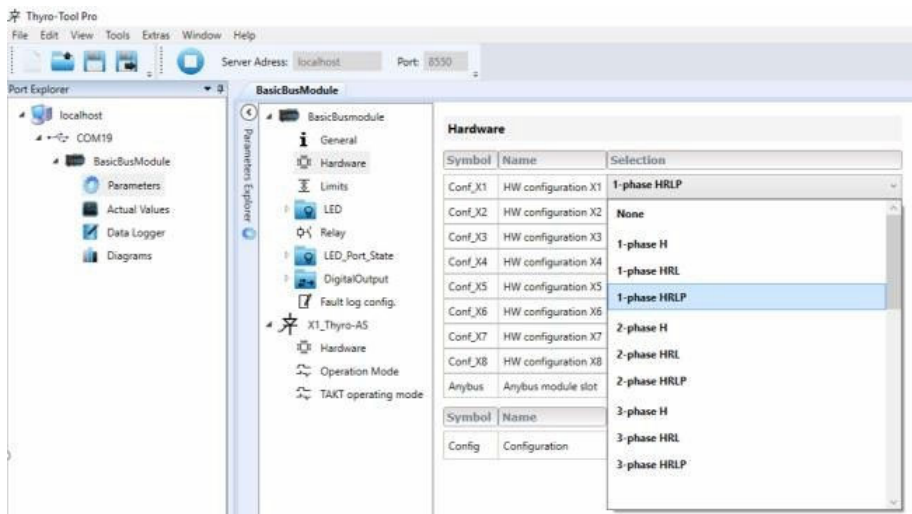
5. Select the module type from the drop-down menu for the inserted module.
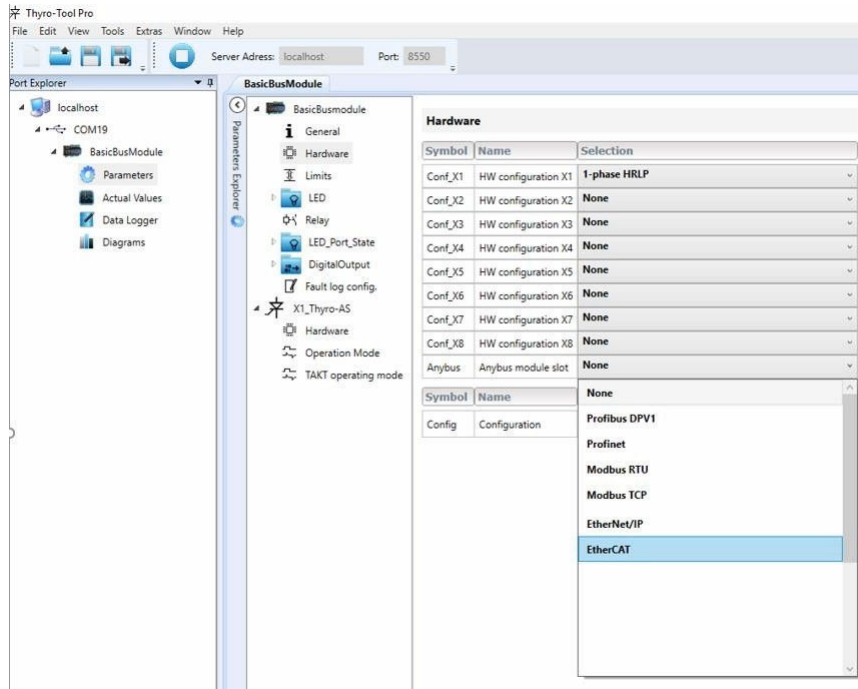
If the Thyro-A, Thyro-A eco, Thryo-S, and Thryo-AX power controllers are delivering power and the **FAULT** LED is not lit, the unit is functioning properly. The Basic Bus Module accessory LEDs indicate the state of each connected power controller.

☞   **Important**

If you would like to connect the Basic Bus Module accessory to Thyro-AX units, or deal with units where **fast regulation** is set, select the **fast no parameter** configuration.

For further available communication software and information, refer to https://www.advancedenergy.com/landing-pages/thyro-accessories-downloads.

Configuration for dASM Using Thyro-Tool Pro Software

The Basic Bus Module accessory with the dASM option can be operated with or without an Anybus communication interface. Once the unit is connected to a PC running the Thyro-Tool Pro software, the pre-settings are automatically set. Load the correct driver as detailed below.

TO CONFIGURE dASM ON THE BASIC BUS MODULE ACCESSORY

1. Navigate to the Thyro-Tool Pro software Thyro-AX driver directory.

2. Double-click ![VCP_V1.3.1_Setup_x64.exe] to install the dASM driver.

3. Start the Thyro-Tool Pro software.

4. Connect the Basic Bus Module accessory to the PC using a customer-supplied USB cable.
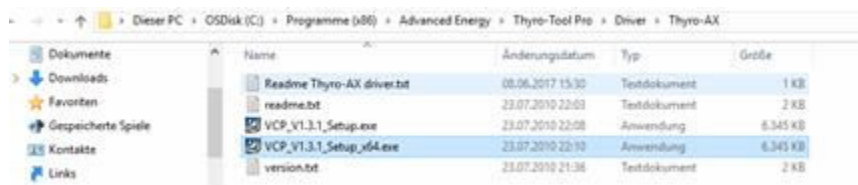
The software detects the Basic Bus Module accessory, and also shows each connected Thyro power controller.
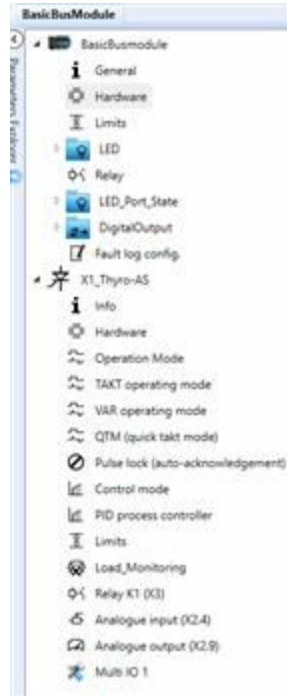
5. Select **Basic Bus Module→ Parameters→ Hardware**.
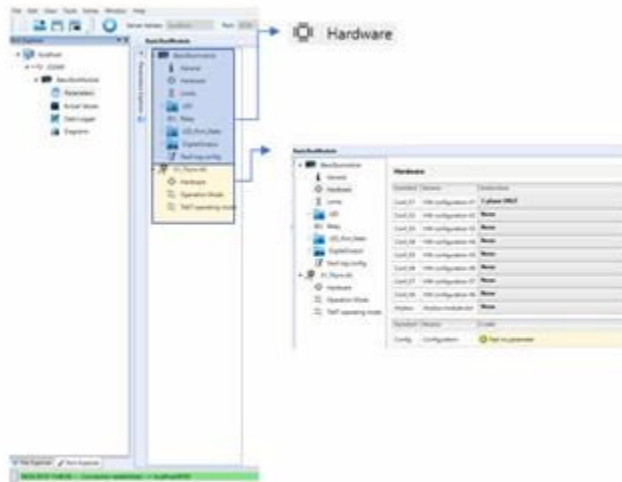
6. For each Thyro-A, Thyro-A eco, and Thyro-S power controller, set **Multi IO 1** to **SYNC OUT** from the **Multi IO 1** drop-down menu.

7. For Thyro-AX, set **Multi IO 2** to **SYNC OUT** from the **Multi IO 2** drop-down menu.
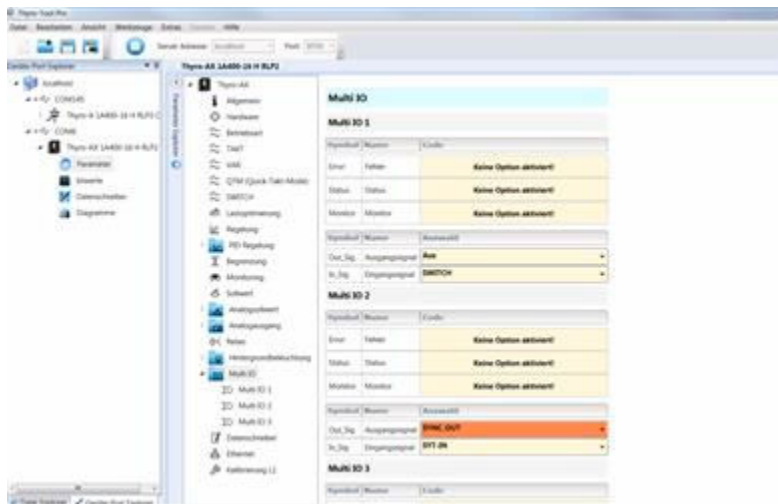
The Basic Bus Module setting window will show full parameter access of each connected power controller. You can configure these power controllers directly from the Basic Bus Module accessory.

OPERATION

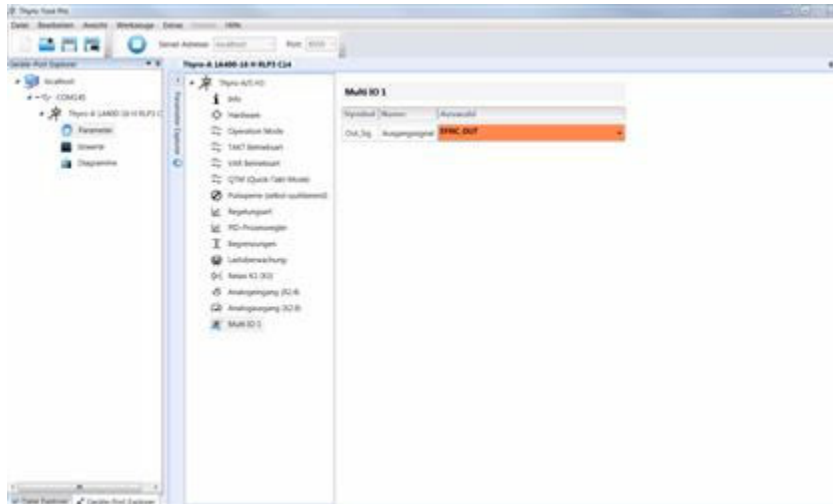On delivery, the power controller is parameterized to the respective power section, and the TAKT operating mode is set. You should review these standard parameters, and, if necessary, adjust them for your application.

To Operate the Thyro-A, Thyro-A eco, Thryo-S, and Thryo-AX Unit With the Basic Bus Module Accessory

1. Install the unit according to the installation procedures in this user guide.

    The minimum connections are power, load, *SETPOINT*, and *PULSE LOCK* jumper.

☞ **Important**

By default, the unit is configured to require a customer-supplied *PULSE LOCK* jumper. The unit can be customer configured to not require this jumper.

2. Turn on the system circuit breakers and apply AC input to the unit and accessory.

When the power controller receives AC input, it performs self diagnostics. If the unit detects an error, the unit sets the respective fault bits and lights the **FAULT** LED; if the fault is severe, the light green **ON / READY** LED lights. You will not be able to apply power to the load until you clear the fault.

3. Verify that the light green **ON / READY** LED is lit.

4. Verify that the **LIMIT** LED is not lit.

5. Verify that the **PULSE LOCK** LED is not lit.

6. Verify that the **FAULT** LED is not lit.

7. Verify that an increase in setpoint applies power to the load.

8. On the accessory, verify that the **ON / READY** LED is lit, and that the **FAULT** and **ALARM** LEDs are not lit.

If the Thyro-A, Thyro-A eco, Thryo-S, and Thryo-AX unit is delivering power and the **FAULT** LED is not lit, the unit is functioning properly. The Basic Bus Module accessory LEDs will indicate the state of each connected power controller.
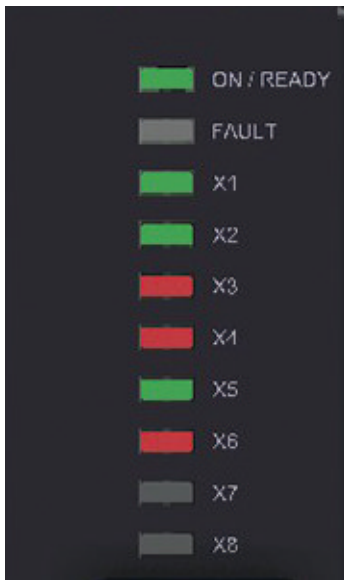
☞ **Important**

AE recommends that you update the firmware to the latest revision using the Thyro-Tool Pro software.

LEDs, I/O, Digital Output, Alarm Relay

LEDS

The Basic Bus Module LED status indicators are located on the front panel of the accessory. The LED functions can be changed using the Thyro-Tool Pro software.

Figure 8. Status LEDs

Table 7. Basic Bus Module status LEDs

LED	Status (Default Configuration)
ON / READY	Green: On, ready for operation. Red: On, not ready for operation, check other LEDs. Off: No power, hardware fault.
FAULT	Red: A fault present.
X1	Green: The connected unit is OK. Red: The Basic Bus Module accessory configuration does not match the power controller type. Off: No unit is configured.
X2	Green: The connected unit is OK. Red: The Basic Bus Module accessory configuration does not match the power controller type. Off: No unit is configured.
X3	Green: The connected unit is OK. Red: The Basic Bus Module accessory configuration does not match the power controller type. Off: No unit is configured.
X4	Green: The connected unit is OK. Red: The Basic Bus Module accessory configuration does not match the power controller type. Off: No unit is configured.
X5	Green: The connected unit is OK.

Table 7. *Basic Bus Module status LEDs (Continued)*

LED	Status (Default Configuration)
	Red: The Basic Bus Module accessory configuration does not match the power controller type. Off: No unit is configured.
X6	Green: The connected unit is OK. Red: The Basic Bus Module accessory configuration does not match the power controller type. Off: No unit is configured.
X7	Green: The connected unit is OK. Red: The Basic Bus Module accessory configuration does not match the power controller type. Off: No unit is configured.
X8	Green: The connected unit is OK. Red: The Basic Bus Module accessory configuration does not match the power controller type. Off: No unit is configured.

X1 TO X8 CONNECTION TERMINALS

Table 8. *Basic Bus Module X1 to X8 connection terminals*

| Connector	Pin	Description
X1 to **X8**	1	Commonly switched ground potential
	2	RxD
	3	TxD
	4	Ground
	5	Individually switched ground potential
	6	dASM sync in
	7	dASM sync out
	8	Shield

FAULT RELAY

The fault relay can be used to signal fault conditions in the Basic Bus Module accessory. You can change the fault relay functions using the Thyro-Tool Pro software.

Table 9. *Fault relay connector X104*

Pin Number	Default Function
X104.1	Common
X104.2	Normally closed
X104.3	Normally open

DIGITAL OUTPUT

The Basic Bus Module accessory can be used as an 8-channel, general purpose digital output. You can change the configuration of each output using the Thyro-Tool Pro software. Each output can switch up to 100 mA.
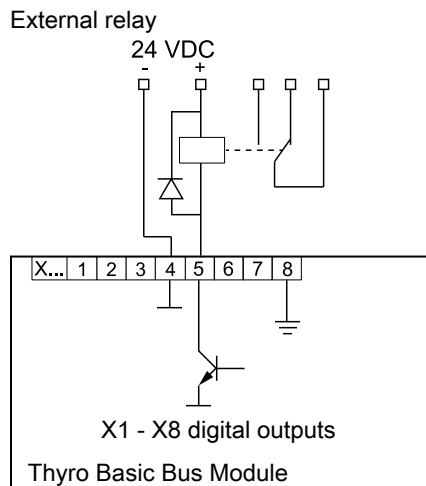
Figure 9. *Digital output*

MAINS LOAD OPTIMIZATION WITH dASM

The digital and dynamic dASM process offers the option of dynamic mains load optimization when multiple Thyro-A, Thyro-A eco, Thryo-S, and Thryo-AX power controllers operate in the TAKT mode.

For systems in which there are multiple power controllers, individual power controllers are synchronized so that a regular mains load is achieved. This avoids random load peaks caused by multiple power controllers switching on at the same time. The upstream transformer and/or the upstream feed point can be designed for a lower load, which results in savings in investment and operating costs, and much smaller system perturbations.

dASM can be applied whenever multiple power controllers operate together on a common grid supply in the TAKT mode. Other features include:

- Grid load optimization for up to 32 power controllers in the TAKT mode
- Grid load optimization on the basis of power consumption of the connected loads

- Dynamic grid load optimization, including the observance of setpoint or of the load alterations
- Digital operation and communication
- Grid load optimization of the dASM group within up to 5 seconds
- Suitable for 1-phase or 3-phase applications
- Simple dASM wiring with shielded RJ-45 patch cables (Ethernet CAT 5 8-pole) with a cable length between two power controllers of up to 100 m (328′) depending on surrounding conditions
- Simple parameterization of monitoring features in the master unit (including configurable total power limit and number of devices)
- Monitoring the grid load (power limit)

dASM Application Considerations

When designing and installing, ensure that the:

- Electric load is evenly distributed onto the 3-phase system
- Parameterization and initiation of the individual power controller devices are in the TAKT mode with the same TAKT cycle period (To)
- Power wiring is correct for the phases
- 1-phase and 3-phase loads are in separate dASM groups
- Power controllers and loads of a dASM group are connected to the same grid in phase
- Shielded RJ-45 patch cables connect the **dASM UP** and **dASM DOWN** connectors of each unit

dASM Example Installation

This example shows how to connect the Basic Bus Module accessory to nine Thyro power controllers in three groups of three.
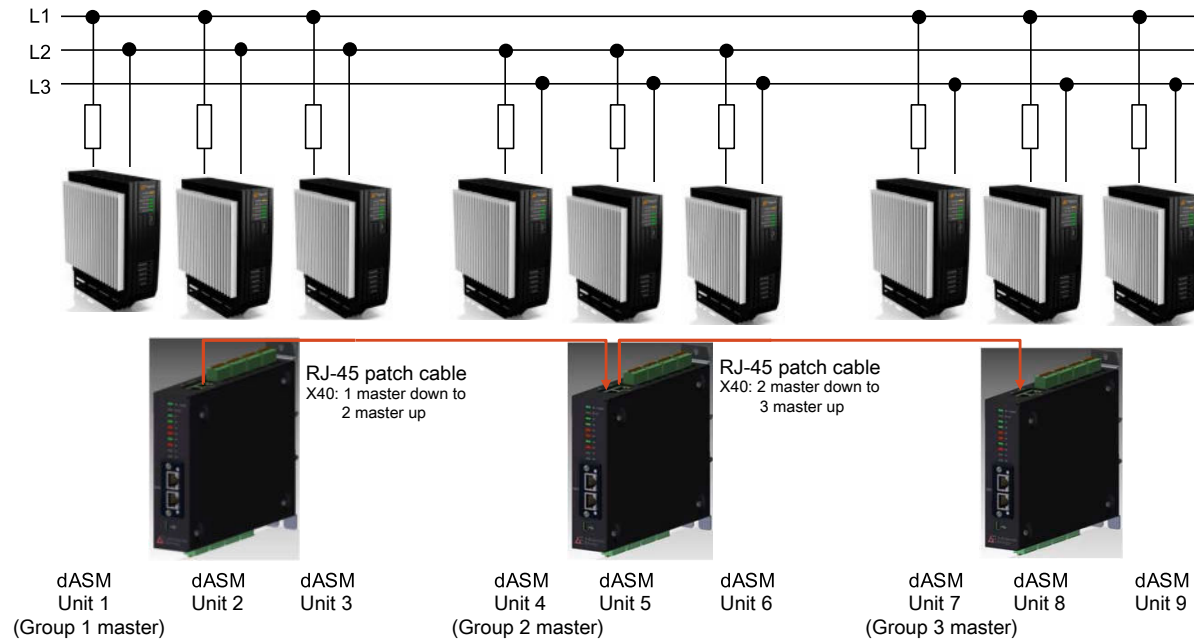
Figure 10. *dASM example installation*

DIAGNOSTICS AND MESSAGES

The following tables show the diagnostics and messages queries which can be seen when the Basic Bus Module accessory is connected to Thyro-Tool Pro software.

Table 10. *Device commands*

Name	Bit	Description
X1 Pulse lock	0	If bit is set, the setpoint for the Thyro unit on port X1 is disabled
X2 Pulse lock	1	If bit is set, the setpoint for the Thyro unit on port X2 is disabled
X3 Pulse lock	2	If bit is set, the setpoint for the Thyro unit on port X3 is disabled
X4 Pulse lock	3	If bit is set, the setpoint for the Thyro unit on port X4 is disabled
X5 Pulse lock	4	If bit is set, the setpoint for the Thyro unit on port X5 is disabled
X6 Pulse lock	5	If bit is set, the setpoint for the Thyro unit on port X6 is disabled
X7 Pulse lock	6	If bit is set, the setpoint for the Thyro unit on port X7 is disabled
X8 Pulse lock	7	If bit is set, the setpoint for the Thyro unit on port X8 is disabled
External error 1	9	If bit is set External error 1 event in the basic bus module generates configurable message External error 1. For example useful to switch the relay in the bus module.
Save	13	Save bus module and all connected Thyro units
Only if bit set	15	Bus module will wait on bit to activate new output data for Thyro (If function is enabled in the Thyro-Tool Pro Software)

Table 11. Device errors

Name	Bit	Description
Aux. supply error	0	DC supply voltage for Basic Bus Module is too low
Parameter error	1	(EEPROM error) The Basic Bus Module has a memory access problem and needs to be replaced
Internal communication error	3	Onboard dASM is not available
External error 1	8	If the bit External error 1 is send to the Basic Bus Module, the message `External error 1` will be shown as event
X1 configuration error	16	Wrong device on bus module port X1
X2 configuration error	17	Wrong device on bus module port X2
X3 configuration error	18	Wrong device on bus module port X3
X4 configuration error	19	Wrong device on bus module port X4
X5 configuration error	20	Wrong device on bus module port X5
X6 configuration error	21	Wrong device on bus module port X6
X7 configuration error	22	Wrong device on bus module port X7
X8 configuration error	23	Wrong device on bus module port X8
Anybus configuration error	26	Wrong Anybus module configured or installed

Table 12. Device error extension

Name	Bit	Description
Anybus not connected	6	Fieldbus not connected (Communication between Anybus module and PLC failed)
Anybus ADI not exist	7	Requested parameter can not be found
dASM total power exceeded	8	Actual total power of all dASM connected power controllers is higher as the configured monitoring value
dASM count error	9	Actual quantity of all dASM connected power controllers is lower as the configured monitoring value

Table 13. X1 - X8 error

Name	Bit	Description
Frequency outside of 47 Hz to 63 Hz	0	Check that the reference is connected to X1 (1Ph, 2Ph power controllers only) and all phases are connected to the power parts
Synchronization error	1	Check that the reference is connected to X1 (1Ph, 2Ph power controllers only) and all phases are connected to the power parts
Temperature monitoring	2	Please check that sufficient cooling is available for the power controller

Table 13. *X1 - X8 error (Continued)*

Name	Bit	Description
Flash values invalid	4	The power controller has a memory access problem and needs to be replaced
Internal error (debug) Datalog_Debug?	6	Only for internal use
Aux. supply error	7	Power controller is supplied by USB only. The required supply for the control unit is not available.
Master slave fault	8	The multiphase power controller can not reach its 2nd or 3rd module. Please check X22 (7 pin) terminals and wires according to the manual.
Left rotating field	16	Right rotating field is required for operation of the power controller
Phase L1 error	17	Phase 1 is missing
Phase L2 error	18	Phase 2 is missing
Phase L3 error	19	Phase 3 is missing
Bootjumper error	22	S300 switch on power controller PCB is in wrong position
Thyristor short-circuit	29	Thyristor in power controller is defective (power part can not deactivate output)
SYT9 OK	30	Only for internal use
Failure rotating field	31	Rotating field is required for operation of the power controller

Table 14. *X1 - X8 status*

Name	Bit	Description
Pulse inhib active	16	Power controller X2.1-X2.2 connection is open or the Pulse lock bit is sent by the fieldbus or Thyro-Tool Pro software. This disables the setpoint.
Mains frequency Is 60 Hz	18	60 Hz mains frequency has been detected
U limit	20	Setpoint cannot be reached as voltage limit is reached
I limit	21	Setpoint cannot be reached as current limit is reached
P limit	22	Setpoint cannot be reached as power limit is reached
Sync out on	25	Only for internal use
Bus module active	27	Digital setpoint active X22.1 on ground

Table 15. *X1 - X8 monitor*

Name	Bit	Description
Load fault	3	The detected heater resistance is too high according to the configured monitoring value

Table 15. *X1 - X8 monitor (Continued)*

Name	Bit	Description
Umains < minimum	5	Monitoring value exceed for mains undervoltage
Umains > maximum	6	Monitoring value exceed for mains overvoltage
Urms < minimum	9	Monitoring value exceed for undervoltage
Urms > maximum	10	Monitoring value exceed for overvoltage
Irms < minimum	11	Monitoring value exceed for undercurrent
Irms > maximum	12	Monitoring value exceed for overcurrent
P < minimum	13	Monitoring value exceed for min power
P > maximum	14	Monitoring value exceed for max power

AE GLOBAL SERVICES

Please contact AE Global Services if you have questions or problems, or if you need customer support. Before contacting AE Global Services, please work through the provided troubleshooting. When you contact Global Services, please include the unit serial number and part number. These numbers are available on unit labels.

☞ **Important**

For returns and repairs, please contact AE Global Services to get the correct shipping address.

Primary Contact Information

Visit the Advanced Energy website for local service and support contact information:

http://www.advancedenergy.com

Click on the service link at the top of the page.

Alternate Contact Information

If you do not have access to the Advanced Energy website, then use one of the following:

- Phone (24 hrs/day, 7 days/week):
  800.446.9167
  or
  +1.970.221.0108

- Email: (We will respond to email by the next business day.)

  mailto:technical.support@aei.com

- AE World Headquarters

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