AMT SyncSys System Specification

Ethernet synchronous motion and I/O control with plain-English scripting · Nov 8, 2026

What AMT SyncSys is

AMT SyncSys is a complete machine-control system: Ethernet controllers that move stepper axes and switch inputs and outputs, and the **AMT Script Engine** software that runs the machine from scripts written in plain English. Plain-English machine control. No G-code, no ladder logic.

A machine sequence is written as short, readable lines such as `MOVE,X,150`, `WAITIN,1,ON` or `SPEAKLINE,Part complete`. The Script Engine checks every line before it runs, shows the machine on screen while it runs, and speaks prompts to the operator. The controller does the time-critical work: step pulses up to 500000 steps per second, ramps, limits, homing and E-Stop, all handled in hardware and firmware.

It is built for machines that index, feed, place, dispense, test and sequence: point-to-point motion with I/O, not contour cutting.

System components

Component	What it is
AMT SyncSys Ax	Ethernet motion and I/O controller: 3 stepper axes (STEP, DIR, ENABLE to external drivers), limit and home inputs, 4 digital inputs, 4 digital outputs, 2 analog inputs, E-Stop
AMT SyncSys IO	The same controller for I/O only, no motion: 13 digital outputs, 10 digital inputs, 2 analog inputs and 3 fast pulse channels
AMT Script Engine	The operator and runtime software: loads, checks and runs scripts, with machine status, jog and home, diagnostics, configuration and spoken prompts. One edition runs a single controller or a machine of up to 2 motion and 4 I/O controllers

Component	What it is
AMT Script Editor	Writes and checks scripts away from the machine, with a command list and line-by-line checking
AMT Visualizer	Stands in for the controllers on the PC and shows the machine moving, including an isometric 3D view, so scripts can be tried without hardware
AMT Test Runner	Automatic qualification of the software, with a Word report that says QUALIFIED when every item passes

What sets it apart

Typically, with a PLC or a motion controller	With AMT SyncSys
Ladder logic, structured text or G-code, and a programming package to learn	**Plain-English scripts** a technician can read and change: `HOME,X`, `MOVE,X,150`, `WAITIN,1,ON`
Mistakes found when the machine runs	**Every line is checked before the script runs**: a wrong command, axis, input, output or speed is listed with its line number and reason, and the script is not started
A lamp or a message on a screen	**Spoken prompts** to the operator (`SPEAKLINE`), on-screen messages and a dated log of every part (`LOG`)
Hardware needed to try a program	**AMT Visualizer** stands in for the controllers on the PC and draws the machine moving, in an isometric 3D view, before any hardware is wired
Validation written up by hand	**AMT Test Runner** qualifies the software automatically and writes a Word report; witnessed tests record each answer
One fixed axis behaviour, or a separate controller for each job	**Three modes on every axis**: Positioning, Feeder-Index (repeat a fixed feed) and Spindle (continuous speed)

Typically, with a PLC or a motion controller	With AMT SyncSys
Outputs switched by the program scan	**Position-synchronized outputs**: an output on each axis switches at a set position in the move, in hardware
Limit and E-Stop wiring left to the installer	**Fail-safe inputs**: normally-closed limit inputs (a broken wire reads as tripped) and an E-Stop that gates every step output in hardware
A closed protocol and a vendor tool	**Open plain ASCII over Ethernet**: the controller also works with a PLC or any PC program
An industrial panel PC	Runs on a **Raspberry Pi 4 with a 10-inch touch display**, or a Windows or Linux PC

Scripts also have registers, `IF` and `LOOP`, named routines (`CALL`), and can start another program on the PC (`RUNPROGRAM`), so a sequence can count parts, branch on an input and hand data to other software.

Software platforms and displays

The AMT Script Engine, Script Editor, Visualizer and Test Runner are Python programs and run on all three platforms. Each platform has its own installation package that installs everything needed, including Python on Windows, and makes desktop and menu icons.

Platform	Typical use
Raspberry Pi 4 (64-bit Raspberry Pi OS) with a **10-inch touch display**	Machine-mounted operator panel; the Small layout fits a 1024 x 600 touch screen
Windows 10 / 11 PC	Office or machine PC; script writing, Visualizer, operation
Linux Mint PC	Machine or office PC

- **Two screen layouts:** Large for 1920 x 1080 monitors and up, Small for 1024 x 600 touch screens.

- **Single or multiple monitors:** the Script Engine, Script Editor and Visualizer are separate windows, so they can share one screen or sit on separate monitors, for example the operator screen on one monitor and the Visualizer on another.
- **Network:** the PC or panel connects to the controllers over Ethernet; each controller has its own address (factory default 192.168.1.222).

A script, as written

A complete cycle: wait for a part, move it, run a 0.5 s process, return, count it, log it and say so, 100 times.

```
ENABLE,ALL,ON
HOME,ALL,SEQ
SET,R1,0
LABEL,CYCLE
WAITIN,1,ON
MOVE,X,150
WAITMOVE
OUTPUT,1,ON
DWELLMS,500
OUTPUT,1,OFF
MOVE,X,0
ADD,R1,1
LOG,Part {R1} done
SPEAKLINE,Part complete
IF,R1,<,100,GOTO,CYCLE
END
```

Positions are in millimetres; speeds, ramps and axis modes are set once on the Configuration screen, not in the script.

Controllers at a glance

	AMT SyncSys Ax	AMT SyncSys IO
Axes	3 (STEP, DIR, ENABLE to external drivers)	None
Step / pulse rate	16 to 500000 steps/s per axis	Fast channels F1-F3: 16 to 500000 Hz, clock or exact burst

	AMT SyncSys Ax	AMT SyncSys IO
Axis modes	Positioning, Feeder-Index, Spindle	-
Limit / home inputs	LIM+ and LIM- per axis, LIM+ also HOME	-
Digital inputs	4	10
Digital outputs	4 (DO1-DO3 also position-synchronized)	13
Output ratings	User outputs 48 V / 150 mA max; high-speed outputs 5 V / 40 mA	Same circuits
Analog inputs	2, 12-bit	2, 12-bit
E-Stop	Normally closed; gates every step output in hardware	Normally closed; stops the fast channels, holds the other outputs
Interface	Ethernet, plain ASCII commands; firmware update over Ethernet	Same
Supply	15-30 Vdc (24 Vdc nominal)	Same
Isolation	Digital inputs and outputs opto-isolated	Same
Size	8.0 x 5.2 x 1.5 in	Same board

Full details: Stepper Controller Spec Sheet 110826, the connection diagrams and the board layout drawing.

Growing the system: several controllers

The same AMT Script Engine that runs one controller also runs several; no separate edition is needed. One machine can use up to **2 SyncSys Ax** and **4 SyncSys IO** controllers on the same network, run from one script.

- **Up to 6 axes:** X Y Z on the first motion controller, U V W on the second.
- **Up to 48 inputs, 60 outputs, 12 analog inputs and 12 fast pulse channels**, numbered on from one controller to the next, so a script simply says `OUTPUT,17,ON` or `WAITIN,23,ON`.

- **Only what is installed is accepted:** the editor and the script check refuse an axis, input or output the machine does not have.
- **Every controller is checked at connect** (its type and, when set, its unique hardware address), and E-Stop and every stop act on all controllers.
- **Timing:** moves, synchronized outputs and pulses are timed within each controller; put axes and outputs that must be timed together on the same controller.

Example applications

- **Indexing feeder:** a Feeder-Index axis advances strip, tape or film by a fixed length per cycle; a sensor input starts each index and an output fires a cutter or punch at the end.
- **Pick and place:** an X Y Z gantry moves parts between fixed positions; vacuum and gripper outputs switch at each station, and the operator hears what to load next.
- **Dispensing:** an axis moves the nozzle along a set path while a position-synchronized output opens the valve at an exact position in the move.
- **Test and inspection fixture:** the part is clamped, probed and released; analog readings and the result are written to the log with the date and time.
- **Winding or rotary table:** a Spindle axis turns at a set speed while a second axis traverses the wire guide or indexes the table.
- **Conveyor and sorting:** inputs detect parts and outputs divert them; an IO controller adds outputs and inputs for a larger line.
- **Pulse and clock source:** an IO controller's fast channels give an exact number of pulses or a steady clock, 16 Hz to 500 kHz, for test benches and external equipment.

Safety and ordering

- **E-Stop:** a normally-closed loop; an open loop (pressed or a broken wire) stops the machine. On SyncSys Ax it gates every step output in hardware.
- **Watchdog:** with the communications watchdog set, a controller stops on its own if the PC or the network stops talking to it.
- **Low-voltage detection:** the controller makes itself safe and records how it last shut down.
- **Safety note:** the E-Stop input is a control function. A machine's safety circuit must still remove power through its own safety-rated hardware.

Order item	Description
AMT SyncSys Ax	3-axis motion and I/O controller
AMT SyncSys IO	I/O controller, no motion
AMT Script Engine	Operator and runtime software, for one controller or up to 6 (2 SyncSys Ax and 4 SyncSys IO)
Accessories	Mating plug connectors