

ATX

From Wikipedia, the free encyclopedia

ATX (Advanced Technology eXtended) is a motherboard configuration specification developed by Intel in 1995 to improve on previous *de facto* standards like the AT design. It was the first major change in desktop computer enclosure, motherboard and power supply design in many years, improving standardization and interchangeability of parts. The specification defines the key mechanical dimensions, mounting point, I/O panel, power and connector interfaces between a computer case, a motherboard and a power supply.



An ATX motherboard

ATX is the most common motherboard design.^[1] Other standards for smaller boards (including microATX, FlexATX and mini-ITX) usually keep the basic rear layout but reduce the size of the board and the number of expansion slots. Dimensions of a full-size ATX board are 12 × 9.6 in (305 × 244 mm), which allows many ATX chassis to also accept microATX boards. The official ATX specifications were released by Intel in 1995 and have been revised numerous times since. The most recent ATX motherboard specification is version 2.2.^[2] The most recent ATX12V power supply unit specification is 2.31,^[3] released in February 2008.

In 2003, Intel announced the BTX standard, intended as a replacement for ATX. However, as of 2015, the ATX design still remains a standard for do-it-yourselfers; BTX has however made inroads into pre-made systems.

Contents

- 1 Connectors
- 2 Variants
 - 2.1 Larger variants
 - 2.1.1 SSI CEB
 - 2.1.2 E-ATX/SSI EEB
 - 2.1.3 EE-ATX
 - 2.1.4 Ultra ATX
 - 2.1.5 XL-ATX
 - 2.1.6 HPTX
 - 2.1.7 SSI MEB
 - 2.1.8 SWTX
 - 2.1.9 WTX
- 3 Power supply
 - 3.1 Physical characteristics
 - 3.2 Main changes from AT and LPX designs
 - 3.2.1 Power switch
 - 3.2.2 Power connection to the motherboard
 - 3.2.3 Airflow
 - 3.3 ATX power supply revisions
 - 3.3.1 Original ATX
 - 3.3.2 ATX12V 1.x
 - 3.3.2.1 ATX12V 1.0
 - 3.3.2.2 ATX12V 1.1
 - 3.3.2.3 ATX12V 1.2
 - 3.3.2.4 ATX12V 1.3

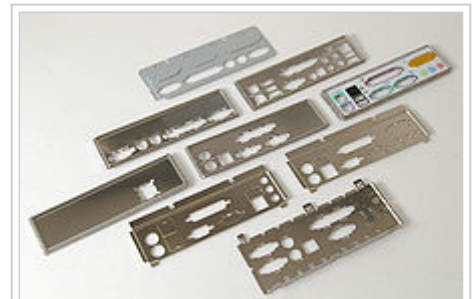
- 3.3.3 ATX12V 2.x
 - 3.3.3.1 ATX12V 2.0
 - 3.3.3.2 ATX12V v2.01
 - 3.3.3.3 ATX12V v2.1
 - 3.3.3.4 ATX12V v2.2
 - 3.3.3.5 ATX12V v2.3
 - 3.3.3.6 ATX12V v2.31
 - 3.3.3.7 ATX12V v2.32
 - 3.3.3.8 ATX12V v2.4
- 3.4 ATX power supply derivatives
 - 3.4.1 SFX
 - 3.4.2 TFX
 - 3.4.3 WTX
 - 3.4.4 AMD GES
 - 3.4.5 EPS12V
- 3.5 Recent specification changes and additions
- 3.6 Interchanging PSUs
- 4 See also
- 5 References
- 6 External links

Connectors



The original AT standard only had a single keyboard port opening on the back of the case. Any additional connectors such as video, audio, printer, serial, network and so forth would require either mounting in a slot or using custom-cut holes.

On the back of the computer case, some major changes were made to the AT standard. Originally AT style cases had only a keyboard connector and expansion slots for add-on card backplates. Any other onboard interfaces (such as serial and parallel ports) had to be connected via flying leads to connectors which were mounted either on spaces provided by the case or brackets placed in unused expansion slot positions. ATX allowed each motherboard manufacturer to put these ports in a rectangular area on the back of the system with an arrangement they could define themselves, though a number of general patterns depending on what ports the motherboard offers have been



ATX I/O plates for motherboard rear connectors

followed by most manufacturers. Cases are usually fitted with a snap-out panel, also known as an I/O plate or I/O shield, in one of the common arrangements. If necessary, I/O plates can be replaced to suit a motherboard that is being fitted; the I/O plates are usually included with motherboards not designed for a particular computer. The computer will operate correctly without a plate fitted, although there will be open gaps in the case and the EMI/RFI screening will be compromised. Panels were made that allowed fitting an AT motherboard in an ATX case.

ATX also made the PS/2-style mini-DIN keyboard and mouse connectors ubiquitous. AT systems used a 5-pin DIN connector for the keyboard and were generally used with serial port mice (although PS/2 mouse ports were also found on some systems). Many modern motherboards are phasing out the PS/2-style keyboard and mouse connectors in favor of the more modern Universal Serial Bus. Other legacy connectors that are slowly being

phased out of modern ATX motherboards include 25-pin parallel ports and 9-pin RS-232 serial ports. In their place are onboard peripheral ports such as Ethernet, FireWire, eSATA, audio ports (both analog and S/PDIF), video (analog D-sub, DVI, HDMI, or DisplayPort) and extra USB ports.

Variants

Several ATX-derived designs have been specified that use the same power supply, mountings and basic back panel arrangement, but set different standards for the size of the board and number of expansion slots. Standard ATX provides seven slots at 0.8 in (20 mm) spacing; the popular Micro-ATX size removes 2.4 inches and three slots, leaving four. Here width refers to the distance along the external connector edge, while depth is from front to rear. Note each larger size inherits all previous (smaller) colors area.

Note: AOpen has conflated the term Mini ATX with a more recent 15×15 cm (5.9×5.9 in) design. Since references to Mini ATX have been removed from ATX specifications since the adoption of microATX, the AOpen definition is the more contemporary term and the one listed above is apparently only of historical significance.

Larger variants

A number of manufacturers have added one, two or three additional expansion slots (at the standard 0.8 inch spacing) to the standard 12-inch ATX motherboard width.

SSI CEB

Server System Infrastructure (SSI) Forum's Compact Electronics Bay (CEB) measures 12×10.5 in (305×267 mm).

E-ATX/SSI EEB

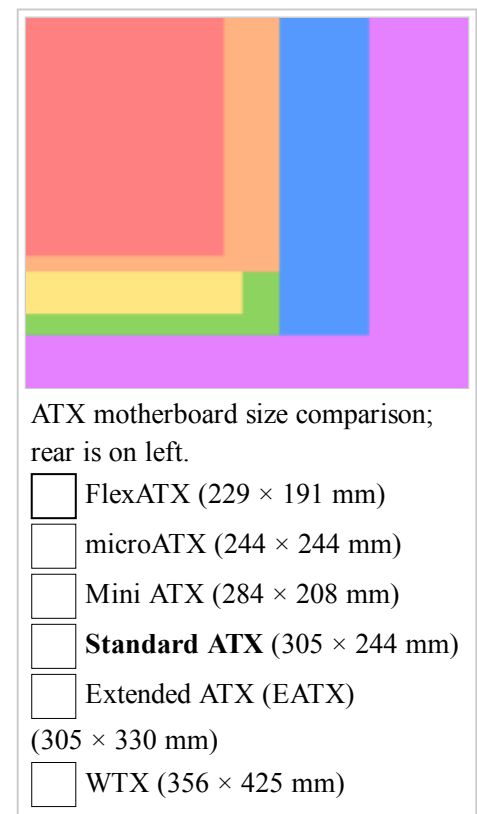
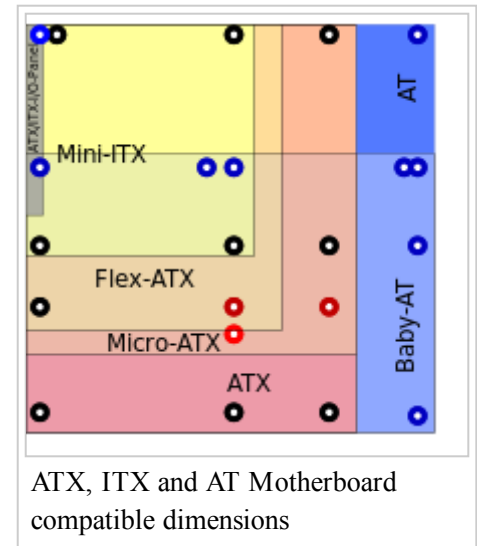
Although true E-ATX is 12×13 in (305×330 mm) most motherboard manufacturers also refer to motherboards with measurements 12×10.1 in (305×257 mm), 12×10.4 in (305×264 mm), 12×10.5 in (305×267 mm) and 12×10.7 in (305×272 mm) as E-ATX. While E-ATX and SSI EEB share the same dimensions, the screw holes of the two standards do not all align; rendering them incompatible.

EE-ATX

Supermicro's server motherboard's measuring 13.68×13 in (347×330 mm)

Ultra ATX

In 2008, Foxconn unveiled a Foxconn F1 motherboard prototype, which has the same width as a standard ATX motherboard, but an extended 14.4" length to accommodate 10 slots.^[4]



The firm called the new 14.4×9.6 in (366×244 mm) design of this motherboard "Ultra ATX"^[5] in its CES 2008 showing. Also unveiled during the January 2008 CES was the Lian Li Armorsuit PC-P80 case with 10 slots designed for the motherboard.^[6]

XL-ATX

The name "XL-ATX" has been used by at least three companies in different ways.

In September 2009, EVGA Corporation had already released a 13.5×10.3 in (343×262 mm) "XL-ATX" motherboard as its *EVGA X58 Classified 4-Way SLI*.^[7]

Gigabyte Technology launched another XL-ATX motherboard, with model number GA-X58A-UD9 in 2010 measuring at 13.6×10.3 in (345×262 mm), and GA-X79-UD7 in 2011 measuring at 12.8×10.0 in (324×253 mm). In April 2010, Gigabyte announced its 12.8×9.6 in (325×244 mm) GA-890FXA-UD7 motherboard that allowed all seven slots to be moved downward by one slot position. The added length could have allowed placement of up to eight expansion slots, but the top slot position is vacant on this particular model.

MSI released MSI X58 Big Bang in 2010, MSI P67 Big Bang Marshal in 2011, MSI X79 Xpower Big Bang 2 in 2012 and MSI Z87 Xpower in 2013 all of them are 13.6×10.4 in (345×264 mm). Although these boards have room for additional expansion slots (9 and 8 total, respectively), all three provide only seven expansion connectors; the topmost positions are left vacant to provide more room for the CPU, chipset and associated cooling.

HPTX

In 2010, EVGA Corporation released a new motherboard, the "Super Record 2", or SR-2, whose size surpasses that of the "EVGA X58 Classified 4-Way SLI". The new board is designed to accommodate two Dual QPI LGA1366 socket CPUs (e.g. Intel Xeon), similar to that of the Intel Skulltrail motherboard that could accommodate two Intel Core 2 Quad processors and has a total of seven PCI-E slots and 12 DDR3 RAM slots. The new design is dubbed "HPTX" and is 13.6×15 in (345×381 mm).^[8]

SSI MEB

Server motherboards measuring 16.2×13 in (411×330 mm).

SWTX

Supermicro's SWTX (Server / Workstation Technology eXtended) design measuring from 16×13 in (406×330 mm) to 18×13 in (457×330 mm). Most SWTX boards seem to be in the middle of this range around 16.48×13 in (419×330 mm).

WTX

Intel's discontinued WTX (Workstation Technology Extended) design measuring 14×16.75 in (356×425 mm).

Power supply

The ATX specification requires the power supply to produce three main outputs, +3.3 V, +5 V and +12 V. Low-power −12 V and 5 V_{SB} (standby) supplies are also required. The −12 V supply was primarily used to provide the negative supply voltage for RS-232 ports, but is also used by one of the pins on Conventional PCI slots. The 5 V_{SB}

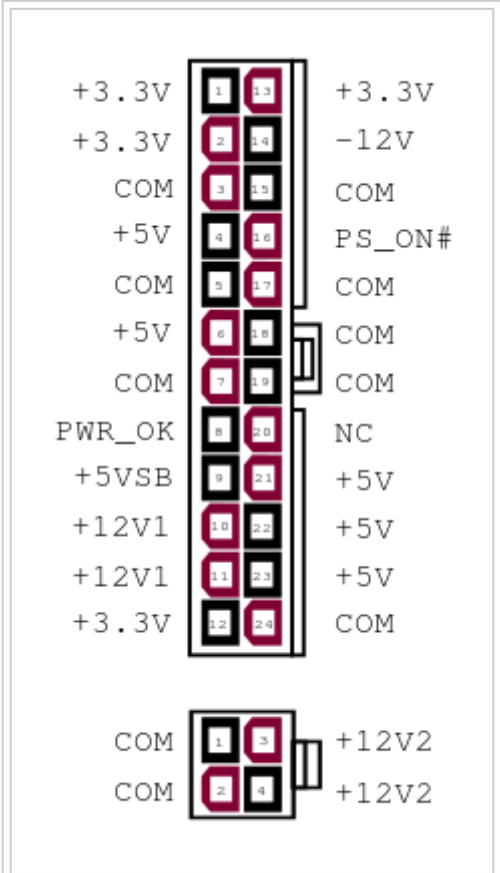
supply is used to produce trickle power to provide the soft power feature of ATX when a PC is turned off. A −5 V output was originally required because it was supplied on the ISA bus, but it became obsolete with the removal of the ISA bus in modern PCs and has been removed in later versions of the ATX standard.

Originally, the motherboard was powered by one 20-pin connector. An ATX power supply provides a number of peripheral power connectors and (in modern systems) two connectors for the motherboard: a 4-pin auxiliary connector providing additional power to the CPU and a main 24-pin power supply connector, an extension of the original 20-pin version. 20-pin MOLEX 39-29-9202 at the motherboard. 20-pin MOLEX 39-01-2200 at the cable.

24-pin ATX12V 2.x power supply connector

Color	Signal ^[i]	Pin ^[ii]	Pin ^{[ii][iii]}	Signal ^[i]	Color
Orange	+3.3 V	1	13	+3.3 V	Orange
				+3.3 V sense ^[iv]	Brown
Orange	+3.3 V	2	14	−12 V	Blue
Black	Ground	3	15	Ground	Black
Red	+5 V	4	16	Power on ^[v]	Green
Black	Ground	5	17	Ground	Black
Red	+5 V	6	18	Ground	Black
Black	Ground	7	19	Ground	Black
Grey	Power good ^[vi]	8	20	Reserved ^[vii]	None
Purple	+5 V standby	9	21	+5 V	Red
Yellow	+12 V	10	22	+5 V	Red
Yellow	+12 V	11	23	+5 V	Red
Orange	+3.3 V	12	24	Ground	Black

- i. Light-blue background denotes control signals.
- ii. Light-green background denotes the pins present only in the 24-pin connector.
- iii. In the 20-pin connector, pins 13–21 are numbered 11–20, respectively.
- iv. Supplies +3.3 V power and also has a second low-current wire for remote sensing.^[10]
- v. A control signal that is pulled up to +5 V by the PSU, and must be driven low to turn on the PSU.
- vi. A control signal that is low when other outputs have not yet reached, or are about to leave, correct voltages.
- vii. Formerly −5 V (white wire), absent in modern power supplies; it was optional in ATX and ATX12V ver. 1.2, and deleted since ver. 1.3.



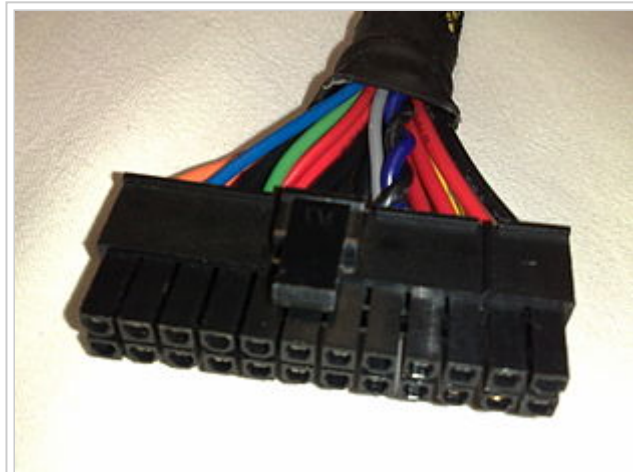
Pinouts of ATX 2.x motherboard power connectors, 24-pin (top) and four-pin "P4" (bottom), as viewed into mating side of the plugs^[9]

Molex connector part numbers

Pins	Female/receptacle on PS cable	Male/vertical header on PCB	Male/plug extender cable
4-pin	39-01-2040	39-28-1043	39-01-2046
20-pin	39-01-2200	39-28-1203	39-01-2206
24-pin	39-01-2240	39-28-1243	39-01-2246

Four wires have special functions:

- **PS_ON#** or *power on* is a signal from the motherboard to the power supply. When the line is connected to ground (by the motherboard), the power supply turns on. It is internally pulled up to +5 V inside the power supply.^{[2][11]}
- **PWR_OK** (a "*power good*" signal) is an output from the power supply that indicates that its output has stabilized and is ready for use. It remains low for a brief time (100–500 ms) after the PS_ON# signal is pulled low.^[12]
- **+5 V_{SB}** or *+5 V standby* supplies power even when the rest of the supply lines are off. This can be used to power the circuitry that controls the Power On signal.
- **+3.3 V sense** should be connected to the +3.3 V on the motherboard or its power connector. This connection allows for remote sensing of the voltage drop in the power supply wiring.



24-pin ATX power plug; pins 11, 12, 23 and 24 form a detachable separate four-pin plug, making it backward compatible with 20-pin ATX receptacles

Generally, supply voltages must be within $\pm 5\%$ of their nominal values at all times. The little-used negative supply voltages, however, have a $\pm 10\%$ tolerance. There is a specification for ripple in a 10 Hz–20 MHz bandwidth:^[2]

Supply [V]	Tolerance	Range (min. to max.)	Ripple (p. to p. max.)
+5 V _{DC}	$\pm 5\%$ (± 0.25 V)	+4.75 V to +5.25 V	50 mV
−5 V _{DC}	$\pm 10\%$ (± 0.50 V)	−4.50 V to −5.50 V	50 mV
+12 V _{DC}	$\pm 5\%$ (± 0.60 V)	+11.40 V to +12.60 V	120 mV
−12 V _{DC}	$\pm 10\%$ (± 1.20 V)	−10.80 V to −13.20 V	120 mV
+3.3 V _{DC}	$\pm 5\%$ (± 0.165 V)	+3.135 V to +3.465 V	50 mV
+5 V _{SB}	$\pm 5\%$ (± 0.25 V)	+4.75 V to +5.25 V	50 mV

The 20–24 pin Molex Mini-Fit Jr. has a power rating of 600 volt, 8 ampere maximum per pin (while using 18 AWG wire).^[13] As large server motherboards and 3D graphics cards have required progressively more and more power to operate, it has been necessary to revise and extend the standard beyond the original 20-pin connector, to allow more current using multiple additional pins in parallel. The low circuit voltage is the restriction on power flow through each connector pin; at the maximum rated voltage, a single Mini-Fit Jr pin would be capable of 4800 watts.

Physical characteristics

ATX power supplies generally have the dimensions of $150 \times 86 \times 140$ mm ($5.9 \times 3.4 \times 5.5$ in),^{[14]:23–24} with the width and height being the same as the preceding LPX form factor (which are often incorrectly referred to as "AT" power supplies due to their ubiquitous use in later AT and Baby AT systems), even though the actual AT power supply form factor was physically larger) and share a common mounting layout of four screws arranged on the back side of the unit. That last dimension, the 140 mm depth, is frequently varied, with depths of 160, 180, 200 and 230 mm used to accommodate higher power or modular connectors.

Main changes from AT and LPX designs

Power switch

Original AT cases (flat case style) had an integrated power switch that protruded from the power supply and sat flush with a hole in the AT chassis. It utilized a paddle-style DPST switch and was similar to the PC and PC-XT style power supplies.

Later AT (so-called "Baby AT") and LPX style computer cases had a power button that was directly connected to the system computer power supply (PSU). The general configuration was a double-pole latching mains voltage switch with the four pins connected to wires from a four-core cable. The wires were either soldered to the power button (making it difficult to replace the power supply if it failed) or blade receptacles were used.

An ATX power supply is typically controlled by an electronic switch connected to the power button on the computer case and allows the computer to be turned off by the operating system. In addition, many ATX power supplies have an equivalent-function manual switch on the back that also ensures no power is being sent to the components. When the switch on the power supply is turned off, however, the computer cannot be turned on with the front power button.

Power connection to the motherboard

The power supply's connection to the motherboard was changed from the older AT and LPX standards; AT and LPX had two similar connectors that could be accidentally interchanged by forcing the different keyed connectors into place, usually causing short-circuits and irreversible damage to the motherboard (the rule of thumb for safe operation was to connect the side-by-side connectors with the black wires together). ATX used one large, keyed connector which could not be connected incorrectly. The new connector also provides a 3.3 volt source, removing the need for motherboards to derive this voltage from the 5 V rail. Some motherboards, particularly those manufactured after the introduction of ATX but while LPX equipment was still in use, supported both LPX and ATX PSUs.^[15]

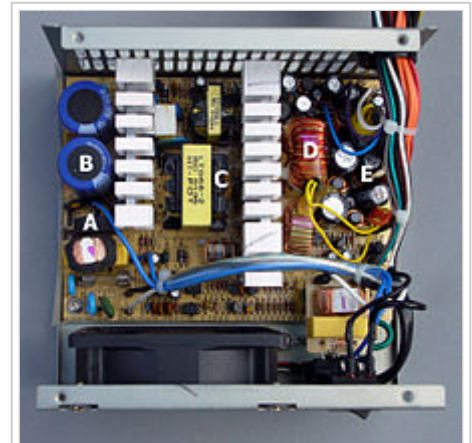
If using an ATX PSU for purposes other than powering an ATX motherboard, power can be fully turned on (it is always partly on to operate "wake-up" devices) by shorting the "power-on" pin on the ATX connector (pin 16, green wire) to a black wire (ground), which is what the power button on an ATX system does. At least the specified minimum load required by the PSU should be present; the standard does not specify operation without load and a conforming PSU may shut down, output incorrect voltages, or otherwise malfunction, but will not be hazardous or damaged.

Airflow

The original ATX specification called for a power supply to be located near to the CPU with the power supply fan drawing in cooling air from outside the chassis and directing it onto the processor. It was thought that in this configuration, cooling of the processor would be achievable without the need of an active heatsink.^[2] (<http://www.intel.com/support/processors/pentium/sb/cs-011025.htm>) This recommendation was removed from later specifications; modern ATX power supplies usually exhaust air from the case.



Typical ATX 1.3 power supply. From left to right, the connectors are 20-pin motherboard, 4-pin "P4 connector", fan RPM monitor (note the lack of a power wire), SATA power connector (black), "Molex connector" and floppy connector.



Interior view in an ATX power supply.

ATX power supply revisions

Original ATX

ATX, introduced in late 1995, defined three types of power connectors:

- 4-pin "Molex connector" — transferred directly from AT standard: +5 V and +12 V for P-ATA hard disks, CD-ROMs, 5.25 inch floppy drives and other peripherals.^[16]
- 4-pin Berg floppy connector — transferred directly from AT standard: +5 V and +12 V for 3.5 inch floppy drives and other peripherals.^[17]
- 20-pin Molex Mini-fit Jr. main motherboard connector — new to the ATX standard.
- A supplemental 6-pin AUX connector providing additional 3.3 V and 5 V supplies to the motherboard, if needed. This was used to power the CPU in motherboards with CPU voltage regulator modules which required 3.3 volt and/or 5 volt rails and could not get enough power through the regular 20-pin header.

The power distribution specification defined that most of the PSU's power should be provided on 5 V and 3.3 V rails, because most of the electronic components (CPU, RAM, chipset, PCI, AGP and ISA cards) used 5 V or 3.3 V for power supply. The 12 V rail was only used by fans and motors of peripheral devices (HDD, FDD, CD-ROM, etc.)

ATX12V 1.x

While designing the Pentium 4 platform in 1999/2000, the standard 20-pin ATX power connector was found insufficient to meet increasing power-line requirements; the standard was significantly revised into ATX12V 1.0 (ATX12V 1.x is sometimes inaccurately called ATX-P4). ATX12V 1.x was also adopted by AMD Athlon XP and Athlon 64 systems. However, some early model Athlon XP and MP boards (including some server boards) and later model lower-end motherboards do not have the 4-pin connector as described below.

Numbering of the ATX revisions may be a little confusing: ATX refers to the design, and goes up to version 2.2 in 2004 (with the 24 pins of ATX12V 2.0) while ATX12V describes only the PSU. For instance, ATX 2.03 is pretty commonly seen on PSU from 2000 & 2001 and often include the P4 12V connector, even if the norm itself does not define it yet!^[2]

ATX12V 1.0

The main changes and additions in ATX12V 1.0 (released in February 2000) were:

- Increased the power on the 12 V rail (power on 5 V and 3.3 V rails remained mostly the same).
- An extra 4-pin mini fit JR (Molex 39-01-2040), 12-volt connector to power the CPU.^[14]

Formally called the *+12 V Power Connector*, this is commonly referred to as the **P4 connector** because this was first needed to support the Pentium 4 processor.

Before the Pentium 4, processors were generally powered from the 5 V rail. Later processors operate at much lower voltages, typically around 1 V and some draw over 100 A. It is infeasible to provide power at such low voltages and high currents from a standard system power supply, so the Pentium 4 established the practice of generating it with a DC-to-DC converter on the motherboard next to the processor, powered by the 4-pin 12 V connector.

ATX12V 1.1

This is a minor revision from August 2000. The power on the 3.3 V rail was slightly increased and other smaller changes were made.

ATX12V 1.2

A relatively minor revision from January 2002. The only significant change was that the -5 V rail was no longer required (it became optional). This voltage was required by the ISA bus, which is no longer present on almost all modern computers.

ATX12V 1.3

Introduced in April 2003 (a month **after** 2.0). This standard introduced some changes, mostly minor. Some of them are:

- Slightly increased the power on 12 V rail.
- Defined minimal required PSU efficiencies for light and normal load.
- Defined acoustic levels.
- Introduction of Serial ATA power connector (but defined as optional).
- Guidance for the -5 V rail was removed (but it was not prohibited).^[18]

ATX12V 2.x

ATX12V 2.x brought a very significant design change regarding power distribution. By analyzing the power demands of then-current PCs, it was determined that it would be much cheaper and more practical to power most PC components from 12 V rails, instead of from 3.3 V and 5 V rails.

In particular, PCI Express expansion cards take much of their power from the 12 V rail (up to 5.5 A), while the older AGP graphics cards took only up to 1 A on 12 V and up to 6 A on 3.3 V. The CPU is also driven by a 12 V rail, while it was done by a 5 V rail on older PCs (before the Pentium 4).

ATX12V 2.0

The above conclusion was incorporated in ATX12V 2.0 (introduced in February 2003), which defined quite different power distribution from ATX12V 1.x:

- Most power is now provided on 12 V rails. The standard specifies that two independent 12 V rails (12 V_2 for the four-pin connector and 12 V_1 for everything else) with independent overcurrent protection are needed to meet the power requirements safely (some very high power PSUs have more than two rails, recommendations for such large PSUs are not given by the standard).
- The power on 3.3 V and 5 V rails was significantly reduced.
- The main ATX power connector was extended to 24 pins. The extra four pins provide one additional 3.3 V, 5 V and 12 V circuit.
- The six-pin AUX connector from ATX12V 1.x was removed because the extra 3.3 V and 5 V circuits which it provided are now incorporated in the 24-pin main connector.
- The power supply is required to include a Serial ATA power cable.
- Many other specification changes and additions



ATX-450PNF by FSP Group

ATX12V v2.01

This is a minor revision from June 2004. An errant reference for the -5 V rail was removed. Other minor changes were introduced.^[19]

ATX12V v2.1

This is a minor revision from March 2005. The power was slightly increased on all rails. Efficiency requirements changed.

ATX12V v2.2

Another minor revision.

- Specified High Current Series wire terminals for 24-pin main and 4-pin $+12\text{ V}$ power connectors.

ATX12V v2.3

Effective March 2007. Recommended efficiency was increased to 80% (with at least 70% required) and the 12 V minimum load requirement was lowered. Higher efficiency generally results in less power consumption (and less waste heat) and the 80% recommendation brings supplies in line with new Energy Star 4.0 mandates.^[20] The reduced load requirement allows compatibility with processors that draw very little power during startup.^[21] The absolute over-current limit of 240 VA per rail was removed, allowing 12 V lines to provide more than 20 A per rail.

ATX12V v2.31

This revision became effective on February 2008. It added a maximum allowed ripple/noise specification of 400 millivolts to the PWR_ON and PWR_OK signals, requires that the DC power must hold for more than 1 millisecond after the PWR_OK signal drops, clarified country-specific input line harmonic content and electromagnetic compatibility requirements, added a section about Climate Savers, updated recommended power supply configuration charts, and updated the cross-regulation graphs.

ATX12V v2.32

This the unofficial name given to the later revisions of the v2.31 spec.^[22]

ATX12V v2.4

This is the current version of the ATX12V spec, published in April 2013. It is specified in Revision 1.31 of the 'Design Guide for Desktop Platform Form Factors',^[23] though it is also unofficially known as ATX12V v2.4.

ATX power supply derivatives

SFX

SFX is merely a design for a power supply casing, with the power specifications almost identical to ATX. Thus, an SFX power supply is mostly pin-compatible with the ATX power supply as the main difference is its reduced dimensions; the only electrical difference is that the SFX specifications do not require the -5 V rail. Since -5 V is required only by some ISA-bus expansion cards, this is not an issue with modern hardware and decreases productions costs. As a result, ATX pin 20, which carried -5 V , is absent in current power supplies; it was optional in ATX and ATX12V version 1.2 and deleted as of ATX version 1.3.

SFX has dimensions of 125 × 100 × 63.5 mm (width × depth × height), with a 60 mm fan, compared with the standard ATX dimensions of 150 × 86 × 140 mm. Optional 80 or 40 mm fan replacement increases or decreases the height of an SFX unit.^[24]

Some manufacturers and retailers incorrectly market SFX power supplies as µATX or MicroATX power supplies.

TFX

Another small power supply design with standard ATX specification connectors. Generally 5.75×3.25×2.5 in (D) × (W) × (H) (146×83×64 mm).

WTX

Provides a WTX style motherboard connector which is incompatible with the standard ATX motherboard connector.

AMD GES

This is an ATX12V power supply derivative made by AMD to power its Athlon MP (dual processor) platform. It was used only on high-end Athlon MP motherboards. It has a special 8-pin supplemental connector for motherboard, so an AMD GES PSU is required for such motherboards (those motherboards will not work with ATX(12 V) PSUs).

a. ATX12V-GES 24-pin P1 motherboard connector. The pinout on the motherboard connector is as follows when viewing the motherboard from above:

12. 12V	yellow	24. 12V	yellow
11. 12V	yellow	23. GND	black
10. GND	black	22. GND	black
9. GND	black	21. 3.3V	orange
8. 3.3V	orange	20. 3.3V	orange
7. 3.3V	orange	19. 3.3V	orange
6. GND	black	18. GND	black
5. PS_ON_N	green	17. -12V	blue
4. GND	black	16. 5VSB	purple
3. GND	black	15. GND	black
2. 5V	red	14. 5V	red
1. 5V	red	13. 5V	red

b. ATX12V-GES 8-pin P2 motherboard connector. This pinout on the motherboard connector is as follows when viewing the motherboard from above:

4. GND	black	8. 12V	yellow_w_black_stripe
3. GND	black	7. 12V	yellow_w_black_stripe
2. PWR_OK	gray	6. 12V	yellow_w_black_stripe
1. 5V	red	5. GND	black

EPS12V



An SFX power supply unit



A TFX power supply unit

EPS12V is defined in SSI and used primarily by SMP/multi-core systems such as Core 2, Core i7, Opteron and Xeon. It has a 24-pin main connector (same as ATX12V v2.x), an 8-pin secondary connector and an optional 4-pin tertiary connector. Rather than include the extra cable, many power supply makers implement the 8-pin connector as two combinable 4-pin connectors to ensure backwards compatibility with ATX12V motherboards.

Recent specification changes and additions

High-performance video card power demands dramatically increased during the 2000s and some high-end graphics cards have power demands that exceed AGP or PCIe slot capabilities. For these cards, supplementary power was delivered through a standard 4-pin peripheral or floppy power connector. Midrange and high-end PCIe graphics cards manufactured after 2004 typically use a standard 6 or 8-pin PCIe power connector directly from the PSU.

Interchanging PSUs

Although the ATX power supply specifications are mostly vertically compatible in both ways (both electrically and physically), there are potential issues with mixing old motherboards/systems with new PSUs and vice versa. The main issues to consider are the following:

- The power allocation between 3.3 V, 5 V and 12 V rails is very different between older and newer ATX PSU designs, as well as between older and newer PC system designs.
- Older PSUs may not have connectors which are required for newer PC systems to properly operate.
- Newer systems generally have higher power requirements than older systems.

This is a practical guidance what to mix and what not to mix:

- Older systems (before Pentium 4 and Athlon XP platforms) were designed to draw most power from 5 V and 3.3 V rails.
- Because of the DC-DC converters on the motherboard that convert 12 V to the low voltages required by the Intel Pentium 4 and AMD Athlon XP (and subsequent) processors, such systems draw most of their power from the 12 V rail.
- Original ATX PSUs have power distribution designed for pre-P4/XP PCs. They lack the supplemental 4-pin 12-volt CPU power connector, so they most likely cannot be used with P4/XP or newer motherboards. Adapters do exist but power drain on the 12 V rail must be checked very carefully. There is a chance it can work without connecting the 4-pin 12 V connector, but caution is advised.^[25]
- ATX12V 1.x PSUs have power distribution designed for P4/XP PCs, but they are also greatly suitable for older PCs, since they give plenty of power (relative to old PCs' needs) both on 12 V and on 5 V/3.3 V. It is not recommended to use ATX12V 1.x PSUs on ATX12V 2.x motherboards because those systems require much more power on 12 V than ATX12V 1.x PSUs provide.
- ATX12V 2.x PSUs have power distribution designed for late P4/XP PCs and for Athlon 64 and Core Duo PCs. They can be used with earlier P4/XP PCs, but the power distribution will be significantly suboptimal, so a more powerful ATX12V 2.0 PSU should be used to compensate for that discrepancy. ATX12V 2.x PSUs can also be used with pre-P4/XP systems, but the power distribution will be greatly suboptimal (12 V rails will be mostly unused, while the 3.3 V/5 V rails will be overloaded), so this is not recommended.
- Systems that use an ISA bus should have a PSU that provides the −5 V rail, which became optional in ATX12V 1.2 and was subsequently phased out by manufacturers.

Not all computers use standard, interchangeable ATX power supplies. In particular, some proprietary brand-name systems require a matching proprietary power supply.

See also

- AT (form factor)

- BTX (form factor)
- Computer form factor
- Mini-ITX
- Power supply rail
- Power supply unit (computer)
- SSI CEB

References

1. Mark, Soper; Prowse, David; Mueller, Scott (September 2012). *Authorized Cert Guide: CompTIA A+*. Pearson Education. ISBN 978-0-7897-4850-8.
2. "ATX Specification - Version 2.2" (PDF). Retrieved April 4, 2014.
3. "Power Supply Design Guide for Desktop Platform Form Factors" (PDF). February 2008. Retrieved April 4, 2014.
4. "Foxconn F1 Motherboard Prototype". Hardwaresecrets.com. Retrieved 18 November 2014.
5. Thomas Soderstrom. "Foxconn Reveals X48, Ultra ATX, and Shamino". *Tom's Hardware*. Retrieved 18 November 2014.
6. "Lian Li Armorsuit PC-P80R Spider Edition". *TechPowerUp*. Retrieved 18 November 2014.
7. "The New 4-Way SLI Platform Has Arrived!". Evga.com. Retrieved 18 November 2014.
8. "EVGA Corporation Super Record 2". Evga.com. Retrieved 18 November 2014.
9. "Power Supply Design Guide for Desktop Platform Form Factors, Revision 1.31" (PDF). Intel. April 2013. p. 26. Retrieved February 6, 2015.
10. "ATX Specification Version 2.1" (PDF).
11. "How to Convert a Computer ATX Power Supply to a Lab Power Supply (with video) - wikiHow". Retrieved 2013-08-17. wikihow.com
12. "PCGuide - Ref - Power Supply - Functions". Retrieved 2013-08-17. pcguide.com
13. "Mini-Fit Jr.™ Power Connectors - Molex". Molex.com. Retrieved 18 November 2014.
14. "AT / ATX12V Power Supply Design Guide Version 1.1" (PDF). Intel Corporation. August 2000. p. 28. Archived from the original (pdf) on 2011-03-11. Retrieved 2011-03-11.
15. "Example of a motherboard that can support connecting AT and ATX PSUs". Createch.com. Retrieved 18 November 2014.
16. "PC peripheral power connector pinout and signals @ pinouts.ru". Pinouts.ru. Retrieved 18 November 2014.
17. "PC floppy power connector pinout and signals @ pinouts.ru". Pinouts.ru. Retrieved 18 November 2014.
18. "ATX12V Power Supply Design Guide Version 1.3" (pdf). Intel Corporation. April 2003. p. 38. Retrieved 2013-03-24.
19. "ATX12V Power Supply Design Guide Version 2.01" (pdf). Intel Corporation. June 2004. p. 44. Retrieved 2013-03-24.
20. "Design Guide for Desktop Platform Form Factors, Intel Corp" (PDF). Formfactors.org. Retrieved 18 November 2014.
21. "#138 - Question/Answer: ATX 12V 2.2 vs. ATX 12V 2.3". *YouTube*. Retrieved 18 November 2014.
22. <https://www.techpowerup.com/reviews/Antec/HCG-750M/2.html>
23. http://cache-www.intel.com/cd/00/00/52/37/523796_523796.pdf
24. "SFX Form Factor". Pcguides.com. Retrieved 18 November 2014.
25. [1] (<http://www.neoseeker.com/Hardware/faqs/kb/12,17.html>) Archived (<https://web.archive.org/web/20091003092553/http://www.neoseeker.com/Hardware/faqs/kb/12,17.html>) October 3, 2009, at the Wayback Machine.

External links

ATX Board Specifications

- ATX Motherboard Specification, v2.2 (http://www.formfactors.org/developer/specs/atx2_2.pdf)
- ATX Riser Card Specification, v1.0 (http://www.formfactors.org/developer/specs/ATX_Spec_V1_0.pdf)



Wikimedia Commons has media related to ***Computer motherboards***.

ATX Power Supply Specifications

- ATX12V Power Supply Design Guide, v2.01 ([http://www.formfactors.org/developer/specs/ATX12V%20PS](http://www.formfactors.org/developer/specs/ATX12V%20PS%20v2.01.pdf) Ericsson Ex. 2070, Page 1

DG2.01.pdf)

- ATX12V Power Supply Design Guide, v2.2 (http://www.formfactors.org/developer/specs/ATX12V_PSDG_2_2_public_br2.pdf)
- ATX12V Power Supply Design Guide, v2.3 (http://www.formfactors.org/developer/specs/ATX12V_PSDG_rev_1_1.pdf) (Power Supply Design Guide for Desktop Platform Form Factors, v1.1)
- ATX12V Power Supply Design Guide, v2.31 (http://www.formfactors.org/developer/specs/Power_Supply_Design_Guide_Desktop_Platform_Rev_1_2.pdf) (Power Supply Design Guide for Desktop Platform Form Factors, v1.2)
- ATX12V Power Supply Design Guide, v2.4 (http://cache-www.intel.com/cd/00/00/52/37/523796_523796.pdf) (Power Supply Design Guide for Desktop Platform Form Factors, v1.31)

EPS Power Supply Specifications

- EPS12V Power Supply Design Guide, v2.0 (http://www.psui.com/1upower/pdf/892_ref.pdf)
- EPS12V Power Supply Design Guide, v2.91 (http://www.pcpower.com/downloads/EPS12VSpec2_91.pdf)
- EPS12V Power Supply Design Guide v2.92 (http://www.enermax.cn/enermax_pdf/EPS12V%20Spec2_92.pdf)

Other

- Power Supply Form Factors (http://www.pcguide.com/ref/power/sup/form_ATX.htm)
- Various power supply cables and connectors (<http://www.playtool.com/pages/psuconnectors/connectors.html>)
- A short history of power supply voltage rails (<http://www.playtool.com/pages/psurailhistory/rails.html>)
- ATX power supply connectors with pinouts (http://pinouts.ru/pin_Power.shtml)
- More ATX power supply connectors with pinouts (http://www.hardwarebook.info/Category:Connector#Power_Supply)
- ATX Power Supply Terminology (https://www.nipron.co.jp/english/product_info/encyclopedia/1_5.htm)

Retrieved from "<https://en.wikipedia.org/w/index.php?title=ATX&oldid=725278137>"

Categories: Motherboard form factors | IBM PC compatibles

-
- This page was last modified on 14 June 2016, at 17:38.
 - Text is available under the Creative Commons Attribution-ShareAlike License; additional terms may apply. By using this site, you agree to the Terms of Use and Privacy Policy. Wikipedia® is a registered trademark of the Wikimedia Foundation, Inc., a non-profit organization.