

Tools for HVACR drive technician

Hand tools to software

Having the right tools for the job allows a technician to effectively and efficiently work on the equipment. This technical note reviews the suggested toolset for working on and supporting ABB ACH580 HVACR drives. While the ACH580 drive is used as the example, many of the concepts are applicable to any drive. This technical note was requested by, its content creation supported by, and approved by the ABB Drive Specialist Council. This council is made up of five wrench-turning drive specialists from US HVACR channel partners. The various tools will be broken down into hand tools and software tools. Electronic metering tools are covered in [Technical Note 180](#). This document is not intended to supersede or replace details within a drive's hardware or IOM manual.

Hand tools

A full arsenal of hand tools is beneficial when working on equipment. Screwdriver sets (slot and Phillips), Torx driver set, pliers, wire strippers, wrenches, socket sets, and Allen wrenches are tools a technician must have available. But what about when the technician needs to pack light? What if the technician's truck is parked a 15-minute walk from the equipment, with the equipment on the roof and only accessible via small roof hatch? There are times when the bare necessities travel with the technician, and the rest gets left behind. The following information is regarding the typical tools used on ACH580 drives.

There are four slotted screwdrivers commonly used, the 3.5 mm, 4 mm, 4.5 mm, and 6 mm sizes. Although when working on larger drives, there are sizes up to 8 mm used on ground connections for North American packaged drives. For Phillips or Pozi, the PH1, PH2, PZ1, and PZ2 are the sizes to have available. The T10, T20, T25, and T30 are the Torx bits used. Having a long shaft or extension available is also beneficial in some situations, especially with the T20 – T30 sizes. A metric Allen wrench set, up to 7 mm (or driver bit set) may be needed, such as when working R5 or larger power terminals.

Metric combination wrenches and a socket set (3/8" drive), up to 17 mm, can also be helpful. Note that while most ABB drive connections are metric, other third-party hardware, such as mounting hardware or equipment access panels may require SAE sizes in the US. Thus, when selecting a tool set for the technician, one must also consider the peripheral devices and work that may be required around the drive. A pliers and wire strippers should always be available if there is any chance of wiring work. Ideally a torque wrench is available to confirm proper terminal torque after any wiring work is completed. For example, the power connections on the smaller drives have torque settings as low as 0.7 lbf-ft while larger drives require over 50 lbf-ft (reference hardware manual for exact torque requirements based on drive size and connection type.) A telescoping mirror may be useful to visually inspect larger drives for damage. Reference Appendix A for a summary list of recommended tools.

The following sections identify the most common locations that hand tools are used along with the specific tool size needed.

Drive cover

A T20 Torx driver is required to remove or install the screws that mount the Type 1 (IP21) and Type 12 (IP55) drive's plastic drive cover. Note that for a Type 4X (IP66) drive, a Pozi PZ2 is used for the cover screws.

Control terminals

The control terminals use the slot 3.5 mm screwdriver. Pro tip: in a pinch, the slot 3.5 mm screwdriver can also be used to remove the T20 Torx screws that hold on the plastic cover.

Option cards

A T10 Torx driver is required for installing (or removing) option cards, such as a FLON Lonworks communication card or a CMOD-01 extension module.

Line and load terminals for ACH580-01 base drives

The tools for the power wiring are dependent on the frame size. Frame sizes can be quickly determined by referencing the number of bars shown on the plastic cover of the drive. For example, four bars on the cover indicate a R4 frame size, as shown by the red arrows pointing to the four bars in Figure 1.

- R1: Combination screw type, slot 4 mm and PH1
- R2: Combination screw type, slot 4.5 mm and PH2
- R3: Combination screw type, slot 6 mm and PH2
- R4: PH2
- R4v2: Torx T30
- R5: Allen (hex) 4 mm
- R6: Allen (hex) 5 mm
- R7: Allen (hex) 5 mm
- R8: Allen (hex) 5 mm
- R9: Allen (hex) 6 mm



Figure 1 Frame size (R4)

Line and load terminals for ACH580-01 Type 4X (IP66) base drives without disconnect

The tools for the power wiring are dependent on the frame size.

- R1: Combination screw type, slot 4 mm and PH1
- R2: Combination screw type, slot 4.5 mm and PH2
- R3: Combination screw type, slot 6 mm and PH2

Line and load terminals for ACH580-01 Type 4X (IP66) base drives with disconnect

The line connections at the disconnect use a different tool than the load connection. The tools for the power wiring are dependent on the frame size.

- R1 Line side: Allen (hex) 4 mm
- R1 Load side: Combination screw type, slot 4 mm and PH1
- R2 Line side: Allen (hex) 4mm
- R2 Load side: Combination screw type, slot 4.5 mm and PH2
- R3 Line side: Allen (hex) 4 mm
- R3 Load side: Combination screw type, slot 6 mm and PH2

Ground terminals for ACH580-01 base drives

There are two primary grounding locations on a base ACH580-01 drive. There is an input (line) ground connection and an output (motor) side ground connection. The input and output grounds use the same size tool. The size of the tool is dependent on the frame size.

- R1: PZ2
- R2: PZ2
- R3: PZ2
- R4: PZ2
- R4v2: Torx T20
- R5: Ring termination with M5 stab available for connection
- R6 to R9: Cable clamp for termination with M6 connection

Ground terminals for ACH580-01 Type 4X (IP66) base drives without disconnect

There are two primary grounding locations on the ACH580 Type 4X (IP66) drive without a disconnect. There is an input ground connection and an output (motor) side ground connection. The input and output grounds use the same size tool. The size of the tool is dependent on the frame size.

- R1: PZ2
- R2: PZ2
- R3: PZ2

Ground terminals for ACH580-01 Type 4X (IP66) base drives with disconnect

There are two primary grounding locations on the ACH580 Type 4X (IP66) drive with a disconnect. There is an input (line) side ground connection landed at the disconnect and an output (motor) side ground connection. The input and output grounds use different tools. The size of the tool is dependent on the frame size.

- R1 Line side ground: Slot 6 mm
- R1 Load side ground: PZ2
- R2 Line side ground: Slot 6 mm
- R2 Load side ground: PZ2
- R3 Line side ground: Slot 6 mm
- R3 Load side ground: PZ2

EMC / VAR screws

The drives have screws that can enable the AC EMC circuit, DC EMC circuit, and the varistor circuit. Depending on the frame size, there will be two or three screws total. The circuit is disabled with the metal screw removed, or a plastic screw installed. A plastic screw is not required to be installed, the screw hole may remain empty for a disabled circuit. The circuit is enabled with a metal screw installed.

- Plastic (nylon): PZ1
- Metal: T20

North American packaged products

There are a variety of packaged drives, with and without bypass, available to the North American market. These include non-bypass drives that come with a disconnect, such as the ACH580-PCR and ACH580-PDR. Bypass packages also include a disconnect and include the ACH580-VCR, ACH580-VDR, ACH580-BCR, and ACH580-BDR packages.

Input power connections of these packages are landed at the disconnect. Thus, the disconnect dictates the tool required to tighten the input power connections. The disconnects use an Allen (hex) connection but the size varies based on the disconnect size, with either 4, 5, or 6 mm. The input (line) side ground is typically landed near the disconnect on a dedicated ground lug. That ground lugs vary based on the package and horsepower size and will have a blade width fall between 5 to 8 mm slot screwdriver.

The output power connection location is dependent on the package type and size. The smaller disconnect-only (PCR or PDR) packages up through Frame 4 land the output power and ground connections directly on the drive module. The larger disconnect-only, along with the bypass, packages will not land the output power and ground connections on the drive module. Instead, there will be a dedicated location, such as a motor terminal block. The smaller vertical and boxed bypass packages have a motor terminal block that uses 6 mm slot screwdriver. The larger bypass packages use an Allen (hex) size 6 mm. Similar to the input power ground lugs, the output ground lugs will fall between 5 to 8 mm depending on drive size.

Electronic support tools

Up until now, this paper has focused on hand tools. However, there are a variety of electronic tools that are also helpful for the field technician, such as a smartphone, laptop, and peripheral devices to connect the laptop to a drive or building automation network. Connecting the drive to a laptop will require one of two cable types, depending on the network type. For RS-485 (such as BACnet MS/TP) networks, a length of 3-conductor shielded twisted pair communication wire is used. The connection of the wire to the laptop requires a USB to RS-485 converter. USB to RS-485 converters have been known to be finicky based on a variety of variables. One that has worked well for ABB is the Advantech BB-485USBTB-2W-A. For a BACnet/IP connect from the drive to laptop, a RJ45 cable is required. An appropriate software program, such as YABE, Modscan, or Wireshark ([Technical Note 123](#)), is required based on the specific task.

There are multiple ABB devices and accessories that are important for a field technician, such as:

- CCA-01 cold configurator adaptor and its included USB cable allows a laptop to be connected to an unpowered drive. This connection allows parameter changes, troubleshooting, or firmware updates without requiring line power.
- A CMOD-01 allows a drive's control board to be powered by a remote 24 VDC.
- A CDPI-01 adapter allows the ACH580's control panel to become handheld. A several meter long, straight through, RJ45 (i.e. Ethernet) cable is required.
- A Bluetooth panel can temporarily replace an existing control panel, allowing connection from the drive to a phone, tablet, or laptop (via DriveComposer). Note that the drive may already have a Bluetooth panel installed.

Software tools

There are multiple ABB software tools to aid with working on HVACR drives. They include:

- Drive Composer Pro is a powerful tool that allows a laptop to be connected to a drive. Among many other things, Drive Composer allows viewing of parameters, changing parameters, flashing firmware, trending data, and creating parameter and support package backups. There is a Pro (paid) and Entry (free) version. ABB drive technicians should have the Pro version.
- The Drivetune app allows a phone or tablet to connect to the drive as long as the drive has a Bluetooth control panel. Access to the panel is required to get the pairing code. With the Drivetune app, the technician can control the drive, access parameters, see the modified parameters, and create parameter backups.
- Driveloader 1.3 is an older software tool that is now primarily used for updating firmware in a North American product, the E-Clipse bypass control board (also known as a RBCU.)
- A technician's laptop should have copies of the latest drive and control panel firmware files, in case the internet connection at the jobsite is poor. The .zip file for the control panel firmware will also include the software tool for updating firmware. PDFs of the drive's manuals (hardware, firmware, IOM) should also be saved on the laptop.

Summary

Having the right tools for the job allows a drive technician to effectively accomplish the task. These tools consist of hand tools, electronic related tools, and software. This technical note is intended as a guide to help a technician understand the tools they should have available when working on various ABB HVACR drives. In addition to the guidance within this document, one should seek out other experienced technicians to see what tools they carry in their truck. Depending on one's role, there may be additional specialty tools required, such as an electrostatic discharge (ESD) protection kit for parts work.

Appendix A: Summary of tool sizes

Slot (flat) sizes

3.5 mm, 4 mm, 4.5 mm, 6 mm, 7 mm and 8 mm sizes

Phillips sizes

PH1 and PH2

Pozi screwdrivers / bit sizes

PZ1 and PZ2

Torx driver

T10, T20, T25 and T30

Metric Allen set including sizes

4mm to 7 mm

Metric combination wrench set

Up to 17 mm

3/8" drive socket set

Recommended to have metric (ABB equipment) and SAE (third-party) sockets available

Miscellaneous hand tools

Pliers, wire strippers, torque wrench, telescoping mirror