

Pre-Energization Installation Checklist

FORM 1 OF 3 | PRE-COMMISSIONING | 42 ITEMS | ABOUT 20 MINUTES



This is the field version of the checklist developed in Chapter 13. Walk the installation in the order shown. Fill it out from the panel, not from memory. If an item cannot be verified, mark it and stop. Do not apply power to a drive that has an unverified item on this checklist.

Each item carries a chapter reference so you can look up the reasoning behind anything that is unclear. The items line up with the major drive manufacturers' own checklists. This checklist does not replace the drive manufacturer's installation manual.

Each item takes one disposition. *P (Pass): verified, acceptable, documented where required. F (Fail): verified, not acceptable; correct before proceeding. NA: not applicable to this installation. Do not mark an item Pass if it has not actually been verified.*

B.2 INSTALLATION IDENTIFICATION

Fill out this header before starting.

Site name and location		Facility / building / area	
Drive designation (tag)		Drive manufacturer	
Drive model		Drive serial number	
Drive HP / kW rating		Drive voltage class	
Drive continuous current rating (A)		Motor designation	
Motor manufacturer		Motor HP / kW	
Motor voltage (as connected)		Motor FLA at installed voltage (A)	
Motor nameplate RPM		Motor frame	
Motor service factor		Motor insulation class	
Date of pre-energization check		Technician performing check	
Technician registration / license no.		Commissioning lead (if different)	

B.3 PHASE 1: ENVIRONMENTAL ASSESSMENT

Overheating causes 50 to 60 percent of VFD failures (Chapter 7), and most of those start with an environmental condition that was never assessed.

☐ P
 ☐ F
 ☐ NA

1.1 Ambient temperature at the drive.
 Measured at the drive air intake with the enclosure closed and ventilation running. At or below the drive rated ambient (typically 104 °F, listed as 40 °C on most data sheets), or derating applied for the actual temperature. (Ch. 7)

 Measured ambient °F Drive rated ambient °F

 Derating applied: ☐ Yes ☐ No ☐ N/A

☐ P
 ☐ F
 ☐ NA

1.2 Altitude.
 Documented. Above 3,300 ft (1000 m), derating applied at about 1 percent per 330 ft above 3,300 ft. (Ch. 7)

 Site altitude ft

 Derating applied: ☐ Yes ☐ No ☐ N/A

☐ P
 ☐ F
 ☐ NA

1.3 Humidity.
 Within the drive rated range (typically 5 to 95 percent, non-condensing). No risk of condensation from temperature swings crossing the dew point. (Ch. 7)

 Humidity range observed %

☐ P
 ☐ F
 ☐ NA

1.4 Contamination and enclosure rating.
 Airborne contaminants at the site identified. Enclosure rating (IP or NEMA) appropriate for the contaminants present. (Ch. 7, Ch. 8)

 Contaminants identified

 Enclosure rating

B.4 PHASE 2: MECHANICAL CHECKS

With the environment confirmed, verify the physical installation of the drive and its associated components.

P ☐	F ☐	NA ☐	2.1 Mounting surface and orientation. Drive mounted vertically (unless the manufacturer permits another orientation) on a flat, rigid surface that carries the drive weight without flexing. Vibration at the mounting location within manufacturer specification. (Ch. 8)
P ☐	F ☐	NA ☐	2.2 Spacing between drives. Minimum clearances per manufacturer specification met above, below, and between adjacent drives. Cooling airflow path not restricted. (Ch. 8)
P ☐	F ☐	NA ☐	2.3 Flange-mount requirements. If flange-mounted, cooling requirements satisfied on both the enclosure side and the heatsink side. (Ch. 8) Flange-mounted: ☐ Yes ☐ No ☐ N/A
P ☐	F ☐	NA ☐	2.4 Mechanical fasteners. All drive mounting bolts, cable glands, conduit fittings, sub-plate hardware, and accessory brackets torqued to specification. (Ch. 8)
P ☐	F ☐	NA ☐	2.5 Motor feedback devices. Encoder, resolver, or other feedback device securely attached per the device manufacturer's mechanical precautions. (Ch. 12) Feedback device installed: ☐ Yes ☐ No ☐ N/A
P ☐	F ☐	NA ☐	2.6 Motor coupling state documented. Coupling state for the ID Run recorded: decoupled for a Normal ID Run, or coupled for a Reduced ID Run if decoupling is not practical. (Ch. 14) State: ☐ Decoupled ☐ Coupled

B.5 PHASE 3: ELECTRICAL CHECKS

The most detailed phase. Twenty-three items in four parts. Work through them in order.

B.5.1 AC Supply Source and Input Power Conditioning

P ☐	F ☐	NA ☐	3.1 Transformer configuration identified. Distribution transformer grounding configuration documented (Delta/Wye grounded, ungrounded, resistance grounded, corner grounded Delta). (Ch. 9) Configuration
P ☐	F ☐	NA ☐	3.2 Power jumper configuration confirmed. Drive internal power jumpers match the transformer grounding system. Grounded systems: jumpers closed. Ungrounded or resistance-grounded systems: jumpers open AND MOVs and common-mode capacitors removed or disconnected per manufacturer procedure. (Ch. 9)
P ☐	F ☐	NA ☐	3.3 Transformer kVA ratio verified. Transformer kVA does not exceed 10 times drive kVA (no DC link choke) or 20 times drive kVA (with DC link choke). If exceeded, line reactor installed. Transformer also large enough to meet the drive full-load kVA. (Ch. 9) Transformer kVA Drive kVA Ratio Line reactor installed: ☐ Yes ☐ No ☐ N/A
P ☐	F ☐	NA ☐	3.4 Isolation transformer grounding or line reactor confirmed. If an isolation transformer feeds the drive, its XO terminal is solidly grounded (below 1 ohm to earth). If not, a line reactor is present with no device wired between the reactor secondary and the drive input. (Ch. 9) Isolation transformer XO to earth ohms Or line reactor installed
P ☐	F ☐	NA ☐	3.5 Supplemental equipment validated. Other equipment on the same bus identified (power factor capacitors, switching devices, passive harmonic filters) and isolated as needed. Power factor capacitors, if present, are on the line side of the drive, never between drive and motor. (Ch. 9)

B.5.2 Grounding and Bonding

P ☐	F ☐	NA ☐	3.6 Paint removed at all ground connections. Every bolt, lug, and mounting point where a ground conductor or bonding strap meets the panel has bare metal contact. (Ch. 11)
P ☐	F ☐	NA ☐	3.7 Drive PE to ground bar. Dedicated ground conductor from the drive PE terminal directly to the enclosure ground bar, sized to match the power conductors per manufacturer specification. (Ch. 11)
P ☐	F ☐	NA ☐	3.8 Motor to drive ground. Dedicated ground conductor from the motor directly to the drive, not routed through the panel ground bar as an intermediate point. (Ch. 11)
P ☐	F ☐	NA ☐	3.9 Sub-plate bonding. Multiple sub-plates bonded together with braided metal straps at low-impedance connections. (Ch. 11) Multiple sub-plates present: ☐ Yes ☐ No ☐ N/A
P ☐	F ☐	NA ☐	3.10 PE terminal placement. Input power ground on the terminal closer to the input wiring. Motor cable ground on the terminal closer to the output wiring. (Ch. 11)
P ☐	F ☐	NA ☐	3.11 Ground resistance measured. Drive PE to panel ground bar, and panel ground bar to facility ground electrode, measured with a milliohm meter. Readings below 0.1 ohm. (Ch. 11) Drive PE to ground bar ohms Ground bar to facility ground ohms

B.5.3 Cable and Shield Verification

P ☐	F ☐	NA ☐	3.12 Motor cable type and shield. Motor cable is VFD cable per ANSI/ICEA S-138-738-2024 (or equivalent construction). Shield terminated 360 degrees at both drive and motor ends. Length within the drive's specified maximum for the motor insulation class. (Ch. 5, Ch. 10) Cable length (one-way) ft Cable type
P ☐	F ☐	NA ☐	3.13 Brake cable shield. If a mechanical motor brake is installed, its cable shield is terminated to the enclosure ground bar, NOT to the drive. (Ch. 12) Mechanical brake present: ☐ Yes ☐ No ☐ N/A
P ☐	F ☐	NA ☐	3.14 Encoder cable type and routing. Correct cable type (double-shielded per ABB and Rockwell). Encoder wiring kept at least 12 in from motor power and brake wiring inside the enclosure; separate raceway with dividers or separate conduit outside it. (Ch. 12) Encoder installed: ☐ Yes ☐ No ☐ N/A
P ☐	F ☐	NA ☐	3.15 Encoder cable shield direction. Shield terminated at the drive end only. Continuous run from device to drive with no breaks, couplers, or intermediate terminals. (Ch. 12)
P ☐	F ☐	NA ☐	3.16 Dynamic brake cable and routing. Twisted pair wired to BR+ and BR-. Length within manufacturer specification for the frame. Routed in the power zone, not with control wiring. (Ch. 5, Ch. 9) Dynamic brake installed: ☐ Yes ☐ No ☐ N/A
P ☐	F ☐	NA ☐	3.17 Wire routing separation. High-voltage and low-voltage wiring separated per the Chapter 8 zone principles. Control and power cables cross at 90 degrees where they must cross. (Ch. 8, Ch. 12)
P ☐	F ☐	NA ☐	3.18 All terminations torqued. Every power, ground, and control terminal torqued to manufacturer specification with a torque screwdriver or wrench. Not feel-tested. (Ch. 9, Ch. 12) Torque specification reference

B.5.4 Surge Suppression and Control Wiring

P ☐ F ☐ NA ☐

3.19 Surge suppressors on all coils.

RC snubbers, MOVs, or flyback diodes (as appropriate for AC or DC coils) across every contactor, relay, solenoid, and brake coil on the same power system as the drive. (Ch. 9)

P ☐ F ☐ NA ☐

3.20 Input fuses sized and installed.

Fuse type and rating match the manufacturer requirement for the specific drive model, sized per NEC and the drive's UL certification. (Ch. 5, Ch. 9)

Fuse type Rating A Interrupting capacity kA

P ☐ F ☐ NA ☐

3.21 Control cable shields.

Analog signal cables are shielded twisted pair, shields at the drive end only. Digital and communication shields terminated per protocol specification. (Ch. 12)

P ☐ F ☐ NA ☐

3.22 Communication cables.

Cables match the protocol specification (shielded Ethernet in VFD environments, not unshielded). Connector termination verified. (Ch. 12)

Protocol

P ☐ F ☐ NA ☐

3.23 Wire run length documented.

Actual one-way length from the motor junction box to the drive output terminals measured and recorded. An ABB warranty registration requirement and the reference for future modifications. (Ch. 10, Ch. 13)

Wire run length ft

B.6 PHASE 4: MOTOR INSULATION TESTING

Megger with the drive DISCONNECTED from the motor. Applying megger voltage through the drive will destroy its output power semiconductors.

P ☐ F ☐ NA ☐

4.1 Drive disconnected from motor.

Motor cable lifted at the drive T1, T2, T3 terminals and left connected at the motor junction box so the test covers cable and windings. (Ch. 13)

P ☐ F ☐ NA ☐

4.2 Megger readings recorded.

Test voltage applied between each phase conductor and PE. Three readings with the test voltage documented. (Ch. 13)

Test voltage VDC

T1 to PE megohms T2 to PE megohms T3 to PE megohms

P ☐ F ☐ NA ☐

4.3 All readings above 1 megohm and reasonably similar.

Above 10 megohms generally healthy. 1 to 10 megohms: investigate for moisture or degraded insulation. Below 1 megohm: correct before connecting the motor. One phase much lower than the others: investigate as a localized insulation problem. (Ch. 13)

All readings above 1 megohm: ☐ Yes ☐ No

Within about 50 percent of each other: ☐ Yes ☐ No

B.7 PHASE 5: MOTOR PREPARATION FOR COMMISSIONING

P ☐ F ☐ NA ☐

5.1 Motor coupling state confirmed and documented.

Decoupled and documented as ready for a Normal ID Run, or coupled and documented as requiring a Reduced ID Run. (Ch. 14)

Coupling state: ☐ Decoupled (Normal ID Run) ☐ Coupled (Reduced ID Run)

P ☐ F ☐ NA ☐

5.2 Rotation direction identified and marked.

For rotation-sensitive equipment (pump, compressor, handed fan wheel, positive displacement machine), correct direction identified and marked at the motor and at the drive output terminals. Otherwise, verified at first rotation. (Ch. 15)

Rotation-sensitive: ☐ Yes ☐ No

Correct direction marked: ☐ Yes ☐ N/A

B.8 PHASE 6: FINAL REVIEW BEFORE POWER-UP

A deliberate pause. Step back from the individual items and consider the installation as a whole.

P ☐ F ☐ NA ☐

6.1 Installation walkthrough performed.

Walked the full path from transformer through the panel to the motor and driven equipment. Cable runs clean, wire ducts closed, no debris, clippings, or loose hardware in the enclosure. (Ch. 13)

P ☐ F ☐ NA ☐

6.2 Panel clean and closable.

Doors and covers close without pinching cables. Warning labels in place. Feeding disconnect or breaker operational and accessible. (Ch. 13)

P ☐ F ☐ NA ☐

6.3 Safe-to-operate confirmation from all stakeholders.

Electrical lead confirms electrical work complete. Mechanical lead confirms motor and driven equipment ready. Operations confirms it is safe to start. LOTO removed by the authorized person and all personnel clear. (Ch. 13)

Electrical lead

Mechanical lead

Operations

P ☐ F ☐ NA ☐

6.4 Checklist signed and dated.

Name, registration or license number, date, and signature recorded in B.9. (Ch. 13)

B.9 CERTIFICATION AND SIGN-OFF

By signing, the verifying technician states that every item has been personally verified to the best of their ability, all required measurements are recorded accurately, and the installation is ready for first power-up per Chapters 14 and 15.

Verifying technician (printed name)

Registration / license number

Signature

Date

Time check completed

Total elapsed time

Disposition of deficiencies. List every item marked F or not verified, the corrective action, and initial when resolved. Do not proceed to first power-up until all deficiencies are resolved.

Item #	Deficiency	Corrective action	Date resolved	Initial

B.10 CONSOLIDATED MEASUREMENT RECORD

The baseline for every future inspection, annual test, and condition assessment on this drive. Values fill in automatically from the items above in Acrobat and most desktop PDF readers; type them in if your viewer does not.

Measurement	Value	Units	Reference
Ambient temperature at drive		°F	Item 1.1
Site altitude		ft	Item 1.2
Ambient humidity range		%	Item 1.3
Transformer kVA		kVA	Item 3.3
Transformer / drive kVA ratio		ratio	Item 3.3
Isolation transformer XO to earth		ohms	Item 3.4
Drive PE to ground bar resistance		ohms	Item 3.11
Ground bar to facility ground resistance		ohms	Item 3.11
Motor cable length (one-way)		ft	Item 3.12
Input fuse rating		A	Item 3.20
Input fuse interrupting capacity		kA	Item 3.20
Wire run length (motor to drive)		ft	Item 3.23
Megger T1 to PE		megohms	Item 4.2
Megger T2 to PE		megohms	Item 4.2
Megger T3 to PE		megohms	Item 4.2
Megger test voltage		VDC	Item 4.2

B.11 DISTRIBUTION OF THE COMPLETED CHECKLIST

- ☐ Drive documentation binder (panel or motor control room)
- ☐ Facility CMMS, attached to the drive asset record
- ☐ Manufacturer warranty registration, if applicable (ABB Certified Start-Up: within 10 days of start-up)
- ☐ Project commissioning package with Forms 2 and 3

Commissioning Record

FORM 2 OF 3 | COMMISSIONING | POWER-UP, LOAD, SAFETY



Use this record after Form 1 is signed with every deficiency resolved. It follows the commissioning sequence in the book: Part A is the Chapter 14 power-up record, Part B is the Chapter 15 first rotation and load test record, and Part C is the Chapter 16 safety verification record. Work the phases in order. Each phase has acceptance criteria that must be met before moving to the next.

The parameter addresses differ by brand. The sequence does not. Record the parameter number from the product manual for the drive in front of you. The average and imbalance boxes calculate themselves in Acrobat and most desktop PDF readers.

Each item takes one disposition. P (Pass): verified, acceptable, documented where required. F (Fail): verified, not acceptable; correct before proceeding. NA: not applicable to this installation. Do not mark an item Pass if it has not actually been verified.

INSTALLATION IDENTIFICATION

Site / area		Drive designation (tag)	
Drive manufacturer and model		Drive serial number	
Drive software / firmware revision		Motor designation	
Motor nameplate FLA, as connected (A)		Motor nameplate RPM	
Driven equipment		Load type (VT / CT / PD)	
Form 1 completed and signed (date)		Commissioning technician	
Commissioning date		Witness / owner representative	

PART A | FIRST POWER-UP AND PARAMETER CONFIGURATION (CHAPTER 14)

Service by qualified persons only. Follow NFPA 70E. DC bus capacitors can hold hazardous voltage for several minutes after power is removed.

A.0 Safety Before Energization

P ☐	F ☐	NA ☐	A0.1 All power sources identified and disconnected. Drawings reviewed for every feed; some panels have more than one. Disconnection visually verified where possible. (Ch. 14)
P ☐	F ☐	NA ☐	A0.2 Lockout/tagout and PPE. Approved LOTO per the facility program. PPE selected from the arc flash documentation for this panel. (Ch. 14)
P ☐	F ☐	NA ☐	A0.3 Electrically safe condition confirmed. Voltmeter reading at the drive input terminals confirms absence of voltage. Equipment grounded as needed for stored capacitive energy. (Ch. 14)
P ☐	F ☐	NA ☐	A0.4 LOTO removed by the authorized person; area clear. (Ch. 13, Ch. 14)

Phase 1 | Applying Power for the First Time

P ☐	F ☐	NA ☐	A1.1 Drive completes soft charge and shows ready status with no fault. Do not cycle power repeatedly on a fault. Read the code, consult the manual, and find the cause before re-energizing. Common first power-up faults: input phase loss, ground fault, overvoltage or undervoltage. (Ch. 14)
			Fault code at power-up (if any)
			Resolution

Phase 2 | Verifying the Input

P ☐ F ☐ NA ☐

A2.1 Input line-to-line voltages recorded with a true-RMS meter.

Pass: all within plus or minus 10 percent of nominal (432 to 528 V on a 480 V system; 216 to 264 V on 240 V). Check the manual for the drive's actual tolerance. (Ch. 14)

Nominal V L1 to L2 V L2 to L3 V L3 to L1 V

Average V

P ☐ F ☐ NA ☐

A2.2 Voltage imbalance below 3 percent.

Maximum deviation from the average, divided by the average. Above 2 to 3 percent points to a power system problem; investigate before proceeding. (Ch. 13, Ch. 14)

Calculated imbalance %

P ☐ F ☐ NA ☐

A2.3 DC bus voltage within 5 percent of expected.

Expected is about 1.35 times the line-to-line voltage: about 650 VDC on 480 V input, 325 VDC on 240 V input. (Ch. 14)

Expected (1.35 x avg) VDC Measured DC bus VDC

Phase 3 | Motor Nameplate Data Entered

Enter values exactly as the nameplate reads for the winding connection in use. A 50/25 A motor at 230/460 V wired for 460 V is entered as 25 A. Do not use the NEC table value or a calculated FLA. 1 HP = 0.746 kW (20 HP = 15 kW).

Nameplate item	Nameplate value	Value entered in drive	Parameter no.	OK
Power (HP or kW)				☐
Voltage (as connected)				☐
Full-load amps (sets motor overload)				☐
Rated speed (RPM, not synchronous)				☐
Frequency (Hz)				☐

P ☐ F ☐ NA ☐

A3.1 Drive continuous current rating at or above motor nameplate FLA.

Premium-efficiency motors can exceed the NEC table FLA. If nameplate FLA exceeds the drive rating, upsize the drive regardless of the HP match. (Ch. 14)

Phase 4 | Motor Identification (ID) Run

P ☐ F ☐ NA ☐

A4.1 ID Run completed successfully.

Treat every ID Run as if the shaft will turn, even a stationary type. The ID Run is not a rotation direction test. (Ch. 14)

Type: ☐ Normal (rotating) ☐ Reduced (stationary) ☐ Standstill ☐ Advanced ☐ Autophasing (PM / SynRM)

Motor state: ☐ Decoupled ☐ Coupled ☐ Mechanically secured

Result / notes

Phase 5 | Auto Tune

P ☐ F ☐ NA ☐

A5.1 Auto Tune performed with the motor coupled to the load.

Recouple first if the motor was decoupled for a Normal ID Run. Some drives combine ID Run and tuning; some require manual loop tuning. (Ch. 14)

Status: ☐ Performed ☐ Combined with ID Run ☐ Not offered (manual tuning)

Tuning level / group (if applicable)

Phase 6 | Essential Operating Parameters

P ☐ F ☐ NA ☐

A6.1 Control mode selected.

Choose the simplest mode that meets the application. V/Hz for fans, centrifugal pumps, and multi-motor groups. (Ch. 14)

Mode: ☐ V/Hz ☐ Sensorless vector ☐ Closed-loop vector

P ☐ F ☐ NA ☐

A6.2 Motor thermal protection set to the motor, not the drive.

Electronic overload uses motor FLA. If PTC or RTD sensors are fitted, the drive monitors them with the specified response. (Ch. 14, Ch. 16)

Overload set to A Parameter no.

PTC / RTD monitored: ☐ Yes ☐ No ☐ N/A

P ☐ F ☐ NA ☐

A6.3 Acceleration and deceleration ramps set conservatively.

Starting points: fans 60 to 90+ s (large fans 90+), pumps 30 to 60 s, conveyors 15 to 30 s, mixers 10 to 30 s. Factory 5 to 15 s is usually too fast for fans and pumps. (Ch. 14)

Accel s Decel s Min freq Hz Max freq Hz

P ☐ F ☐ NA ☐

A6.4 Run command and speed reference left on local keypad for commissioning.

Changed to the final control source only after load testing (Phase 8 of Part B). (Ch. 14)

Recording the Configuration

P ☐ F ☐ NA ☐

A7.1 Parameter configuration saved before first rotation. (Ch. 14)

☐ Saved to drive internal memory / keypad

Uploaded to laptop or USB, file name

☐ Parameter list printed for the panel documentation folder

Software revision recorded

PART B | FIRST ROTATION AND LOAD TESTING (CHAPTER 15)

Before pressing Run: motor area clear of personnel and out of the line of travel if a guard fails. Coupling and belt guards in place. Driven equipment in a safe state (valves, dampers, belt clear). Drive on local keypad control.

P ☐ F ☐ NA ☐

B0.1 Pre-run conditions confirmed. (Ch. 15)

Motor decoupled for first rotation: ☐ Yes ☐ No (rotation checked under load)

Phase 1 | First Rotation, Uncoupled Motor

P ☐ F ☐ NA ☐

B1.1 Rotation direction correct at minimum speed (about 5 Hz).

Match the rotation arrow or equipment documentation. For the permanent fix, swap two motor leads at the drive output. A direction parameter reverts on a factory reset. (Ch. 15)

Direction: ☐ Correct as wired ☐ Reversed by lead swap ☐ Reversed by parameter

If by parameter: no. and setting

P ☐ F ☐ NA ☐

B1.2 No-load baseline at full speed recorded.

Uncoupled current should be magnetizing current only, typically 25 to 40 percent of FLA. Much higher points to a winding problem or wrong nameplate entry. (Ch. 15)

Speed reference Hz No-load current A Percent of FLA %

Noise: ☐ Normal ☐ Abnormal

Vibration: ☐ Smooth ☐ Slightly rough ☐ Rough

P ☐ F ☐ NA ☐

B1.3 Motor decelerates smoothly under drive control.

Coasting means the stop mode is not ramp. An overvoltage trip means the decel time is too short or a braking resistor is needed. (Ch. 15)

Phase 2 | Coupling the Motor to the Load

☐ P ☐ F ☐ NA **B2.1 Drive locked out before coupling work. (Ch. 15)**

☐ P ☐ F ☐ NA **B2.2 Coupling installed and alignment verified. (Ch. 15)**

Method: ☐ Laser ☐ Dial indicator ☐ Straightedge and feeler ☐ Not decoupled

☐ P ☐ F ☐ NA **B2.3 LOTO removed per facility procedure. (Ch. 15)**

Phase 3 | Low-Speed Operation Under Load

Know the load type and what current to expect before the first rotation. If current is already approaching FLA at 30 Hz, stop and look for binding, a closed valve, or an undersized motor.

Speed	Current (A)	Noise	Vibration	Process output	OK to continue
5 Hz					☐ Y ☐ N
15 Hz					☐ Y ☐ N
30 Hz					☐ Y ☐ N

Phase 4 | Ramping to Full Speed

☐ P ☐ F ☐ NA **B4.1 Speed range covered in 5 to 10 Hz steps with a 10 to 15 s pause at each.**

Watch for any discontinuity: a jump in current or vibration, or a noise that appears and disappears at one speed. (Ch. 15)

Maximum application speed Hz Resonance observed at Hz

Skip frequency band programmed to Hz

Phase 5 | Full-Speed Electrical Measurements

Full speed, full load. Use a true-RMS meter rated for PWM output. Phase currents should balance within about 5 to 10 percent.

Measurement	T1 to T2 / T1	T2 to T3 / T2	T3 to T1 / T3	Average	Imbalance %
Output voltage (V)					
Output current (A)					

☐ P ☐ F ☐ NA **B5.1 Motor current as a percentage of nameplate FLA.**

85 percent leaves 15 percent thermal margin. 98 percent is at the limit. Above 100 percent the motor is overloaded and the situation must be corrected. (Ch. 15)

Average current / FLA %

☐ P ☐ F ☐ NA **B5.2 DC bus, drive temperature, and speed recorded.**

A DC bus more than 5 percent below 1.35 times line voltage points to an input problem. Speed well off the expected nameplate value may mean the ID Run needs repeating. (Ch. 15)

DC bus VDC Drive heatsink temp °F Operating frequency Hz

Motor speed displayed RPM Expected speed RPM

Phase 6 | Mechanical and Thermal Observations

Starting reference only; the steady-state values go on the Form 3 baseline. Bearing temperatures above 176 °F on a standard TEFC motor in a 104 °F ambient need investigation; above 203 °F is cause for immediate concern.

Location	Temperature (°F)	Vibration (in/s or Smooth / Slightly rough / Rough)	Notes
Motor frame			
Motor drive-end bearing			
Motor non-drive-end bearing			
Coupling			
Driven equipment bearing 1			
Driven equipment bearing 2			

☐ P ☐ F ☐ NA

B6.1 Thermal image captured at full speed and load. (Ch. 15)

File name and storage location

Phase 7 | Process Performance Verification

If the process falls short, the cause is almost always mechanical or process design, not the drive. Check maximum frequency and current limit before blaming the drive. Typical tolerance: pumps and fans plus or minus 10 percent at design speed, PD pumps 5 percent, conveyors and mixers 2 percent.

Process variable	Method	Design value	Measured	Within tolerance
				☐ Y ☐ N
				☐ Y ☐ N
				☐ Y ☐ N

Phase 8 | Parameter Adjustments Based on Actual Load

Parameter (name / no.)	Original value	New value	Reason

☐ P ☐ F ☐ NA

B8.1 Final control sources set and verified.

For 4 to 20 mA, confirm 4 mA gives minimum speed and 20 mA gives maximum. For a network, confirm the drive follows commands from the PLC or SCADA. (Ch. 15)

Speed reference: ☐ Analog ☐ Network ☐ Preset ☐ Keypad ☐ PIDStart / stop: ☐ Terminal ☐ Network ☐ Keypad☐ Minimum and maximum reference scaling verified

☐ P ☐ F ☐ NA

B8.2 Updated parameter backup made with all four methods.

Internal memory, laptop or USB, printed list, and CMMS. (Ch. 15, Ch. 17)

Load Test Anomalies

Symptom	Cause found	Action taken	Resolved
			☐ Y ☐ N
			☐ Y ☐ N
			☐ Y ☐ N
			☐ Y ☐ N

PART C | SAFETY SYSTEM VERIFICATION (CHAPTER 16)

Inspection confirms the wire is landed. Only a functional test confirms the safety function works. Activate each function under control and record what actually happens.

Phase 1 | Safe Torque Off (STO)

Run at about 30 Hz, activate STO by the method used in normal operation, confirm the motor coasts and the drive shows STO status, confirm a start is refused, then restore and confirm normal restart. Test every activation point separately.

Activation point (switch, relay, PLC)	Speed (Hz)	STO status shown	Coast-down (s)	Start refused	Normal restart
		☐ Y ☐ N		☐ Y ☐ N	☐ Y ☐ N
		☐ Y ☐ N		☐ Y ☐ N	☐ Y ☐ N
		☐ Y ☐ N		☐ Y ☐ N	☐ Y ☐ N

Phase 2 | Emergency Stop Circuits

Automatic restart when an E-stop is released is a serious safety violation. If it happens, stop the test and correct the configuration before proceeding.

E-stop button (location / ID)	Stop category observed	Decel time (s)	Start refused while latched	No auto restart on release
	☐ 0 ☐ 1 ☐ 2		☐ Y ☐ N	☐ Y ☐ N
	☐ 0 ☐ 1 ☐ 2		☐ Y ☐ N	☐ Y ☐ N
	☐ 0 ☐ 1 ☐ 2		☐ Y ☐ N	☐ Y ☐ N

Phase 3 | Safety Interlocks

Verify the logic direction on every interlock. A normally closed device configured as normally open runs the drive with the door open.

Interlock	Normal state	Test method	Drive response observed	Logic verified	Restart
	☐ NO ☐ NC	☐ Real ☐ Sim		☐ Y ☐ N	☐ Man ☐ Auto
	☐ NO ☐ NC	☐ Real ☐ Sim		☐ Y ☐ N	☐ Man ☐ Auto
	☐ NO ☐ NC	☐ Real ☐ Sim		☐ Y ☐ N	☐ Man ☐ Auto
	☐ NO ☐ NC	☐ Real ☐ Sim		☐ Y ☐ N	☐ Man ☐ Auto
	☐ NO ☐ NC	☐ Real ☐ Sim		☐ Y ☐ N	☐ Man ☐ Auto

Phase 4 | Motor Overload Protection

On an oversized drive the electronic overload is the motor's only protection. Every setting below is for the motor, not the drive.

Parameter	Correct setting	Value found	OK
Motor FLA	Motor nameplate FLA, not drive rated current		☐ Y ☐ N
Thermal overload	Enabled		☐ Y ☐ N
Thermal time constant / class	Per motor type (TEFC Class 10 to 20; ODP Class 10)		☐ Y ☐ N
PTC / RTD monitoring	Enabled if sensors installed		☐ Y ☐ N ☐ NA
Overload trip point	105 to 110 percent of motor FLA		☐ Y ☐ N
Thermal utilization at full load	Well below 100 percent		☐ Y ☐ N

Phase 5 | Fault Response Behavior

Simulate a fault safely, for example by temporarily lowering a protection threshold below the operating point. Confirm the stop matches what the process needs (ramp stops for water hammer, held load for hoists). Restore every threshold afterward.

Fault simulated	Method	Drive response	Process response	Fault code	Reset OK	Restored
		☐ Coast ☐ Ramp ☐ Brake			☐ Y ☐ N	☐ Y ☐ N
		☐ Coast ☐ Ramp ☐ Brake			☐ Y ☐ N	☐ Y ☐ N
		☐ Coast ☐ Ramp ☐ Brake			☐ Y ☐ N	☐ Y ☐ N

RELEASE TO PRODUCTION

Commissioning is complete, every test is performed and documented, every anomaly is resolved or recorded with a plan, and the installation is safe to operate.

Role	Printed name	Signature	Date
Commissioning technician			
Maintenance supervisor			
Production / operations manager			

ABB Certified Start-Up (or equivalent) warranty registration submitted. ABB requires submittal within 10 days of start-up.

Date submitted

Notes

Operational Baseline and Handoff

FORM 3 OF 3 | POST-COMMISSIONING | BASELINE AND HANDOFF



Take the baseline after the system has run 24 to 48 hours under normal production, at the peak sustained operating condition, once temperatures have settled. Record individual phase, bearing, and axis readings, not averages alone. Future troubleshooting depends on them.

Part A is the Chapter 17 baseline. Part B is the Chapter 20 handoff. Part C carries the baseline into the month 3, 6, and 12 checks. Tape a copy inside the panel door, attach one to the CMMS asset record, and file one with Forms 1 and 2.

BASELINE IDENTIFICATION AND OPERATING CONDITION

Date and time of baseline		Drive tag / asset number	
Drive manufacturer, model, serial		Drive continuous current rating (A)	
Motor manufacturer and model		Motor HP / kW	
Motor FLA (A) and RPM		Driven equipment (pump, fan, conveyor)	
Operating speed at baseline (Hz)		Load / production mode	
Hours in normal production before baseline		Ambient at motor (°F)	
Humidity (if measured)		Recorded by	

PART A | OPERATIONAL BASELINE (CHAPTER 17)

A1 | Electrical

Measurement	T1 / T1 to T2	T2 / T2 to T3	T3 / T3 to T1	Average	Imbalance %
Output current (A)					
Output voltage (V)					

P F NA
☐ ☐ ☐

A1.1 DC bus, frequency, and power recorded.

DC bus should be about 1.35 times input line-to-line voltage (about 621 VDC on 460 V input). Commanded and actual frequency should be close in sensorless vector. (Ch. 17)

DC bus VDC Commanded Hz Actual Hz Output power kW / HP

P F NA
☐ ☐ ☐

A1.2 Current utilization against the drive rating.

Average output current divided by the drive continuous rating. A drive sized with ORCA-Size should run at 51 to 78 percent. Record it on the ORCA-Size worksheet and investigate a large gap from the prediction. (Ch. 3, Ch. 17)

Utilization % ORCA-Size predicted %

A2 | Thermal

Temperature rise above ambient, not the absolute reading, shows how hard the drive is working. A large DE to NDE bearing difference can point to misalignment or an early bearing problem.

Point	Reading (°F)	Point	Reading (°F)
Drive inverter (heatsink)		Motor surface (hottest point)	
Ambient at drive air intake		Motor DE bearing	
Drive rise above ambient		Motor NDE bearing	
Ambient at motor		DE to NDE difference	

A3 | Thermal Imaging Baseline

Label each image with date, time, ambient, motor speed, and load. The images are a reference; detailed analysis comes later by side-by-side comparison.

Area imaged	File name / location	Hottest spot (°F)	Notes
Drive panel interior (or IR window)			
Drive heatsink / heat exchanger			
Motor frame, drive end			
Motor frame, non-drive end			
Motor junction box and terminations			
Input power (disconnect, fuses, breaker)			

A4 | Vibration

Overall velocity in three axes at each motor bearing. ISO 10816 zones for small to medium machines: A below 0.07 in/s, B 0.07 to 0.18, C 0.18 to 0.45, D above 0.45. Retake future readings at the same speed and load.

Location	Horizontal (in/s)	Vertical (in/s)	Axial (in/s)	ISO zone
Motor drive-end bearing				☐ A ☐ B ☐ C ☐ D
Motor non-drive-end bearing				☐ A ☐ B ☐ C ☐ D
Driven equipment bearing 1				☐ A ☐ B ☐ C ☐ D
Driven equipment bearing 2				☐ A ☐ B ☐ C ☐ D

Full vibration spectrum captured (if the site has spectrum analysis).

File / location

A5 | Process Performance

Pump: flow, discharge, suction, and differential pressure. Fan: airflow and static pressure. Conveyor: belt speed and throughput. Mixer: speed and process indicator.

Process variable	Units	Design value	Baseline value

A6 | Drive Internal Diagnostics

☐ P ☐ F ☐ NA

A6.1 Drive diagnostics recorded.

The fault log should be empty or hold only commissioning faults already explained on Form 2. Resolve any unexplained fault before accepting the baseline. (Ch. 17)

Run hours h Motor thermal utilization % Software revision

Fault log: ☐ Empty ☐ Commissioning faults only, all explained ☐ Unexplained faults present

DC bus ripple (if available) Stable / excessive

A7 | Parameter File Backup

P ☐ F ☐ NA ☐

A7.1 Parameter backup made at baseline.

Store at least one digital copy (CMMS or network) and one local copy at the drive. (Ch. 17)

1. Drive internal memory or SD card
2. Uploaded with configuration software, file name
3. Copied to the HMI keypad module
4. Critical parameters printed or recorded by hand

Digital copy location

A8 | Second Operating Mode (if the process has one)

Speed (Hz)	Load / mode	Current T1	T2	T3	Inverter °F	Ambient °F

Baseline record stored in all three places.

- ☐ Inside the drive panel door
- ☐ Facility CMMS asset record
- ☐ Commissioning package with Forms 1 and 2

PART B | HANDOFF AND DOCUMENTATION (CHAPTER 20)

The handoff is not new paperwork. It is assembling what already exists and getting it to the people who will live with this drive, in the places they will look.

B1 | Handoff Package

#	Category	Contents	Delivered	Stored at
1	Commissioning record	Form 1 checklist, Form 2 power-up, load test, and safety verification	☐	
2	Operational baseline	Part A of this form, thermal images, vibration data, parameter backup file	☐	
3	Annotated parameter list	Every non-default parameter with what it was changed to and why	☐	
4	Installation reference	Cable type, lead length, mitigation devices, environmental data, circuit protection	☐	
5	As-built wiring diagrams	Updated drawings where installed wiring differs from the design set	☐	
6	Manufacturer documentation	Product manual, quick-start guide, warranty registration acknowledgment	☐	

B2 | Parameter Annotations

P ☐ F ☐ NA ☐

B2.1 Annotation written for every non-default parameter.

A setting that looks wrong without its reason gets changed by the next technician. Example: motor voltage at 230 V on a 480 V drive because the motor is on its 230 V tap. (Ch. 20)

- ☐ Motor data entries, especially any that differ from the apparent nameplate
- ☐ Control mode and the reason for the choice
- ☐ Acceleration and deceleration ramps, if far from default
- ☐ Carrier frequency, if changed from default
- ☐ PID parameters, if active, and any Chapter 19 tuning changes
- ☐ Application parameters: braking resistor, sleep, min and max speed

B3 | Security Configuration

☐ P ☐ F ☐ NA

B3.1 Drive security settings documented.

Passcode kept in a sealed envelope or secure digital location, never on the panel door or in an unlocked binder. A lost passcode can turn a 30-minute call into a control board swap. (Ch. 20)

Security features enabled: None Button lockout Passcode Keypad removed Checksum Network

Passcode storage location

Authorized contact for passcode

Unlock procedure for authorized service written down

B4 | Installation-Specific Reference

VFD cable (manufacturer, model, size)

Lead length drive to motor (ft)

Motor-side mitigation (ring, bearings, shield)

Drive-side mitigation (reactor, dV/dt, sine, EMI)

Environment (location, temp, dust, altitude)

Circuit protection (type and size)

Surge protection installed

As-built drawing numbers

B5 | Warranty Registration

☐ P ☐ F ☐ NA

B5.1 Warranty registration submitted within the manufacturer's window.

ABB Certified Start-Up requires the complete form within 10 days of start-up. Submit as soon as load test readings exist; do not wait for the handoff meeting. (Ch. 20)

Program

Start-up date

Date submitted

Confirmation / reference no.

B6 | Training the Operations Team

Topic (about 30 minutes each)	Delivered by	Date	Attendees
How to read the baseline record			
How to respond to common faults (Chapter 18 card)			
How to perform routine maintenance (3, 6, 12 month tasks)			
When to call for help (escalation criteria)			

☐ P ☐ F ☐ NA

B6.1 Escalation criteria given to the maintenance team.

A fault that recurs more than twice after correction, a baseline change over 20 percent not explained by load or ambient, any ground fault, any component failure, or any time the team is unsure. (Ch. 20)

Who to call (name, phone)

B7 | Tools Left Behind

Tool	Where it lives	In place
Fault reference card (laminated)	Panel door	☐
Baseline record	Panel door and CMMS	☐
Parameter backup file	CMMS, USB in panel, facility network	☐
Annotated parameter list	Documentation binder and CMMS	☐
First-year maintenance schedule	CMMS as scheduled work orders	☐

B8 | Handoff Acknowledgment

Not a legal document. A record that the documentation was received, the training was given, and the operations team accepts responsibility for the drive.

Role	Printed name	Signature	Date
Commissioning engineer			
Plant engineer / maintenance manager			
Lead maintenance technician			
Operations supervisor			

PART C | FIRST-YEAR FOLLOW-UP (CHAPTER 20)

Enter each milestone as a scheduled CMMS work order before the commissioning engineer leaves. About three hours of effort across the year.

Milestone	Tasks	Due	CMMS WO #	Done	Initials
Month 3	Retorque input, output, and ground connections. Inspect and clean the air filter (check at month 1 in dusty sites). Compare key baseline readings.				
Month 6	Check cooling fan operation and bearing noise. Thermal images compared to baseline. Repeat vibration readings.				
Month 12	Repeat all baseline categories. Compare parameters to the annotated list. Record DC bus ripple as the capacitor reference. Confirm spare fan, filters, and fuses on hand.				

Compare at the same speed, load, and similar ambient. Investigate more than 10 percent change in current or more than 9 °F change in temperature rise. Baseline values copy across from Part A automatically in Acrobat and most desktop readers.

Parameter	Baseline	Month 3	Month 6	Month 12	Action needed
Average output current (A)					
Drive inverter temperature (°F)					
Ambient at drive intake (°F)					
Drive rise above ambient (°F)					
DC bus voltage (VDC)					
Motor DE bearing temperature (°F)					
Motor NDE bearing temperature (°F)					
Motor DE vibration, horizontal (in/s)					
Motor NDE vibration, horizontal (in/s)					
DC bus ripple (if available)					

Notes and follow-up findings