Drives Troubleshooting 301

Agenda

- Drive will not start
- Drive will not get to speed
- 10 Common Fault codes
    1. Overcurrent
    2. Current limit controller
    3. Ground fault
    4. Output phase fault
    5. Overvoltage Fault
    6. Overvoltage controller
    7. Undervoltage fault
    8. Unit over temperature
    9. Motor over temperature
    10. Input phase fault

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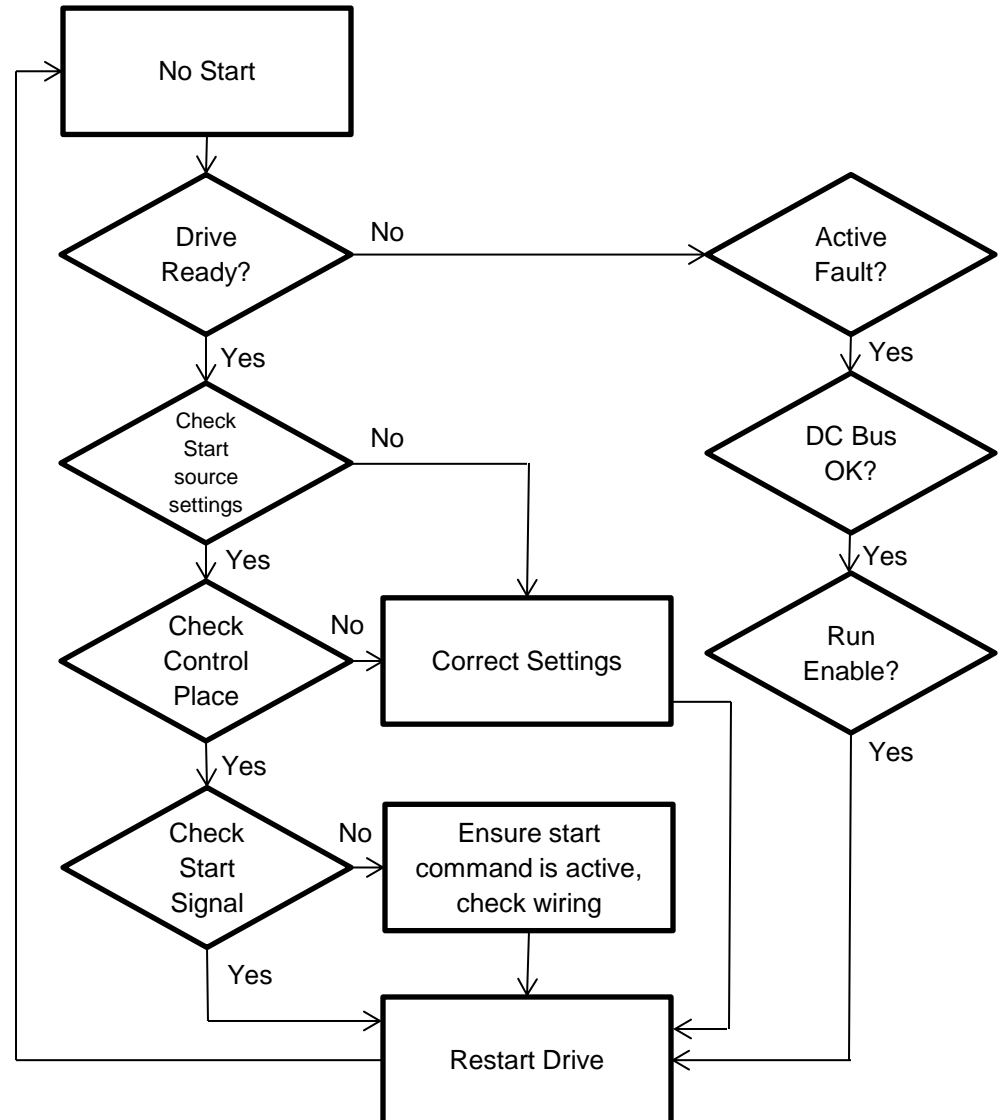*Powering Business Worldwide*

Drive does not start

Causes

- **Drive not ready**
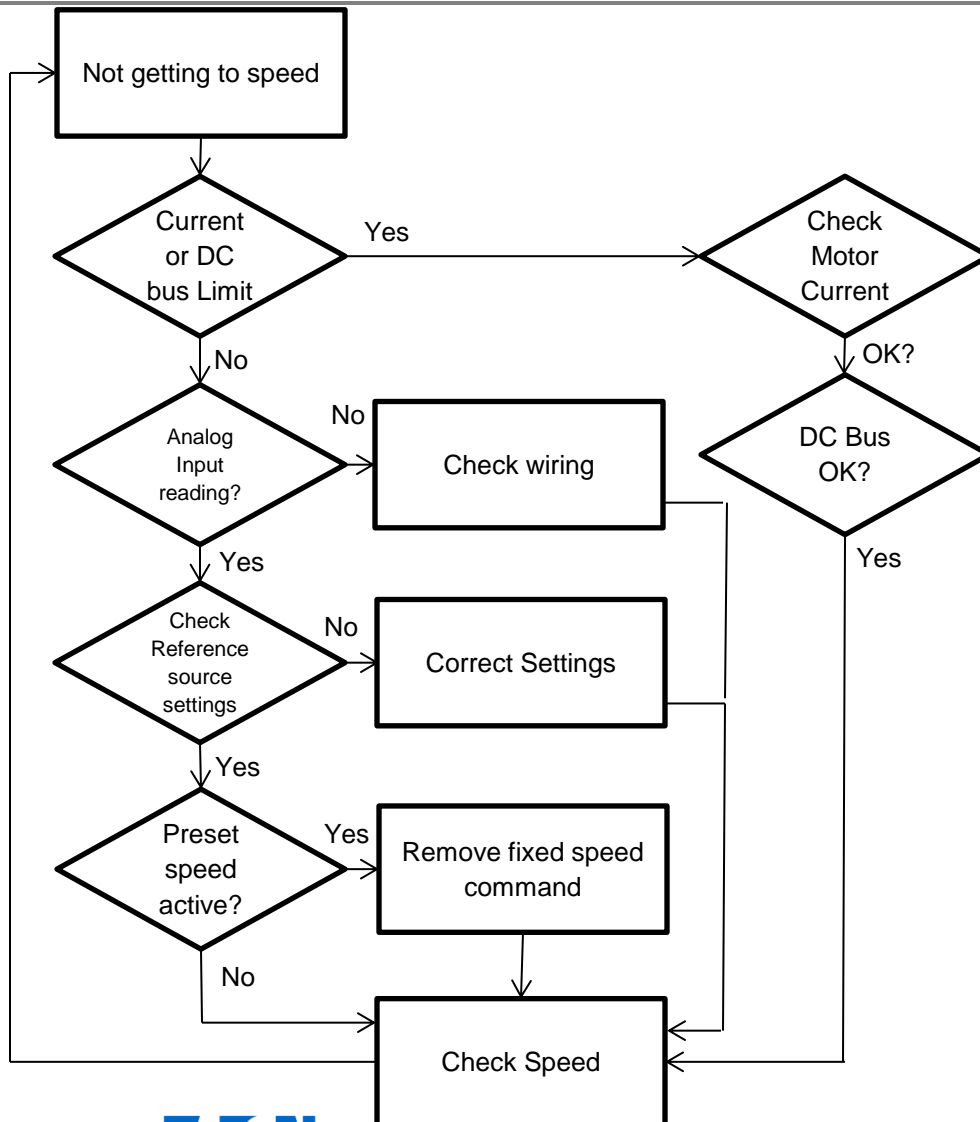- **Drive not receiving a Run Signal**

Not Ready Causes

- Active fault
- DC bus too high or low
- Run enable input not present

Run Signal not present

- Control place not correct Example trying to start from I/O when active control place is keypad.

No Start

Drive Ready? — No → Active Fault?

Drive Ready? — Yes ↓

Check Start source settings — No →

Check Start source settings — Yes ↓

Check Control Place — No → Correct Settings

Check Control Place — Yes ↓

Check Start Signal — No → Ensure start command is active, check wiring

Check Start Signal — Yes ↓

Active Fault? — Yes ↓

DC Bus OK? — Yes ↓

Run Enable? — Yes ↓

Restart Drive

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Drive does not get to speed

Causes

- **Missing reference**
- **Preset speed or jog speed active**

Missing Reference

- Check analog input monitor
- Check that the drive is programmed to follow the correct input
- Ensure the drive is not hitting any other limits
- Check frequency reference compared to output frequency

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10 Common Fault Codes - Overcurrent

Causes

- **Incorrect motor parameters**
- **Mechanical fault**
- **Electrical fault**
- **Current measurement error**

- Check wiring and motor for insulation failures and proper connections
- Check for mechanical overload, Locked rotor
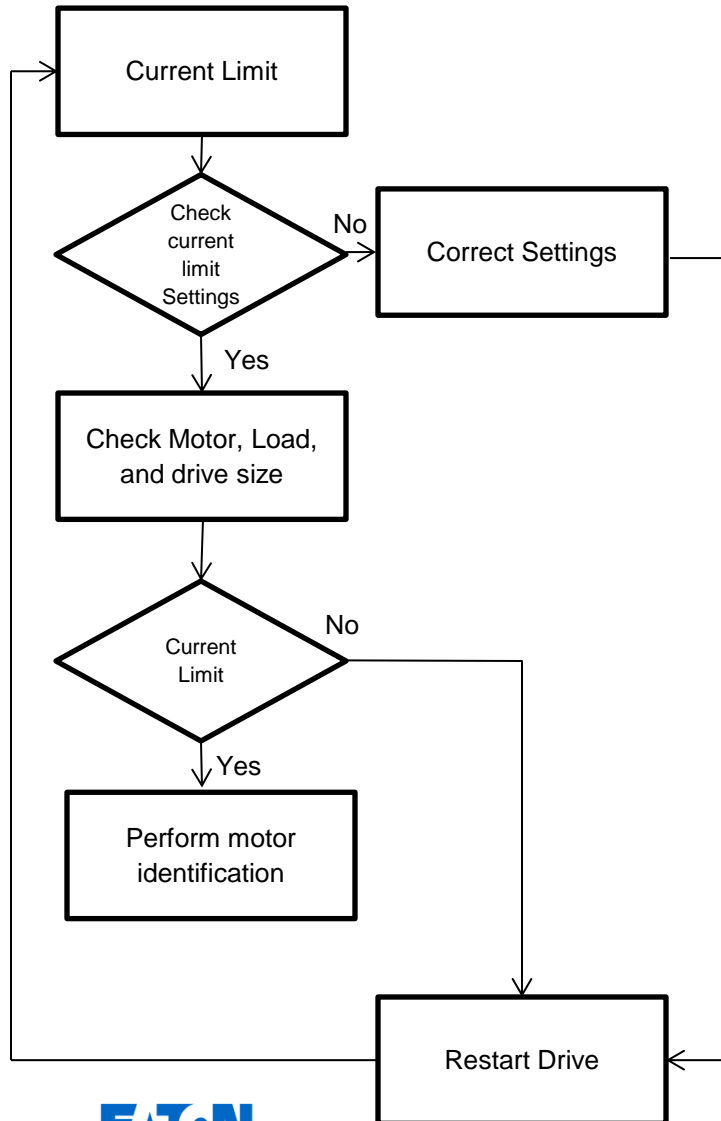- Check for proper drive size

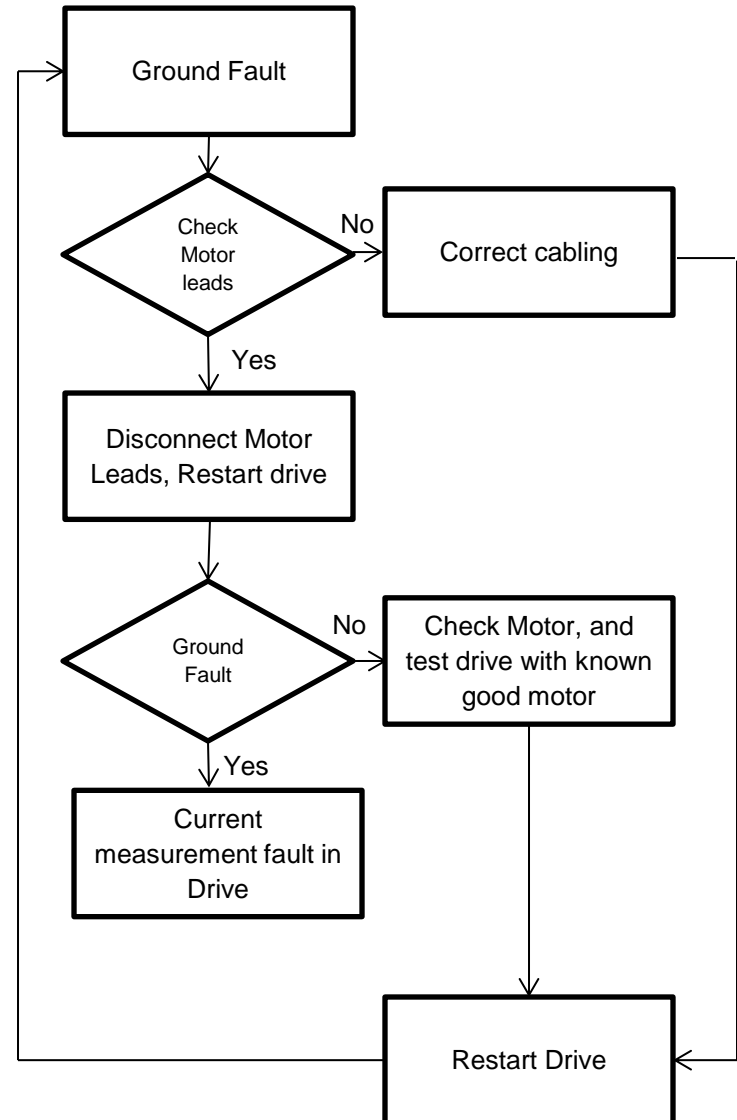Powering Business Worldwide
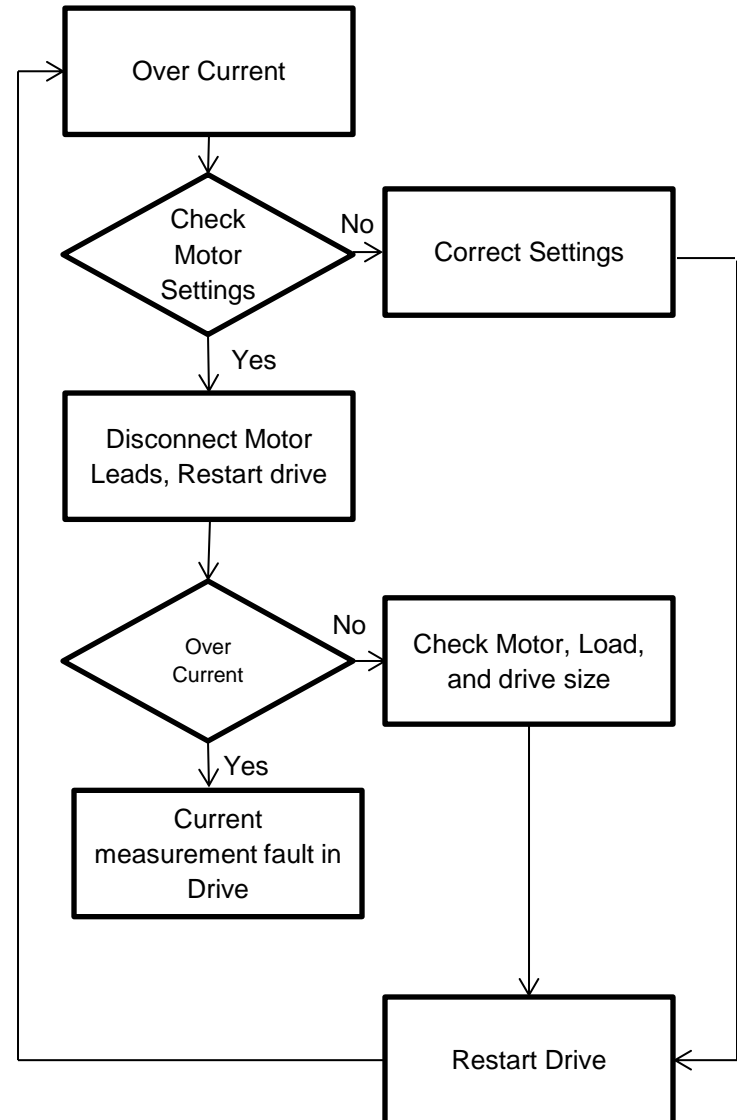
10 Common Fault Codes – Current Limit

Causes
- **Incorrect motor parameters**
- **Mechanical fault**
- **Electrical fault**
- **Current measurement error**

- Not all models have an indication when the current limit is reached
- Current limit will reduce output frequency to reduce output current to at or below the current limit setting

10 Common Fault Codes – Ground Fault

Causes

- **Faulty motor**
- **Electrical fault**
- **Current measurement error**

- Check for loose or high resistance connections to the motor
- Test motor for electrical failure
- Disconnect motor leads or apply known good motor to verify current measurements

```
                    Ground Fault
                         |
                         v
                    Check          No
                    Motor    ------------>  Correct cabling
                    leads
                         |
                        Yes
                         v
                  Disconnect Motor
                  Leads, Restart drive
                         |
                         v
                    Ground         No      Check Motor, and
                    Fault    ------------>  test drive with known
                                           good motor
                         |
                        Yes
                         v
                   Current
                 measurement fault in
                     Drive

                                           Restart Drive
```

10 Common Fault Codes – Output Phase
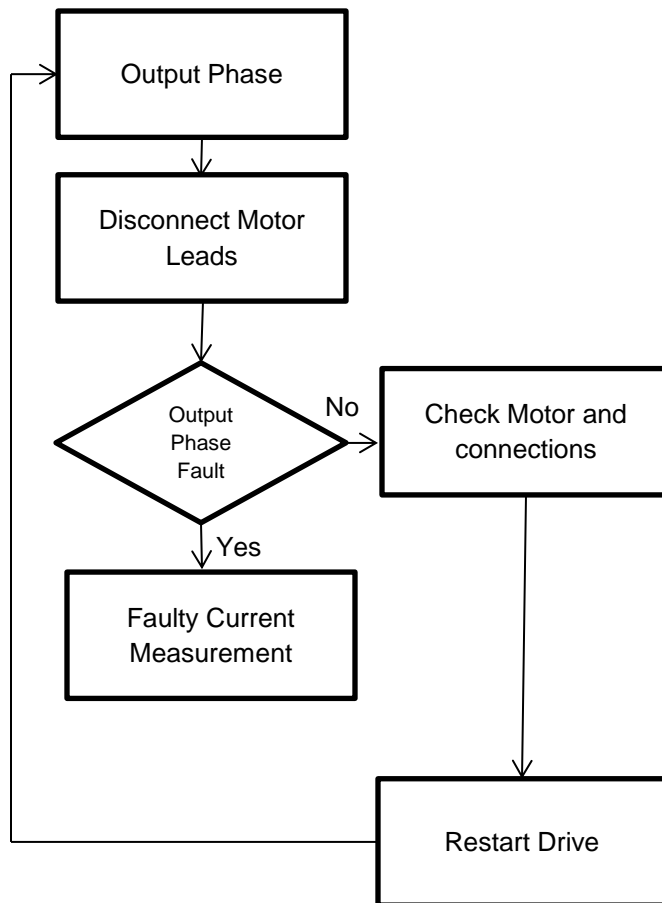
Causes

- **Loose Motor Connections**
- **Faulty Motor**
- **Current measurement error**

- Caused by current imbalance on the output of the VFD
- Look for loose connections or fault in motor windings

Flowchart:
- Output Phase
- Disconnect Motor Leads
- Output Phase Fault
  - No → Check Motor and connections
  - Yes → Faulty Current Measurement
- Restart Drive

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10 Common Fault Codes - Overvoltage

Causes

- **High Line Voltage**
- **Regenerated voltage from load**
- **Excessive line side harmonics**

- If Fault occurs during deceleration or stop command then increase deceleration time or brake chopper may be needed.
- Cyclic loads may need regen unit or brake chopper.
- Excess harmonics may be overcharging DC link capacitors.

Over Voltage

Line Voltage OK? — No → Correct input voltage

Yes

Fault occurs during deceleration or when motor is over run — Yes → Increase deceleration time or add brake chopper

No

Monitor = Measured value — Yes → Check line side Harmonics

No

measurement fault in drive

Restart Drive

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10 Common Fault Codes – Overvoltage Controller

```
┌─────────────────┐
│   Over Voltage  │
└─────────────────┘
         │
         ▼
     ◇ Line
       Voltage      ──No──▶  ┌──────────────────────┐
       OK? ◇                 │ Correct input voltage │
         │                   └──────────────────────┘
        Yes
         ▼            Yes
┌─────────────────┐         ┌──────────────────────┐
│ Fault occurs    │  ──▶    │ Increase             │
│ during          │         │ deceleration time or │
│ deceleration or │         │ add brake chopper    │
│ when motor is   │         └──────────────────────┘
│ over run        │
└─────────────────┘
         │
        No
         ▼
     ◇ Monitor =     ──Yes──▶ ┌──────────────────────┐
       Measured              │ Check line side      │
       value ◇               │ Harmonics            │
         │                   └──────────────────────┘
        No
         ▼
┌─────────────────┐
│ measurement     │
│ fault in drive  │
└─────────────────┘

         ┌──────────────────────┐
         │   Restart Drive      │
         └──────────────────────┘
```

Causes

- **High Line Voltage**
- **Regenerated voltage from load**
- **Excessive line side harmonics**

- Trouble shooting is the same as for the overvoltage fault, the overvoltage controller will increase the reference in an attempt to bleed off excess voltage
- Not all series of VFD's have an indication of when this controller is active.

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10 Common Fault Codes – Undervoltage

Causes

- **Low Line Voltage**
- **Improperly sized drive**

- Check for low line voltage or drops in line voltage under load.
- Check for damaged input rectifiers with static checks
- Check for even current draw on input when drive is running

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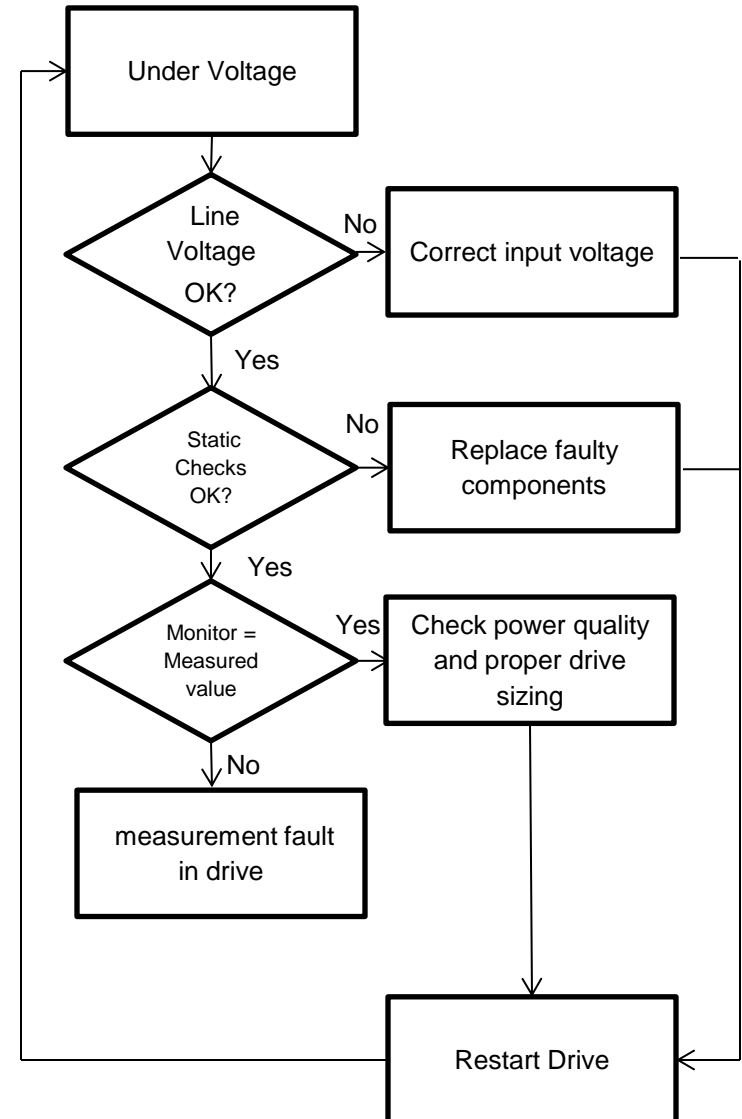
10 Common Fault Codes – Unit Over temp

Flowchart:

- Unit Over Temperature
  - Cooling fan on? — No → Repair Cooling Fan(s)
    - Yes ↓
  - Heat sink clear — No → Clean heat sink
    - Yes ↓
  - Monitor = Measured value — Yes → Check ambient temperature of inlet air
    - No ↓
  - measurement fault in drive
- Restart Drive
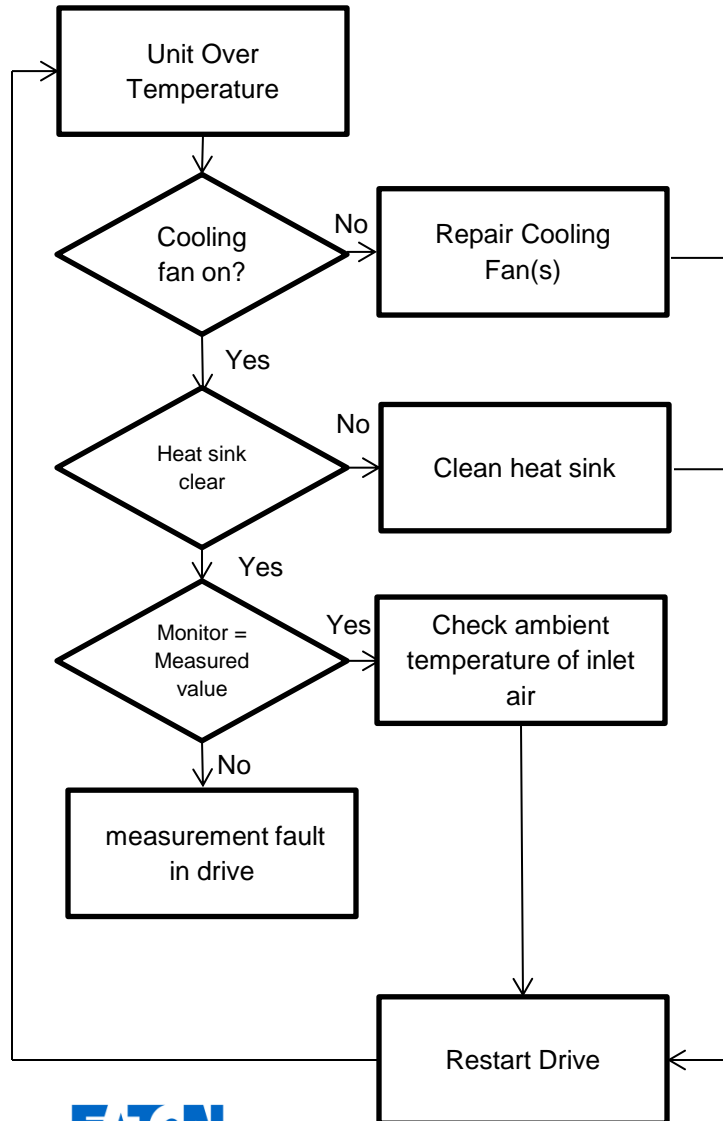
Causes

- **High Ambient temperature**
- **Insufficient airflow**
  - **Plugged heat sink**
  - **Failed cooling fan**

- Check Main cooling fan for rotation
- Ensure unobstructed heat sink and airflow
- Check ambient temperature is below the drives ratings

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10 Common Fault Codes – Motor Over temp

Causes

- **Overloaded Motor**
- **Operating Motor at high load at low speeds**
- **Undersized Motor**
- **Incorrect Motor Parameters**

- Check Motor Parameters
- Observe current and speed
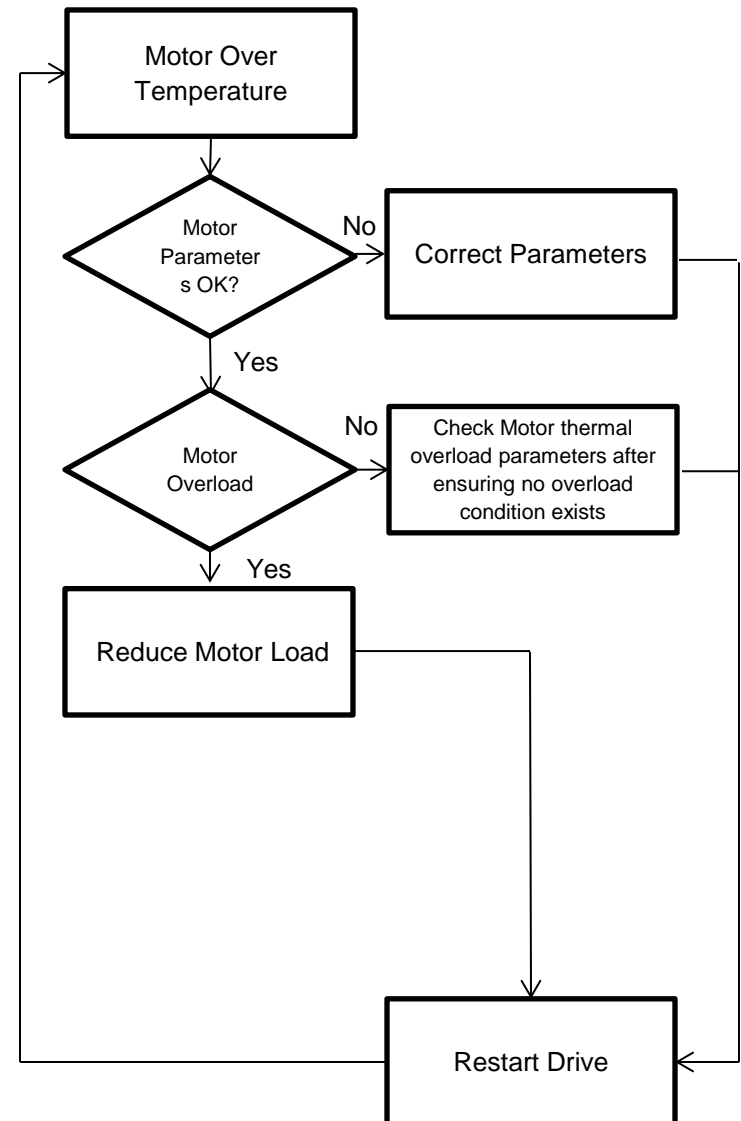- Current should be nearly proportional to speed, if running half speed at FLA drive will protect motor from increased thermal stress from reduced cooling

```
┌─────────────────┐
│  Motor Over     │
│  Temperature    │
└─────────────────┘
        │
        ▼
   ◇ Motor          No    ┌──────────────────┐
   Parameters  ──────────▶│ Correct Parameters│
   OK? ◇                  └──────────────────┘
        │ Yes
        ▼
   ◇ Motor          No    ┌──────────────────────┐
   Overload  ───────────▶ │ Check Motor thermal  │
        ◇                 │ overload parameters  │
        │ Yes             │ after ensuring no    │
        ▼                 │ overload condition   │
┌──────────────────┐      │ exists               │
│ Reduce Motor Load│      └──────────────────────┘
└──────────────────┘
                          ┌──────────────────┐
                          │  Restart Drive   │
                          └──────────────────┘
```

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10 Common Fault Codes – Input Phase

```
            ┌─────────────────────┐
            │  Input phase fault   │
            └─────────────────────┘
                      │
                      ▼
                   ╱Line╲          No    ┌─────────────────────┐
                 ╱ Voltage ╲──────────►  │ Correct input voltage│
                 ╲  OK?   ╱             └─────────────────────┘
                   ╲   ╱                           │
                    │ Yes                          │
                    ▼                              │
                  ╱Static╲         No    ┌─────────────────────┐
                ╱ Checks  ╲────────────► │  Replace faulty      │
                ╲  OK?   ╱              │  components          │
                  ╲   ╱                 └─────────────────────┘
                    │ Yes                          │
                    ▼                              │
                 ╱ Input ╲       No                │
               ╱  phase   ╲──────────────────┐     │
               ╲  fault  ╱                   │     │
                  ╲   ╱                       │     │
                    │ Yes                     │     │
                    ▼                         │     │
            ┌─────────────────────┐          │     │
            │  measurement fault   │          │     │
            │      in drive        │          │     │
            └─────────────────────┘          ▼     ▼
                                      ┌─────────────────────┐
                                      │    Restart Drive     │
                                      └─────────────────────┘
```
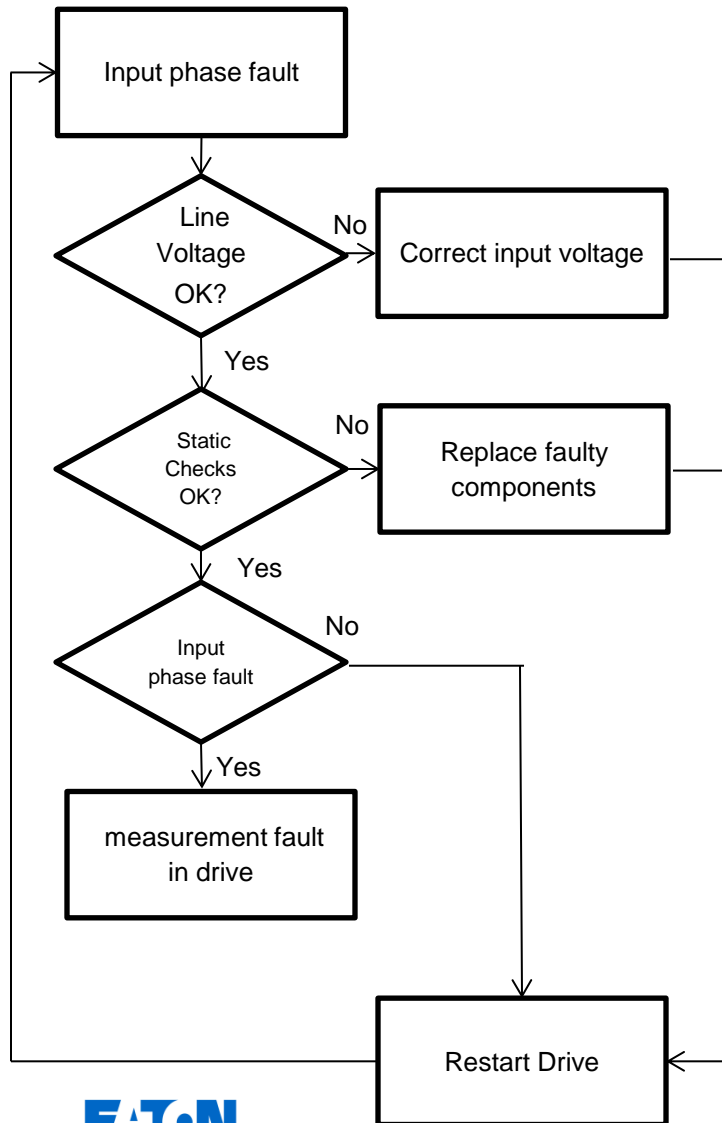
Causes

- **Missing Input phase**
- **Damaged Drive**

- Check for Line Voltage imbalance
- Check for loose connections or blown fuses
- Check for damaged input rectifiers with static checks
- Single phase input drives need to have this protection disabled
- Check for even current draw on input when drive is running

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