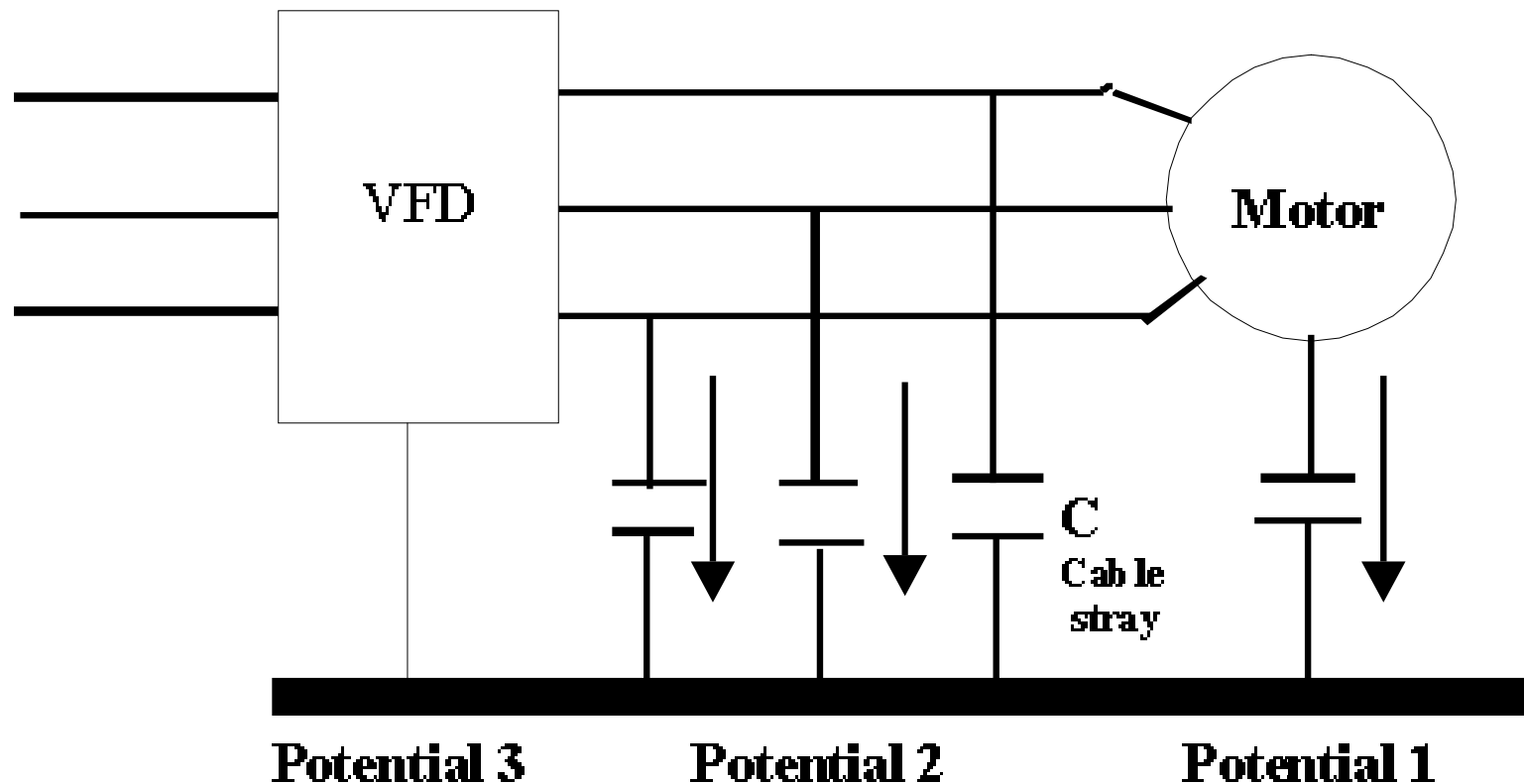


EMI/RFI Filters

- ✓ **EMI Sources**
- ✓ **EMC Standards**
- ✓ **Solutions**

Capacitive Coupled Noise Current from Unshielded Phase Conductor of VFD



Power Electronics can cause Conducted Electromagnetic Interference Problems

Power Switching Devices Cause EMI

- **Improvements in static switching devices have led to higher speeds**
- **Higher speed devices generate more EMI**
- **The problem: Common mode high frequency noise**

$$**I = c dv/dt**$$

RFI/EMI Filter Applications

- **Adjustable Speed Drives**

- **Computers**
- **Automatic Lighting**
- **Telecommunications**
- **Laboratory Equipment**
- **Factory Automation**
- **Radio Controls**
- **Overhead Cranes**
- **AM Radio Equipment**
- **TVs and Monitors**
- **Energy Mgt Systems**

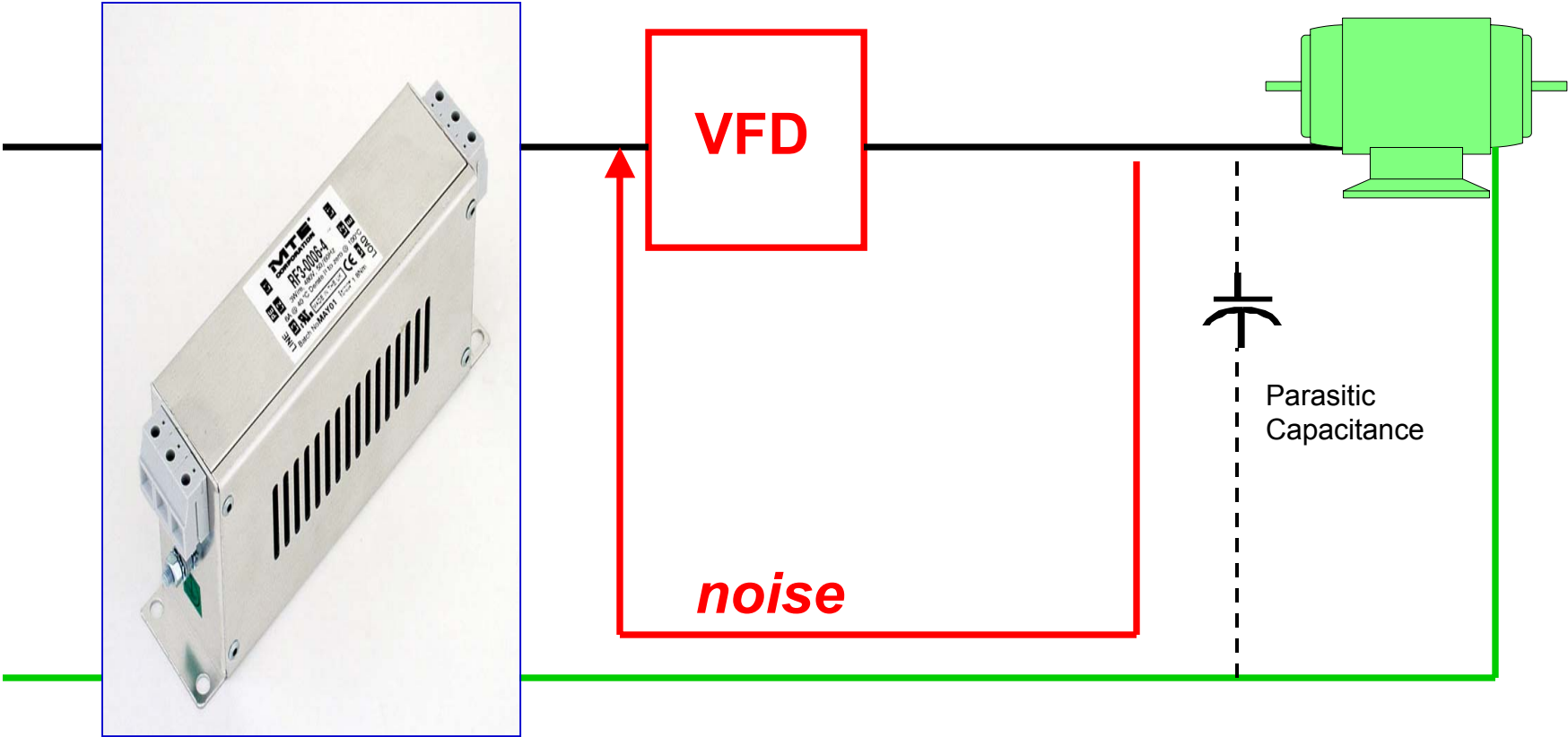
Adjustable Speed Drives

Conducted Electromagnetic Interference Problems

Drive EMI Affects:

- **Communication Links**
- **Control Signals**
- **Encoder Feedback**
- **Programmable Controllers**
- **Remote I/O**
- **Sensors**
- **Vision Systems**

MTE RFI/EMI Filters block high frequency electrical noise



“RF3” RFI/EMI filter

RFI / EMI FILTERS

- **Help meet EMC directive**
- **Solve high frequency interference problems**
- **Have minimal panel space requirements**
- **RFI filter installed base over 15,000**



EMI Mitigation

- **Wiring Practices**
 - **Shield power cables**
 - **Separate power and control**
- **EMI/RFI Filter**
- **Motor sine wave filter**

RFI/EMI Filter Insertion Loss

- **I.L. (dB) = 20 Log₁₀ V_{out}/V_{in}**
- **50 ohm source; 50 ohm load**
- **Useful for comparison**
- **Does not predict actual results**

MTE “RF” Series Filters

Typical Common Mode Insertion Loss

- **100 KHz > 60 dB (uV)**
- **150 KHz > 70 dB (uV)**
- **1 MHz > 70 dB (uV)**
- **10 MHz > 40 dB (uV)**

European (CE) RFI/EMI Filter Requirements

EMC Directive Limits

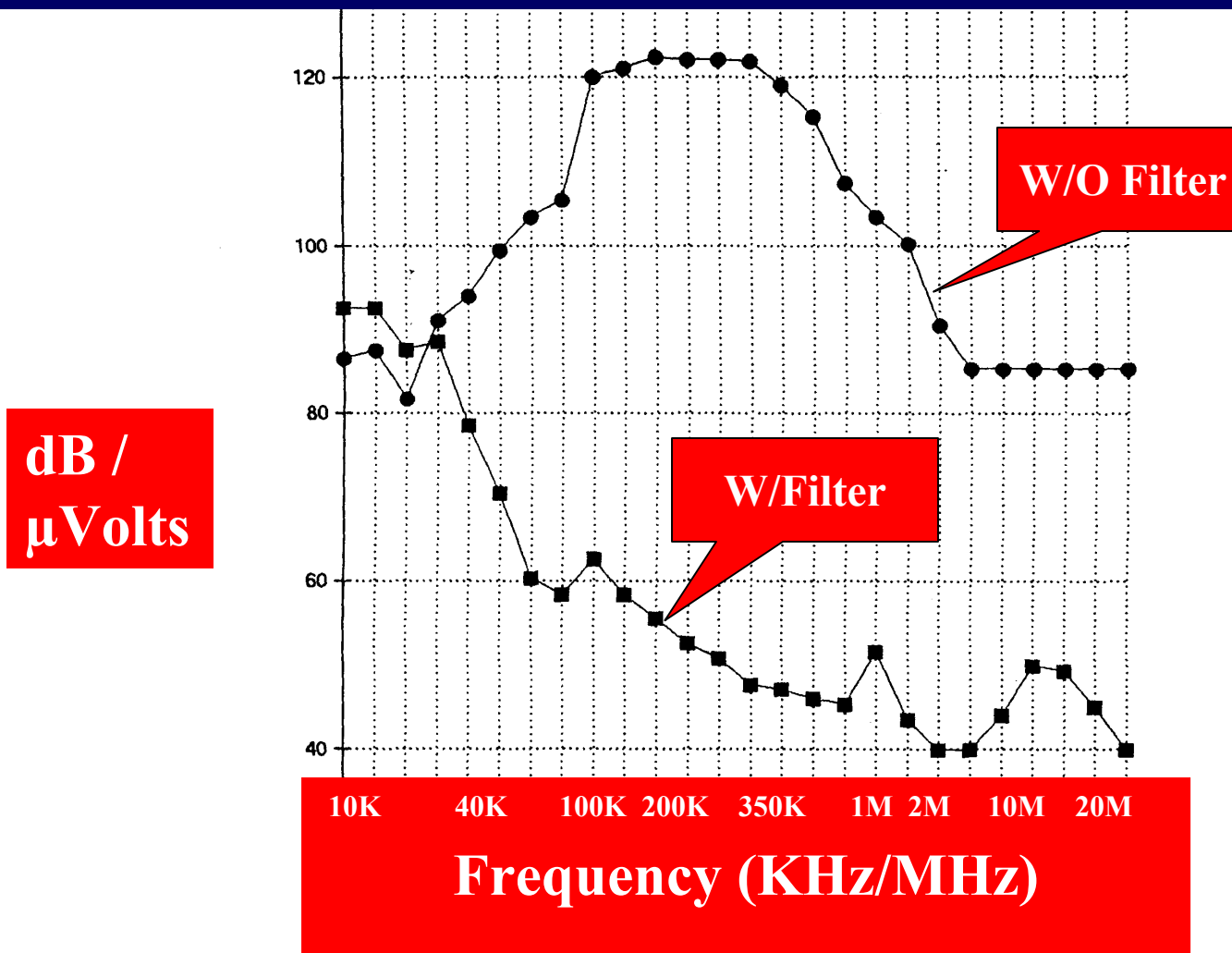
- **150 KHz - <500 KHz** **66 dB (uV)**
- **500 KHz - <5 MHz** **60 dB (uV)**
- **5 MHz - <30 MHz** **60 dB (uV)**

RFI/EMI Filters

FCC Limits

- **500 KHz - <2 MHz** **60 dB (uV)**
- **2 MHz - <30 MHz** **70 dB (uV)**

PWM Drive RFI Interference



MTE "RF" Series RFI/EMI Filters

- **UL Approved through 600 volts**
- **CE (LVD) Marked (up to 600 volts)**
- **All ratings STOCKED at MTE**
- **Fingersafe terminals**
- **3-phase (6 amps thru 330 amps)**
- **1-phase (10, 16 and 20 amps)**

RFI/EMI Filter Selection

- **Install on VFD input only**
- **Size for total RMS current:**
- **Select proper voltage rating**
- **Connect in parallel for higher current ratings**

MTE Gives You...

- ➔ **Delivery from stock**
- ➔ **Availability of high current ratings**
- ➔ **All standard voltages available**
- ➔ **Lowest installed cost**
- ➔ **High insertion loss**
- ➔ **A global delivery system**

MTE **CORPORATION**

