General Wiring Specifications

IMPACC (Integrated Monitoring Protection and Control Communications) was specifically designed with the intention of delivering a comprehensive and powerful energy management solution for use in electrical distribution environments while ensuring affordability, flexibility, simplicity and noise immunity. An IMPACC System installed per the following rules will allow the user to fully realize all of the above advantages. (Refer to Cutler-Hammer for specific system layout recommendations and details.)

Rule 1: Cable Selection

Approved cable types:

- Any of the cables in the Belden 9463 family;
- Quabbin 6205
- Commscope 9022
- IMPCABLE - a 600V rated cable custom designed for IMPACC - Style # 2A95705G01

Rule 2: Cable Intermixing

Any of the various application cables within the Belden 9463 family of cables may be intermixed without compromising communication performance.

Rule 3: System Topology, Size, and Capacity

Topology (See Fig. 3)

- Bus or Single star
- Maximum of long lines from star: 5
- Line termination:
  None for tap
  100 ohms at end of long line
- Maximum cable length between ends of longest lines; 10,000 feet

Attenuation

- Total system capacity: 25 dB
- Attenuation per device: 0.01 dB
- Attenuation for approved wire types:

Cable type	Attenuation/ 1000 feet
IMPCABLE	1.6 dB
Belden 9463 family	2.0 dB

- Attenuation at star:

Number of long lines	Attenuation
3	3.5 dB
4	6 dB
5	8 dB

Definition

- Daisy chain: point-to-point wiring between devices or clusters of devices
- Star: Single point with a number of long lines emanating from it
- Long line: >200-foot wire run
- Simple Tap: <200-foot connection to cluster of devices

See example on page B5-10 for typical layout calculation.

Rule 4: Cable Splicing

The prime goal is to create a secure electrical connection while minimizing exposure to electrical transients. Ferrules are used to dress cable ends. Most IMPACC devices have built-in two-pole terminal blocks which can be used for splicing. Additionally, terminal blocks should be utilized when splicing elsewhere in the gear facility to ensure a secure electrical connection. All devices, End-Of-Line Termination Resistors, Simple Taps and Complex Taps should be placed in parallel across the cable.

Rule 5: Cable Shielding

The cable shielding and outer jacket should not be stripped back beyond 1½ inches. Three-pole terminal blocks are used at tap points to ensure a continuous metallic shield ground path. To ensure a secure electrical connection when daisy chaining IMPACC devices that have built-in two-pole terminal blocks, mechanically crimp sleeves onto the two shield path drain wires. The cable shield ground path for a Main Network and Subnetwork must not be joined together. Each should have a separate connection to earth ground reference.

Rule 6: Cable Grounding

The shield ground path of a Main Network (and each Subnetwork) should be broken up into separate isolated segments in such a way that a single, solid earth ground is available within 3000 feet of any point along a Main Network (or Subnetwork). Isolation is accomplished by *not* tying together the drain wires of neighboring segments at the appropriate splicing junction. The unused drain wire end may be taped back upon the cable to prevent accidental grounding. A solid earth ground is accomplished by connecting the shield ground path's drain wire to a #14 AWG or larger multi-stranded wire that has an impedance path of 1 ohm or less to a known earth ground.

Note: The building electrical ground may not be effective since it may travel through many connections and considerable distances before reaching earth ground. In such cases a new ground path will be required since the effectiveness of this shield earth ground connection will affect the integrity of data transferred over the cable (see Figs. 1 and 2).

Rule 7: Cable Termination

The Main Runs of the Main Network and each Subnetwork require a pair of End-Of-Line Termination Resistors (EOLTRs) (see Fig. 2). The EOLTRs maintain signal strength and minimize reflections. The EOLTRs should be ½ watt 100 ohm carbon or metal film resistors. Wire wound resistors are not acceptable. The EOLTRs should be placed at the two most distant points along the Main Runs of a Main Network or Subnetwork. EOLTRs should be placed in parallel across the splicing junction servicing the Complex Tap rather than at the far end within the Complex Tap. Taps off of the Main Runs do not require end-of-line termination.

Rule 8: Device Address

In order to avoid the possibility of devices in a Main Network having the same addresses as those in Subnetworks, set Main Network device addresses at 100 or higher excluding addresses 901 to 908.

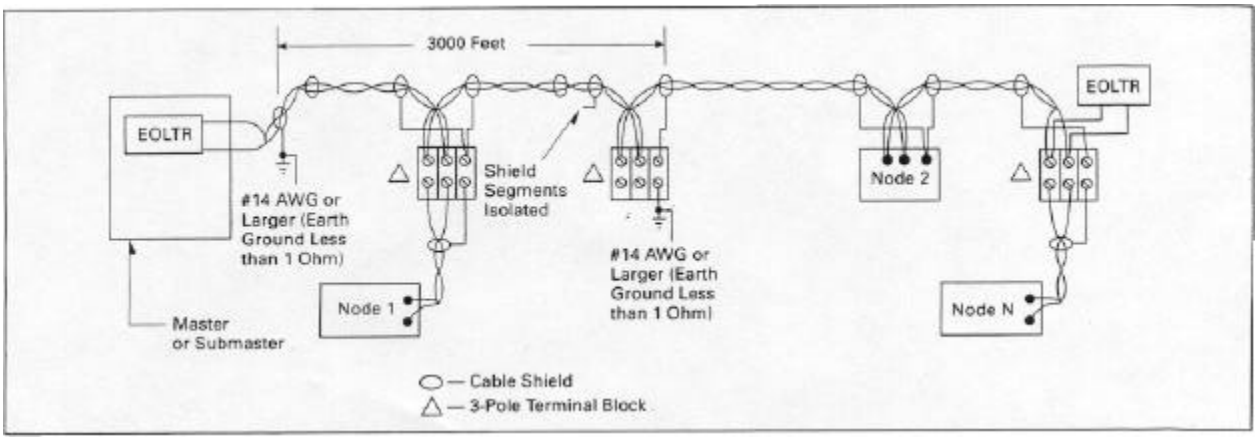

Figure 1

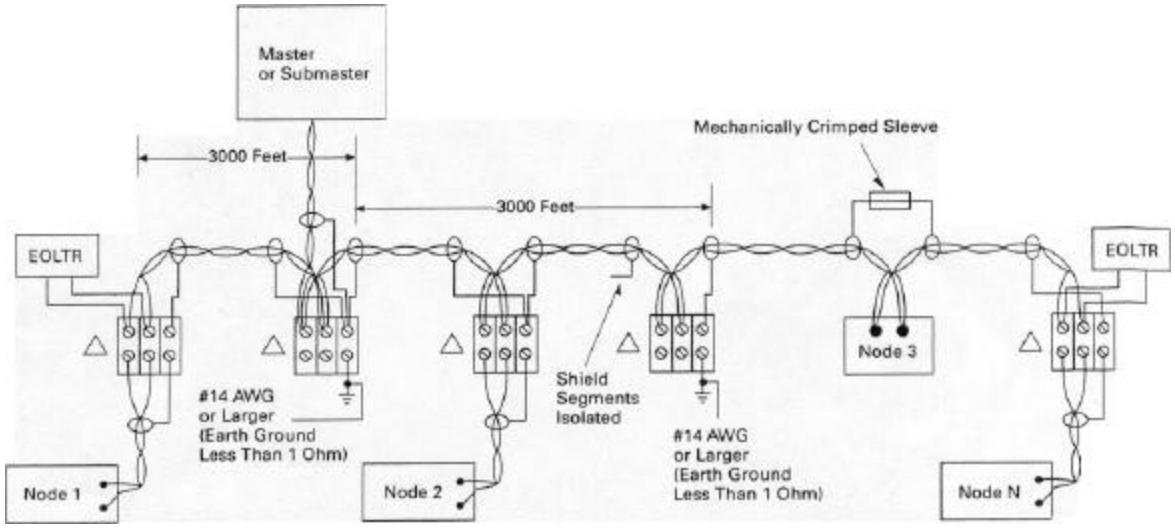

Figure 2

Note: Addressable Relay IIs on a CED Subnetwork must have addresses 901 to 908. Choose addresses less than 100 for Subnetwork devices, except for Addressable Relay IIs on a CED Subnetwork. Devices in separate Subnetworks may have the same address settings.

Example: Star Configuration

Topology: Single star with four long lines using Belden 9463 wire.

Procedure:

- Compute "allowed attenuation" for star system

Total system capacity	25 dB
Deduct for star	-6 dB
Net capacity	19 dB

- Calculate attenuation of each long line:

Line	Length	Devices	Attenuation
A	3,000	150	(2 dB* 3) + 1.5 = 7.5 dB
B	1,500	200	(2 dB* 1.5) + 2 = 5.0 dB
C	1,500	100	(2 dB* 1.5) + 1 = 4.0 dB
D	2,000	100	(2 dB* 2) + 1 = 5.0 dB

- Add two largest attenuations: A + D = 12.5 dB
- Compare to allowed attenuation: 12.5 dB <19 dB, therefore the network is OK.

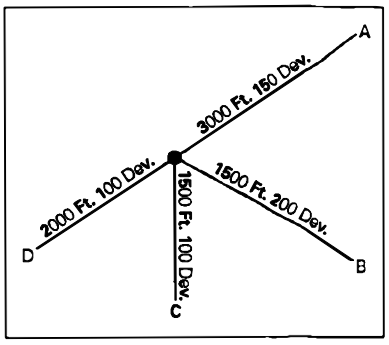

Figure 3