Inductive Control System (ICS)
Automated Vehicle to Wayside Control System
For Electric Trolley Buses
The Inductive Control System (ICS) uses modern electronic design to transmit three different inductive signals within an approximate range of two feet. These frequencies are too low to initiate transmission of an electromagnetic radio wave. Power output is kept below regulatory limits, therefore, licensing of the system is generally not required. The three inductive signals work automatically in conjunction with the vehicle's turn signals.

**Transmitting the Signal**
Under normal conditions, operators approaching an area with overhead trolley frogs will simply use their turn signal switch to signal the appropriate turn. The turn signal switch then causes the transmitter unit to change the transmitting signal from straight to the corresponding turn direction signal. Without the turn signal switch on, the transmitter unit constantly transmits a straight signal. Placing the turn signal switch in the right or left turn position initiates the transmitting of the appropriate right or left signal.

**Operating the Override Switch**
A four-position selector switch (Override Switch) is provided on the dash to operate the trolley frogs independently of the turn signal during unusual traffic conditions. For example, a stalled vehicle just before an intersection may require the trolley bus operator to use their right of left turn signal for going around the vehicle, although the trolley bus route is straight ahead. In this situation the operator will place the Override Switch selector to straight, then give the right or left turn signal to maneuver around the vehicle or obstacle. The transmitter system will transmit a straight signal regardless of the turn signal switch position until the override switch is placed back to normal.

**Receiving the Signal**
The transmitted signal continues its path through an isolation transformed designed to protect the transmitter unit from possible feedback from the catenary system's power. The signal then travels to the transmitter coil which is mounted on the negative trolley pole. The transmitter coil emits into the air an inductive signal, which is collected by a receiving antenna mounted on the negative trolley wire. The signal is then sent from the receiving antenna to to wayside-mounted receiver control unit, where the signal is discriminated. Once discriminated, the appropriate control relay is activated, providing a momentary contact closure suitable for energizing the trolley frog coils, activating headway recorders, initiating traffic signal preemption or unmanned gate controls.

**System Capabilities**
Economical and Reliable Transmission of Control Signals for Remote Actuation of:
- Trolley frogs (mainline or yard)
- Headway recorders
- Traffic signal pre-emption
- Unmanned gates (at storage or shop facilities)

**System Features**
- No mechanical interaction between bus and wayside (mainline or yard)
- Secure - low transmission range
- Immune - chopper control/CB
- Integration - during installation
- Compatibility - retrofit or new vehicles
- Portable test equipment - (optional)

**System Benefits**
- Replaces older method such as:
  A. Power on/off
  Subject to operator error
  Dewirements/overhead damage
  Impractical on hills/slopes
  B. Selectric or turning angle
  Difficult maneuvering in yards and unusual traffic conditions
  Dewirements/overhead damage
  Mechanical devices/maintenance expense
- Lower maintenance costs
- More efficient vehicle movements

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**System Diagram**

![Diagram of bus turn signal with override switch](image)
2) TRANSMITTER
Low maintenance solid-state device easily mounts under dash.

3) ISOLATION TRANSFORMER
Protects from high voltage breakdown. Completely waterproof. Units mounts on roof.

4) TRANSMITTER COIL
Waterproof, double-impregnated rugged coil mounts on the negative trolley pole.

5) RECEIVER ANTENNA
Light-weight PVC waterproof design allows overhead mounting on negative trolley wire.

6) RECEIVER
Features solid-state logic and noise-proof reception filter. Special mounting bracket and wire disconnects allow ease of unit maintenance.

Actuation Of:
- Trolley Frogs
- Headway Recorders
- Traffic Signal Pre-Emption
- Unmanned Gates
System Specifications

Transmitter Components
Operates from vehicle battery voltage of 12 to 32 VDC @ .50 Amp max.

Signal Frequencies
- Straight: 11.5 KHZ
- Left: 9.2 KHZ
- Right: 14.0 KHZ

1. Override Switch
- Weight: .31 lbs. / .1406 kg
- Dimensions: 1 7/8” L / 4.7625 cm
- Width: 1 7/8” W / 4.7625 cm
- Depth: 3 3/8” D / 9.525 cm

2. Transmitter
- Weight: 1.5 lbs. / .4536 kg
- Dimensions: 10 1/2” L / 26.67 cm
- Width: 6 1/2” W / 16.51 cm
- Depth: 3 3/4” D / 9.525 cm

3. Isolation Transformer
- Weight: 1.0 lbs. / .4536 kg
- Dimensions: 4” L / 10.16 cm
- Width: 3 1/4” W / 8.255 cm
- Depth: 2 1/16” D / 5.2388 cm

4. Transmitter Coil w/Housing
- Weight: 1.25 lbs. / .567 kg
- Dimensions: 5” L / 12.7 cm
- Width: 2 7/8” Dia / 7.3025 cm

Receiver Components
Operates from 24 - 1000 VDC or 12 - 600 VAC
- Power requirements: 250 MA @ 24 VDC
- Output duration: 0.5 seconds

5. Receiver Antenna
- Weight: 3.75 lbs. / 1.701 kg
- Dimensions: 48” L / 1.2192 m
- Width: 8 1/4” W / 20.955 cm
- Depth: 2” D / 5.08 cm

6. Receiver
- Weight: 18.0 lbs. / 8.1648 kg
- Dimensions: 14 1/2” L / 36.83 cm
- Width: 14 1/2” W / 36.83 cm
- Depth: 8” D / 20.32 cm

Support Equipment (Optional)
IMPulse NC also offers portable transmitter and receiver test systems for shop or field testing of installations.

Other IMPulse Products
Other IMPulse products include: (A) Frog Position Indicator; (B) Universal Trolley Frog Switch; (C) Push-button Remote Controls for a single pair of overhead frogs or lane controls for multiple (storage yard) frog sets. IMPulse also has a complete line of overhead hardware for ETB systems.