



Remtron Technical Note Infrared Wireless Control

Infrared (IR) has advantages and disadvantages for the use in remote control. Infrared radiation is electromagnetic radiation whose wavelengths are greater than those of visible light but shorter than those of microwaves. In its most familiar form, it is radiated heat which can be sensed by our skin, yet cannot be seen by our eyes. All objects, whatever their temperature, emit infrared radiation. Like light and unlike radio frequency (RF), IR is very directional and is usually focused into a beam for best propagation. RF propagates in all directions depending on the polarization of the antenna and, especially at lower frequencies, can “bend” around objects.

The primary advantages of using IR in remote control are: 1) no requirement for licensing or FCC certification for use in license free bands, 2) relatively low cost and, 3) safety restrictions that require the user to be close to the receiver (usually less than 150 feet) and in direct sight of the receiver. The disadvantages especially over RF control systems include the following;

1. Directionality – At moderate distance, IR systems require an operator to “aim” the hand held unit in the direction of the receptor. If on a crane, this is toward the bridge and upward. The most significant operating problem introduced is the fact that an operator must split his attention between thinking of aiming constantly, verses, thinking of moving the object involved.
2. Range – IR has very limited reliable range compared to RF. IR tends to become intermittent at distances over 100 feet.
3. Sun Light – The IR component of the sun can interfere with the IR signal. The receiver must be shaded from the sun. In outdoor use the receiver must be installed to avoid direct or reflected exposure from the sun. This is particular difficult at dawn and dusk and in very bright and reflective environments.
4. Weather – IR is attenuated by dust, smoke, rain and fog that will substantially reduce operating range. The receiver lens must be frequently cleaned and protected from rain, frost and ice to avoid further attenuation of the signal.
5. Cluttered Work Environments – IR requires line-of-sight from the transmitter to the receiver unlike RF. Operators cannot control the equipment if vehicles and other obstructions are between the transmitter and receiver.
6. Emergency Stop Response – In an emergency, the operator must acquire the receiver before sending an emergency stop command which delays shutting down equipment. RF is almost instantaneous.
7. Safety Link – RF can maintain a constant link from the transmitter to the controlled equipment (“maintained link”) and automatically shutdown the equipment if the transmitter fails or the batteries fail. Normal IR systems are not capable of a “maintained link” mode and will continue last command if the transmitter fails.
8. Night and Low Visibility Operations – Operators have difficulty acquiring the receiver if the receiver location is hard to locate.
9. Interference – There can be interference noise that is disruptive to IR signals, some common sources are lighting systems, heaters, and especially strobe lights used on mobile vehicles.