



Remtron Command Pro Technical Note Safety of Operation

Safety is a special requirement of industrial wireless control systems. Other wireless systems such as cellular phones, car keyless locks, pagers, and even garage door openers don't have the safety concerns that face the wireless operation of cranes or construction equipment. The design of industrial wireless controls must have additional features that reduce the probability of injury to operators and damage to equipment or material. Remtron Command Pro systems are designed specifically for this use and have the following features that address each potential hazard:

- **False Command Prevention** – Wireless control receivers must be designed to accept only valid commands, and those valid commands must come from only one authorized transmitter. Spurious signals from any other RF energy source should not be misinterpreted as a command. Nor should the receivers accept commands from any other transmitter except the one that is registered and in control of the equipment. Remtron developed a very unique design that is solely for controlling equipment and for the reception of the Remtron specially formatted signals in an industrial environment. Each command or packet is subjected to error checking using Cyclic Redundancy Codes (CRC) to prevent false commands. More than 64,000 unique address codes assigned to 82 frequencies are available using Remtron's 16-bit address code. This results in over 5 million unique identifiers. For the transmitter to work, the unique identifier must be registered with the receiver.
- **Inadvertent Command Prevention** – The transmitter should not transmit a command unless the operator makes a purposeful action to issue a command. Remtron protects the controls during operation from inadvertent commands by using a protective ridge around the unit. Critical commands such as load release are protected by requiring the operator to press two rocker switches simultaneously and hold them for a couple of seconds. After that time interval, the receiver implements the command. For further protection, the unit "times out" when not being used and must be turned back on to activate the controls. Time-outs may be set very short if a push-to-operate (PTO) control must be pressed for each command. For special concerns, Remtron provides a *Safety-T-Range™* feature that limits the distance from the receiver at which the operator can issue commands to the system.
- **Emergency Stop Override** – In the event of an emergency, there must be a simple and readily accessible command that will take precedence over all other communications, stop the controlled equipment, and place the equipment in a safe mode. Remtron provides an ESTOP button on all Command Pro transmitters. The ESTOP overrides all commands and has priority communication to the receiver. Once received, the ESTOP command triggers the receiver's safety circuit to implement a three-step shutdown procedure. The first step opens the motor relays and stops movement of the equipment.
- **Interrupted Transmission Failsafe** – In the event that the receiver loses the command signal from the transmitter, the receiver must take action to place the controlled equipment in a safe mode. Remtron uses a continuously transmitting protocol (maintained link) with the receiver that includes a failsafe watchdog timer. If the receiver does not receive a valid command in less than 60 milliseconds, it goes into shutdown mode. Shutdown mode is programmed to go through three phases that safely bring the equipment into a safe state of operation.
- **Receiver Failsafe** - In the event the receiver's electronics fail or lose power, the relays that control the equipment must fail to a safe mode of operation. Remtron has a special safety circuit in each receiver that automatically shuts down operations if the microprocessor fails or if power is lost to the receiver. The relays themselves are designed to fail to the open position, which effectively disrupts the commands and halts operation.

Remtron customers include major amusement parks and industrial plants that depend on Remtron systems as their primary emergency shutdown system.