

TOGGLE STYLE CONTROLLER

SECTION 1

PRODUCT DATA AND SPECIFICATIONS

INTRODUCTION - Designed specifically for rough heavy duty applications, the T01 toggle style radio remote controller is ideal for steel mill, steel service center and other severe industrial applications. Its functional operation is customized to duplicate the operating characteristics of the controls most commonly found in crane and locomotive cabs. Therefore the change from manual to radio control is easily learned by operators. This controller has a sophisticated electronics circuit board using micro-computer digital circuitry. It is protected by a sturdy thick-walled, anodized aluminum housing with specially designed tough rubber endcaps. Extensive use of seals and gaskets provides all weather protection for the electronics circuit board which uses industrial rated digital components, a powerful micro-computer and flexible operating software code.

Some significant performance and safety features:

POWER ON SELF TEST DIAGNOSTICS - When the operator first turns the power switch on, a sophisticated self-test routine tests the microcomputer and input integrated circuits to detect a failure. Any optional paddle style switches are tested for neutral at this time. A small speaker beeps twice when the test is complete & all is okay.

FAILURE MESSAGE - If a motion function switch circuitry failure occurs, it is recognized as a problem and "locked out" from any further input. A special message is sent to the receiver/decoder to advise maintenance personnel of the problem. The message is both displayed and stored in the datalog of the Cattron 864 decoder.

TOGGLE SWITCH PLACEMENT - Each layout is customized according to user needs. The levers are placed far enough apart to accommodate operators who wear heavy gloves.

TRANSMIT/BATTERY CHARGE INDICATOR - The low battery detection circuit is a two stage design. With a good battery, this indicating light flashes green for each burst of transmitted data. If the battery voltage drops below the normal level, this LED flashes red during each transmission. A beeping sound every 10 seconds alerts the operator. When this happens, the battery has approximately one hour of operating time remaining. The controller stops transmitting before the voltage drops so low that erratic operation could occur. An optional

charging jack allows battery recharging without battery removal.

BATTERY OPTIONS - AA alkaline batteries, alkaline packs, NICAD and mercury batteries are available. Whether you choose rechargeable or disposable batteries, changing the battery is easy - simply open the gasketed battery cover, drop the battery in place and close the cover. There are no wires or connectors to insert into the battery, which improves long-term reliability of this unit.

SAFETY BAR - A full length safety bar is provided to function as an enable device to all motion switches. It is a large full-length switch that is easily and naturally activated by the thumb or palm of the operator's hand any time he places his hand into position to move the motion switches. This push-to-operate (PTO) safety bar electronically disconnects all motion switches when it is released, thus stopping motion commands from these switches. This feature is programmable. Certain applications may have some switches removed from control of the PTO bar. An example of this is the brake function of a locomotive.

RUGGED HOUSING - The housing that surrounds and protects the electronic circuitry is a thick-walled extruded aluminum, which has a hard anodized exterior. The ends of the housing are rubber coated plates that make shock absorbing end "bumpers" which shield the toggle switches.

DURABLE/OUTDOOR OPERATION - The toggle switches are extremely long lived units that are sealed, providing water and dust protection. All modules and sub-components are gasketed, making this unit suitable for outdoor operation in rain and snow.

ADDITIONAL EMERGENCY STOP - An optional tilt switch is available with this model. If the controller is tilted in any axis beyond 45° of upright for longer than the programmed time (typically 5 seconds), a programmable function is sent automatically. This function can be assigned in the decoder to stop the equipment, sound an alarm, or both. Reset time is also programmable.

FREQUENCY OF OPERATION - A variety of RF transmitters can be built into this model allowing operation in 72-76, 402-420, and 450-470 MHz bands on licensed radio channels and 447-471 MHz on unlicensed channels. Most models in the 450 MHz range are synthesized (16 frequency max).

APPLICATIONS - The T01 toggle type control unit can operate any digital Cattron Series receiver/decoder built by Cattron Incorporated. It can be used with existing systems as a replacement or as an extra transmitter/encoder.

STANDARD SPECIFICATIONS

Case Material	Anodized Aluminum Extrusion with Molded Rubber End Caps
Weight	3 lbs. (1.1 Kgs), (1 2 Toggle Unit) Including Battery Pack
Dimensions	Height: 9.75 in. (25.0 cm) Depth: 4 in. (10.0 cm) Width: 3.75 in. (9.5 cm)
Environmental	-4° F to + 140° F (-20° C to + 60° C), RH 0 to 95% Non-condensing
Number of Functions	40 On/Off (space permitting) or 2 Analog with 30 On/Off max.
Switch Type	Spring Return to Center, Maintained, Pushbutton, Rotary Select, etc.
Lever Switch Choices	Detented (5 Steps Each Side of Center) or Stepless (Analog) (2 maximum, side mounted)
Lever Styles (side mounted)	Spring Forward Idle and 8 Steps For Throttle, etc.
Push To Operate Safety Bar	Large Flag Type, Special Shapes Optional
Push To Operate Safety Bar	Standard
Lever Guards	Optional
Labeling	Custom, Reverse Engraved Polycarbonate and Multi-layered Mylar
Diagnostic Port to IBM® PC	Standard
Keylock Switch	Standard (Power On/Off)
Security	An optional 'keyless entry code" is available.
Antenna	Internal (External Optional)
Low Battery Indicator	2 Color LED: Green - Battery Normal; Red - Battery Low
Micro-Controller	80C51 Family
Short Circuit Protection	Automatically Resettable Pollyswitch™ (No Fuses)
Conformal Coating	Standard on PC Board
Transmitter Frequency	Synthesized 425-447 MHz or 447-471 MHz
Power Output	447-473 MHz: 450 mW Maximum 425-447 MHz: 450 mW Maximum
Emission/Modulation	14KOF1 D ± 2.5 KHz for 100%
Synthesized Channels	16 Maximum (Factory Programmed)

FEATURES SUMMARY

- **Material**
Extruded aluminum body with fiberglass sides covered with molded rubber. These sides are designed as a switch guard. They are held in place with stainless steel screws.
- **Battery Compartment and Door**
A large, hinged door with gaskets covers the battery tray, which is separated from the electronics by the main body. A metal latch holds the door in place.
- **Battery Connection and Electrical Protection**
Electrical connections are by stainless steel springs with a wiping action that makes contact when the battery is placed into the tray. Electrical short-circuit protection is built into the battery tray via a 'Pollyswitch' device. This device resets once the short is cleared and there are no fuses to replace.
- **Weight and Dimensions**
The standard 12 toggle unit weighs approximately 3 pounds and is 9.75 inches high x 3.75 inches wide x 4 inches deep. (A chest pack unit with one or two side-mounted lever switches is the same height, 2 inches wider per switch added, and has little noticeable weight change.)
- **Battery Management**
There is a two stage battery condition indicator light, which FLASHES GREEN when the unit is ON and the battery is OK. It FLASHES RED when the battery is low and sounds a beeper to alert the operator. The indicator is OFF when the battery is dead. A LOW BATTERY CUTOFF CIRCUIT stops the micro-processor when voltage goes below safe operating range. RF transmitters always operate at full power over the entire life of the battery.
- **Labeling**
A large easy-to-read reverse engraved custom faceplate is nearly indestructible. It has large letters that won't wear off or fill with dirt.
- **Waterproofing/Dustproofing**
There is extensive gasketing throughout construction. Each switch is totally sealed as are the battery door and end plates. The circuit board is conformal coated.
- **Switch Protection From Accidental Operation**
Rubber sides guard the toggle switches from most accidental bumps. A convenient palm-operated bar must be pressed to allow any motion switch electrical operation. Simply releasing the PTO bar stops all motion.
- **Side-mounted Lever Styles**
One or two side-mounted lever pods can be installed as an option. Standard units have a large easy-to-locate and comfortable 'FLAG' style paddle. Shaped knobs are available as an option.
- **Self Diagnostics Capabilities**
There is extensive power ON self-testing with two beeps from the beeper. A standard tilt switch and beeper are used to check all switches (ACTIVATED BY HAVING THE UNIT TILTED WHEN POWER IS TURNED ON). A diagnostic port is standard to allow connection to an IBMO PC for in-depth analysis by technicians.
- **Interconnection Circuitry and Connectors**
Flex circuits are used intensively to reduce wiring and improve reliability. Connectors are goldplated throughout.
- **Synthesized RF Transmitters**
Used in most 450 MHz operations, it reduces the spare controller requirements. Models with up to 16 RF channels are available.

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SECTION 3

OPERATION INSTRUCTIONS (GENERAL)

The custom Radio Remote controller unit attempts to duplicate all functions normally found in the cab of a crane or locomotive that is being remote controlled. It contains all basic control functions and may also be equipped with some of the auxiliary control functions described. It is carried and operated at the hip or chest position using a specially designed carrying strap.

BASIC CONTROL FUNCTIONS

1. **Power On/Off Switch** - This switch is located on the left side of the unit, prevents unauthorized personnel from operating the system, and controls the battery power of the control transmitter. When the switch is ON, the operator can control all auxiliary functions without pressing the PUSH-TO-OPERATE bar (no motor functions). The power on/off switch controls a mainline magnetic contactor on the machine which in turn controls the main power to the motors.
2. **Push-To-Operate Bar (PTO)** - This bar is a spring-return switch located on top of the unit and **MUST** be operated simultaneously with all motion control toggle switches. (Not required for auxiliary functions, i.e. magnet, lights, etc.) In special cases like locomotive brakes, the PTO is not required. Refer to the custom description of controller functions for each job. This safety feature, commonly referred to as the "Deadman Control," is conveniently located so that it may be pressed with the thumb or palm of either hand, leaving the fingers free to operate other switches. **This switch is used to select diagnostic mode if held down while power is turned on.** See the maintenance section for details.
3. **Motor Control Toggle Switches** - These switches, located across the front of the unit, are the motor function control switches.

These switches are usually three (3) position, spring return-to-center switches, maintained two (2) position switches, or pushbuttons. For cranes with stepped output there are forward (or down) positions, reverse (or up) positions, and a center "off" (or neutral) position. Each of the toggle switches selects a different motor speed. The motor speed increases as the different switches are selected and moved away from the center position in each direction.

Locomotive controllers with optional side lever positions are laid out according to your requirements and you should refer to the special drawings in the back of this manual. Normal configuration is: Levers for the THROTTLE on the right side, for the BRAKE on the left side, and all other functions use toggle or pushbutton switches.

Refer to special operation descriptions and "as built" drawings for specific information.

CARRYING HARNESS

The carrying harness consists of a shoulder strap with hooks.

A special carrying harness with a chest carrying design is available - see the accessory section of this manual for details of wearing and ordering.

OPERATING PROCEDURE

Put on the carrying harness, following instructions for the particular harness used. Attach the controller to the harness and adjust for comfortable operation.

Basic Control Unit Operation:

CAUTION: Make certain that the Push-To-Operate bar is not jammed down. The PTO bar must be up when starting the controller. Holding the PTO bar down places the system in diagnostic mode. The system will not operate. See the maintenance section for details.

1. If equipped, insert the key into the key switch on the left side of the unit and turn the key to the ON position. Observe that the transmit LED is flashing green. If red, refer to battery charging instructions. If steady green, it is in diagnostic mode, refer to the maintenance section.

If equipped with the optional "Keyless Entry Code" feature, an assigned sequence of function switches must be operated within 10 seconds after the power switch is turned on. The switches will not operate any functions. The controller power comes on only after the correct sequence has been entered.

2. Place the thumb or palm of either hand on the push-to-operate bar on top of the unit. This switch must be depressed before any motor command may be initiated.
3. Operate the motion control toggle switches as required, remembering that the toggles must be pulled upward for all reverse and up motions and pushed down for all forward and down motions. A speed increase is obtained by selecting different, appropriately marked toggle switches. Compass direction labels may be engraved by appropriate switches. Custom engraving is provided by CATTRON with all new controllers if notified prior to assembly.
4. While commanding a motion with a switch, release the Push-To-Operate bar without centering the switch. The motion must stop - if this does not happen, turn off the power and notify your supervisor immediately.

OPERATOR ACCESSIBLE ADDRESS SELECTOR SWITCHES

For a variety of reasons, these controllers are sometimes equipped with address and frequency select switches, allowing control of multiple cranes or locomotives with one controller. Extreme caution should be used to insure that the operator does not inadvertently select the wrong crane.

CAUTION: After changing a frequency select, crane select switch, trolley select, hoist select, or any other selector switch, be extra cautious and verify that the desired unit is under control. Start by commanding a function like HORN and proceed with care - *Failure to do so can cause injury or death.*

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SECTION 4

FCC REGULATIONS & COMPUTER SOFTWARE COPYRIGHTS

FCC REGULATIONS

FCC Regulations state that:

1. These toggle style controllers are approved by the FCC for licensed operation . No modifications to the design are permitted. A station license is required by the FCC.
2. The RF power output of a radio transmitter shall be no more than that required for satisfactory technical operation considering the area to be covered and local conditions.
3. Frequency and deviation of a transmitter must be checked before it is placed into service and should be rechecked once each year thereafter.

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