RULES AND INSTRUCTIONS FOR THE OPERATION OF REMOTE CONTROL LOCOMOTIVE SYSTEMS (REVISED AUGUST 15, 2003)

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THE FOLLOWING INFORMATION, RULES, INSTRUCTIONS, AND PROCEDURES GOVERN THE USE OF REMOTE CONTROL LOCOMOTIVE SYSTEMS ON EACH OF THE FOLLOWING RAILROADS:

Idaho Northern and Pacific

Nebraska Central

New Orleans and Gulf Coast

Wichita, Tillman, and Jackson
# REMOTE CONTROLLED LOCOMOTIVE SYSTEM

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SECTION .5 -- DEFINITIONS AND ABBREVIATIONS

REMOTE CONTROL (RC)—The process of operating locomotives via a radio frequency established between a qualified operator using an operator control unit (OCU) and a locomotive control unit (LCU) so that the locomotive operates in the same manner as if the operator were using the controls in the cab of the locomotive.

REMOTE CONTROL LOCOMOTIVE (RCL)—A locomotive (an engine, or more than one engine coupled and MU’d together) capable of being operated by an operator on the ground using an operator control unit (OCU).

REMOTE CONTROL LOCOMOTIVE SYSTEM (RCLS) – Used to describe the entire system for operating a remote control locomotive; to include the OCU, the LCU, and any other equipment required in practice or by rule (such as strobe lights/beacons, signage, harnesses, connecting hoses, electrical cables, mounting brackets, radio transmission repeaters).

REMOTE CONTROL OPERATOR (RCO) – A locomotive engineer with a valid engineer’s license who has been trained and certified as a remote control locomotive system operator.

REMOTE CONTROL OPERATOR - EMPLOYEE IN CHARGE (RCO-EIC) – For each tour of duty on which two operator control units (OCU) are used by a single RCL crew, one RCO must be designated as the RCO-EIC for purposes of controlling entrance of other trains, engines, employees, and contractors into the Remote Control Zone. The crewmembers will jointly determine the RCO-EIC for that tour of duty and promptly notify the dispatcher or other designated person(s).

PRIMARY RCO – At different times during a tour of duty using the RCLS with two OCU’s, one RCO will be the primary RCO, depending on his position on the ground and other circumstances. When practical, the primary RCO should control RCL movement at all couplings. The primary RCO will not always be the RCO-EIC.

REMOTE CONTROL ZONE (RCZ) – Any section of track, to include main line and/or yard or industry tracks, the limits of which are designated by General Order or Timetable and/or by posted signs on the right of way, in which a remote control system may operate according to rules established for that purpose.

ACTIVE REMOTE CONTROL ZONE (ACTIVE RCZ) – A designated remote control zone made active by General Order or Timetable for certain hours of specified days of the week, or made active by Track Bulletin, or made active by authority of the dispatcher via radio or telephone. If the RCZ is activated by Track Bulletin or verbal authority, all
employees or contractors who might have occasion to enter the ACTIVE RCZ must be notified before the RCZ is activated.

OPERATOR CONTROL UNIT (OCU) – A portable unit attached to the RCL operator with a harness or specially designed vest, equipped with controls duplicating the key controls in the locomotive cab, operating on a designated radio frequency, used by the operator to control the movement of the remote control locomotive. (See diagram page 22).

QUICK CONNECT (QC) -- This term is used by Cattron, the manufacturer of our railroads’ remote control system, to apply to its product that provides for the use of any locomotive with MU capabilities to be quickly connected and used as a remote control locomotive without the need for extensive rewiring and re-piping of the individual locomotive unit. The QC is completely portable and easily moved from one locomotive to another. The QC is actually two boxes which are connected with an electrical cable after mounting on the locomotive—the LCU box and the EPI box.

LOCOMOTIVE CONTROL UNIT (LCU) – The first of two boxes comprising the Quick Connect (QC) system. This box contains the electronic controls for communicating between the locomotive and the OCU. This box is easily distinguished by cable receptacles on the side of the box. (See below for further description of LCU, and diagram on page 8).

ELECTRO-PNEUMATIC INTERFACE (EPI) -- is a completely self-contained unit that is connected to, and controlled by, the LCU. When connected to the Locomotive Pneumatic System by way of the MU connectors, the EPI allows the Automatic and Independent Braking systems to be operated under remote control. This box is distinguished by the air hose connectors on the bottom of the box.

**LCU Detailed Description: On-board Computer Components**

The Electronic Chassis (“Goldbox”):

The “gold box” is an EMI/RFI shielded enclosure in which all of the on-board computer electronics are housed. This enclosure contains the decoder circuit board, transceiver circuit board, and DC-DC converter. Each circuit board has its own compartment within the goldbox. Each of these compartments is shielded from the others to provide for optimum EMI/RFI protection. Since all of the electronics of the on-board computer are contained in this 14.5” L x 11” W x 2.75” D enclosure, it can be easily removed and replaced by removing 4 nuts, a couple of ribbon cables, the antenna cables and the incoming power cables (usually takes about 5 minutes).

Engine alarm monitoring.

The system is configured to monitor the locomotive MU train line alarm pin to detect low oil pressure, and high engine water temperature.

If any of these conditions occur, a Full Service Penalty reduction will be commanded. See the Penalty section of the manual for recovery procedure.

Air filtration:

A 5-micron self-draining filter is provided for cleaning the air entering the remote control system. If extreme cold temperature operation is required, an air dryer system may be needed – please consult factory.
SECTION 1.0 – SAFETY RULES FOR REMOTE CONTROL OPERATIONS

1.1 Employees assigned to and working on a remote control (RC) crew are governed by these instructions and must have a current copy they can refer to while on duty.

Remote Control Operators (RCO) will be issued an Operator’s Manual (this document), governing the operation of the Remote Control Locomotive System (RCLS), and will be trained and certified in its contents.

All rules or instructions contained in other publications adopted for company use remain in effect unless specifically exempted in these instructions.

1.2 Prior to operating an OCU for controlling a RCL, a job briefing must be held among all crewmembers (see “Job Briefing” -- Appendix 1 of this document -- for an outline of how to conduct an effective job briefing). All RCLS crewmembers must be informed and clearly understand which crewmember is controlling movement of the RCL at all times (the primary RCO). Before the control of the OCU can be transferred from one crewmember to another, the receiving RCO must be notified and acknowledge they are in a position to assume control.

1.3 A crewmember must not go under or between cars coupled to a RCL (enter the Red Zone) or when a RCL is on the same track until each member of the crew has been informed of the work to be performed. The RCO must ensure that the OCU’s throttle is reduced to idle, and the air brakes are APPLIED.

The RCO must acknowledge that he/she understands that another employee will be entering the Red Zone announcing via radio “set and centered.” The speed control, direction control, and air brakes must not be repositioned on the OCU or control of the OCU transferred to another operator until each crewmember has advised the RCO that they are “in the clear.”

While operating a moving remote control locomotive, RCLS crewmembers must not foul the track in front of the lead car or locomotive.

1.4 Each RCL crewmember shall be equipped with an operative bolstered handheld radio equipped with a wired microphone.

1.5 OCUs must not be left unattended unless secured. Spare OCUs shall not be stored with batteries installed. The LCU will not permit control from more than one OCU at one time.
1.6 When cars or engines are shoved and conditions require, a crewmember must take an easily seen position on the leading car or engine, or be ahead of the movement to provide protection unless the leading end of the movement is within an active RCZ.

1.7 Movements past any block, interlocking, or controlled signal (regardless of indication) or through an interlocking shall be made only when a RCL crewmember, or other authorized employee who can signal or communicate with the RCL crew, has taken a position where the signal aspect can be observed and the indication is PROCEED.

1.8 Movements over public crossings at grade must be made only when a RCL crewmember, or another qualified person, has taken a position where the crossing and crossing signals can be observed.

1.9 Prior to leaving the locomotive cab to operate the RCL from a position other than in or on the locomotive, a RCL crewmember must place a tag on control stand indicating the locomotive is in REMOTE mode. The tag must be removed and secured when placing the locomotive into MANUAL mode.

If tag is unavailable, a handwritten message must be used.

1.10 Operation of passenger or excursion trains with RCLS is prohibited.
2.0 SETUP AND TESTING

Prior to operating a RCLS, the RCO must ensure the equipment is properly set up and tested to be certain it will respond properly to OCU commands. If two OCU’s are to be used in a “shared” operation, both must be tested at beginning of shift. A FULL test of ONE OCU requires about ten minutes; testing TWO OCU’s may require twenty minutes.

If unable to successfully perform required tests; retest equipment--if still unable to successfully perform required tests, contact supervisor.

Setting up a locomotive for remote operation:

2.1 Preparing the locomotive for RCL operation:

- Set number lights switch to ON
- Set MU Headlight switch to appropriate position
- Set isolation switch to RUN position
- Set automatic brake valve to CONTINUOUS SERVICE position
- Set automatic brake valve cutoff valve to OUT position
- Move automatic brake valve handle to HANDLE OFF position
- Set independent brake valve to FULL APPLICATION position
- Set Throttle to IDLE
- Set Reverser in NEUTRAL and remove
- Set engine run switch to ON
- Set generator field to ON
- Set Control & Fuel Pump to ON
- Set MU-2A valve to TRAIL
- APPLY red “Remote Control” tag to control stand

2.2 Setup the QC boxes (this operation is performed infrequently—only when transferring QC boxes from one locomotive to another or when removing the QC boxes from secure storage):

- Use the mounting brackets to mount the QC boxes (the LCU and the EPI) on the locomotive guard rail less than ten feet apart and as close as possible to the MU connectors (see diagram below). (The LCU box is the one with the MU cable receptacle.). THIS IS A TWO-PERSON JOB—DO NOT ATTEMPT TO DO THIS ALONE!
- Set the Power On/Off switch on the side of the LCU box to OFF
- Connect the electrical connecting cable between the LCU and EPI box receptacles labeled C2 and C3 (see diagram below).
- Open angle cocks for all air lines.
2.2 Remote Antenna Installation

- Mount the antenna in a vertical position on top of the locomotive with a minimum of 48 inches clearance from obstructions in all directions of the antenna within the line of sight. **NOTE: The typical RGPC configuration has the antenna permanently mounted on the locomotive.**
- Install the plug from the antenna connector cable into the bottom of the LCU box. Carefully coil any excess cable and secure to prevent interference with moving equipment.

2.3 Setup the OCU (s):
General and introduction:

- Attach the OCU to the carrying harness or carrying vest – adjust to most comfortable position
• “Vigilance” is actually an alerter. The Vigilance pushbutton (see diagram on page 22) must be depressed when:
  • to acknowledge warnings from the OCU
  • to reset Vigilance timer
  • within 5 seconds of moving throttle from idle
  • within 10 seconds of moving independent brake from apply to release

• With Vigilance, the RCO is required to activate a control function (or push the Vigilance button) once every 60 seconds. If the Operator does not change the state of any of the control functions for 50 seconds, the OCU will emit an audible warning. Once the warning begins, the Operator must push the Vigilance button. Failure to press the Vigilance button after the warning begins will result in a Full Service Reduction Shutdown.

• Now:

  1. Ensure that the address code and frequency of your OCU exactly matches the address code and frequency of the LCU to be operated. The address and frequency of the OCU is on a serial tag inside the battery door. The address and frequency of the LCU is on the front of the LCU box. For ease of checking, the Railroad has affixed labels/numbers to each “mated” OCU and LCU.
  2. Set the OCU’s power switch to ON. If transmitting OK, you will hear two short “beeps” immediately after switching the unit ON and the green TRANSMIT/LED will flash rapidly and continuously. The LED will change to RED when the battery gets low.
  3. Press the HORN button on the OCU and listen for the locomotive horn.
  4. Check each brake function on the OCU independently to make sure the locomotive is responding properly. Observe cab gauges for proper readings and verify that brake cylinders are moving properly.
  6. Test locomotive brakes in accordance with UPRR Air Brake & Train Handling Rule 30.3.3 Modified (See General Order).
  7. Check all auxiliary controls—bell, sanders, etc.
  8. Test Tilt Feature
     • Tilt OCU more than 45 degrees.
     • If an OCU is operating properly it will:
       • Sound the continuous tone alarm after 1 second.
       • Cause a tilt time-out fault after approximately 5 seconds (this applies emergency brakes)
       • Right the OCU and recover emergency
  9. Test Vigilance Feature by allowing OCU to enter Vigilance warning and then full Vigilance activation mode. When this occurs, RCL will get a full-service brake reduction and OCU will display penalty condition on LED.
10. On the first move of the RCL, move it slowly and be sure it is under your control.

11. OCU **Diagnostic Mode.**
In this mode the OCU operator can easily check that all function switches (motion and non-motion) are fully operational.

**WARNING:**
**THE LOCOMOTIVE’S GENERATOR FIELD SWITCH MUST BE SET TO ‘OFF’ TO PREVENT MOVEMENT UNDER REMOTE CONTROL IN THE SWITCH DIAGNOSTIC MODE.**

11.1 Switch the OCU power to ‘OFF’
11.2 Place the OCU in a tilted (horizontal) position with its battery door face down.
11.3 Re-apply power using the ON/OFF switch while the OCU is in the horizontal position.
   This activates the beeper when any non-motion (auxiliary) toggle or pushbutton switch changes state, and when any motion control lever/switch changes state.
   For example, push any one of the auxiliary toggle switches UP and a single ‘beep’ will be heard. Release the toggle switch and another single ‘beep’ will be heard as the switch spring returns to center. Repeat this procedure on the remaining non-motion toggle and pushbutton switches in both UP/DOWN or ON/OFF positions. A ‘beep’ should be heard each time the switch changes state.
11.4 To disable the switch diagnostic mode, simply turn the OCU’s power to ‘OFF’, then re-apply power to the OCU while it is in an upright position.

2.4 **When** to test the equipment

1. Perform a full test as described in rule 2.3 when initially setting up the equipment for remote operation for the day.
2. Perform a “non-activating” test when relieving a previous crew. A “non-activating” test is exactly as described in 2.3 above, but only check until the alarms are heard.
3.0 OPERATING THE EQUIPMENT

3.1 Only Certified RCO’s are permitted to operate the RCLS.

3.2 Prior to operating the RCLS, ensure the proper setup and testing procedures are completed. If two control units are to be used in shared operations, test both.

3.3 A RCO shall control only one RCL consist at a time, and shall not operate simultaneously any other locomotive.

3.4 Dropping cars while in REMOTE mode is prohibited.

3.5 When using a Remote Control locomotive to make a coupling, the RCO located at the coupling should, when practical, be the primary RCO.

3.6 Only operate the RCL remotely from the ground, from the locomotive or caboose platform. Do not operate the RCLS from a motorized vehicle.

3.7 Changing control of the RCL from one operator to the other in a shared control situation:
1. Bring movement to a stop.
2. Switch OFF controlling (primary) OCU (OCU 1).
3. Switch ON the new primary OCU (OCU 2).
4. Recover from full-service application
5. Verify control has transferred by activating horn or other control on OCU 2.
6. Ensure all crewmembers understand which operator is controlling movement (job briefing).
7. On the first move of the RCL, move it slowly and make sure it is under your control.

3.8 What happens when the tilt switch is activated? When the tilt switch is activated an emergency application will be triggered, returning the RCL throttle to idle, and setting all air brakes. THE OCU causing the tilt switch shutdown to activate is also the OCU that must be used to recover from the shutdown.
3.8.1 The “man-down” feature is an automated process that broadcasts an emergency message over the locomotive radio, sending it once per minute until the operator corrects the condition causing the tilt switch activation and recovers from it.

3.9 What is the tilt-bypass switch and how does it work? The tilt bypass switch is a feature that allows the operator of the OCU, by pressing this switch, to gain an extra 50 seconds to bend over, throw switches, etc. without triggering the
tilt feature. It does sound the alarm but does not activate the penalty brake application. There is an indication on the OCU’s LED display when the tilt bypass feature has been activated. Should the amount of time in tilt bypass be exceeded, the throttle will return to idle and full-service brake application initiated.

3.9 SYSTEM RECOVERY—Regaining control after STOP conditions activated:
3.9.1 Identify the reason for the STOP condition

NOTE: Operator commanding an Emergency or Full Service shutdown must be the one to recover.

3.9.2 CONDITION: EMERGENCY APPLICATION -- What causes it?

3.9.2.1 An EMERG brake has been commanded by the OCU.
3.9.2.2 An OCU TILT condition has been detected.
3.9.2.3 An extremely low pressure has been detected on the Automatic Brake Pipe.
3.9.2.4 An Automatic brake check fault has been detected. A pressure greater than the commanded brake reduction has been detected for a predetermined length of time. The fault must be corrected and then cleared on the LCU by pressing the ALR/RST pushbutton located on the LCU box.

When any of these events occur (3.9.2), a full independent brake and emergency brake application is commanded with the throttle returned to IDLE.

Recovery from Emergency:
1. Return Throttle to idle.
2. Place Independent brake lever into 45LB (Full Service) application.
3. Place Automatic brake lever into 27LB (Full Service) reduction.
4. Depress Push-To-Operate bar or Vigilance pushbutton.
5. Place Automatic brake lever into REL position

3.9.25 CONDITION: FULL SERVICE PENALTY – What causes it?

1. A direction opposite of the previously commanded direction is detected for 20 seconds while a throttle position other than IDLE is selected.
2. An Engine Alarm from the Locomotive has been detected. The fault must be corrected and then cleared by pressing the ‘ALARM RESET’ Pushbutton located on the LCU Enclosure.
3. An Independent brake check fault has been detected. A pressure less than the commanded pressure has been detected for a predetermined length of time. The fault must be corrected and then cleared by pressing the ‘ALR/RST’ Pushbutton located on the LCU Enclosure.
4. A “RS485” check fault has been detected. This is an internal LCU fault. The fault must be corrected and then cleared by pressing the ‘ALR/RST’ Pushbutton located on the LCU Enclosure.
5. A decoder fault has been detected. This is an internal LCU fault. The fault must be corrected and then cleared by pressing the ‘ALR/RST’ Pushbutton located on the LCU Enclosure.
6. A radio frequency Communication fault has been detected; for example, the OCU moves out of communication range of the LCU.
7. If Vigilance time (greater than 60 seconds) expires.
8. If system detects that Vigilance button is stuck down.

When any of the above events occur (3.9.25), a full independent brake application is commanded, a 27psi reduction is applied to the automatic brakes, and the throttle is returned to IDLE.

3.9.3 RECOVER FROM FULL SERVICE PENALTY SHUTDOWN:
1. Return Throttle to idle.
2. Place Independent brake lever into 45LB (Full Service) application.
3. Place Automatic brake lever into 27LB (Full Service) reduction.
4. Depress Push-To-Operate bar or Vigilance pushbutton.
5. Place Automatic brake lever into REL position.

3.9.4 Service Application--a full independent brake application is commanded, and the throttle is returned to idle.
Conditions initiating a ‘Service Application’ shutdown:
1. Low air pressure has been detected on the Locomotive’s Main Reservoir. Once the low air condition has cleared, return OCU THROTTLE Lever to ‘IDLE’ and depress the Vigilance Button to clear the fault.
2. NEUTRAL is selected on the OCU.
3. A direction opposite of the previously commanded direction is detected.
4. Automatic brake pressure less than 45psi is detected.

When any of these events occur (3.9.4),
RECOVERY FROM A ‘SERVICE APPLICATION’ SHUTDOWN occurs automatically when the penalty condition is removed.

3.9.5 Non-Operator Induced Malfunctions Reporting:
A RCL/OCU Malfunction Reporting must be completed when the operator (RCO) encounters a malfunction of any part of the RCLS during operation of the RCLS equipment. Space has been added to the daily locomotive inspection form for this purpose. For any inspections reporting defects, a copy of the completed form must be submitted no later than the end of shift to the local manager, and manager or dispatcher must be verbally notified of the problem prior to end of shift.
4.0 SECURING EQUIPMENT

4.1 Remote control locomotives (RCL) and Operator Control Units (OCU) must not be left unattended unless secured or disabled—that is, the RCL is not set up (linked) to an operating OCU in the possession of a crewmember.

4.2 To secure an unattended, operating, RCL, follow these steps:
   1. Set throttle to idle
   2. Fully apply brakes
   3. Set hand brake
   4. Switch OCU to OFF
   5. Remove battery from OCU

4.3 To return the locomotive to MANUAL mode:
   1. Throw power ON/OFF switch on LCU of OFF--This applies emergency brakes.
   2. Recover from emergency application.
   3. Turn the MU-2A valve to the “LEAD or DEAD” position and apply the Independent brakes.
   4. Set automatic brake valve to RELEASE position.
   5. Set automatic brake valve cutoff valve to IN position.
   6. Turn off the lights.
   7. Apply sufficient handbrakes.
   8. Set the isolation switch to the START/STOP/ISOLATE position.
   9. Set Generator Field switch to OFF.
  10. Remove the red “Remote Control” tag from control stand and attach to your OCU for future use.

4.4 When ending tour of duty, the Remote Control operator (RCO) must place the locomotive in the manual mode unless being relieved by another RCO. If another RCO is relieving the first RCO, a job briefing must be held among all involved employees. Relieving crew must perform tests as described in rule 2.4 item 2.

4.5 Spare control units must be stored with power off and batteries removed.

4.6 When a RCL is released to the Mechanical Department (either at the mechanical facility or the RCL is placed under blue signal protection), the RCL shall be placed into MANUAL mode.

4.7 When a RCL crew takes custody of a RCL from the Mechanical Department, the transfer can take place when the controls are in either MANUAL or REMOTE mode. The RCO must perform the same tests required when relieving another RCL crew.
4.8 When a RCL is left unattended the appropriate number of hand brakes must be applied and the control units must be turned off and secured. Control units may be left on while in a crewmember’s possession.

5.0 REMOTE CONTROL ZONES

5.1 Timetable special instructions or General Order will designate Remote Control Zones—areas of Remote Control Operations. Signs will be posted at the access points to Remote Control Zones; the signs will state: “BEGIN RCL ZONE.”

5.2 Remote Control Zones may also be designated or activated by issuance of Form C Track Bulletin that must be issued to all potential users of the track segment designated.

5.2 The RCO-EIC in control of a Remote Control locomotive must be notified of any track removed from service or working limits established for the protection of another craft. The RCO-EIC must conduct a job briefing with all members of the crew.

5.3 Before a train, engine, or other men/equipment may enter a Remote Control area (RCZ), a crewmember must communicate with the supervisor in charge of the RCZ and the RCO-EIC.

5.4 Activating the Remote Control Zone (RCZ): Only the RCO-EIC, or the Operations Coordinator (Dispatcher) may activate a Remote Control zone. Remote Control zone limits do not include tracks within CTC or interlocking limits (CTC or interlocking rules apply). The RCO-EIC must notify the dispatcher or designated person when activating the RCZ.

5.5 When a Remote Control zone is activated, the Remote Control operator is relieved of point protection for pullout movements (locomotive on leading end) only. **Rule 6.28 requirements to stop within one-half the range of vision is suspended for the RCL crew only.** After the Remote Control zone is activated, the RCO-EIC must ascertain that switches/derails are properly lined and track(s) within the zone are clear of trains, engines, railroad cars and men or equipment fouling track before initial pullout movement. This process must be repeated each time the Remote Control zone is activated.

5.6 An activated RCZ is under the jurisdiction of the RCO-EIC.

5.7 A RCL crew going off duty may turn the RCZ over to the relieving RCL crew provided the relieving RCO-EIC notifies the dispatcher or other designated person of the change.

5.8 Prior to operating an RCL in an activated RCZ, the relieving crew must conduct a job briefing with the RCL crew going off duty.
5.9 When the RCZ is vacated and no longer needed by that crew or an immediate relief crew, the RCO-EIC must deactivate the RCZ by promptly notifying the dispatcher or other designated person.

5.10 The RCZ may remain active by General Order or Timetable special instruction if such document specifies the hours and days that the RCZ is active.
6 ENTERING REMOTE CONTROL ZONES

6.1 Before entering a Remote Control zone, all employees that are not part of the Remote Control crew must determine whether the zone is activated. Employees may receive this information from:

- the RCO-EIC, or
- the supervisor in charge of yard movements, or
- the dispatcher

When the Remote Control zone is activated, track(s) within the zone must not be fouled, occupied, or switches operated until the Remote Control zone has been deactivated or authority is granted by the RCO-EIC to enter the Remote Control zone. The RCL crew must fully comply with Rule 6.28 (unmodified) while other employees are in the Remote Control zone. The RCO-EIC must ensure the track is clear and switches are properly lined after other employees are clear of the RCZ.

6.2 Maintenance of Way and Maintenance of Equipment employees and contractors must receive permission from the RCO-EIC before occupying or fouling any track within or adjacent to the activated RCZ. Permission must be repeated and acknowledged.

6.3 Upon receiving permission to work within or foul the RCZ, those personnel specified in 6.2 above must display red flags (or blue flags, as applicable to craft) and lock out tracks against movement into them. The RCO-EIC must be advised of the location of all flags and which switches have been lined.

6.4 After all men and equipment are clear, all flags are removed and switches returned to the proper position, the employee in charge of the work crew must notify the Lead RCO.

6.5 Train or engine crews must receive permission from the RCO-EIC before occupying or fouling any track within an activated RCZ. Permission must be repeated and acknowledged.

6.6 Upon receiving permission to enter the RCZ the train or engine crew must comply with instructions from the RCO-EIC in charge of the RCZ.

6.7 A job briefing among all members of the RCL crew must be held any time other employees are granted permission to occupy the activated RCZ.

6.8 A supervisor or dispatcher may relay instructions from the RCO-EIC to employees requesting permission to enter an activated RCZ.
6.9 When permission is granted to other employees to occupy an activated RCZ, the RCL crew is responsible for providing protection against such employees.

6.10 At specified RCZ crossings, employee foot traffic and off-track vehicles may cross the RCZ without permission from the RCO-EIC. Employees crossing the RCZ must be alert for movement of equipment at any time in either direction. Such crossings will be designated by a sign reading:

“REMOTE CONTROL ZONE
STOP
PROCEED WITH CAUTION”
7 PERIODIC INSPECTION OF THE RCLS

7.1 As a part of the daily locomotive inspection for a locomotive(s) being used in RCL service, certain added checks must be performed and noted on the daily inspection form:

- Check the QC boxes and mounting brackets for obvious cracks or dents in the metal cases.
- Check the external connectors on the QC boxes for signs of unusual wear and tear.
- Check all MU hoses and cables used to connect the QC boxes for unusual wear and tear, especially at the ends of each hose.
- Check the operation of the locomotive strobe light used as a visual indication that the locomotive is in remote operation.

7.2 If any part of the locomotive RCLS equipment is found to be defective, it must be repaired immediately or the locomotive must not be used in remote operation.

7.3 The LCU is checked at the beginning of each tour of duty. If defective, it must not be used and must be turned in for immediate shipment to Cattron for repairs.

7.4 General Managers will be certain that FRA requirements related to the recording of defects, repairs made, person making repairs, and maintenance of those records for the required time, are in full compliance.

7.5 OCU Batteries:
Nickel-Cadmium (Ni-Cad) Battery Pack provides approximately 23 hours of continuous OCU operation. This battery pack is re-chargeable using the CATTRON-THEIMEG™ 70C-0004 Battery Conditioner. It requires 3 hours to fully charge and each battery is good for over 200 cycles of use.

Battery Pack Replacement.
When the OCU’s ‘TRANSMIT/LOW BATTERY’ LED starts flashing red, the battery has approximately one hour of continuous operation remaining, after which the battery pack must be replaced or re-charged.
Replace the battery pack as follows:
1. Set the OCU’s Power ON/OFF switch to the ‘OFF’ position.
2. Referring to the diagram below, unlock the battery door by inserting a coin into the slot and twisting.
3. Open the battery door and lift the battery pack out of the tray.
4. Install a fresh, fully charged battery pack in the OCU, making sure the contacts on the underside of the battery pack locate with their corresponding pick-up contacts in the battery tray.
5. Close the battery door and secure by pressing firmly until it snaps into the locked position.
6. Set the OCU’s Power ON/OFF switch to ‘ON’. Observe that the ‘TRANSMIT/LOW BATTERY’ LED momentarily flashes yellow and two quick beeps are heard. When resuming your remote control operation, observe the ‘TRANSMIT/LOW BATTERY’ LED as you operate a **non-motion function** toggle switch such as a horn or bell. If this LED is now flashing green, your OCU is fully operational.

A Ni-Cad battery pack must be removed from the OCU’s battery compartment for external charging. The Battery Conditioner automatically conditions the battery pack by first discharging it at 600mA for 2-hours before applying a rapid charge for 1-hour. The conditioner incorporates end of charge detection circuitry to accurately sense when the battery pack is fully charged. When this condition has been detected, the conditioner switches to a ‘trickle’ mode that keeps the battery pack fully charged and ready to use for up to 48-hours. To prevent damage to the battery pack, it should be removed from the conditioner within 48-hours of achieving a fully charged state.

The CATTRON-THEIMEG™ Battery Conditioner incorporates an LED that indicates status as follows:

- **Amber Color** – indicates the battery pack is being discharged.
- **Red Color** - indicates the battery pack is being charged at a rapid rate.
- **Green Color** - indicates the battery pack is fully charged and that a ‘trickle’ charge is being applied to maintain the fully charged state.
8.0 RF Transmission Instructions and Information

8.1 The most critical technical component of the RCLS is the radio frequency send and receive features. Every effort has been made to ensure that there is no radio frequency overlap between any OCU, LCU, and any other radio operated equipment in the RCZ area. If the RCO suspects that there is a radio frequency problem, it must be reported at once. The OCU and the matching LCU have been color coded or numbered to prevent accidental misuse.

8.2 Do not attempt to alter the radio frequency of any OCU or LCU without the permission of a manager or other designated person.

8.3 Radio frequencies operate on a line of sight string. If the RCO cannot see the locomotive, it is possible that the RCL will not receive commands from the OCU. When in doubt, stop the movement, and adjust position.

8.4 Each LCU is equipped with an Automatic Safety Override (ASO) feature that monitors STOP commands and fault conditions and will disconnect the RCL’s generator field and set the independent brake when triggered.

There are several electronic “watchdogs” built into the system constantly monitoring its performance and ready to shut the system down if defects/faults are found.
9.0 OCU Functional Description (with picture):

Full Description of each feature:

1. 'POWER ON/OFF' SWITCH -- Used to apply power to the OCU.
2. DIGITAL READOUT -- Allows the operator to review 'real-time' status indications from the Locomotive. Typically, such indications will be:
   - Throttle Notch Selected
3. HORN-- This (momentary ‘ON’) push-button switch activates the locomotive horn.
4. EMERG--This latching pushbutton switch is used to stop the locomotive in an emergency. When the pushbutton switch is depressed, the locomotive throttle will be returned to ‘IDLE’ and the brakes set to ‘EMERGENCY’.
5. BELL--Two-position toggle switch used to ring the locomotive bell.
6. VIGILANCE SWITCH-- A safety device that requires the operator to either press the switch button or operate some other switch on the OCU every 60 seconds. Failure to do so places the RCL into Full Service Reduction position.
7. SAND ON/OFF--Applies sand in the direction of travel. Sand will also be commanded automatically when a wheel slip condition is detected.
8. LOW BATTERY/TRANSMIT’ LED--This LED flashes green when the OCU’s Power ON/OFF Switch is set to ‘ON’ and the controller is transmitting with a good battery installed. The LED flashes red when the battery is low and sounds a beep to alert the operator. A low battery cut-off circuit stops the OCU’s microprocessor when voltage goes below safe operating range.
9. THROTTLE CONTRO—Paddle lever has a “spring return to idle”. Eight individual throttle steps are available corresponding to the eight steps available from the locomotive’s manual throttle.
10. LED INDICATOR PANEL-- Each LED indicator provides the operator with ‘real-time’ status indications from the Locomotive. Typically, such indications will be:
   - Locomotive Direction (Forward or Reverse)
   - Throttle Advanced
   - Wheel Slip
   - Engine Alarm

   Note: When the Engine Alarm indicator is illuminated, it will remain latched, requiring the operator to return to the locomotive to investigate and correct the alarm condition. This alarm condition will disable the throttle and apply the independent brakes until the fault condition is corrected and the ‘ALARM RESET’ pushbutton on the LCU cabinet is depressed.
11. DIRECTION CONTROL--Paddle lever with three separate 'zones' of operation: FORWARD, NEUTRAL, and REVERSE. Typically, direction cannot be changed until the throttle selection is in ‘IDLE’ for more than 3 seconds. If a change in direction is commanded with the throttle advanced, the throttle is returned to idle signifying an illegal direction change.
12. ANTENNA--Allows 2-way RF communication between the OCU and QC LCU.
13. INDEPENDENT’ (locomotive) BRAKE CONTROL--Paddle lever has ‘RELEASE’ plus eight steps of braking (5 pound increments up to 45 pounds). When ‘RELEASE’ is commanded, the independent brakes will release. When the lever is moved to any of the remaining positions, the LCU computer will maintain the requested pressure in the independent brake control pipe.
14. BAIL PUSHBUTTON—duplicates the independent brake-bail feature available on the manual control stand.
15. AUTOMATIC TRAIN BRAKE CONTROL--Paddle lever has ‘RELEASE’ plus four steps of braking (7 pound reduction, 10 pound, 15 pound, 27 pound)
When ‘RELEASE’ is commanded, the automatic brakes will release. When the lever is moved to any of the remaining positions, the LCU computer will maintain the requested pressure in the train brake control pipe.

16. TILT EXTEND SWITCH – Extends time the OCU may be in “tilt” position from typical 3 seconds before placing RCL throttle into IDLE and initiating full Emergency Brake Application to allows the operator of the OCU, by pressing this switch, to gain an extra 50 seconds to bend over, throw switches, etc. without triggering the tilt feature. It does sound the alarm but does not activate the penalty brake application. There is an indication on the OCU’s LED display when the tilt bypass feature has been activated. Should the amount of time in tilt bypass be exceeded, the throttle will return to idle and full-service brake application initiated.

### 9.1 OCU Status Messages

On the OCU there is an 8-character LED alphanumeric display that normally shows the throttle position, independent brake pressure, and automatic brake pressure. Under certain conditions the display will post operator Status and/or Fault messages.

- **EMERG BRAKE** – An EMERG braking application has been commanded by the OCU.
- **OCU TILTED** – An OCU TILT condition has been detected.
- **AUTO BRAKE FAULT – CHECK LCU** – An Automatic brake check fault has been detected. A pressure greater than the commanded brake reduction has been detected for a predetermined length of time. The fault must be corrected and then cleared on the LCU by pressing the ALR/RST pushbutton located on the LCU box.
- **RECOVER EMG PENALTY** – The operator must perform an EMG Penalty recovery procedure.
- **INVALID DIR CHANGE** – A direction opposite the previously selected direction is detected for 20 seconds while a throttle position other than idle is selected.
- **ENGINE ALARM DETECTED – CHECK LCU** – An Engine Alarm from the Locomotive has been detected. The fault must be corrected and then cleared on the LCU by pressing the ALR/RST pushbutton located on the LCU box.
- **IND BRAKE FAULT-CHECK LCU** – An Independent brake check fault has been detected. A pressure less than the commanded pressure has been detected for a predetermined length of time. The fault must be corrected and then cleared on the LCU by pressing the ALR/RST pushbutton located on the LCU box.
- **LCU FAULT – CHECK LCU** – RS485 check fault has been detected or a decoder fault has been detected. This is an internal LCU fault. The fault must be corrected and then cleared on the LCU by pressing the ALR/RST pushbutton located on the LCU box.
- **RECOVER FS PENALTY** – The operator must perform an EMG Penalty recovery procedure.
- **LOW MR AIR PRESS** – Low air pressure has been detected on the Main reservoir. Once the low air condition goes away, the throttle must be returned to idle & Vigilance button pressed to clear the fault.
- **RECOVER SERVICE PENALTY** – Neutral is selected, or a direction opposite the previously selected direction is detected.
- **COMM LOSS** – A radio frequency Communication fault has been detected.
VIGILANCE EXPIRED – RECOVER FS PENALTY -- The vigilance timer has expired. The operator must recover a FS penalty to clear this fault.

THROTTLE SELECT WITHOUT VIG PB -- The throttle lever has been moved from the idle position without first pressing the Vigilance pushbutton. To clear this condition, return the throttle lever to the idle position.

STUCK VIG PB -- A stuck Vigilance pushbutton has been detected. The fault must be corrected and then recover a FS penalty.

9.2 Operational Parameters

- Operating range up to ½ mile (800 meters) using direct transmission. This distance assumes line of sight operation and is dependent on power, frequency and antenna.
- Operating environments from approximately -4°F to +140°F (-20°C to +60°C); RH 0 to 95%, non-condensing. Special temperature units available.
- Solid State electro-mechanical and pneumatic interfacing capabilities.
- Up to 48 inputs & 96 outputs allow for complete customization.
- Multiple operators may use a single Radio Frequency.
- Rapid response to operator commands.
- Optional Repeater Unit extends operating range up to 1-mile (1600 meters).
10.0 **Technical and Mechanical Features and Instructions**

10.1 The QC-LCU box records all commands transmitted to it by each OCU into “data-logs”. The data-logs may be downloaded to a laptop computer for analysis and troubleshooting.

10.2 Isolate power to the RCL’s generator field before performing ASO tests.

10.3 The LCU (QC boxes) and the OCU contain devices sensitive to electrostatic discharge. Any time these pieces of equipment are to be opened for maintenance, and then only by qualified personnel, an anti-static mat and personal grounding strap must be used.

10.4 Adhere to all lockout/tagout requirements when performing maintenance on any of the RCLS equipment; always try to have another person available nearby in the event of problems; never wear finger rings or other jewelry that may come in contact with electrical components.

10.5 There are a series of tests required when a system is set up for operation for the first time. See complete manual section 2 for details.

During the Warranty period (three years), inoperative OCU’s and LCU ‘Gold Boxes’ are to be returned to CATTRON-THEIMEG™ as complete units for repair. Any attempt to disassemble or repair these items during this period will void our warranty. After the Warranty period has expired, we still recommend that inoperative OCU’s and LCU ‘Gold Boxes’ be returned as complete units to the Cattron Repair Center for repair. The internal circuit boards are sensitive to electrostatic discharge and internal components are highly miniaturized and assembled to within very close tolerances. Consequently, internal components may be irreparably damaged when repaired by unqualified maintenance personnel. Only technicians who have completed CATTRON-THEIMEG™ repair and maintenance training be allowed to repair and replace circuit boards.

Every three months perform the SYSTEM CHECKOUT procedures described in Section 2 of Cattron’s “Quick Connect Locomotive Radio Remote Control System—Installation, Operation, and Maintenance Manual”. These procedures provide a thorough check of the entire remote control system.
Appendix 1-- Job Briefings:

Safe and efficient work practices are enhanced with properly planned and conducted job briefings. Initiate a job briefing prior to any work to ensure complete understanding of all concerned who will be performing the specific task.

- Review the task to be accomplished as well as location and characteristics of the work area.
- Divide the task into step-by-step procedures addressing existing and potential hazards of each task and list precautionary measures that are to be implemented.
- Identify tool, equipment, and material requirements.
- Explain the task to the employees when conducting job briefings.
- What, Why, When, Where, How, Who, and any special considerations pertaining to the task.
- Consider existing / potential hazards (not all inclusive):
  - weather conditions; tools, equipment and materials to be used; train, vehicular and pedestrian traffic; slip/trip/falls
  - If the task is more complex than routinely performed, advise the employees and brief only a portion of the job. Give additional briefings as the job progresses.
  - Ensure complete understanding of the task, clearly define work assignments, and other requirements at hand by obtaining an acknowledgment from each employee.
- Conduct additional briefings as necessary due to change in plans, protection afforded, or workplace conditions.

Examples of Changes:

- changes in personnel
- changes in weather conditions
- assignment changes
- changes of equipment

Supervisor or employee in charge should follow up to determine that:

- plans are being followed;
- each employee is performing his or her assigned task;
- additional hazards have been identified and action initiated to protect employees; and
- employees are performing duties in a safe, efficient, and responsible manner.
All employees are responsible to see that the work plan is being carried out in accordance with the job safety briefing, and that the plan is modified when conditions change.

Job De-Briefings

- review what went well
- review opportunities for improvement
- prepare workers mentally for the trip home or back to headquarters
- identify slip/trip/fall hazards that may be encountered when leaving the job-site
- emphasize safe driving

Appendix Two:

Cattron Repair Center Information

Address:
Cattron-Theimeg Inc.
Service Center
58 W. Shenango St.
Sharpsville, PA 16150

Phone:
Dial 724-962-3571. You will get a menu. Press the Service Inquiries option (option 4)

The service manager is Mike Fitzpatrick(ext 280)
Production manager is Gary Hall(ext 223)
Parts order entry is Ed Cunningham(ext 216),
Lisa Black(ext 214) handles new orders and radio frequency issues
Brian Ellison (724 854 3851) is our account rep