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TRAIN CHIEF® II
LOCOMOTIVE REMOTE CONTROL SYSTEM
w/LIGHTWEIGHT OCU-BT

OPERATOR'S MANUAL

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1 INTRODUCTION / SAFETY

1.1 Introduction

This Owner's Manual provides operating and troubleshooting information for the installer and end user of the Train Chief® II Locomotive Remote Control System (LRCS) with a Lightweight Operator Control Unit (OCU) Brake & Throttle variant (BT).

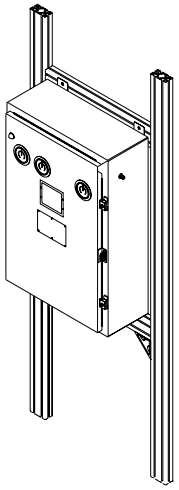
The Train Chief® II LRCS has been designed as a permanently installed ("fixed") system, directly interfaced to the appropriate locomotive electrical and pneumatic controls. The system consists of the following main components: (1) - the receiver / controller unit, (2) - the wireless remote-control radio Operator Control Unit (OCU), (3) - the installation kit.

1.2 Common Acronyms

CFR - Code of Federal Regulations
FRA - Federal Railroad Administration
LRCS - Locomotive Remote Control System
OCU - Operator Control Unit
PTC - Positive Train Control
PLC - Programmable Logic Controller
RCL - Remote Control Locomotive
RCO - Remote Control Operator
RCU - Receiver Control Unit
RCT - Remote Control Transmitter
RCR - Remote Control Receiver

1.3 Receiver / Controller Unit

The receiver / controller unit (RCU) contains the main control electronics and pneumatic hardware of the remote control system. This includes; the PLC controller (the Allen Bradley SLC 500), the Control Chief Communicator® module and Control Chief Watchdog module, analog and discrete interface modules, pneumatic proportional control valves, air regulation, control relays, solenoid valves, and pressure sensing devices.



The RCU interface to the locomotive involves both electrical and pneumatic connections. The electrical interface is primarily accomplished through DC relay contact closures, wiring into the existing locomotive's electrical control system. The pneumatic interface typically involves direct air service tie-ins using the dedicated pneumatic control devices in the RCU. A dedicated DC/DC converter and line conditioning module are provided to interface the locomotive's existing DC supply to the RCU.

Figure 1-1 – The Receiver / Controller Unit

1.4 The Installation Kit

In order to effectively and reliably interface to the locomotive controls / operations, various kitted items are provided to complete the installation. An antenna kit is provided to allow the radio antenna to be mounted on the locomotive cab. Surge suppressors are provided for installation on all inductive devices (i.e. solenoid coils, electrical contactor coils, etc.) to minimize Electro Magnetic Interference (EMI). Optional colored status lights can also be provided to provide visual indications during remote operations.

1.5 The Lightweight OCU

The lightweight OCU is rugged and durable, with a custom designed encapsulated antenna for maximum performance. Reliable radio communication distances up to 5200 feet can be achieved (depending on operating environment). The comfortable ergonomic shape eliminates sharp corners and puts a wide range of functions within easy reach. The top display panel instantly shows the operator the current control settings without having to remember the switch movements.

Figure 1-2: Typical Lightweight OCUs
Speed Control Variant **Brake-Throttle Variant**

1.6 Reference Drawings

The system drawing package contains the following typical drawings, which are referenced throughout this document. These drawings will be specific to your system with exact configuration details.

Note: "XXXX" references a Control Chief assigned system serial number.

Typical Drawing List

DRAWING NUMBER	DESCRIPTION
E-XXXX-00-1, 2, etc	OCU LAYOUT
E-XXXX-01-1, 2, etc	OCU WIRING
E-XXXX-03-1	RECEIVER / CONTROLLER LAYOUT
E-XXXX-31-1, -2, etc, E-XXXX-33-1,2, etc	ELECTRICAL WIRING
E-XXXX-53-1	PNEUMATIC INTERFACE
E-XXXX-9X	OPTIONS, CONFIGURATION, SPECIALS

1.7 Safety

The safety guidelines in this manual are not intended to replace any rules or regulations or any applicable local, state, or federal governing laws. The following information is to be used in conjunction with all other rules and/or regulations already in existence. It is important to read all safety information before operating any wireless radio remote control system. The Federal Railroad Administration (FRA) has published a ***Notice of Safety Advisory 2001-1*** (in the Federal Register, Vol 66, #-31, Pg. 10340) addressing the establishment of recommended minimal guidelines for the operation of remote control locomotives. A copy of all referenced FRA regulations can be obtained directly from the FRA or contact Control Chief for help in obtaining a copy of these regulations.

The term “Remotely Controlled Locomotives” or “Remote Control Locomotives” (RCL) refers to a locomotive, which, through use of a wireless radio operator control unit and receiver system, can be operated by a person not physically located at the controls within the confines of the locomotive cab. The wireless Remote Control Operator (RCO) must exercise extreme caution and be alert at all times.

Only properly trained persons (*certified and qualified in accordance with 49 CFR Part 240, as conventional operation of a locomotive under the same circumstances would require*) should be operating RCLs. RCLs should not be operated by any person who cannot read or understand signs, notices and operating instructions that pertain to the locomotive operation.

Any person operating a remote controlled locomotive should possess the following knowledge and/or skills:

- Current certification on methods of safe train handling, operating rules, conditions of equipment, personal safety practices
- Knowledge/training on hazards specific to locomotive operation
- Knowledge/training of safety rules for RCLs
- Knowledge of the radio transmitter/receiver equipment/system
- Knowledge/training on all required inspections and testing
- Knowledge on transferring control from one operator to another
- Reporting unsafe or unusual operating conditions

Upon going off duty, each RCO should place the RCL in manual operation and properly secure it and the OCU to prevent unauthorized operation. The recommended practice for OCU security includes the designation of a dedicated, lockable location for OCU storage, which can have access controlled to only appropriately trained / knowledgeable personnel.

When operating a RCL, the RCO should **NOT**:

- Ride on a freight car under any circumstances
- Mount or dismount moving equipment
- Operate any other type of machinery
- Stand or walk within the gage of the track or foul the track on which the movement is occurring

RCOs should ensure that the track is clear and properly aligned ahead of the remotely controlled movement. Therefore, RCL operations should be operated at restricted speed not to exceed a speed that will enable stopping the movement within half the range of vision assuring that all movements are protected.

Strict procedures must be followed to ensure that there can only be one RCT in active control of the RCL at any one time.

Prior to performing any function (*as prescribed in 49 CFR 218.22.c.5*) the RCO should apply three-point protections; (1) fully apply the locomotive and train brakes, (2) center the reverser, and (3) place the generator field switch to the OFF position.

Passenger trains should NOT be operated by use of a remote control device.

The following security procedures are recommended:

- Have instructions for the proper storage, handling and security of RCTs when not in use or in the operator's possession.
- Operation control handles located in the RCL cab should be removed or pinned in place to prevent accidental or intentional movement while the RCL is being operated in remote.
- Have strict procedures in place to ensure that only the intended RCT is assigned to the appropriate RCL.

All inspections and calibrations must be performed as required.

Each RCL should have a tag placed on the control stand throttle indicating the locomotive is being used in a remote control mode. The tag should be removed when the locomotive is placed back in manual mode.

In areas where RCL operations are being conducted, warning signs should be posted indicating that there are remote control locomotives in use. These warning signs should be highly visible and posted at conspicuous locations so as to maximize their exposure to those most likely to encounter RCL operations.

Whenever worker protection is required (*according to 49 CFR Part 218*) the locomotive should be placed in manual mode and be properly secured. The appropriate blue signal protection should then be provided.

All accidents and/or incidents (*described in 49 CFR Part 225*) must be reported to FRA using the appropriate "remote control" reporting codes.

CAUTION
THE RECEIVER UNIT OR RELAYS ARE NOT RATED AS EXPLOSION PROOF. THE RECEIVER UNIT MUST NOT BE INSTALLED OR OPERATED IN EXPLOSIVE ENVIRONMENTS UNLESS APPROPRIATE SECONDARY ENCLOSURE MEASURES ARE TAKEN.

WARNING
THE UNIT MUST BE WIRED TO THE CORRECT VOLTAGE; FAILURE TO DO SO MAY DAMAGE THE SYSTEM.

NOTE
IN AN EMERGENCY, PUSH "E-STOP" TO STOP WIRELESS RADIO CONTROLLED EQUIPMENT

2 SPECIFICATIONS

2.1 General Specifications

Frequency	450-470 MHz (FCC Part 90)
Operating Range	½ to 1 mile (0.8-1.6km) environment dependent
Temperature Range	-20 to +140 F (-30 to +60 C)
System Diagnostics	Various LED indicators
System Address Capacity	65,535
Encoding/Decoding Method	Microprocessor/software based
Data Security	Real time 16 bit CRC
Communication Security	OCU v Locomotive via Infra-Red registration port.
Modulation	Frequency Modulated Class F1D
Response Time	250 milliseconds

2.2 Lightweight OCU Specifications

Dimensions	6”(h) x 5”(d) x 10”(w)
Weight	3.9 lbs (1.8 Kg) with battery
Carrying Method	Six point vest-harness, break-away style
Environmental Conditioning	Waterproof (NEMA-4)
OCU Diagnostics	2-line 16 character display
Switches	Push buttons, toggle switches, knobs.
Supply Voltage	7.4 V Lithium rechargeable battery pack
Battery Life	12 hours continuous duty
RF Power Output	UHF 0.5 watts
Frequency Stability	+/- 1.5 kHz over temperature
Channel Spacing	12.5 kHz
Antenna Type	Internal

2.3 Receiver / Controller Specifications

Enclosure	NEMA 12 dust tight
Weight	Approximately 95 lbs (~36 Kg)
Dimensions	30.0 x 20.0 x 11.0” (76.2 x 51 x 30 cm)
Electrical Interface Connection	Various cable connections
Pneumatic Interface Connection	Various push-in type tubing connections
Diagnostics	Built-in w/ Human Machine Interface (HMI)
Mounting Provisions	Top/bottom tabs @ 16” centers
Power Source	Locomotive DC supply
Pneumatic Source	Locomotive main air reservoir

Due to Control Chief Corporation’s commitment to continuous improvement, the above specifications are subject to change without notice.

WARNING:
CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY CONTROL CHIEF® CORPORATION COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

RF Exposure Warning!
This device uses RF energy for communications and is limited to use in a controlled occupational environment. The device must be used only in a manner as described in this operators manual.

3 PHYSICAL DESCRIPTION AND INSTALLATION

3.1 The Lightweight OCU-BT

Train Chief® II equipped locomotives are controlled by using one or two Lightweight OCU's (Operator Control Unit). Each OCU is a small 3.9 lb hand operated device that gives an operator complete speed and braking control of the locomotive up to approximately ½ mile away. Control of the locomotive can be passed between two OCU's when the optional Selective Dual Control feature is installed.

3.2 OCU Control Groups

The OCU has controls for:

1. Movement commands (direction, throttle and braking)
2. Miscellaneous locomotive commands (bell, horn, and sand)
3. OCU operations (power, reset, status, pitch, time, tilt)

It also has visual and audio signals indicating the status of commands to the locomotive and OCU operational status.

3.2.1 Movement Controls

Figure 3-1: Lightweight OCU-BT Movement Controls

Reverser (Directional) Selector: This 3-position switch selects locomotive movement direction as Forward, Reverse, or Neutral.

Note: Train Chief® II does not allow you to change the direction of movement while the locomotive is in motion. If attempted, Train Chief® II will automatically stop the locomotive by commanding a Full-Application Locomotive Stop (see section 4.1).

EMERGENCY Mushroom Switch: Push in to activate an Emergency Locomotive Stop. See section 4.5.10 for E-Stop actions. For normal operations the EMERGENCY switch must be pulled out.

Note: E-Stop develops high brake cylinder pressures that increase the chance of sliding wheels. Only use the EMERGENCY mushroom switch when absolutely necessary.

Throttle Selector: Ten-position selector represents the throttle position available in the cab. However, one additional feature of the OCU throttle is the HALT function.

- HALT: commands the throttle to idle, removes the generator field, and also gradually applies independent brakes.
- IDLE: commands throttle to idle and removes generator field but does not apply brakes.
- The remaining positions, 1 through 8, command the same throttle settings as the control cab console settings.

Automatic Brakes: This 3-position spring centered switch allows the operator to release or apply train brakes by **reducing** brake pipe by the following pressures:

- Release 0-psi reduction
- Minimum 6-8 psi reduction
- Light 10 psi reduction
- Medium 18 psi reduction
- Full 26 psi reduction
- The Charge position is used to pressurize the air brake system.

The center switch position (LAP) maintains the last brake setting.

Each time the switch is pressed (must be held for 0.5 sec), the train brakes are incremented to the next higher/lower setting.

On the First application of Auto Brake the locomotive brake portion of the train brake application is automatically bailed off.

Whenever the switch is pulled (must be held for 2 sec), the train brakes immediately revert back to Release position.

Independent Brakes: This 5-position selector allows the operator to apply independent locomotive brakes to achieve the desired stopping power. Some positions limit and override the throttle control.

Selectable positions are:

- Release (0 psi): this is the normal operating position when operating in power mode (Throttle positions 1-8). (Note RELEASE selection is indicated when all Independent Brake LEDs are off.)
- **B1**: Applies 1/5 of the available independent brake pressure to the brake cylinders. Throttle selections T1 to T8 are allowed.
- **B2**: Applies 2/5 of the available independent brake pressure to the brake cylinders. Throttle selections T1 to T8 are allowed.
- **B3**: Applies 3/5 of the available independent brake pressure to the brake cylinders. Throttle selections T1 to T8 are allowed.
- **B4**: Applies 4/5 of the available independent brake pressure to the brake cylinders. When brake pressure reaches 20 PSI the throttle is limited to T4. See note.
- **FULL**: Applies total available independent brake pressure to the brake cylinders. When brake pressure reaches 20 PSI the throttle is limited to T4. See note.

NOTE: The parameters used to establish thresholds for limiting throttle for a given brake pressure can be adjusted per owners' operating rules and requirements.

3.2.2 Misc. Locomotive Controls

Figure 3-2: Lightweight OCU Misc. Locomotive Controls (Manual Brake/Throttle model shown)

Bell / Horn switch:
This is a 3-positon switch. It is latched at the rear (OFF) position and at the center (BELL) position. The forward (HORN) position is spring loaded to return to BELL position when released. Return the switch to the OFF position to silence the Bell.

1. Bell function only: whenever the locomotive is stopped and the Throttle Selector is moved from Halt to some movement position, Train Chief® II sounds the bell for 5 seconds.
2. Horn function only: The horn function is also used to acknowledge or accept a "Pitch" from a transferring OCU.

Headlight button:
This button toggles the locomotive headlights between DIM and BRIGHT. Only the headlight facing the direction of movement is affected. An indicator on the OCU keypad will illuminate when the headlight is BRIGHT.

Reset / Bail button:
When depressed briefly the button acts as a RESET for several functions.

1. It resets the ALERT warning. See section 4.5.4 for description of ALERT function.
2. It allows the RCU to accept the next Throttle command when the operator moves the Throttle selector out of the HALT position.
3. It instructs the RCU to accept the next brake reset command.

When depressed for longer than 2 seconds the second function of BAIL is activated. The BAIL function allows the independent brakes to be released while the train brake continues to be applied.

Reset / Sand button:
When depressed briefly the button acts as a RESET for several functions.

1. It resets the ALERT warning. See section 4.5.4 for description of ALERT function.
2. It allows the RCU to accept the next Throttle command when the operator moves the Throttle selector out of the HALT position.
3. It instructs the RCU to accept the next brake reset command.

When depressed for longer than 2 seconds it activates the sanders in the direction of movement.

3.2.3 OCU Operation Controls and Associated Functions

Figure 3-3: Lightweight OCU-BT Controls

Power Button:
Push-On / Push-Off switch to apply power to the OCU. Power is supplied from the battery pack and the power bridge. Depending on the charge state of the power bridge, the OCU may activate for a short time without an installed battery. However, operations are not recommended without a battery.

Transfer (Pitch) button:
The TRANSFER button is used to transfer movement control of the locomotive from one OCU to another. Refer to section 4.6 in this manual describing the Selective Dual Control feature.

Tilt Time Extend (F1):
This button extends the allowable tilt time to 60 seconds. To activate this command the operator must depress the F1 button for 2 seconds until the OCU beeps to acknowledge the command.

Status (F4):
Depressing the F4 key causes the OCU to initiate a status report from the locomotive or activate a status menu that will be shown on the OCU display. Refer to the OCU display section for more details.

3.2.4 OCU Keypad, Indicators and Display

The location of the LEDs, Character-display, and Intensity sensor are shown in the diagram below. All LEDs will illuminate during the power on sequence to allow detection of inoperative LEDs.

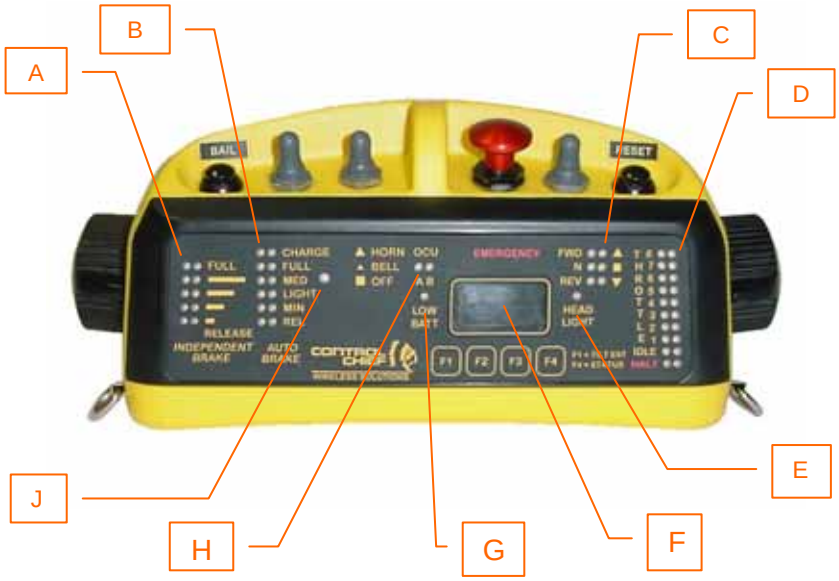


Figure 3-4: Display Panel for Throttle-Brake Unit

[A] Independent Brakes
[B] Auto Brakes
[C] Reverser
[D] Throttle
[E] Headlight Bright Indicator
[F] 16 Character Display
[G] Low Battery Indicator
[H] OCU A / B indicator
[J] Ambient Light Sensor

Steady LEDs at the respective locations in the above figure show the selected positions of the OCU controls.

3.2.5 Battery Compartment

The 7.4 volt Lithium-Ion battery is secured in the compartment by its own locking lip and does not require a latching cover. Additional details are described in section 6.4.

3.2.6 OCU Harness

The harness system is an integral part of the LRCS. With the many situations encountered in rail equipment operations it is imperative the OCU does not constantly occupy an operator's hands. Control Chief has combined the OCU support harness with a high visibility safety vest to avoid the operating gear and safety gear conflicts that are sometimes present when having to don separate items.

- The Control Chief Break-away Safety Vest uses hook-and-loop material at the shoulders and waist belts to be easily opened and release the operator in the event of being entangled.
    - The hook and loop fabric also allows size adjustment for secure fit and carry of the OCU.
- The vest should be kept clean to maintain high visibility.
    - Hand cleaning with mild detergent soap (non-abrasive) or citrus cleaner is recommended.
    - The vest can be machine washed with common laundry detergents but useful service life will be reduced.
    - Use of petroleum solvents (diesel fuel, kerosene, alcohol) is not recommended.
    - Use of chlorinated cleaners (bleach, powders, etc) is not recommended.
    - Use of machine dryers is not recommended.

3.3 The Receiver / Controller Unit (RCU)

The RCU consists of the control electronic and pneumatic components. The electronic components consist of the programmable logic controller (the SLC 500 PLC) with various I/O and specialty modules, the transfer switch and various DC relays. The pneumatic components consist of proportional valves, solenoids valves, pressure switches, and pressure regulator, all mounted on specifically designed manifolds. The RCU is mounted inside the locomotive cab on a dedicated rail system (Unistrut). The RCU is then interfaced to the locomotive system(s) via cable wiring and tubing as per the specific pneumatic and electrical requirements.

Controls depicted here are only one example of a typical arrangement. For details on the specific configuration of your particular system please refer to your system drawing package, specifically, drawing number E-XXXX-03-1 RECEIVER / CONTROLLER LAYOUT. (Note: XXXX=system serial number.)

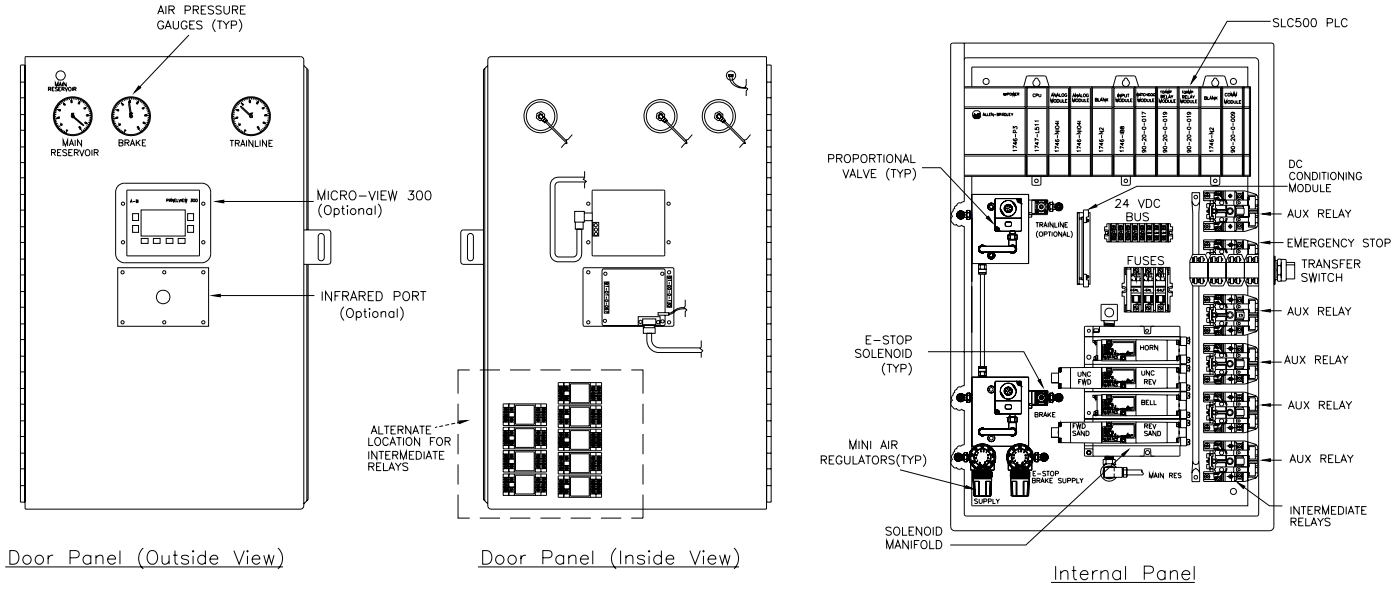


Figure 3-4: Typical RCU Layout

3.3.1 Transfer Switch, Intermediate Relays and DC Conditioning Module

The transfer switch is used to select between MANUAL and REMOTE operations. This switch utilizes a switch-block arrangement that allows for various hardwired control functions.

The intermediate relays are used to control a number of auxiliary electrical devices such as status lights, horn, sanding, and others depending on the locomotive requirements. The intermediate relays may be located inside the enclosure or on the enclosure door. Refer to your system prints for details specific to your system.

The DC conditioning module is used to condition the wheel slip input down to 24VDC prior to going to the PLC input module. A DC-to-DC solid state, isolated, voltage converter is provided to regulate the locomotive DC to 24VDC.

Programmable Logic Controller - SLC 500 System

The SLC 500 is the control center for the Train Chief® II system. The SLC 500 incorporates the necessary I/O modules to control the various locomotive interfaces based on a ladder logic program, specifically, developed for locomotive remote control and tuned for your particular application.

1746-P3 POWER SUPPLY

Allen-Bradley SLC 500 power supply modules include a LED that illuminates when the power supply is functioning properly. Power supplies are designed to withstand a brief power loss (brown-out) for a period of between 0.02 to 3 seconds, depending upon loading conditions. The P3 fuse is accessible by opening the module's front panel located to the upper left of the input terminal block. A replacement fuse can be obtained from your local AB distributor or through Control Chief Customer Service.

CHASSIS

The chassis houses the P3 power supply, processor, and all the I/O modules. All components slide easily into the chassis along guides formed into the chassis. No tools are required to insert or remove the processor or I/O modules. The power supply and removable terminal strips on the I/O modules do require a philips screwdriver for removal and installation.

SLC 500 PROCESSOR

The SLC 500 processor utilized in the Train Chief® II system contains the primary control program. The processor is programmed using ladder logic which is uniquely suited for control applications. For troubleshooting purposes the processor provides several LED indicators; RUN, FAULT, and BATT (other modules will have additional indicators, but the ones listed are the most important).

MEMORY MODULE

The memory module is a plug-in to the processor module and provides non-volatile and secure program storage for the specific ladder program for your particular application.

ANALOG MODULE(S)

The analog modules incorporate high-resolution providing for precision control of analog outputs, which are typically used to control the proportional pneumatic valves for locomotive brake, trainline brakes, and where applicable, pneumatically controlled locomotive throttle. The modules also incorporate high resolution inputs to precisely monitor the controlled pressures. The modules feature input filtering providing high immunity to electrical noise.

OUTPUT MODULE(S)

The output module(s) provide the means with which to actuate the various functions on the locomotive system. Typical functions controlled by the output modules include; generator field, reverser directional selection, sand, horn, bell, throttle position, and indicator lights/strobe. Intermediate relays are used (located in the locomotive interface panel) where a control function current rating may exceed the rating of an output module. All output modules provide LED indicators for each output point. The LED's illuminate when the processor applies power to an output terminal.

INPUT MODULE(S)

The input module(s) provide a means to monitor critical functional states of the locomotive system. Typical system parameters monitored are the manual throttle, manual reverser, external E-Stop switches, pressure switches, and wheel slip. The module features input filtering, optical isolation, and built-in surge protection. All input modules provide LED indicators for each input point. The LED's illuminate when the proper signal is received at an input terminal.

REMOTE CONTROL WITH ALLEN-BRADLEY SLC-500

SLC 500 remote control is facilitated by the implementation of Control Chief's Communicator® module and Watchdog relay module. This advanced technology is a result of Control Chief's partnership with Rockwell Automation to develop remote control capability for the SLC 500. The following paragraphs discuss how the remote control capability is implemented in the Train Chief® II system providing safe and reliable operation.

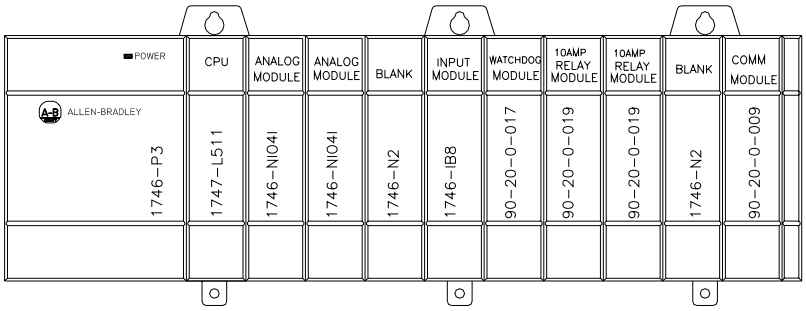


Figure 3-5 SLC 500 PLC

WATCHDOG SYSTEM

Remote control systems based on the SLC 500 controller with the Communicator® module will utilize a multiple feature watchdog safety system. The first watchdog circuit is built into the wireless Communicator® module and monitors the operation of the module CPU. Should this watchdog time out, then an automatic interrupt is generated which faults the SLC 500 CPU and clears all SLC output tables. An additional watchdog feature within the module will clear the module I/O image table if communication with the remote unit is lost.

The High Current Relay/Watchdog module incorporates two (2) additional watchdog safety systems. Each watchdog safety system consists of a circuit that drives a dedicated output relay. Each circuit monitors a critical system function to verify proper system operation. The dedicated watchdog relay outputs are used to control the E-Stop relay in the locomotive interface panel.

COMMUNICATOR® MODULE

The Communicator® module included in the Train Chief® II system provides remote control capability in a SLC 500 for Control Chief's Lightweight OCU. The Communicator® module provides full integration into the Allen Bradley SLC 500 chassis by presenting the command data received from the OCU into the PLC scanned input image data table.

3.3.2 Pneumatic Components

The following pneumatic components comprise the pneumatic control and interface for the Train Chief® II system and are included in the RCU, mounted on the specifically designed enclosure back plate.

PROPORTIONAL VALVES AND MANIFOLD

Manifolds have been specifically designed to integrate the brake pneumatic components. Referred to as the "proportion valve manifold", one manifold integrates all components used both normal and emergency brake control with the required regulators. Another proportional valve manifold is used for normal and emergency trainline brakes, when present.

PRESSURE REGULATORS

Supply air from the locomotive main reservoir is controlled using a 0-100-psi regulator, for the pneumatic components used in the Train Chief® II system. A second stage 0-100-psi regulator is used to further control the air used for emergency brake system. Both regulators are located at the supply end of one of the proportional valve manifolds.

PRESSURE MONITORING

Status of the main air reservoir pressure is provided through either feedback from the proportional valves and/or via a dedicated transducer on the proportional valve manifold.

EMERGENCY SOLENOIDS

The Brake Emergency Stop (BKES) solenoid is used to apply air for independent emergency brake application. Additional solenoids are used for similar emergency applications for trainline brakes (if present).

SOLENOIDS VALVES

Solenoid valve(s) are provided (and integrated on a dedicated manifold) that are used to control additional locomotive functions such as horn/bell, sanding, and uncoupling. Refer to your system specific documentation to find exactly which features are included on your system.

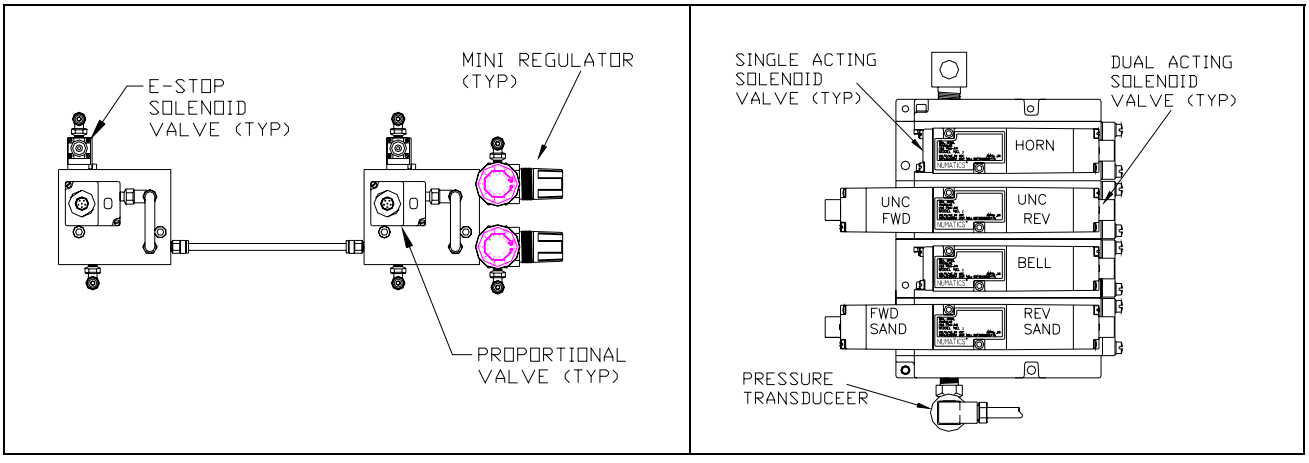


Figure 3-6 Typical Pneumatic Components

3.4 The Installation Kit

Each system is shipped with an installation kit which includes various materials required for the integration of the receiver / controller unit into the locomotive systems. The types of standard materials provided included:

- **Power Supply Input Filter and Surge Suppressor.** The DC locomotive power is conditioned by an input filter and surge suppressor. The function of this module is to protect the Train Chief® II equipment from the Electro-Magnetic (EM) noisy locomotive power source to insure reliable operation of the remote control system.
- **Surge Suppressors**. Additional surge suppressor devices are provided to be installed across all locomotive devices that are considered inductive loads (coils, contactors, etc.). This is required to further control EM noise, created by the inductive devices, which may interfere with the control electronics.
- **Strobe Light**. A strobe light, to be placed on the outside for the locomotive cab, is included to provide visual indications during remote operation.
- **Locomotive Antenna System.** The antenna system consists of an external antenna cable, mounting bracket, ½ wave whip antenna, the necessary parts and instructions to install the antenna cable and antenna. The locomotive antenna kit contains 20' of cable (custom length versions are available) with a TNC bulk head jack pre-installed (the other end is un-terminated to facilitate installation), antenna mounting brackets, TNC right angle plug, cable strain relief, and instructions. The installation crimping tool kit (P/N 90-70-0-074) is required for proper antenna connector installation.
- **Cables.** Pig-tail cables are provided for the electrical interface between the receiver / controller and the locomotive controls. Cables are provided with mating connectors at one end for direct connection to the receiver / controller enclosure.
- **Shock Mounts.** Vibration shock mounts are provided for the mounting of the receiver / controller in the locomotive cab. These are required to minimize locomotive vibration and prevent damage of the receiver / controller components.
- **Pneumatic Interface Hardware.** A variety of hardware is provided for the pneumatic interface between the receiver / controller and the locomotive air systems. A water separation/ filter assembly, shuttle valve, nylon tubing and various DOT-approved fittings are typical in this kit.
- **J1 Valve Kit.** A J1 brake control valve can be provided, if trainline brakes are required.

3.5 Receiver / Controller Unit Mounting

The RCU should be securely mounted inside the locomotive cab. The mounting location should allow for reasonable access for both the electrical and pneumatic interfaces, but also be picked to avoid interference with normal locomotive cab operations.

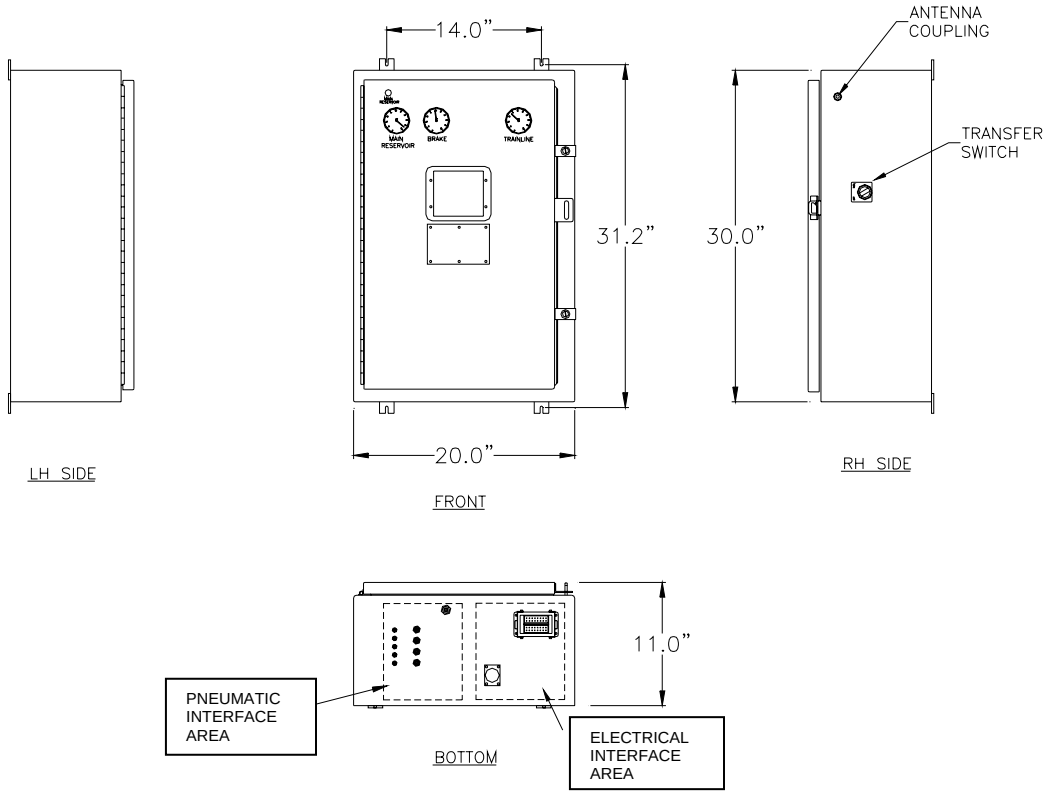


Figure 3-7: Typical RCU Physical Details

The best approach for mounting is to erect a simple rail system allowing for some adjustment yet providing a good secure support. It is recommended that the mounting frame be erected using metal rails strong enough to support the enclosure's weight (~95 lbs.). As shown above, the mounting tabs on the RCU enclosure are on 16" centers and are ~31" between top and bottom. Be sure to leave adequate clearance below the unit to make all interface connections and in front to allow for the access panel opening. The following figure provides a basic mounting concept.

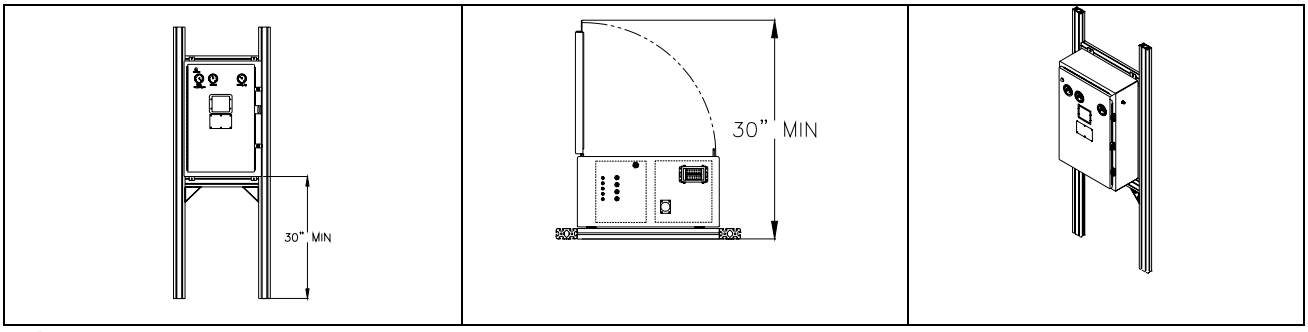


Figure 3-8

3.6 Locomotive Interface

Introduction

The connection of the RCU to the locomotive is achieved through both electrical and pneumatic (air) interfaces. All locomotive interface connections are located on the bottom of the RCU. The RCU manages all necessary conversions for the specific locomotive functions. Once interfaced, the RCU becomes an integral part of the locomotive system and utilizes the locomotive DC power and main air reservoir supply. This enables the Train Chief® II system to support the full functionality of the locomotive without any non-typical system configurations. Below is discussion on some of the key elements of the locomotive interface. Refer to the system prints for the detailed interfacing requirements for your specific locomotive.

3.6.1 Main Air Supply Shut-Off Valve and Filter Assembly

Located on the bottom of the RCU unit is the main air supply input for all pneumatic functions controlled by the system. Ahead of the main air supply inlet (installed separately in the locomotive cab) there must be a pneumatic shut-off valve and filter assembly (supplied in the installation kit). The shut-off valve must be in the closed position (handle is at a right-angle to the air-line) for manual and in the open position (handle in-line) for remote. The assembly also includes two (2) filter housings: one is a particulate filter and the second is a coalescing unit. These filters protect the pneumatic components in the system. These filters must be part of your scheduled maintenance for the locomotive to insure optimum performance and maintain warranty requirements.

3.6.2 Manual/Remote Transfer Switch

The manual/remote transfer switch is located on the right-hand side of the RCU. The function of the switch is to transfer out critical manual (cab) locomotive functions when switching from manual to remote, and to transfer out critical remote functions when switching from remote to manual.

Manual/Remote Transfer Switch Selections and Functions

Function	Manual (CAB)	Remote	Comments
Strobe	OUT	IN	Strobe active ONLY in remote mode
Ignition Wire	IN	OUT	Disables engine start when in remote mode.
Throttle Switch	IN	OUT	Disables manual throttle lever in remote mode.
Head Light	IN	OUT	Disables manual headlight switch in remote mode.
Reverser	IN	OUT	Disables reverser lever in manual mode.

Table 3.6.2

3.6.3 Dedicated Locomotive Hook-Ups

Locomotive connections to the locomotive interface panel are accomplished through the bottom of the panel via dedicated locomotive hookups. These hookups consist of connector sockets based on system options to facilitate ease of installation.

- The pneumatic connections are located on the bottom left of the panel, and include quick connect ports for main air, locomotive brake, train brake, and bail.
- The rectangular connector is the general locomotive hook-up cable. The cable is a 30-conductor with a strain relief.
- The round connector(s) are for specific functions such as external E-Stop, strobe status lights, and other optional features.

Refer to system prints, drawing E-XXXX-53-01 for more application specific details.

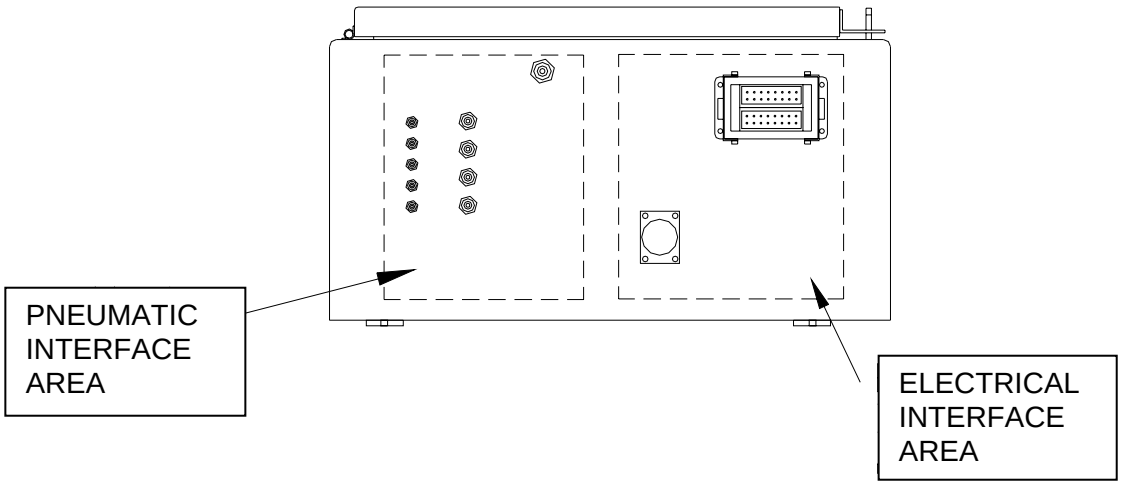


Figure 3-9: Typical Receiver / Controller Interface Connections

Refer to Figure 6-6, for typical interface diagram. Details depicted are only one example of a typical configuration. Always refer to your system prints for details specific to your system configuration.

3.7 General Installation Practices

WARNING: Before attempting to service any pneumatic components, ensure the air system has been vented to atmosphere (zero pressure in air lines).

CAUTION: Contaminants in the air system can significantly reduce the component life and performance of the remote control pneumatics. Therefore, to insure long component life and optimum system performance it is essential to implement a preventive maintenance schedule for the locomotive pneumatics system. This should include draining water from the main reservoir tank and replacing filter cartridges. Failure to maintain main reservoir and/or filter may void the warranty.

3.7.1 General Installation Practices

- Resolve any problems with the locomotive's operation prior to attempting any remote equipment installation or operation.
- All field wiring should be done by a qualified electrician. All electrical work and practices must meet all federal, state, local, and industry standards.
- Route all wire and/or cable to avoid moving parts, mechanical vibration points, pinch points, and high temperature surfaces. All wiring/cabling should be secured and must meet all federal, state, local, and industry standards.
- Do not run power (high voltage $\geq$ 50V) together with control (low voltage < 50V) wire or cable.
- Electrical wiring running through the engine compartment should be contained in conduit of proper rating for the environmental conditions present.
- All field plumbing should be done by a qualified technician. All plumbing work and practices must meet all federal, state, local, and industry standards.
- Route all tubing and/or pipe to avoid moving parts, mechanical vibration points, pinch points, and high temperature surfaces. All tubing/piping should be secured and must meet all federal, state, local, and industry standards
- All plastic plumbing components must be DOT Approved.
- All equipment must be shock mounted in an appropriate manner to withstand all normal operational conditions.
- Always read and follow all instructions provided with specific components in the field installation parts kit.
- System specific requirements are included in the system print package. Please review before beginning the installation. If you have any questions please contact Control Chief Application Engineering department.

3.7.2 Specific Installation Requirements

- During the installation you may have mark-up prints. Upon completion of the installation forward these prints to Control Chief Corporation Application Engineering so the mark-ups can be incorporated in our drawings and an updated copy provided.
- **Locomotive Antenna Installation**. Included with the locomotive antenna kit are detailed installation procedures (P/N 94-85-0-006). Always consider the following general guidelines:
    - The locomotive antenna should be mounted on the cab roof in a vertical position using the brackets and mounting hardware contained in the kit.
    - The locomotive antenna should have a minimum clearance of 36" between it and any other obstruction mounted on the cab roof. If the minimum clearance is not possible, then the installation must be tested to determine if the proximity of obstructions impact system performance.
    - Do not locate antenna in close proximity of any existing UHF/VHF (voice) antenna(s).
    - Pick a location (typically as high as possible) that provides a clear path between the antenna and the likely transmitter location(s).
    - Ensure the antenna cable routing to the receiver / controller unit is such that the antenna cable will not be cut or damaged by any moving parts.

  Note: Two (2) antennas are used on systems with the dual selective control option.
- **Wiring and Grounding**. To avoid EM interference and ensure control system reliability, specific grounding and shielding practices are required. The following list provides the minimum guidelines and practices required:
    - All coaxial and/or shielded cables are to be grounded at ONE end only. The cable shield must be grounded at the end closest to the transmitted voltage source (i.e. power supply end for transducers not at the transducer itself).
    - All required grounding must be to a common ground plane, which in turn has a single ground (bonding) connection to earth ground.
    - Bonding of the locomotive ground connection must be done using a copper braid (provided). DO NOT SUBSITUTE.
- **Remote E-Stop Installation.** All externally mounted remote E-Stop enclosures must be NEMA 4 rated. All remote E-Stop enclosures provided are NEMA 4 or better. Any field modifications must be done in such a way as to maintain this rating. All enclosure penetration must be appropriately sealed to prevent environmental leakage. "Dowty" washer should be used on all cable connectors.
- **Suppressors Installation Requirements**. Another very important requirement, to minimize EMI, is the installation of suppressors across ALL inductive loads (solenoid valve and relay/contactor coils). Control Chief will provide all the appropriate suppressors based on your locomotive design. **It is very important to identify all inductive loads present and to have the appropriate suppressors installed prior to remote control operation.**

- **J-1 Valve and Shuttles Valves.** The J-1 valve must be installed with the correct orientation, as per the manufacturer. All brake shuttle valves must be installed with the mounting feet pointing up.

4 START UP AND OPERATING PROCEDURES

4.1 Locomotive Stops

The locomotive remote control system can automatically initiate either of two (2) types of locomotive stops, depending on the specific situation. The two locomotive stops are defined below and are referenced in subsequent operational descriptions.

Full-Application Locomotive Stop - The full-application locomotive stop is automatically initiated in certain situations that are deemed non-emergency. This type of locomotive stop requires a reset of the OCU to resume normal operation. The full-application locomotive stop automatically initiates the following actions;

- full application of independent (locomotive) brakes
- full application of trainline brakes (when present)
- locomotive throttle to idle
- disengagement of generator field

Emergency Locomotive Stop - The emergency locomotive stop is automatically initiated in certain situations (including the E-Stop command) that are deemed an emergency. This type of locomotive stop **will** require specific intervention in order to resume normal operation. The emergency locomotive stop automatically initiates the following actions;

- emergency applications of independent (locomotive) brakes
- emergency application of trainline brakes(when present)
- locomotive throttle to idle
- disengagement of generator field
- After any emergency locomotive stop, the operator may not be able to restart the system from the remote OCU (or remote control station) because the locomotive will be in a Power Cut-off Switch (PCS) fault condition. To recover from this condition the operator may need to go to the locomotive cab to reset the PCS fault. PCS fault reset procedures will be dependant and specific to the locomotive.

Locomotive PCS Fault – The locomotive PCS fault is a latching condition that may occur on the locomotive that will prevent locomotive operation. This fault may occur whenever there is an emergency application of trainline brakes, based on a locomotive pressure switch that monitors the trainline brake air pressure.

- The emergency application of trainline brakes will occur whenever the remote control system commands an emergency locomotive stop, forcing the PCS fault condition. This will happen whenever;
  - an E-Stop button is pressed
  - the OCU tilt (man down) feature is triggered

- **Depending on the locomotive and whether it is in manual control or remote control mode, the procedure to reset a PCS fault may be different. It is the responsibility of the operator to understand the specific locomotive PCS fault reset procedures required. Refer to section 4.3 for additional PCS reset remarks.**

4.2 Setup and Remote Control Operation

4.2.1 Initial Locomotive Setup

It is essential for safe and efficient remote control operations that the locomotive is in proper working order in manual mode. Verify that all brake pipe hoses are connected and cutout valves are OPEN.

Verify the transfer switch on RCU is in the MANUAL position. This switch is located on the left hand side of the unit.

Verify the locomotive **throttle is in idle** and the **reverser is centered**.

Start engine. Let engine idle in manual until main reservoir air pressure reaches 90- psi or greater.

Verify the automatic brake valve handle is in the HANDLE OFF position. Wait for brake pipe pressure and equalizing reservoir pressure to equal zero. Both the brake pipe pressure and equalizing reservoir pressure must be equal before transferring to remote. Failure to do so will result in a locomotive PCS fault.

> **CAUTION:** Failure to position the automatic brake valve handle in the HANDLE OFF position could result in a brake release condition when the remote control system is switched back to manual mode.

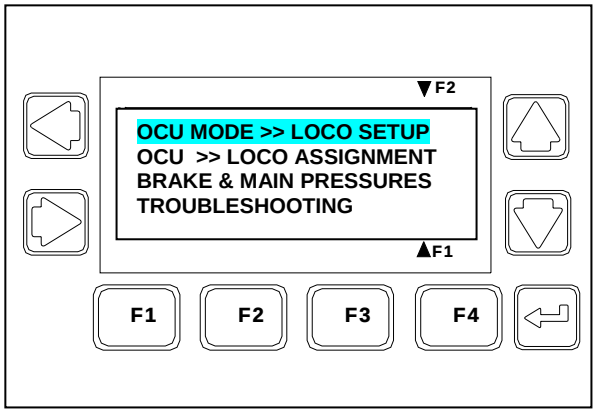
Place the transfer switch on the left side of the receiver / controller unit in the REMOTE position.

Locate the isolation valve on the filter assembly air supply and make sure that the valve is in the ON/OPEN (UP) position.

4.2.2 OCU Mode > > Locomotive Setup (Train Chief® II)

Note 1: HMI screen views are for example only.

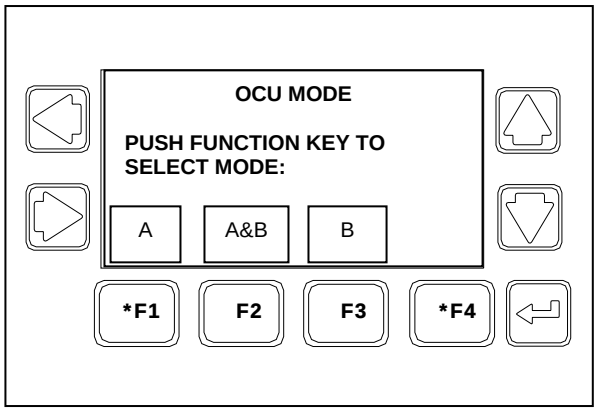
Note 2: This screen is only available on systems configured with the Selective Dual Control feature. If your system does not have this feature, skip to section 4.2.3 OCU Assignment Procedure – Locomotive Setup.



- The RCU is equipped with a Human Machine Interface (HMI) display panel. Access the "OCU MODE" selection from the HMI screen select menu by using the F1/F2 for UP/DOWN scroll. Select the "OCU MODE" screen using the ENTER button.
- The OCU Mode establishes an operator network configuration for the OCU to RCU communication link. The network has basically two configurations.

1. The first operator-to-locomotive configuration consists of a single OCU registered to a *specific* Locomotive to form a point-to-point communication link. This is accomplished with OCU Mode selections "A" or "B" on the HMI. In this point-to-point network the locomotive will ONLY receive operator commands from the designed OCU established by the OCU Mode selection. For example, if the selected Locomotive OCU Mode is "A", the Locomotive will only receive commands from OCU A and will not accept commands from OCU B. The converse is true if Locomotive OCU Mode is "B". The Locomotive will only receive commands from OCU B and will not accept commands from OCU A.

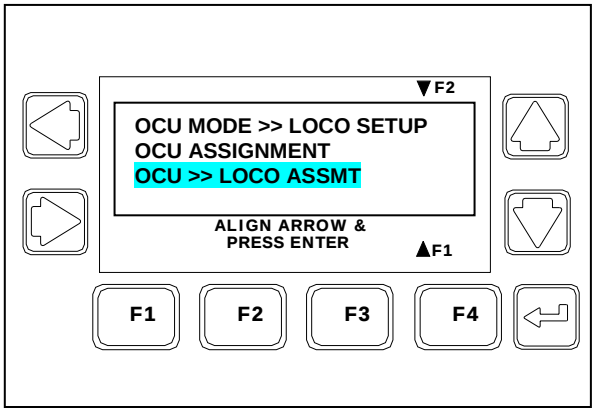
2. The second operator-to-locomotive configuration consists of a pair of OCU's registered to a *specific* locomotive to from dual point-to-point communication links. This is accomplished with the OCU Mode selection "A&B". This configuration is used for Selective Dual Control feature. (See section 4.6 on Selective Dual Control for operational details.)



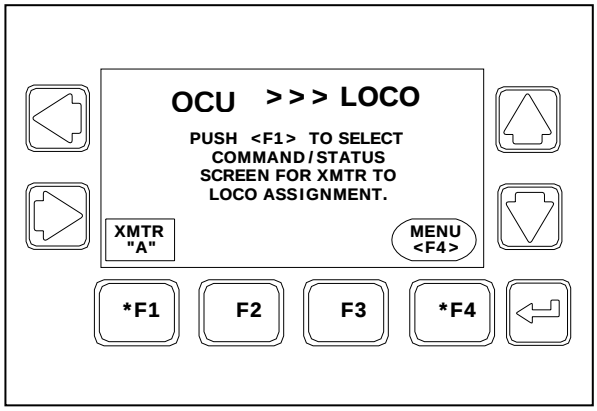
- Select the desired OCU Mode by pressing the appropriate function key on the HMI. When the selected mode is indicated press the appropriate function key to exit from this screen and return to the Main Menu.
- When operating in OCU Mode "A&B" the RCU requires an active link from each OCU. Otherwise (after a delay period) the controller will command a Full-Application Locomotive Stop.

Note 3: The single OCU Mode selections "A" or "B", can also being used when operating in Selective Dual Control and one OCU's experiences a problem, such as a dead battery. The operator can select the single OCU Mode for the operating OCU until the other unit is back to operational order. (The typical situation might be a dead battery pack and the operator had to replace the pack. The process required more time than expected and operations needed to continue with the operable OCU.)

4.2.3 OCU Assignment Procedure – Locomotive Setup (Train Chief® II)



- Access the "OCU >> LOCO ASSIGNMENT" selection from the HMI screen select menu by using the F1/F2 for UP/DOWN scroll.
- Select the "OCU >> LOCO ASSIGNMENT" screen using the ENTER button.



- The "OCU >> LOCO ASSIGNMENT" screen allows for the selection of the appropriate OCU to be assigned. In most cases this will be the "A" OCU only. When a system is equipped with the Selective Dual Control feature, "A" and "B" selections would be available to support assignments for dual OCU's.
- Select the appropriate OCU by pushing the associated function button (F1 or F2) for the desired OCU configuration. This will bring up the "COMMAND/STATUS" screen.

The locomotive is now ready to register an OCU(s) for RCL operations. Continue to the next step.

Note: for OCU Mode "A&B" the RCU will not allow RCL operations until both OCU's have been registered and have established their communication links.

4.2.4 OCU Setup

All switches and levers should be in their OFF positions.

Set INDEPENDENT BRAKE Selector to fifth position for FULL service brake application

Check AUTO BRAKE toggle in center position

Place HORN/BELL switch in OFF position (toward operator)

Place Reverser switch in NEUTRAL position.

Throttle selector in HALT position.

E-Stop pulled out.

OCU not tilted.

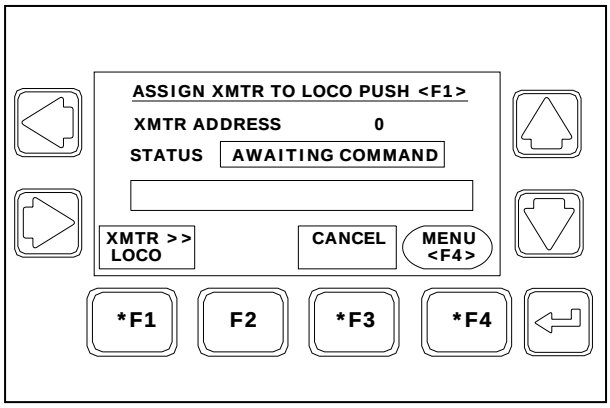
Note: The operator should be wearing the break-away vest by this time. The unit should be secured to the break-away vest. The operator can adjust the equipment straps so the unit fits on the chest at a comfortable position. The break-away vest also has a waist belt to accommodate a comfortable fit using one of three belt sizes.

Turn on the Lightweight OCU by pressing the Power-On pushbutton at the lower right hand corner of the unit (see section 3.2.3). At power-on the OCU will perform a Power-On-Self-Test (POST). When POST has completed successfully the unit is ready for to be assigned to a Train Chief® II equipped locomotive.

- A successful POST is indicated by the flashing OCU indicators and appropriate display message (“READY TO REGISTER WITH LOCOMOTIVE>>OCU>LOCO” The last eight characters of the scrolled message remain on the display).

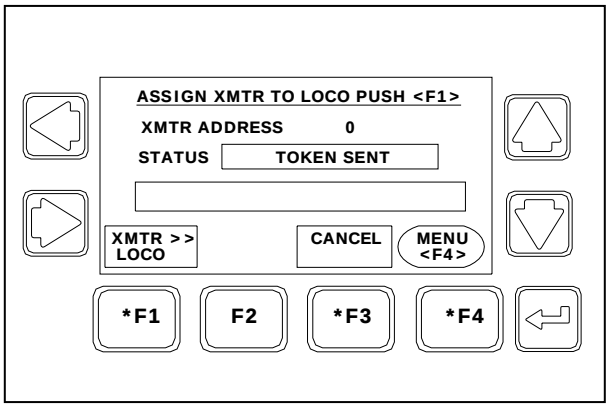
- If an error is detected during the POST an appropriate error message will be displayed and the unit will be disabled. See the troubleshooting section for further details.

4.2.5 OCU Assignment Procedure – Register OCU with Locomotive



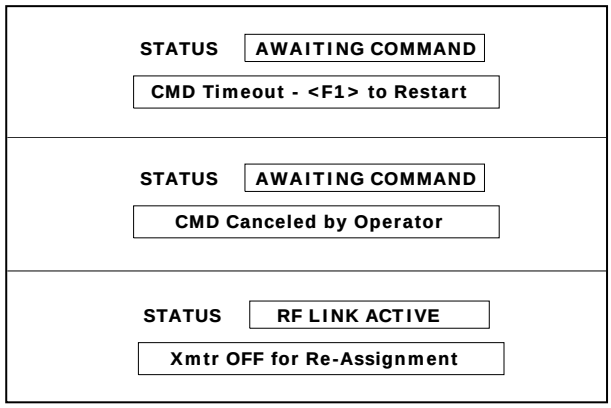
- The "COMMAND/STATUS" screen is used to initiate the assignment process.
  - Before initiating, align the IR ports of the OCU and receiver so they can see each other. The OCU should be held between 6" to 18" from the RCU.

- Push "**F1**" button to start the assignment process.



- During the data exchange, information will be displayed in the HMI "Status" field. The assignment process takes about 2-3 seconds. It can take longer if the operator is moving or does not have good IR Port alignment. The system will continue to attempt the assignment until a timeout occurs (30 seconds).

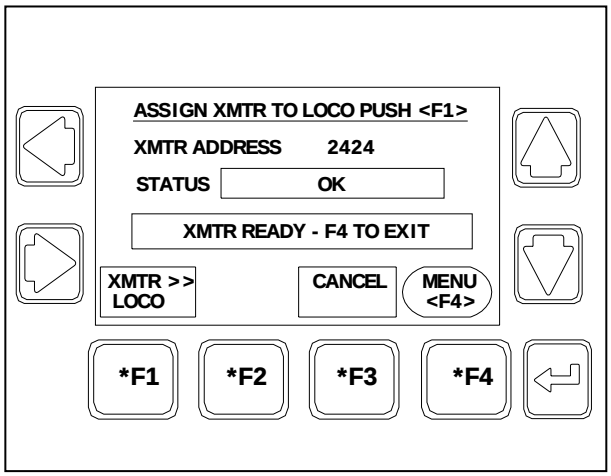
- The OCU A and B indications will flash and the display will show status information during IR communications.



- If the assignment process is unsuccessful, the system will cancel the command and display one of several messages. Be sure both IR ports are not obstructed and are clean.
  - The operator can restart by simply pressing <F1> again.
  - The operator can cancel the assignment process by pressing the "Cancel", <F3>, command.

- The OCU will also signal assignment failure with two beeps to indicate an error was detected. The display will show the type of error.
  - IF the error is a communications error the assignment can be attempted again.
  - IF the error is due to a configuration problem then other measures maybe required. For example a configuration error might be the operator is attempting to register a Lightweight OCU Model SPEED with a Train Chief® II controller configured for a Lightweight OCU Model THROTTLE / BRAKE. The RCU will not allow this

configuration to be assigned. (The HMI display will provide a message to identify the nature of the error; “Invalid OCU Config” for example.)



- The assignment process is complete when the OCU sounds a one (1) second beep and the HMI “Status” field displays “**OK**”. The OCU and controller are ready for Remote Control operation.
- Push F4 to Exit screen
- Upon successful assignment the OCU will beep the audible alarm once, the display will show Locomotive Running number, operating frequency, battery status, and the OCU A or B indicator on the keypad will illuminate to show the OCU assigned designator.

- To assign another OCU (**B** if system permits) or a new OCU **A**, return to the main menu (F4 key) and repeat the steps for the new OCU

  Note: for OCU Mode “A&B” the RCU will not allow RCL operations until both OCU’s have been registered and have established their communication links.

OCU Setup and Assignment Completed.

4.3 Transfer to Remote Mode and Resetting Locomotive PCS Fault.

To activate the communication link from OCU to locomotive, move the horn toggle to HORN. The locomotive should respond by sounding the locomotive horn.

Note: *If the locomotive bell begins to sound it is an indication that the main reservoir is below 60-psi. This could indicate that the isolation valve is in the wrong position. Recheck the valve and continue with the start up procedure. If the valve is in the correct position then recharge the main air reservoir. This is accomplished by placing the directional switch on the* OCU *in NEUTRAL and increase engine throttle. Throttle will automatically reduce once the 90-psi main reservoir pressure in reached. Now activate the HORN toggle.*

Release the trainline brake by pressing the AUTO BRAKE toggle switch to the release position. The command is accepted when the keypad AUTO BRAKE REL indicator turns ON.

Reset the locomotive PCS fault, if required.

- Older systems did not provide an indication of when or if the PCS Fault was activated. If the system didn't respond the operator would go to the locomotive and manually reset the fault.
- On newer systems the locomotive brake status lights are disabled when a PCS Fault is activated. To recover from PCS Fault the operator simply sounds the horn. When the fault is cleared the brake status lights should turn on.
- The OCU with two-way communication link will be able to show a PCS Fault message on the OCU display.)

Ensure the Independent (locomotive) brake valve handle is in the FULL INDEPENDENT RELEASE position.

WARNING: The remote control system cannot control independent brakes until the independent brake valve handle is in the FULL INDEPENDENT RELEASE position.

Ensure that the manual headlight switches are OFF, the dimmer switch is set to DIM, the generator field is ON, and the isolation switch is in the RUN position.

The remote control system now has primary control of the locomotive.

4.4 Air Brakes and Safety Features Test

According to the FRA Safety Advisory 2001-01 it is recommended that the air brake and safety function of the OCU be tested at the beginning of any remote control activity. The following summary is provided in support of that practice.

Locomotive Brake Test. Perform all required standard locomotive and trainline brake tests using the OCU to ensure all remote braking functionality.

E-Stop Test. Perform an E-Stop from the OCU to verify remote activation of the emergency locomotive stop. Also test all other locomotive mounted E-Stop push buttons associated with the remote control system.

Tilt Test. To test the Tilt feature of the OCU, tilt the OCU more than 45-degress. If the OCU is operating properly, it will

- Sound a fast rate pulse tone within three (3) seconds
- Cause a Tilt Time Out Fault after approximately two (2) seconds.
- The receiver / controller will respond by commanding an Emergency Locomotive Stop

To recover from a Tilt Time Out Fault, return the OCU to normal operation position.

Local Man-Down Alarm Test. To test the local man down alarm, maintain the OCU in a tilted position while in an active tilt alarm condition. After a period of not greater than 90-seconds and not less than 60-seconds the locomotive horn shall sound at an alternating rate of one second. The locomotive horn will continue to sound the man down alarm until the system is reset.

Remote Man-Down Alarm Test (if present). If your system is equipped with the optional remote man down feature, the remote man down alarm is triggered when the local man down alarm is activated. Refer to the system configuration documents for your specific operational detail.

Alert Test

To test the Alert feature of the OCU

- Place the Reverser selector in Neutral
- Place Independent Brake to Full position
- Set Auto Brake to Full indication
- Set speed selector out of STOP
- Wait 20 seconds

If the OCU is operating properly

- Sound a fast rate pulse tone after approximately 20 seconds
- Cause an Alert timeout fault within approximately 10 seconds
- The receiver / controller will respond by commanding Full-Application Locomotive Stop.

To recover from an Alert Time Out Fault, return the OCU Throttle selector to HALT position.

Initial start-up and safety checks are completed.
The system is ready for operation.

4.5 Normal Operation

4.5.1 Train Chief® II with Lightweight OCU Throttle/Brake Control Configuration

As an operator, you can control movement with an OCU in several different ways. This section covers:

- Setting movement direction
- Starting (Train Handling)
- Alert Operation
- Stopping using the Independent brake and Throttle selectors
- Emergency brake applications
- Charging train brakes system
- Winter operation
- Transferring operator control (pitch and catch)

4.5.2 Setting Movement direction

Set direction of movement using the reverser selector.

- Forward is the direction the short hood in the Train Chief® II equipped locomotive faces.
- Train Chief® II does not allow you to change the direction of movement until the locomotive brakes are fully applied.

Operating procedure:

- Throttle selector to HALT.
- Wait for locomotive to come to a complete stop.
- Move Reverser to a desired direction selection.
    - If a direction change is made while the locomotive brakes are released, the OCU will declare a Reverser Change Alarm and the controller will command the throttle to idle, apply full locomotive brakes, and disengage generator field.
    - To recover from the Reverser Change Alarm place the Throttle selector to HALT position.

Caution

This Train Chief® II configuration employs a Manual Throttle & Brake Control enabling the operator to achieve similar movement control as if the operator where at the locomotive control stand. This type of operation from a distance requires the operator to be very conservative about judging speed and stopping distances relative to being in or near the locomotive cab.

4.5.3 Starting (Train Handling)

- Set Movement Direction (FWD or REV)
- Press RESET (to reset reverser)
- RELEASE the locomotive brakes:
    - Move the Independent Brake selector to RELEASE (rotation toward operator) as shown by all indicators off.
    - Pull the Auto Brake and hold for at least two (2) seconds to release train brakes (if equipped).
- Press RESET (to reset brakes)
    - Throttle selector must be moved from the HALT position within 2 seconds of pressing the RESET.
- Advance the throttle selector to the appropriate throttle position to generate the required power to slowly accelerate the train.
- Use the Automatic or Independent Brake selectors to slow or stop the locomotive.
    - Locomotive brakes can also be applied by moving the throttle selector to HALT.
- To resume movement (without reverser change):
    - Press RESET
    - Within two seconds the Throttle selector must be moved out of HALT position or else the selection will be ignored.
        - If ignored, place Throttle to HALT and repeat from RESET.

Note: Radio Communications – Typically the OCU transmits four messages per second to the locomotive equipment. If the locomotive does not receive a valid message within a set timeout period (typ 1.25 sec) a Full Service Brake Application will occur. During the timeout period the last valid command will prevail.

4.5.4 Alert Operation

- The operator alert function is only activated when the Throttle selector is moved out of the HALT position.
- If there has not been any function or command switch activity (i.e. periodic pressing of the RESET switch) for more than 30 seconds then Train Chief® II will automatically initiate the Full-Application Locomotive Stop command.
    - The Alert Timeout warning will cause a fast pulse tone after 20 seconds of command switch inactivity to alert the operator of an impending Full-Application Locomotive Stop.
    - If the operator responds to the Alert Warning by pressing ANY button within 10 seconds the alarm is cleared.
- To recover from an Alert Timeout, return the OCU Throttle selector to HALT position.
- The specific time setting for the alert feature may be different, based on specific user request. Refer to site operating rules.

4.5.5 Stopping (using the Independent Brake and Throttle selectors)

To stop the train manually using the Independent Brake selector:

- Turn the Independent brake selector to apply the required braking power to bring the train to a manually controlled stop.
- To recover from a Full Brake application
    - move the Throttle selector to HALT,
    - set Independent Brake selector to RELEASE,
    - press RESET and within two seconds move the Throttle selector out of HALT.

To stop the train automatically using HALT:

- Turn the Throttle selector to HALT.

    Note: This is a more aggressive controlled stop where the Train Chief® II system applies a ramped application of independent brake until a full-application locomotive stop is achieved. Recover from Full Brake application same as above.

4.5.6 Trainline Brake Operation (when equipped)

- When the Train Chief® II system is equipped with optional trainline brake control the Automatic Brake selector on the OCU will be used to apply and release train brakes.
- The Automatic Brake release is selected when the toggle is pulled toward the operator
    - The receiver / controller commands full air pressure to the brake pipe which places the train brakes in a fully released state.
- The trainline brakes are progressively applied each time the trainline brake switch is momentarily pressed away from the operator.
    - When the switch returns to center the last commanded pressure is maintained.
    - If desired, Bail off independent brakes by pressing the Bail function switch.
- When the Automatic Brake selector is pressed for apply for more than two (2) seconds full service trainline brakes are commanded.

4.5.7 Tilt

When communications are active and the OCU is tilted, the audible indicator will sound a fast beep (critical warning), for about 3 seconds before commanding an emergency locomotive stop.

Once the emergency locomotive stop command is sent, the alarm no longer sounds continuously, but will sound once every 3 seconds to indicate that the locomotive emergency stop command continues to be sent.

- This condition continues as long as the OCU remains tilted.

The tilt condition is cleared when the OCU is returned to its upright position, or when power is turned off, or when the battery becomes fully discharged.

- Once cleared, the tilt alarm will stop.

4.5.8 Tilt Extend

The tilt extend is provided to facilitate operator tasks requiring two hands.
To extend the tilt timeout the brakes must be applied.

- Set the Throttle selector to HALT.
- Press the F1 push button on the keypad until the OCU acknowledges the request with a double beep then release F1.
- The operator has 60 seconds to perform tasks while tilting the OCU.
- The Tilt Extend is canceled when the operator commands a brake release.

4.5.9 Man Down Alarm

When the tilt function has been active for more than 1 minute the locomotive horn will begin to cycle on and off or sound continuously depending on your site operating rules.

The alarm will continue to be active until the receiver/controller is reset.

If the OCU is returned to its normal operating position before the man down timer expires the alarm will be cleared.

4.5.10 Emergency brake Applications

In emergency situations, emergency brakes are activated by pushing in the RED Mushroom push button next to the reverser switch. This action causes the OCU to send an operator Emergency Stop command. The controller will respond by commanding an Emergency Locomotive Stop.

To recover from an operator Emergency Stop, pull-out the Red E-stop mushroom push button, Throttle selector to HALT, Independent Brake to FULL.

Train Chief® II will also apply emergency brakes when a serious fault occurs in the system. In either case, Train Chief® II quickly opens the Brake pipe to apply emergency brakes to both consist and train (if connected).

- When operating with dual OCU's in Selective Dual Control operation, the locomotive will accept an Emergency Stop command from either OCU at any time.

  Note: An emergency brake application completely drains (dumps) the brake pipe on all cars. Recharging times will vary greatly depending on the number of cars connected and weather conditions.

4.5.11 Charging Train Brakes

The Train Chief® II RCU monitors the brake pipe pressure.
The Charge position of the Train Brake selector notifies the RCU to expect a large air flow and pressure changes on the Brake pipe.
To charge the brake reservoirs of a cut of cars:

1. Couple to the cars.
2. Place the reverser selector in Neutral position.
   NOTE: Charge can only be accomplished from Neutral.
3. Move the Train Brake Selector to Charge Position. Press the Auto Brake toggle for two seconds until the OCU beeps once to acknowledge Charge command was accepted.
   NOTE: When the operator commands Charge, the Locomotive BRAKE Status (red) strobe will cycle on and off at a slow rate to show the Brake Pipe is being charged. Additionally, the locomotive may automatically "Fast Idle" in order to deliver sufficient air flow to the train)
4. Return the selector to Release position.
5. Charging is complete when Locomotive Brake Status indicator changes from cycling on and off, to a continuous indication.

4.5.12 Operating under winter conditions

- During winter conditions, brake components may get covered with snow or ice and braking power may be reduced. Therefore, during these types of conditions, make regular brake applications to keep the braking components working properly.
    - With the locomotive moving at a speed of no greater than 4 mph (6 ft/sec), apply a small amount of brakes by moving the Independent Brake selector to Low position. This allows friction to melt away snow and ice on the shoes and wheels.

4.5.13 Active and Maintain Communication Modes

- During normal operations, when the operator is actively commanding the locomotive, communications with the controller occurs at an active rate. In this condition, as indicated by fast flashing of the OCU A or B indicator, communication occurs at a fast rate to ensure a fast response to the operator's commands.
- If the position of the control switches or selectors are not changed for some time (about six (6) seconds), then communication is switched to a slower "maintain" rate to conserve battery power.
    - The slow blinking of the OCU A or B indicator shows the maintain rate.
    - If any control switch or selector is moved, while communications is at a maintain rate, the active rate is immediately activated to restore fast operator response.

4.6 Selective Dual Control (also known as Pitch & Catch)

4.6.1 Introduction

Selective dual control enables a team of two operators to selectively control a locomotive during remote control operations, commonly referred to as “Pitch & Catch”. The operator currently in control of a locomotive can simply relinquish control status of the locomotive until the other operator acquires control status.

Locomotives configured for selective dual control can be assigned two OCU’s designated as OCU – A and OCU – B. The locomotive is equipped with RED and BLUE strobes to provide an active indication of primary control. The RED strobe represents OCU – A and the BLUE strobe represents OCU – B.

Terms used in the selective dual control procedure
Primary – OCU with active control of the locomotive, as indicated by the flashing strobe on the side of the locomotive; can issue all Control commands and Priority commands.
Secondary – OCU does not have active control of locomotive but can issue a priority command.
Priority Command – E-stop, tilt, and HORN only
Control Command – reverser, throttle, brakes, and auxiliary functions (lights, sand, Bell, etc).

4.6.2 OCU Controls

PITCH – momentary – operators presses button to transfer (relinquish) control to another operator.
HORN – momentary – operator pushes this toggle to acknowledge acceptance of an acquired transfer from another operator.

4.6.3 Locomotive Indications

Strobe Lights: RED and BLUE
RED Flashing – OCU “A” has primary control of the locomotive
BLUE Flashing – OCU “B” has primary control of the locomotive
RED and BLUE OFF – neither OCU has primary control of the locomotive

4.6.4 Selective Dual Control Procedure

After initial setup and test procedures are completed the system is ready for general remote control operations.

1) Initial ACQUIRE – establishing primary operator
   a) Locomotive movement must be brought to a complete stop.
   b) Perform the following setup to ready OCU to acquire control:
      i) Reverser to NEUTRAL
      ii) Throttle selector to the HALT position
      iii) Trainline brake centered
      iv) IF the above switch positions are not set and the operator attempts to acquire control the OCU will sound an audible alarm and the system will ignore the acquire request.
   c) Operator wishing to acquire control as primary must press HORN.

d) Locomotive acknowledges the operator's acquire command by activating the appropriate RED or BLUE strobe to designate which operator is the primary.
   i) The locomotive will only accept control commands from the primary operator.
   ii) Priority commands will be accepted by the locomotive from either operator.
e) Primary operator commences with remote control tasks.

2) Selective Dual Control Operation
   a) Transfer of control by primary operator to other operator or idle locomotive.
   b) Locomotive movement must be brought to a complete stop.
   c) Perform the following setup to ready a OCU to transfer control:
      i) Reverser to NEUTRAL
      ii) Throttle selector to HALT
      iii) Trainline brake to center (LAP)
      iv) If the previous switch positions are not set and the operator attempts to pitch, the OCU will sound an audible alarm, the display will show the message "PITCH SETUP ERROR", and the system will ignore the switch command.
   d) Primary operator presses PITCH. Locomotive responds by turning off both RED and BLUE status indicators. (The locomotive can stay in this mode indefinitely.)
   e) Perform the following setup to ready a OCU to acquire control:
      i) Reverser to NEUTRAL
      ii) Throttle selector to HALT position
      iii) Trainline brake to center (LAP)
      iv) If the previous switch positions are not set and the operator attempts to acknowledge the transfer, the OCU will sound an audible alarm, the display will show the message "ACQUIRE SETUP ERROR", and the system will ignore the switch command.
   f) Operator wishing to acquire control must press HORN. (Provided all switches are set properly as described above.)
   g) Locomotive acknowledges operator acquire command by activating the appropriate RED or BLUE strobe to designate which operator Is the primary
      i) The locomotive will only accept control commands from the primary operator.
      ii) Priority commands will be accepted by the locomotive from either operator.
   h) Primary operator commences with remote control tasks.

Note:
If the OCU of the primary operator were to go off-the-air, that OCU will retain its designation as primary as indicated by the locomotive status indicator. In order for the other OCU to acquire control, the primary OCU must re-initiate communications with the locomotive and execute the transfer procedure, or the operator must go into the cab and reset the system or change the OCU Mode from "A&B" to the appropriate "A" or "B" mode designator.

4.7 Transferring from Remote to Manual

- Turn off the OCU.
- Go to the locomotive and place the independent brake handle into the FULL APPLY position and the automatic brake handle to the EMERGENCY position.
- Place the transfer switch on the receiver / controller unit in the MANUAL position.
- Place the air valve that feeds the receiver / controller unit in the OFF/MANUAL position.
- Recover from the locomotive PCS fault condition using the normal procedure.
- Secure the OCU to provide protection against unauthorized operation.
- Resume normal operations.

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