INTRODUCTION

The Satellite Locomotive Remote Control System utilizes the Union 539 Code Control System to remotely control a "satellite" locomotive unit located anywhere in a long train, from the "lead" or head-end locomotive. The transmission medium of this system extending between the lead locomotive and the satellite locomotive, is a radio frequency carrier channel modulated by two tones in the voice frequency range.

CAUTION

THE SATELLITE REMOTE CONTROL SYSTEM IS NOT INTENDED FOR CONTROL OF ANY LOCOMOTIVE OTHER THAN A PROPERLY EQUIPPED SATELLITE UNIT. THE OPERATOR MUST BE THOROUGHLY EXPERIENCED IN THE NORMAL PROCEDURES OF RUNNING A LOCOMOTIVE BEFORE ATTEMPTING TO USE THE SATELLITE SYSTEM.

CONTROLS AND INDICATIONS

The Remote Control Console, located in the cab of the lead locomotive, contains the indication lamps and control pushbuttons required for remote control operation. The following is a tabulation of the indications and controls and their functions.
G = Green    R = Red    W = White

Figure 1. Remote Control Console
**CONTROL**

1. **POWER ON-OFF**
   - **FUNCTION**: Energizes or deenergizes power to the satellite system.

2. **LEAD RADIO 1-2**
   - **FUNCTION**: Selects main (1) or standby (2) radio transmission channel.

3. **GND RELAY ON-OFF**
   - **FUNCTION**: Resets ground protection relays in the satellite high voltage system. (See operating procedure.)

4. **A. B. ISOL I-N**
   - **FUNCTION**: Isolates the air brake feed valve on the satellite locomotive.

5. **MAN SAND ON-OFF**
   - **FUNCTION**: Controls operation of the manual sand valves on the satellite locomotive.

6. **ALARM RESET**
   - **FUNCTION**: Silences the audible alarm bell once it has been energized by the occurrence of an alarm condition.

7. **THROTTLE SELECTOR**
   - **(a) I (Isolation)**
   - **(b) MU (Multiple Units)**
   - **(c) 1-8 (Throttle Speeds)**
   - **FUNCTION**: Isolates satellite throttle power. (Satellite locomotive at idle throttle.)
   - **FUNCTION**: Satellite throttle automatically follows position of lead locomotive manual throttle lever.
   - **FUNCTION**: Positions the satellite throttle to desired speed. Satellite throttle operates independent of lead locomotive. (See operating procedure).

**INDICATION**

1. **POWER ON** (Green)
   - **FUNCTION**: Indicates when illuminated.

2. **POWER OFF** (Red)
   - **FUNCTION**: Indicates when illuminated.

3. **LEAD RADIO 1** (Green)
   - **FUNCTION**: Main communication channel energized.

4. **LEAD RADIO 2** (Red)
   - **FUNCTION**: Standby communication channel energized.

5. **GND RELAY ON** (Green)
   - **FUNCTION**: Request for ground relay reset has been made.

6. **GND RELAY OFF** (Red)
   - **FUNCTION**: Ground protection relay reset is normal. (Pushbutton must be depressed to obtain normal OFF indication.)

7. **A. B. ISOL 1** (Green)
   - **FUNCTION**: Request for feed valve on satellite locomotive to isolate has been made.
INDICATION

A. B. ISOL N (Red)

(5) MAN SAND ON (Green)

MAN SAND OFF (Red)

(6) ALARM RESET (Red)

(7) THROTTLE SELECTOR
   (a) I (Isolation) (White)
   (b) MU (Multiple Units) (White)
   (c) 1-8 (Throttle Speeds) (White)

(8) WHEEL SLIP (White)

(9) B (Dynamic Brake) (White)

(10) GF (Generator Field) (Red)

(11) NO POWER (Red)

(12) NO CONT (Red)

(13) CONT (Green)

(14) XMIT (Green)

(15) A. B. FEED VALVE (White)

INDICATES WHEN ILLUMINATED

Feed valve on satellite locomotive is at normal position. (Pushbutton must be depressed to obtain normal N indication).

Request for satellite manual sand valve to open (sand) has been made.

Satellite manual sand valve is closed. (Pushbutton must be depressed to obtain normal OFF indication).

Lamp is continuously illuminated. (Pushbutton used only to silence audible alarm.)

Satellite throttle power is isolated (at idle).

Satellite throttle will follow position of lead locomotive manual throttle.

Speed position of satellite throttle.

Wheel slip condition has occurred.

Satellite is in dynamic braking operation.

The battery field of the main generator is present (excited) in all satellite units (for each throttle position).

One or more satellite units have lost power.

Communication channel is inoperative.

Communication link is operating normally.

Code is being transmitted to the satellite.

Satellite air brakes are isolated. (Feed valve cut-out).
OPERATING INSTRUCTIONS FOR REMOTE CONTROL SYSTEM

A. PRELIMINARY PROCEDURES

1. Place the lead locomotive REVERSE lever in the NEUTRAL position.

2. Place the lead locomotive automatic brake valve to the FULL RELEASE position and insert the brake release hold pin.

3. Depress the POWER-ON pushbutton on the remote control console. Green light should illuminate.

   a. Make certain all normally lighted indication lamps are illuminated as follows:

   (1) LEAD RADIO 1 (Green)
   (2) GND RELAY RESET (Green)
   (3) A. B. ISOL N (Red)
   (4) MAN SAND OFF (Red)

4. Place THROTTLE SELECTOR switch to the ISOLATION (I) position. White light should illuminate.

5. Advise satellite unit personnel to energize remote control equipment, following the instructions issued by railroad personnel.

NOTE

When both the lead locomotive and satellite equipment have been energized properly the CONT indication lamp will burn steadily and the XMIT lamp will light once each minute.

6. Depress the A. B. ISOL pushbutton. Green light should illuminate.

   a. Make certain that A. B. FEED VALVE indication light illuminates.

7. Depress the SERVICE RELEASE pushbutton on the air brake control console and observe the EMERGENCY BRAKE lamp (red) is extinguished.

8. Place the THROTTLE SELECTOR switch to the MU position. White light should illuminate.


   a. Make certain the A. B. FEED VALVE indication lamp extinguishes.
B. AIR BRAKE LEAKAGE TEST

1. Depress the A.B. ISOL pushbutton. The green lamp should illuminate.
   a. Make certain the A.B. FEED VALVE indication lamp illuminates (white).
2. Perform normal locomotive air brake leakage test.
3. If leakage test is satisfactory, depress the A.B. ISOL pushbutton. The red lamp should illuminate and the A.B. FEED VALVE indication lamp should extinguish.

C. CONTROL FUNCTION TEST

1. Test the standby radio control by depressing the LEAD RADIO pushbutton. The green (1) indication lamp should extinguish and the red (2) lamp illuminate. The CONT indication lamp (green) should remain illuminated. If the standby radio test is satisfactory, depress the LEAD RADIO pushbutton to return to main radio communication.
2. Test the sand control function by depressing the MAN SAND pushbutton. The red (OFF) indication lamp should extinguish and the green (ON) lamp illuminate. If the sand test is satisfactory, depress the MAN SAND pushbutton to return the sand control to the OFF position.

D. OPERATING PROCEDURES

If all preliminary procedures outlined above have been performed satisfactorily the train is now ready to move.

With the throttle control in the MU position the satellite units will automatically follow the normal locomotive throttle operation.

1. Independent Satellite Throttle Operation
   a. On GP-9 units, placing the THROTTLE SELECTOR switch in positions 1 through 8 operates the satellite units at the desired throttle position, independent of the lead locomotive throttle. Operation on F7-A units is similar, however, because of locomotive interlocks the lead locomotive must be in throttle #1 to enable independent satellite throttle operation.

2. Air Brake Operation
   Air Brake Control Console Controls and Indications:
   a. EMERGENCY button - Used to make an emergency brake application. The red indication lamp under the button, indicates when illuminated that the EMERGENCY button has been operated.
b. SERVICE RELEASE button (green) - To release the brakes after an emergency or service brake application; first restore the train-line, if necessary, and then depress the SERVICE RELEASE pushbutton. (If an emergency brake application is being released, it will be necessary to hold the SERVICE RELEASE pushbutton depressed for approximately 20 seconds).

c. SERVICE APPLICATION button (green) - Used for progressive brake application. The first time the SERVICE APPLICATION pushbutton is depressed an automatic minimum reduction of seven psi is applied. If required, a supplemental reduction can be applied by depressing the SERVICE APPLICATION button a second time. If a supplemental reduction is requested, the SERVICE APPLICATION button must be held depressed until the equalizing reservoir gauge indicates the desired amount of air reduction.

d. INDEPENDENT APPLICATION (amber) - Used for application of both the lead and satellite locomotive brakes.

e. INDEPENDENT RELEASE (amber) - Used to release both the lead and satellite locomotive brakes.

NOTE

The SERVICE APPLICATION and SERVICE RELEASE control functions will still operate on the entire train in the event the remote radio communications fail. However, the INDEPENDENT APPLICATION and INDEPENDENT RELEASE control functions will only operate in the lead locomotive.

3. Dynamic Brake Operation

   a. To apply dynamic brakes to the satellite units and the lead locomotive at the same time, the THROTTLE SELECTOR switch must be in the MU position. The B (Brake) lamp will illuminate to indicate the dynamic brake system is operating on the satellite unit.

   NOTE

   The remote control system will transmit dynamic brake controls to the satellite locomotive in four degrees: 25, 50, 75 and 100 percent. The dynamic brake lever must fully reach these degree positions to initiate a control command. The operator can observe the XMIT indication lamp, to know when a dynamic brake control is being transmitted to the satellite locomotive.
b. Dynamic braking on the satellite can be independently operated (once the lead locomotive dynamic brake lever is placed in the B position) in the following manner.

1. Place the THROTTLE SELECTOR switch to the MU position.
2. Move the dynamic brake lever to the B position.
3. Place the THROTTLE SELECTOR switch in the position desired; position 1 applies 25% dynamic brake, position 2 applies 50%, position 3 applies 75% and position 4 applies 100%.

NOTE

If the THROTTLE SELECTOR switch is not placed in the MU position before operating the dynamic brake lever, the satellite units will remain in the power position indicated by the THROTTLE SELECTOR switch.

4. Pick-up and Set Off

a. When the lead unit is not separated from the satellite units, normal pick-up and set-off procedures are followed. However, if the lead unit is separated from the satellite units, it is absolutely essential that the satellite units be isolated as follows:

1. Depress the A.B. ISOL pushbutton. The green lamp should illuminate and the A.B. FEED VALVE indication lamp should illuminate.

   CAUTION

   In case of failure to receive the A.B. FEED VALVE indication, it will be necessary to manually cut-out the brake valve on the satellite unit or open the train line on the standing section of train.

2. Place the THROTTLE SELECTOR switch to the I (Isolate) position. If this is not done, the satellite units, although physically uncoupled from the train, will follow the throttle position of the lead locomotive.

3. When the train is recoupled, depress the A.B. ISOL pushbutton. The I (green) indication lamp should extinguish and the N (red) lamp illuminate. The A.B. FEED VALVE indication lamp should extinguish. Next, depress both the SERVICE RELEASE and INDEPENDENT RELEASE pushbuttons on the air brake control console. This brake operation is necessary to insure the satellite units are in agreement with the lead locomotive.
5. **Ground Relay Reset Operation**

If a NO POWER indication is received at the remote control console, it should initially be assumed the alarm has been caused by a tripped ground relay on a satellite unit. Depressing the GND RELAY pushbutton will initiate only one code to the satellite unit requesting the ground relay to reset. Therefore, if the tripped relay does not reset after the first request has been made, the request should be repeated by depressing the GND RELAY pushbutton twice; once to restore to normal, and a second time to transmit another reset request.

**E. SHUTDOWN OF REMOTE CONTROL EQUIPMENT**

1. To deenergize the remote control equipment, perform the following procedures.
   a. Depress the POWER· ON-OFF switch. The green (ON) lamp should extinguish and the red (OFF) lamp illuminate.
   b. Advise satellite unit personnel to deenergize remote control equipment in accordance with procedures outlined by the railroad.