Engineer: Bruce Page	Date: 4/15/04	Raytheon JPS Communications 5800 Departure Drive, Raleigh, NC 27616			
Drawn: Bruce Page	Date: 4/16/04				
Approved: CTS	Date: 4/16/04	Title: ACU RADIO APPLICATION NOTES			
Issued/ Revised	Date: 12/2/04	Size: A	Dwg. #: **5961-271232-APP**	Rev: **B2**	Sheet: 1 Of 17

APPLIES TO: Mitsubishi Mobile Satellite ST251 (Radio Only)

RADIO MODIFICATIONS: None required.

The PTT Microphone SZ300A and Junction box SZ351A options are required to use interface cable.

RADIO PROGRAMMING: See Commissioning of Mitsubishi MSAT Mobile Terminal Equipment section of this document.

RADIO CONTROLS:

See the MSV Dispatch Radio Service User Guide section of this document to select talkgroup and initiate a dispatch call.

CABLING:

Standard ACU-1000 and ACU-T Interface cables are made up of a 2 foot TRP Radio Tray Interface cable and the appropriate 13-foot Extension cable.

ACU-1000 Interface Cable	JPS P/N 5961-291251	(5961-271251 + 5961-261002-00)
ACU-T Interface Cable	JPS P/N 5961-281251	(5961-271251 + 5961-281013-00)
TRP-1000 Shelf Interface Cable	JPS P/N 5961-271251	
Radio RF Connector Type	Integral antenna (lid), SMB connector.	

DSP-1 JUMPERS:

JP1	Low Impedance *
JP2	Balanced *

DSP PROGRAMMING:

RX Level	3*	0dBm*
TX Level	8	8dBm
Squelch Type	VOX*	
COR Polarity	Active Low*	
High Frequency Equalizer	2	-3.5dB Cut
RX Audio Delay	4	180 ms
TX Audio Delay (Radio Type)	4	800 ms (See Notes)
Noise Reduction Value	0*	Off*

VOX/VMR Threshold	1*	Med1*
VOX/VMR Hang Time	3*	775 ms*
COR Inhibit After PTT	1*	100 ms*
All Others	As needed	

(* Indicates Default Value)

NOTES:

Channel acquisition for Sat-com radio can take approximately 2.4 seconds. This could result in initial syllables of transmission being lost during channel acquisition time. An equivalent delay in the TX Audio path will require an AP-1 (TX Option) to add up to the 1.6 seconds of delay on top of the 800mS provided be the DSP-1.

Commissioning
of
Mitsubishi
MSAT Mobile Terminal (MT) Equipment

It is recommended that the user familiarize themself with the MT's handset key layout and all of the following steps (particularly step 1, which includes a time-sensitive element), prior to attempting the commissioning process. These steps (per current and "upgraded" software versions Z1.1d & Z2.1b) are tailored for commissioning of a single-line, Circuit-Switched Voice service, and as such, other steps will apply to the commissioning of alternate/additional services, features and options. In pressing any handset key, "firm and deliberate" key depressions are recommended.

IF commissioning a:

Transportable or Omniquest portable MT, verify that the battery is charged, or that the optional AC/DC adapter is connected;

Mobile MT in a vehicle, ensure that the vehicle's engine is running and steady;

Fixed MT, ensure that the AC/DC adapter or alternate power source is connected.

1. **Start with MT powered-off**
   - **Note:** this step includes a time-sensitive element ! At the designated sequence, you will have only 7 seconds to correctly enter a specified 7-digit code ! This code is valid for only 20 programming cycles (including errors/unsuccessful attempts), after which the MT must be returned to the manufacturer's designated representative for re-programming (re-setting)
   - In all cases, ensure that all connections are tight and any external power input is "ON" and stable. In the case of the Transportable MT, open the lid-antenna and secure it in the open position (using the thumb-lock on the slider arm), toggle the power switch (located at the lower left corner) to the "ON" position and ensure that the power indicator is illuminated (green)
   - Press [PWR] on the MT handset (for at least ½ second).
   - Wait approximately 3 seconds (for the wake-up cycle to finish), during which "**Program/SAT NAM**" is displayed on the handset's Liquid Crystal Display (LCD). Note that other indications may be displayed as well
   - Press and hold [CLR] while simultaneously entering **8761015**. Release [CLR]. You have only 7 seconds to successfully complete this entry sequence. During this entry sequence, no keypad tones will sound nor will the entered digits be displayed.
   - IF you miss the 7 second window, or "???" is not displayed (i.e. if the display cycles to "???"), press [PWR] and start again.
   - IF, at anytime, a wrong key is pressed, try pressing [CLR]. Note that a momentary (quick) press clears the last entry, while a longer press usually clears a total entry string and/or backs-out to the previous level.

2. **Entering the MT's Assigned Phone Number**
   - if the previous step was successfully executed, "**MIN 000/0000000**" (or a previously entered telephone number) is displayed
   - enter your assigned 10-digit MT telephone number (i.e. overtype the displayed number with your new 60070XXXXX number)
   - press [SEND]

3. **Security Code**
   - "**SecCode**" is displayed
   - enter **0000**
   - press [SEND]

Commissioning
of
Mitsubishi
MSAT Mobile Terminal (MT) Equipment

4. **Deleting the Emergency Telephone Number**
   Note: the MSAT Network does not currently support "911" calls
   - "**EMG.No/911**" " (or a previously entered telephone number) is displayed
   - enter **000**
   - press [SEND]

5. **Setting the MT Antenna Type**
   - "**AU Type**" is displayed (possibly followed by a previously entered 2 digit code)
   - enter the 2 digit code corresponding to your MT antenna type
     - **01** for mobile MT with AU100 or AU200 dome antenna
     - **03** for ST251 Omniquest portable MT with integral lid antenna
     - **05** for ST151 transportable MT with integral lid antenna
     - **07** for ST121 series / TU130A fixed site MT with AU501A 21" diameter flat-panel super high gain antenna (this setting also applies to the ST150TS transportable MT with fixed site antenna
   - press [SEND]

6. **Entering the Security Access Code**
   - "**ASK=XXX/XXXXXXX**" is displayed
   - enter your assigned 20-digit code (no spaces or delineators – i.e. 12345678901234567890). Note: only 14 digits are displayed, and scroll as additional digits are entered.
   - press [SEND]
   - press [STO/END]
   - MT sounds a long tone and powers-off

7. **Configuring Automatic Communications Mode**
   - Press [PWR] on the MT handset (for at least ½ second)
   - IF the MT is new, "**Enter PFC/CFC**" is displayed
   - IF the MT is not new, "**BxxSxx OK*/NG#**" is usually displayed
   - Press [FCN] briefly, ensure that "FCN" is displayed (immediately to the right of "PWR")
   - Enter **94** (this must be entered within a few seconds of pressing [FCN], if not - the FUNCTION mode will be cancelled. If this occurs, press [FCN] and try again - more quickly)
   - IF "**AutoCom OFF**" is displayed, press "**#**" to toggle the selection to "**AutoCom ON** (IF "**AutoCom ON**" is displayed, simply proceed)
   - press [STO/END]

8. **Entering Pilot and Commissioning Frequencies**
   - "**SAT/ -ON-**" is displayed
   - Press [FCN] briefly, ensure that "FCN" is displayed (immediately to the right of "PWR")
   - Enter **93** (this must be entered within a few seconds of pressing [FCN], or else, the FUNCTION mode will be cancelled. If so, press [FCN] and try again - more quickly)
   - "**PFC / CFC press 1**"is displayed
   - enter **1**
   - "**PFC=XXX/XXXXXXX**"is displayed
   - enter your assigned PFC – Pilot Frequency (i.e. 155XXXX0000).
   - press [STO/END]
   - "**CFC=XXX/XXXXXXX**" is displayed
   - enter your assigned CFC – Commissioning Frequency (i.e. 15XXXXXX000).
   - press [STO/END]

Commissioning
of
Mitsubishi
MSAT Mobile Terminal (MT) Equipment

9. **Pointing the Antenna & "Locking On" to the Satellite**
   - **"To SRCH push SND"** is displayed.
   - press [SND]
   - **"SAT Search"** is displayed, then changes to **"BxxSxx OK*/NG# PWR No SVC"**
   - at this at this time, you must "point" the antenna (i.e. manually readjust azimuth and elevation for all, except dome, antenna). During this step, the indicated power level may fluctuate significantly, however, settles down after approximately 30 seconds to 1 minute.
   - numerical values are displayed in place of the "XX" (i.e. BOOS24, which indicates Beam 00 – East Beam and Signal Strength = 24)
   - Only when signal strength is adequate (consult the Help Desk for "adequate" signal strength levels for specific MT antenna types), continue to the next (final) step.

10 **COMPLETING THE COMMISSIONING PROCESS**
   - Note: a clear line-of-sight to the satellite is critical throughout this step – it is recommended that you ensure that nothing causes the antenna to move or become obstructed and that no power interruptions or fluctuations occur. During this step, the exchange of commissioning information between the MT and the MSAT Network takes place. This step may take up to 5 minutes to complete.
   - press [*]
   - **"SAT Search PWR NO SCV"** is displayed, which changes to **"SAT Signal Strength - ON- PWR NO SVC"**
   - IF successful, the **"NO SCV"** disappears (i.e. changes to **"SAT Signal Strength -ON- PWR"**
   - press [*] (note: pressing [*] may not be required). **"BxxSxx"** is displayed.
   - The MT is now ready to place and receive calls.
   - IF unsuccessful, **"Shut DWN Push PWR PWR NO SCV"** is displayed, press [PWR] and try commissioning process again. IF, after a repeated attempt **"Shut DWN Push PWR PWR NO SCV"** is displayed contact the Help Desk (as the MT will likely be in a "Fail/Repair" status on the Network – this status cannot be changed by the user, only by a Network controller).


MSV
Mobile Satellite Ventures
spatch Radio Service
USER GUIDE

CONTENTS

1.0 MSV Dispatch Radio Service (DRS)

Welcome to Mobile Satellite Ventures (DRS), a unique and powerful communications service for workgroups of any kind.

DRS provides two-way radio functionality with the reliability, security, and coverage available only with satellite communications.

DRS is a real-time, voice-based service that provides point-to-multipoint communication at the push of a button. With DRS, a dispatcher can easily exchange information with an individual, a select group of workers, or an entire fleet. Mobile workers can speak with a base operation, coworkers, or customers from the road or on-site. Increased communications result in greater efficiency, improved response time, and cost effectiveness.

In an emergency situation, the Priority One emergency function allows a user to automatically activate a talkgroup or be the next speaker on that talkgroup.

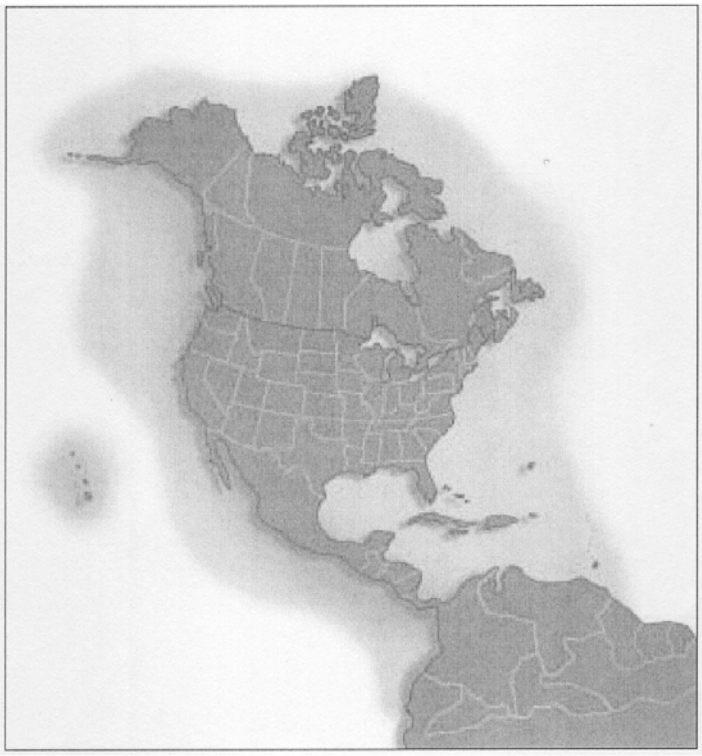
DRS Operations

Private Mode allows users to initiate private person-to-person communications between any two members in a talkgroup over dispatch radio.

Dial-In and Dial-Out Dispatch services allow dispatch communication via a landline phone. Dial-In Dispatch lets a supervisor relay a broadcast message to an entire talkgroup from any landline telephone. Dial-Out Dispatch enables talkgroup members to call an assigned number.

Coverage Map

MSV Dispatch Radio Service provides seamless communication at any time and virtually anywhere across North America.



Key Features of Dispatch Radio Service

- Provides seamless two-way radio coverage across North America, Alaska, Hawaii, the Caribbean, and hundreds of miles of coastal waters
- Utilizes L-band spectrum, which is not susceptible to most degradation effects of inclement weather
- Provides clarity and security to assure private communications through all-digital network
- Provides real-time point-to multipoint and point-to-point voice communications
- Customize private talkgroups to meet operational needs
- Provides 24-hour access to the MSV Customer Service Center

Benefits

- Provides the power to manage your remote operations
- Cost effective — No need to build, license, or maintain private networks
- Safety — Reliable backup or emergency communications and an effective tool for emergency response operations
- Security — Private digital communications that cannot be intercepted by scanners
- Reliability — with a proven network, DRS ensures communications when other systems fail. Because there are no radio towers, there are no dead zones or outages due to lack of tower coverage and/or failure from storm damage.

2.0 Using DRS with Mitsubishi Satellite Terminals

Mitsubishi subscriber equipment requires a separate Push-to-Talk (PTT) microphone for dispatch communication.

Note: *You cannot access telephone functionality using the PTT.*

Basic Operation

1. Powering on Unit:

   Power on the Mobile Terminal (MT), by pressing and holding the PWR key on either PTT or telephone handset.

   Note: *If you power on the unit using the telephone handset, the PTT display will read* **SLEEP**. *To activate PTT, press and hold any key on the PTT keypad except PWR or BAR.*

   If using a land mobile unit, remain stationary until the satellite has been acquired and the service is ready to use.

   You will see **NO SVC** in the upper right corner of the PTT display. Within 20 seconds to one minute, your MT should be locked on the satellite, **NO SVC** will disappear from the display and you will be ready to use the service. The bottom left corner of the display on PPT will either read **NOSEL** indicating that no talkgroup has been selected, or it will display the talkgroup tag (i.e. 05, 06, ...) number that was selected when the unit was powered off.

2. Selecting a Talkgroup:

- Press the **GRP** key on the keypad of the PTT, and enter the two-digit number of the tag (i.e. 01, 02, 03,...).

OR

Press the **GPR** key and scroll through the talkgroup tags preprogrammed in your MT using the arrow keys.

OR

Press and hold the **GRP** key for one second and you will enable the SEARCH ("SCAN") mode. **GRP** will blink on the display and every 10 seconds your display will show the next talkgroup programmed in your MT. SEARCH mode will continue until you either press the **GRP** key again, press the **STO/END** key, or someone begins talking on the talkgroup that you have SEARCHED on.

Note: *To select a talkgroup, you need its associated tag number (i.e. 01, 02, 03,...).*

3. Initiating a Dispatch Call:

- Press and hold the PTT. When the display reads **SELF** you will hear a two-tone beep. You can begin talking, holding the microphone approximately two inches from your mouth.

Note: *Be sure to wait until* **SELF** *is displayed before speaking, to avoid having your voice cut off.*

- When finished speaking, release the PTT and the display will change to **VACANT**, accompanied by a single beep, someone can now respond to you.

Note: **VACANT** *means that the talkgroup is still active and anyone can now become the speaker.*

- When someone in the talkgroup responds, you will see their unique four-digit Directory Number (DN) appear on the PTT display. When they stop talking, the DN will be replaced by **VACANT**.

- You can respond to a communication as soon as you see **VACANT** on your display. To respond, simply press and hold the PTT. When **SELF** is displayed, you may begin speaking. Release PTT when finished speaking.

  Note: *A talkgroup will remain in the VACANT state for 10 seconds if another user does not PTT. After 10 seconds in the VACANT state the dispatch call will be terminated.*

- When **IDLE** is displayed it means the talkgroup has broken down, you must follow the steps for initiating a dispatch call to re-establish communication on the talkgroup.

- The cue that the talkgroup is available – **VACANT** – is always accompanied by a single beep. The cue that you may speak – **SELF** – is always accompanied by a two-tone beep. Once users become accustomed to the service they can navigate usage through audio tones without relaying on the PTT display.

Priority One

- Each talkgroup offers a Priority One feature, which allows anyone to override the current speaker (except in Private Mode talkgroups).
- You can access Priority One from any talkgroup except Private Mode (tag #00).
- Press and hold the **EMG** key on bottom left of PTT keypad until the **EMG** indicators are displayed.
- Display will then read **SELF** and you will remain the speaker for approximately 30 seconds. Your speaker assignment will automatically be released after approximately 10 seconds of silence.
- You can talk on the talkgroup for up to 30 seconds without pressing the PTT.
- If you wish to hear a response prior to the expiration of those 30 seconds, press and release the PTT and the talkgroup will become available to other speakers.

Private Mode (Optional)

Private Mode allows point-to-point communication between two MTs using PTT functionality. It is a separate talkgroup not a feature of a talkgroup. Therefore, to have Private Mode, a customer would have a minimum of two talkgroups configured on each MT, one standard and one private. Like standard dispatch talkgroups, a private talkgroup is half-duplex, identical to standard dispatch. A private talkgroup is always located on tag 00. To activate Private Mode:

- Press **GRP** and toggle to tag 00 or enter 00.
- Display will read 00:DN??.
- Enter the four-digit DN of the MT you are trying to reach.
- Press and hold PTT and speak when display reads SELF.

Note: *If the person you are trying to reach does not have their MT powered on, or is tuned to an active talkgroup call, you will be unable to pull them into a Private Mode call.*

Dial-In Dispatch (Optional)

The Dial-In Dispatch service provides the ability for anyone with access to a standard telephone, which could be a landline, cellular, or satellite telephone without dispatch service, to dial directly into a dispatch talkgroup. The number is supplied by the MSV Customer Service Center (CSC) when the Dial-In Dispatch feature is configured. Customers need to provide a four-digit pin number that MSV will program into the talkgroup for access.

To activate Dial-In Dispatch:

- Dial the 10-digit telephone number supplied by the CSC.
- At the beep enter four-digit pin number followed by #.

  Note: *If you have not received a response within the 10 second talkgroup hangtimer you will lose the connection and will need to retry the entire Dial-In Dispatch process.*

- Press 4 to enable PTT and speak, when finished speaking press * to release PTT.

  Note: *The dial-in dispatcher will hear a click and can then begin speaking.*

- The dial-in dispatcher can always be heard on the talkgroup, even if the 4 or * is not pressed.
- To leave talkgroup, hang up the phone.

Dial-Out Dispatch (Optional)

The Dial-Out Dispatch service allows the user's network administrator to assign a single telephone number to the talkgroup that can be automatically dialed from any MT. This feature allows the talkgroup to communicate with a home base whenever the need arises. Dial-Out Dispatch is a subscription feature that must be activated by MSV before it can be utilized. The dial-out number is supplied by the customer at account set-up, and is configured into the talkgroup by MSV.

To activate Dial-Out Dispatch:

- Press and hold PTT until **SELF** appears on the display.
- Continue holding PTT and press **SEND**.
- The display will read **SETUP*TEARDOWN#** – press * and release the PTT.
- The MSV dispatch network will automatically dial the assigned telephone number.
- You will hear the phone ring and the dialed party will join the talkgroup by answering the phone.

  Note: *The dialed party is the priority speaker.*

- To respond you need to press and hold PTT to speak and release when finished.

  Note: *Everyone on the talkgroup will be able to hear the conversation.*

- To remove Dial-Out Dispatch, the current talkgroup speaker must press the **STO/END** key.

Frequently Asked Questions

Q: My PTT display says NOSEL and my dispatch is not working.
A: Press GRP button and use up or down arrows to scroll through the talkgroups and select desired talkgroup.

Q: My PTT display says NET BAR and it's not allowing me to transmit.
A: Press the BAR button; this acts as a toggle switch.

Q: I see TXFAIL on my display.
A: Wait a few seconds and try again, be sure to firmly press and hold the PTT button only once. If the problem persists call the CSC.

Q: I see RETRYING on my display.
A: Wait a few seconds and try again. Someone else may be trying to access the talkgroup a the same time. The MSV network will automatically handle network contention to avoid garbled transmissions from two users trying to speak at the same time.

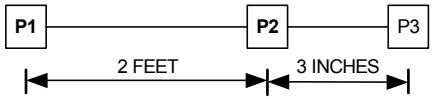
Q: I'm using a transportable unit and NO SVC will not disappear from the display.
A: If using the ST251 or ST151: position the antenna toward the satellite. After you achieve the best signal strength as indicated by the Return Signal Strength Indicator (RSSI) on the handset display, press * for satellite acquisition.

Sufficient signal strength (measured by RSSI): ST111, ST141, ST121, ST151 — RSSI is 17-24; ST251 — RSSI is 46-54.

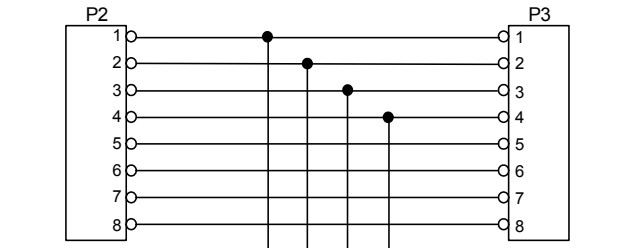
Q: What is my Directory Number (DN)?
A: To learn your DN press FCN 11 on the PTT. A DN can be any number between 0001-9999. You are automatically assigned a DN when dispatch service is added to your MT.

Rev	ECO	Date
A		

PURCHASED PART

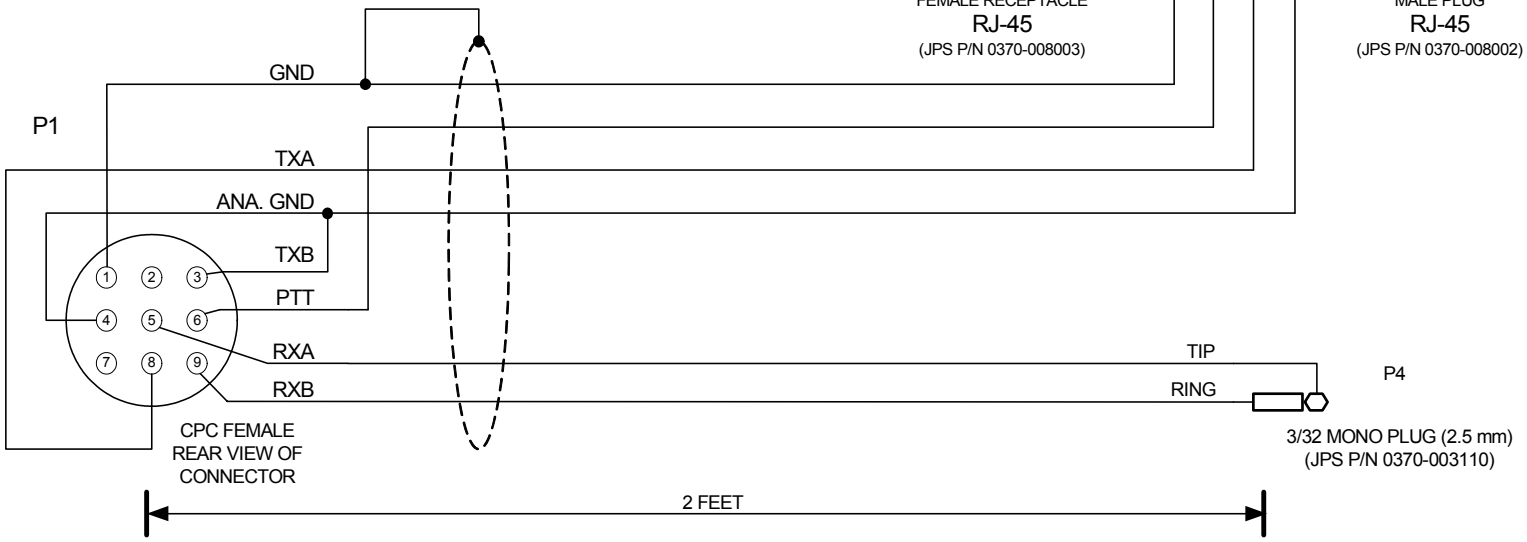


USE MOLDED CABLE
(JPS P/N 5961-261003-00)



FEMALE RECEPTACLE
RJ-45
(JPS P/N 0370-008003)

MALE PLUG
RJ-45
(JPS P/N 0370-008002)



COMPONENT PCB (JPS P/N 5961-271000)
JU1
JU2
JU4
JU5

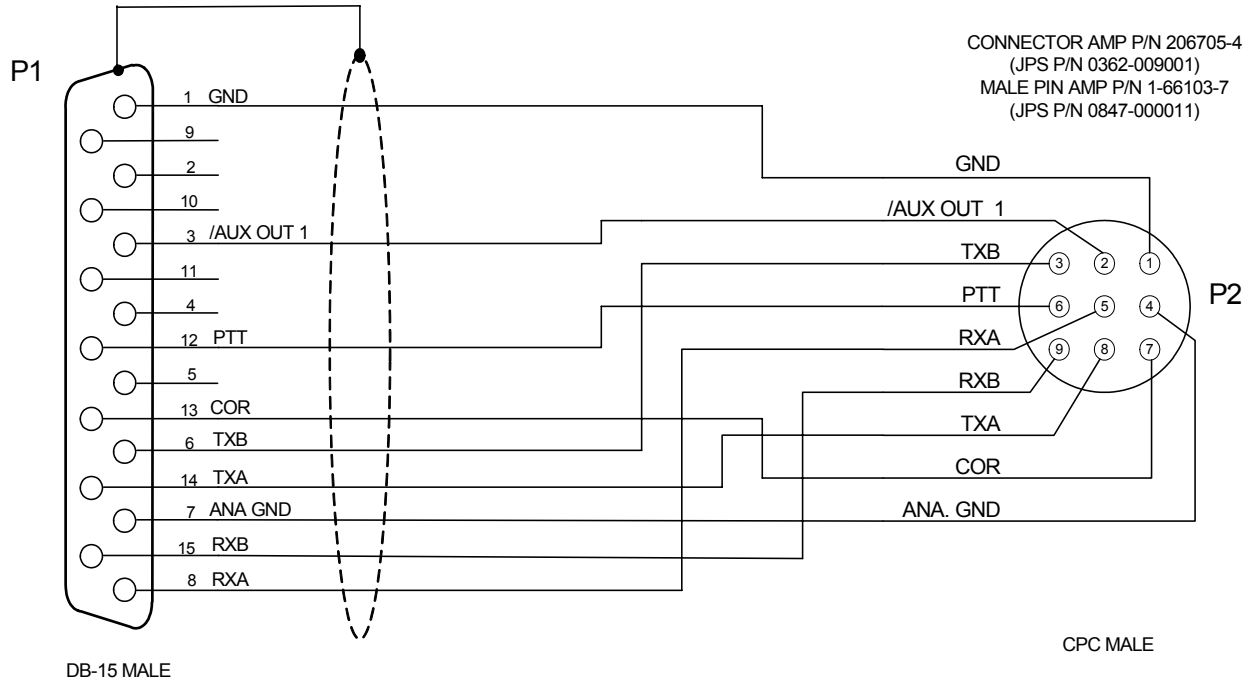
NOTE: SHIELD DRAIN CONNECTED TO PIN 1 OF P1 ONLY.

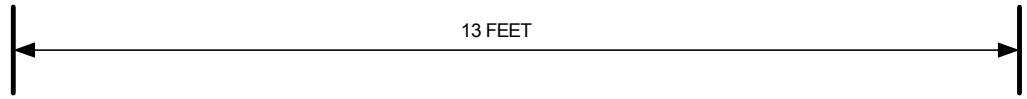
USED WITH:
MITSUBISHI ST211 SATELLITE TRANSCEIVER (RADIO ONLY)
MITSUBISHI ST221 SATELLITE TRANSCEIVER (RADIO ONLY)
MITSUBISHI ST251 SATELLITE TRANSCEIVER (RADIO ONLY)

Designed By: CTS	Raytheon JPS Communications Raleigh, NC USA		
Drawn By: EDV	Title: CABLE, CPC TO MITSUBISHI ST211		
Checked By: JAC	Size: A	Document Number: **5961-271251**	Rev: A
	Issued Date: NOVEMBER 5, 2003		Sheet 1 of 1

PURCHASED PART

Rev	ECO	Date
A		





NOTES:
1) USE BELDEN 9934 SHIELDED CABLE.
2) CONNECT SHIELD DRAIN TO SHELL OF P1 ONLY.
3) CONNECTORS P1 AND P2 MUST BE MOLDED TO THE CABLE.
4) CABLE MUST BE LABELED WITH THE RAYTHEON/JPS P/N AND REV, VENDOR CODE AND DATE (MM/YY).

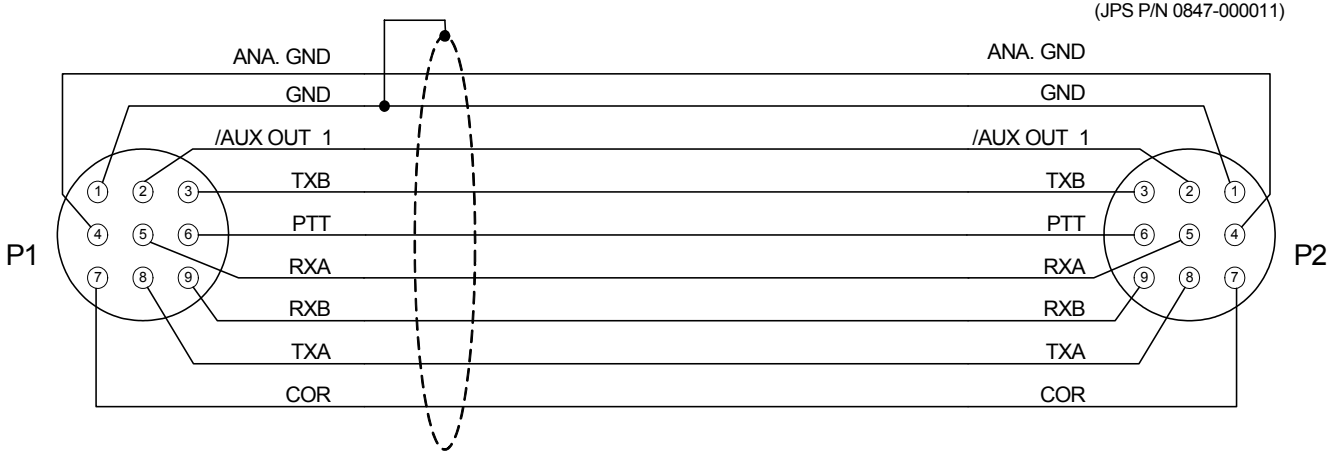
Designed By: JAC	Raytheon JPS Communications		
Drawn By: JAC	Title: CABLE, ACU-1000 RADIO EXTENSION - 13 FT		
Checked By: RBP	Size: A	Document Number: **5961-261002-00**	Rev: A
	Issued Date: JANUARY 5, 2004		Sheet 1 of 1

Rev	ECO	Date
A		

PURCHASED PART

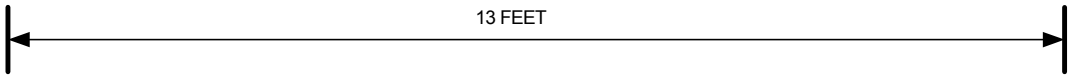
CONNECTOR AMP P/N 206708-1
(JPS P/N 0362-005003)
FEMALE PIN AMP P/N 1-66105-8
(JPS P/N 0362-005002)

CONNECTOR AMP P/N 206705-4
(JPS P/N 0362-009001)
MALE PIN AMP P/N 1-66103-7
(JPS P/N 0847-000011)



CPC FEMALE

CPC MALE



NOTES:
1) USE BELDEN 9934 SHIELDED CABLE.
2) CONNECT SHIELD DRAIN TO PIN 1 OF P1 ONLY.
3) CONNECTORS P1 AND P2 MUST BE MOLDED TO THE CABLE.
4) CABLE MUST BE LABELED WITH THE RAYTHEON/JPS P/N AND REV, VENDOR CODE AND DATE (MM/YY).

Designed By: JAC	Raytheon JPS Communications Raleigh, NC USA		
Drawn By: JAC	Title: CABLE, ACU-T RADIO EXTENSION - 13 FT		
Checked By: RBP	Size: A	Document Number: **5961-281013-00**	Rev: A
	Issued Date: JANUARY 5, 2004		Sheet 1 of 1