# UB-54

## Breakout Panel
## Installation and Operation Manual

**Part Number MN/UB54.IOM Revision 1**

# UB-54

## Breakout Panel
## Installation and Operation Manual

Comtech EFData is an ISO 9001
Registered Company.

Part Number MN/UB54.IOM
Revision 1
November 11, 1997


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For more information regarding the warranty policies, see Warranty Policy, p. vi.

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## Overview of Changes to Previous Edition

A summary of the changes made to Rev. 0 includes:

- Incorporated various (non-technical) changes (e.g. formatting).
- Updated table 2-2, (Tributary #1 Circuit Assignment) (J1).
- Updated table 2-4, (Tributary #3 Circuit Assignment) (J3).
- Updated table 2-10, (Auxiliary Circuit Pin Assignments) (J9).
  Updated table 2-13, (Receive Aggregate Pin Assignments) (J11).

## About this Manual

This manual provides installation and operation information for the EFData UB-54 breakout panel. This is a technical document intended for earth station engineers, technicians, and operators responsible for the operation and maintenance of the UB-54.

## Conventions and References

## Cautions and Warnings


***CAUTION indicates a hazardous situation that, if not avoided, may result in minor or moderate injury. CAUTION may also be used to indicate other unsafe practices or risks of property damage.***


***WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.***

## Metric Conversion

Metric conversion information is located on the inside back cover of this manual. This information is provided to assist the operator in cross-referencing English to Metric conversions.

## Recommended Standard Designations

Recommended Standard (RS) Designations have been superseded by the new designation of the Electronic Industries Association (EIA). References to the old designations are shown only when depicting actual text displayed on the screen of the unit (RS-232, RS-485, etc.). All other references in the manual will be shown with the EIA designations (EIA-232, EIA-485, etc.) only.

## Trademarks

Other product names mentioned in this manual may be trademarks or registered trademarks of their respective companies and are hereby acknowledged.

## Reporting Comments or Suggestions Concerning this Manual

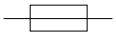
Comments and suggestions regarding the content and design of this manual will be appreciated. To submit comments, please contact the Comtech EFData Customer Support Department.

## Low Voltage Directive (LVD)

The following information is applicable for the European Low Voltage Directive (EN60950):

| | |
|---|---|
| <HAR> | Type of power cord required for use in the European Community. |
|  | CAUTION: Double-pole/Neutral Fusing.<br><br>ACHTUNG: Zweipolige bzw. Neutralleiter-Sicherung. |

International Symbols:

| Symbol | Definition |
|---|---|
|  | **Alternating Current.** |
|  | **Fuse.** |

| Symbol | Definition |
|---|---|
|  | **Protective Earth.** |
|  | **Chassis Ground.** |

**Note:** For additional symbols, refer to “Cautions” listed earlier in this preface. Applicable testing is routinely performed as a condition of manufacturing on all units to ensure compliance with safety requirements of EN60950.

## Warranty Policy

This Comtech EFData product is warranted against defects in material and workmanship for a period of one year from the date of shipment. During the warranty period, Comtech EFData will, at its option, repair or replace products that prove to be defective.

For equipment under warranty, the customer is responsible for freight to Comtech EFData and all related custom, taxes, tariffs, insurance, etc. Comtech EFData is responsible for the freight charges **only** for return of the equipment from the factory to the customer. Comtech EFData will return the equipment by the same method (i.e., Air, Express, Surface) as the equipment was sent to Comtech EFData.

## Limitations of Warranty

The foregoing warranty shall not apply to defects resulting from improper installation or maintenance, abuse, unauthorized modification, or operation outside of environmental specifications for the product, or, for damages that occur due to improper repackaging of equipment for return to Comtech EFData.

***No other warranty is expressed or implied. Comtech EFData specifically disclaims the implied warranties of merchantability and fitness for particular purpose.***

## Exclusive Remedies

The remedies provided herein are the buyer's sole and exclusive remedies. Comtech EFData shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

## Disclaimer

Comtech EFData has reviewed this manual thoroughly in order that it will be an easy-to-use guide to your equipment. All statements, technical information, and recommendations in this manual and in any guides or related documents are believed reliable, but the accuracy and completeness thereof are not guaranteed or warranted, and they are not intended to be, nor should they be understood to be, representations or warranties concerning the products described. Further, Comtech EFData reserves the right to make changes in the specifications of the products described in this manual at any time without notice and without obligation to notify any person of such changes.

If you have any questions regarding your equipment or the information in this manual, please contact the Comtech EFData Customer Support Department.

# Chapter 1. INTRODUCTION

The UB-54 (Figure 1-1) functions as an 8-channel multiplexer (MUX) or 8-channel demultiplexer (DEMUX) data breakout panel in one small, rack-mountable unit.

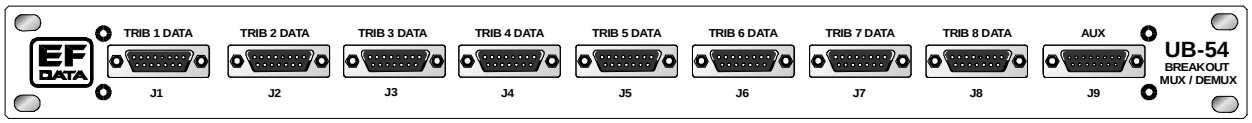



**Figure 1-1. UB-54 Breakout Panel**

## 1.1 Overview

The breakout panel is used to provide a convenient access to tributary data when an 8-channel MUX or 8-channel DEMUX is used.

Major UB-54 features include:

- Breakout of the 100-pin, 8-channel MUX interface connector through nine standard 15-pin D connectors (8 tributary connectors plus 1 auxiliary circuit connector). Refer to the SDM-300 Satellite Modem Installation and Operation manual for more information.

- Breakout of the three rear panel 25-pin D 8 channel DEMUX interface connectors through nine standard 15-pin D connectors (8 tributary connectors plus 1 auxiliary circuit connector). Refer to the SDR-54 Satellite Demodulator Installation and Operation manual for more information.

- An auxiliary circuit connector to provide easy access to 8-channel Mux Master Clock inputs, Demod and Mod fault indicators, and Demux aggregate clock and data signals.

## 1.2 Description

The UB-54 is a standard one unit (1U) rack-mountable chassis.

The unit consists of a printed circuit board and connectors. The connectors are located at the front and rear panels. Refer to Chapter 2 for connector specifications.

The UB-54 consists of the following assemblies:

| Assembly | Part # |
|---|---|
| Chassis | AS/5986 |
| Printed Circuit Board | AS/6027 |

**Note:** The electrical specifications for the UB-54 meet or exceed the electrical requirements of the interfacing modem.

Refer to Figure 1-2 for a schematic illustration of the breakout panel.

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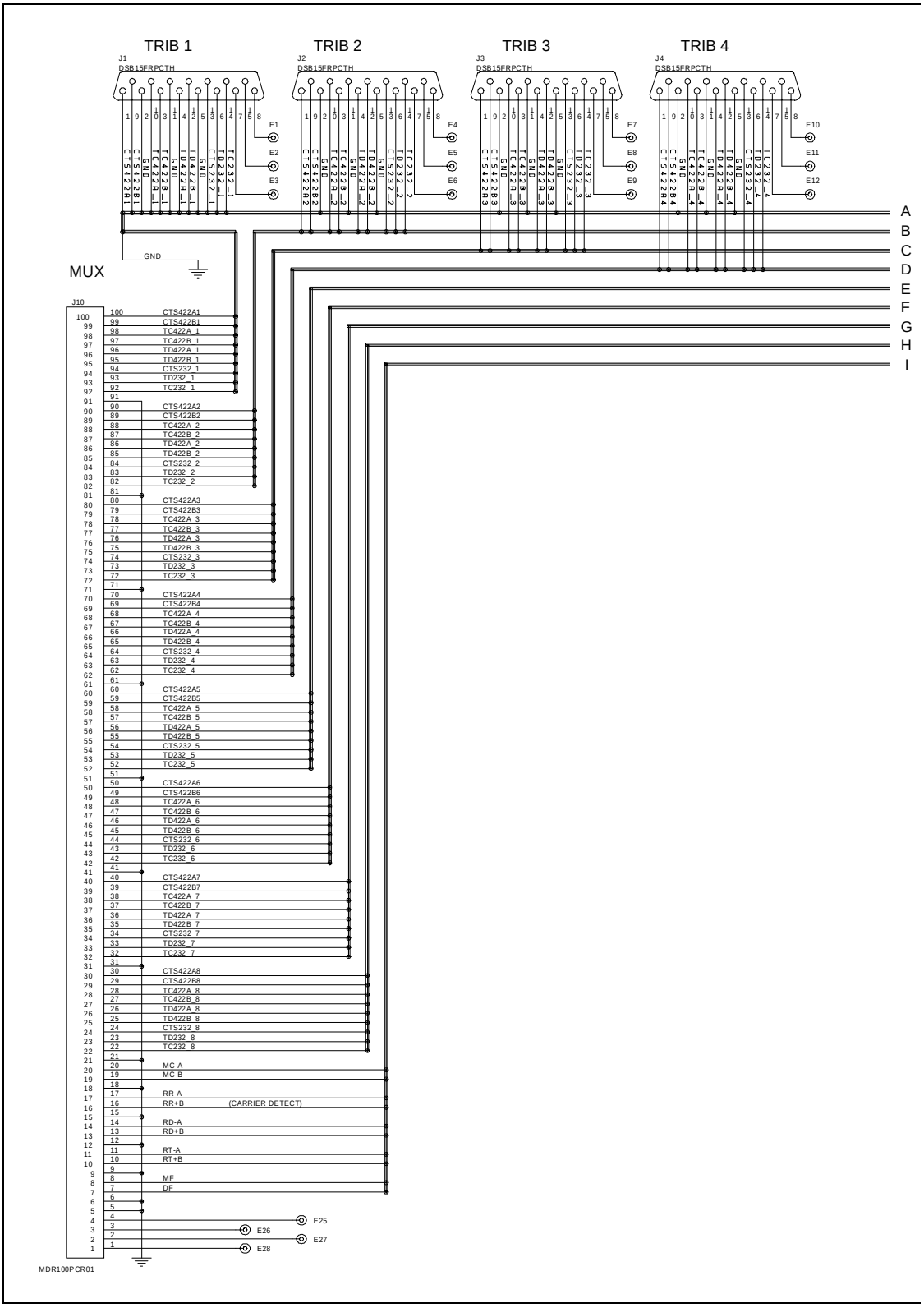


**Figure 1-2. UB-54 Breakout Panel Schematic**

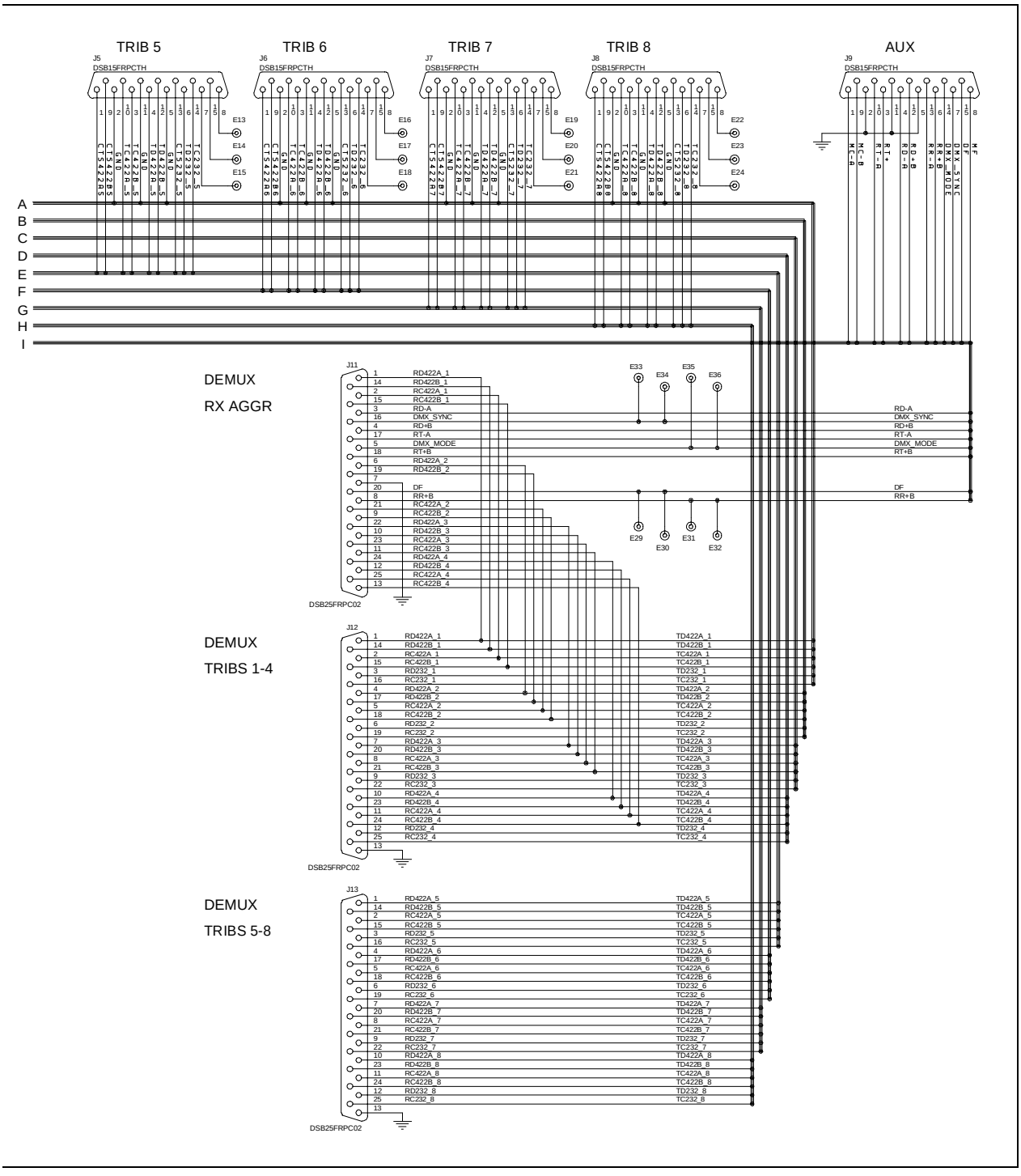


**Figure 1-2. UB-54 Breakout Panel Schematic (continued)**

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# 2 Chapter 2. INSTALLATION

This chapter provides unpacking and installation instructions, and a description of external connections.

## 2.1 Unpacking

The breakout panel and manual are packaged in a pre-formed, reusable, cardboard carton containing foam spacing for maximum protection.


*Do not use any cutting tool that will extend more than 1", (2.540 cm), into the container. This can cause damage to the breakout panel.*

1. Cut the tape at the top of the carton, where it is labeled "OPEN THIS END."
2. Lift out the cardboard/foam spacer covering the breakout panel.
3. Remove the breakout panel, manual, and power cord from the carton.
4. Save the packing material for reshipment.
5. Inspect the equipment for any possible damage incurred during shipment.
6. Check the equipment against the packing list to ensure the shipment is correct.
7. Refer to Section 2.2 for installation instructions.

## 2.2 Installation

The breakout panel arrives fully assembled from the factory. Install the breakout panel as follows:

1. Position the breakout panel in the rack.

2. Secure the breakout panel to the rack using 10-32 screws.

3. Connect the cables to the front and/or rear panel (refer to Figure 2-1). Refer to Section 2.3 for connector pinout, placement, and function.

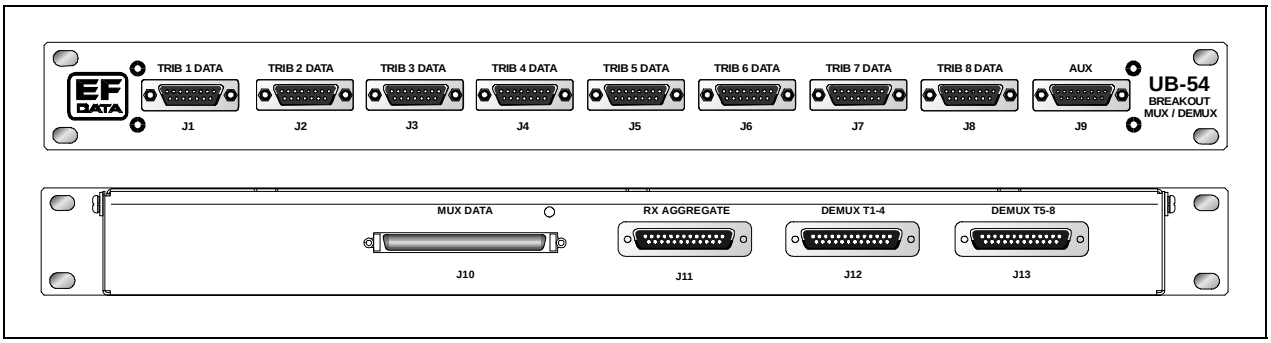


**Figure 2-1. UB-54 Front and Rear Views**

**Note:** One UB-54 breakout panel can be used with a multiplexer or a demultiplexer, but not both at the same time.

4. (Used with a Multiplexer only) Connect breakout panel to the SDM-300 Satellite Modem using a 100-pin ribbon cable conforming to Table 2-12, (Comtech EFData Part No. CA/90101G100-3 or equivalent) as shown in Figure 2-2.

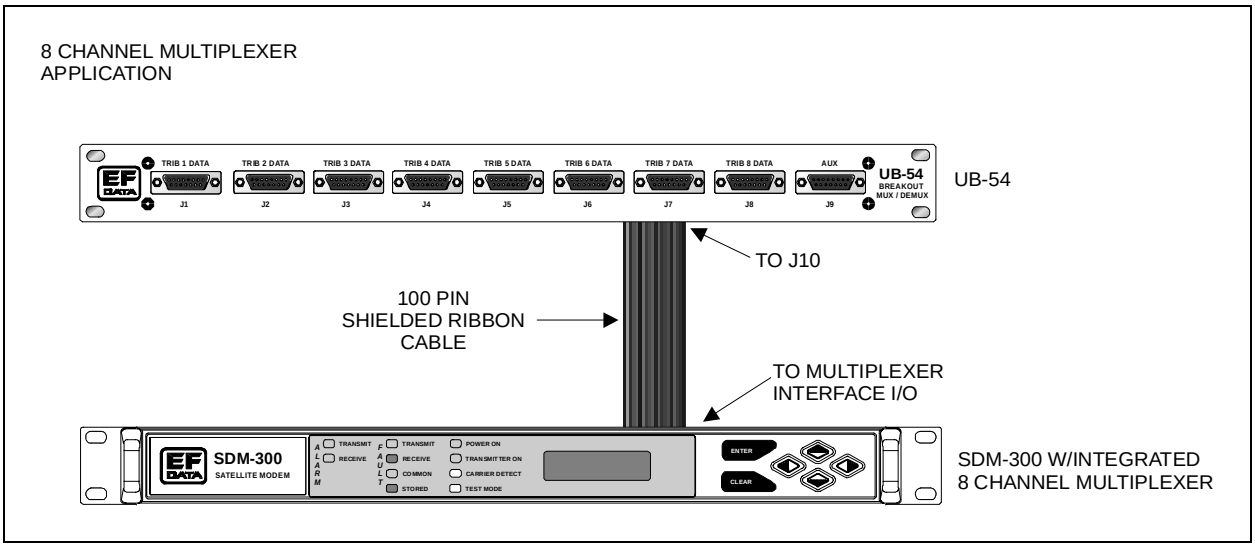


**Figure 2-2. UB-54 to SDM-300 Interconnection Diagram**

5. (Used with DEMUX only) Connect the breakout panel to the SDR-54 Demodulator using three standard 25-pin interface cables conforming to Tables 2-13, 2-14, and 2-15 as shown in Figure 2-3.

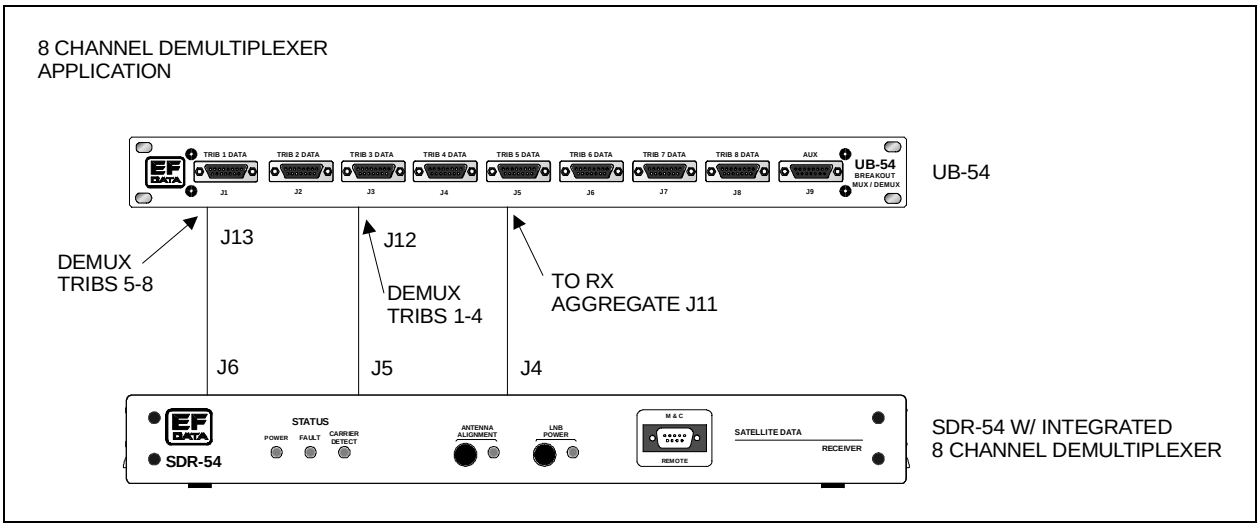


**Figure 2-3. UB-54 to SDR-54 Interconnection Diagram**

6. If problems exist with the installation, contact Comtech EFData Customer Support for additional information.

## 2.3 External Connections and Circuit Assignments

### 2.3.1 Front Panel Connectors

The location of the connectors are shown in Figure 2-1. Refer to Table 2-1 for a list of UB-54 front panel connectors.

**Table 2-1. Front Panel Connectors**

| Ref. Desig. | Type | Interface Function |
|---|---|---|
| J1 | 15-pin D socket | EIA-422 or EIA-232 Tributary 1 Clock and Data |
| J2 | 15-pin D socket | EIA-422 or EIA-232 Tributary 2 Clock and Data |
| J3 | 15-pin D socket | EIA-422 or EIA-232 Tributary 3 Clock and Data |
| J4 | 15-pin D socket | EIA-422 or EIA-232 Tributary 4 Clock and Data |
| J5 | 15-pin D socket | EIA-422 or EIA-232 Tributary 5 Clock and Data |
| J6 | 15-pin D socket | EIA-422 or EIA-232 Tributary 6 Clock and Data |
| J7 | 15-pin D socket | EIA-422 or EIA-232 Tributary 7 Clock and Data |
| J8 | 15-pin D socket | EIA-422 or EIA-232 Tributary 8 Clock and Data |
| J9 | 15-pin D socket | Auxiliary Data |

## 2.3.2 Circuit Assignments for Front Panel Connectors

Refer to Table 2-2 through 2-10 for circuit assignments.

**Table 2-2. Tributary #1 Circuit Assignments (J1)**

| TRIB 1 J1 | MUX | | DEMUX | |
|---|---|---|---|---|
| **Pin #** | **Circuit** | **Description** | **Circuit** | **Description** |
| 1 | CTS422A | EIA-422, Clear to Send A(-) | - | N/A |
| 2,5,11 | GND | Ground | GND | Ground |
| 3 | TC422B | EIA-422, Transmit Clock B(+) | RC422B | EIA-422, Receive Clock B(+) |
| 4 | TD422A | EIA-422, Transmit Data A(-) | RD422A | EIA-422, Receive Data A(-) |
| 6 | TD232 | EIA-232, Transmit Data | RD232 | EIA-232, Receive Data |
| 9 | CTS422B | EIA-422, Clear to Send B(+) | - | N/A |
| 10 | TC422A | EIA-422, Transmit Clock A(-) | RC422A | EIA-422, Receive Clock A(-) |
| 12 | TD422B | EIA-422, Transmit Data B(+) | RD422B | EIA-422, Receive Data B(+) |
| 13 | CTS232 | EIA-232, Clear to Send | - | N/A |
| 14 | TC232 | EIA-232, Transmit Clock | RC232 | EIA-232, Receive Clock |

**Table 2-3. Tributary #2 Circuit Assignments (J2)**

| TRIB 2 J2 | MUX | | DEMUX | |
|---|---|---|---|---|
| **Pin #** | **Circuit** | **Description** | **Circuit** | **Description** |
| 1 | CTS422A | EIA-422, Clear to Send A(-) | - | N/A |
| 2,5,11 | GND | Ground | GND | Ground |
| 3 | TC422B | EIA-422, Transmit Clock B(+) | RC422B | EIA-422, Receive Clock B(+) |
| 4 | TD422A | EIA-422, Transmit Data A(-) | RD422A | EIA-422, Receive Data A(-) |
| 6 | TD232 | EIA-232, Transmit Data | RD232 | EIA-232, Receive Data |
| 9 | CTS422B | EIA-422, Clear to Send B(+) | - | N/A |
| 10 | TC422A | EIA-422, Transmit Clock A(-) | RC422A | EIA-422, Receive Clock A(-) |
| 12 | TD422B | EIA-422, Transmit Data B(+) | RD422B | EIA-422, Receive Data B(+) |
| 13 | CTS232 | EIA-232, Clear to Send | - | N/A |
| 14 | TC232 | EIA-232, Transmit Clock | RC232 | EIA-232, Receive Clock |

### Table 2-4. Tributary #3 Circuit Assignments (J3)

| TRIB 3 J3 | MUX | | DEMUX | |
|---|---|---|---|---|
| **Pin #** | **Circuit** | **Description** | **Circuit** | **Description** |
| 1 | CTS422A | EIA-422, Clear to Send A(-) | - | N/A |
| 2,5,11 | GND | Ground | GND | Ground |
| 3 | TC422B | EIA-422, Transmit Clock B(+) | RC422B | EIA-422, Receive Clock B(+) |
| 4 | TD422A | EIA-422, Transmit Data A(-) | RD422A | EIA-422, Receive Data A(-) |
| 6 | TD232 | EIA-232, Transmit Data | RD232 | EIA-232, Receive Data |
| 9 | CTS422B | EIA-422, Clear to Send B(+) | - | N/A |
| 10 | TC422A | EIA-422, Transmit Clock A(-) | RC422A | EIA-422, Receive Clock A(-) |
| 12 | TD422B | EIA-422, Transmit Data B(+) | RD422B | EIA-422, Receive Data B(+) |
| 13 | CTS232 | EIA-232, Clear to Send | - | N/A |
| 14 | TC232 | EIA-232, Transmit Clock | RC232 | EIA-232, Receive Clock |

### Table 2-5. Tributary #4 Circuit Assignments (J4)

| TRIB 4 J4 | MUX | | DEMUX | |
|---|---|---|---|---|
| **Pin #** | **Circuit** | **Description** | **Circuit** | **Description** |
| 1 | CTS422A | EIA-422, Clear to Send A(-) | - | N/A |
| 2,5,11 | GND | Ground | GND | Ground |
| 3 | TC422B | EIA-422, Transmit Clock B(+) | RC422B | EIA-422, Receive Clock B(+) |
| 4 | TD422A | EIA-422, Transmit Data A(-) | RD422A | EIA-422, Receive Data A(-) |
| 6 | TD232 | EIA-232, Transmit Data | RD232 | EIA-232, Receive Data |
| 9 | CTS422B | EIA-422, Clear to Send B(+) | - | N/A |
| 10 | TC422A | EIA-422, Transmit Clock A(-) | RC422A | EIA-422, Receive Clock A(-) |
| 12 | TD422B | EIA-422, Transmit Data B(+) | RD422B | EIA-422, Receive Data B(+) |
| 13 | CTS232 | EIA-232, Clear to Send | - | N/A |
| 14 | TC232 | EIA-232, Transmit Clock | RC232 | EIA-232, Receive Clock |

### Table 2-6. Tributary #5 Circuit Assignments (J5)

| TRIB 5 J5 | MUX | | DEMUX | |
|---|---|---|---|---|
| **Pin#** | **Circuit** | **Description** | **Circuit** | **Description** |
| 1 | CTS422A | EIA-422, Clear to Send A(-) | - | N/A |
| 2,5,11 | GND | Ground | GND | Ground |
| 3 | TC422B | EIA-422, Transmit Clock B(+) | RC422B | EIA-422, Receive Clock B(+) |
| 4 | TD422A | EIA-422, Transmit Data A(-) | RD422A | EIA-422, Receive Data A(-) |
| 6 | TD232 | EIA-232, Transmit Data | RD232 | EIA-232, Receive Data |
| 9 | CTS422B | EIA-422, Clear to Send B(+) | - | N/A |
| 10 | TC422A | EIA-422, Transmit Clock A(-) | RC422A | EIA-422, Receive Clock A(-) |
| 12 | TD422B | EIA-422, Transmit Data B(+) | RD422B | EIA-422, Receive Data B(+) |
| 13 | CTS232 | EIA-232, Clear to Send | - | N/A |
| 14 | TC232 | EIA-232, Transmit Clock | RC232 | EIA-232, Receive Clock |

## Table 2-7. Tributary #6 Circuit Assignments (J6)

| TRIB 6 J6 | MUX | | DEMUX | |
|---|---|---|---|---|
| Pin # | Circuit | Description | Circuit | Description |
| 1 | CTS422A | EIA-422, Clear to Send A(-) | - | N/A |
| 2,5,11 | GND | Ground | GND | Ground |
| 3 | TC422B | EIA-422, Transmit Clock B(+) | RC422B | EIA-422, Receive Clock B(+) |
| 4 | TD422A | EIA-422, Transmit Data A(-) | RD422A | EIA-422, Receive Data A(-) |
| 6 | TD232 | EIA-232, Transmit Data | RD232 | EIA-232, Receive Data |
| 9 | CTS422B | EIA-422, Clear to Send B(+) | - | N/A |
| 10 | TC422A | EIA-422, Transmit Clock A(-) | RC422A | EIA-422, Receive Clock A(-) |
| 12 | TD422B | EIA-422, Transmit Data B(+) | RD422B | EIA-422, Receive Data B(+) |
| 13 | CTS232 | EIA-232, Clear to Send | - | N/A |
| 14 | TC232 | EIA-232, Transmit Clock | RC232 | EIA-232, Receive Clock |

## Table 2-8. Tributary #7 Circuit Assignments (J7)

| TRIB 7 J7 | MUX | | DEMUX | |
|---|---|---|---|---|
| Pin # | Circuit | Description | Circuit | Description |
| 1 | CTS422A | EIA-422, Clear to Send A(-) | - | N/A |
| 2,5,11 | GND | Ground | GND | Ground |
| 3 | TC422B | EIA-422, Transmit Clock B(+) | RC422B | EIA-422, Receive Clock B(+) |
| 4 | TD422A | EIA-422, Transmit Data A(-) | RD422A | EIA-422, Receive Data A(-) |
| 6 | TD232 | EIA-232, Transmit Data | RD232 | EIA-232, Receive Data |
| 9 | CTS422B | EIA-422, Clear to Send B(+) | - | N/A |
| 10 | TC422A | EIA-422, Transmit Clock A(-) | RC422A | EIA-422, Receive Clock A(-) |
| 12 | TD422B | EIA-422, Transmit Data B(+) | RD422B | EIA-422, Receive Data B(+) |
| 13 | CTS232 | EIA-232, Clear to Send | - | N/A |
| 14 | TC232 | EIA-232, Transmit Clock | RC232 | EIA-232, Receive Clock |

## Table 2-9. Tributary #8 Circuit Assignments (J8)

| TRIB 8 J8 | MUX | | DEMUX | |
|---|---|---|---|---|
| Pin # | Circuit | Description | Circuit | Description |
| 1 | CTS422A | EIA-422, Clear to Send A(-) | - | N/A |
| 2,5,11 | GND | Ground | GND | Ground |
| 3 | TC422B | EIA-422, Transmit Clock B(+) | RC422B | EIA-422, Receive Clock B(+) |
| 4 | TD422A | EIA-422, Transmit Data A(-) | RD422A | EIA-422, Receive Data A(-) |
| 6 | TD232 | EIA-232, Transmit Data | RD232 | EIA-232, Receive Data |
| 9 | CTS422B | EIA-422, Clear to Send B(+) | - | N/A |
| 10 | TC422A | EIA-422, Transmit Clock A(-) | RC422A | EIA-422, Receive Clock A(-) |
| 12 | TD422B | EIA-422, Transmit Data B(+) | RD422B | EIA-422, Receive Data B(+) |
| 13 | CTS232 | EIA-232, Clear to Send | - | N/A |
| 14 | TC232 | EIA-232, Transmit Clock | RC232 | EIA-232, Receive Clock |

## Table 2-10. Auxiliary Circuit Pin Assignments (J9)

| AUX J9 | MUX | | DEMUX | |
|---|---|---|---|---|
| **Pin #** | **Circuit** | **Description** | **Circuit** | **Description** |
| 1 | MC-A | Master Clock A(-) | - | N/A |
| 2,5,11 | GND | Ground | GND | Ground |
| 3 | RT+B | EIA-422, Receive Timing B(+) | RT+B | EIA-422, Receiver Timing B(+) |
| 4 | RD-A | EIA-422, Receive Data A(-) | RD-A | EIA-422, Receiver Data A(-) |
| 6 | RR+B | Receiver Ready B(+) | RR | Receiver Ready |
| 7 | - | N/A | DSYNC | DEMUX SYNC |
| 8 | MF | MOD Fault | - | N/A |
| 9 | MC-B | Master Clock B(+) | - | N/A |
| 10 | RT-A | EIA-422, Receive Timing A(-) | RT-A | EIA-422, Receiver Timing A(-) |
| 12 | RD+B | EIA-422, Receive Data B(+) | RD+B | EIA-422, Receiver Data B(+) |
| 13 | RR-A | Receiver Ready A(-) | - | N/A |
| 14 | - | N/A | DMODE | DEMUX Mode |
| 15 | DF | DEMOD Fault | --- | N/A |

## 2.3.3 Rear Panel Connectors

The location of the connectors are shown in Figure 2-1. Refer to Table 2-11 for a list of UB-54 rear panel connectors.

**Table 2-11. Rear Panel Connectors**

| Ref. Desig. | Type | Interface Function |
|---|---|---|
| J10 | 100-pin miniature D | MUX Data and Tributaries 1-8 |
| J11 | 25-pin D socket | Rx Aggregate |
| J12 | 25-pin D socket | DEMUX Tributaries 1-4 |
| J13 | 25-pin D socket | DEMUX Tributaries 5-8 |

## 2.3.4 Circuit Assignments for Rear Panel Connectors

Refer to Tables 2-12, 2-13, 2-14, and 2-15 for circuit assignments for rear panel connectors.

## Table 2-12. MUX Data Pin Assignments (J10)

| J10 | MUX Data | | | | |
|---|---|---|---|---|---|
| Pin # | Circuit | Description | Pin # | Circuit | Description |
| 1 | - | N/A | 51 | GND | Ground |
| 2 | - | N/A | 52 | TC232_5 | EIA-232,Transmit Clock,TRIB5 |
| 3 | - | N/A | 53 | TD232_5 | EIA-232,Transmit Data,TRIB5 |
| 4 | - | N/A | 54 | CTS232_5 | EIA-232,Clear to Send,TRIB5 |
| 5 | GND | Ground | 55 | TD422B_5 | EIA-422,Transmit Data B(+),TRIB5 |
| 6 | GND | Ground | 56 | TD422A_5 | EIA-422,Transmit Data A(-),TRIB5 |
| 7 | DF | DEMOD Fault | 57 | TC422B_5 | EIA-422,Transmit Clock B(+),TRIB5 |
| 8 | MF | MOD Fault | 58 | TC422A_5 | EIA-422,Transsmit Clock A(-),TRIB5 |
| 9 | GND | Ground | 59 | CTS422B5 | EIA-422,Clear to Send B(+),TRIB5 |
| 10 | RT+B | Receive Timing B(+) | 60 | CTS422A5 | EIA-422,Clear to Send A(-),TRIB5 |
| 11 | RT-A | Receive Timing A(-) | 61 | GND | Ground |
| 12 | GND | Ground | 62 | TC232_4 | EIA-232,Transmit Clock,TRIB4 |
| 13 | RD+B | Receive Data B(+) | 63 | TD232_4 | EIA-232,Transmit Data,TRIB4 |
| 14 | RD-A | Receive Data A(-) | 64 | CTS232_4 | EIA-232,Clear to Send,TRIB4 |
| 15 | GND | Ground | 65 | TD422B_4 | EIA-422,Transmit Data B(+),TRIB4 |
| 16 | RR+B | Receiver Ready B(+) | 66 | TD422A_4 | EIA-422,Transmit Data A(-),TRIB4 |
| 17 | RR-A | Receiver Ready A(-) | 67 | TC422B_4 | EIA-422,Transmit Clock B(+),TRIB4 |
| 18 | GND | Ground | 68 | TC422A_4 | EIA-422,Transmit Clock A(-),TRIB4 |
| 19 | TMUXDAT | Transmit Aggregate Data | 69 | CTS422B4 | EIA-422,Clear to Send B(+),TRIB4 |
| 20 | TMUXCLK | Transmit Aggregate Clock | 70 | CTS422A4 | EIA-422,Clear to Send A(-),TRIB4 |
| 21 | GND | Ground | 71 | GND | Ground |
| 22 | TC232_8 | EIA-232,Transmit Clock,TRIB8 | 72 | TC232_3 | EIA-232,Transmit Clock,TRIB3 |
| 23 | TD232_8 | EIA-232,Transmit Data,TRIB8 | 73 | TD232_3 | EIA-232,Transmit Data,TRIB3 |
| 24 | CTS232_8 | EIA-232,Clear to Send,TRIB8 | 74 | CTS232_3 | EIA-232,Clear to Send,TRIB3 |
| 25 | TD422B_8 | EIA-422,Transmit Data B(+),TRIB8 | 75 | TD422B_3 | EIA-422,Transmit Data B(+),TRIB3 |
| 26 | TD422A_8 | EIA-422,Transmit Data (-),TRIB8 | 76 | TD422A_3 | EIA-422,Transmit Data A(-),TRIB3 |
| 27 | TC422B_8 | EIA-422,Transmit Clock B(+),TRIB8 | 77 | TC422B_3 | EIA-422,Transmit Clock B(+),TRIB3 |
| 28 | TC422A_8 | EIA-422,Transmit Clock A(-),TRIB8 | 78 | TC422A_3 | EIA-422,Transmit Clock A(-),TRIB3 |
| 29 | CTS422B8 | EIA-422,Clear to Send B(+),TRIB8 | 79 | CTS422B3 | EIA-422,Clear to Send B(+),TRIB3 |
| 30 | CTS422A8 | EIA-422,Clear to Send A(-),TRIB8 | 80 | CTS422A3 | EIA-422,Clear to Send A(-),TRIB3 |
| 31 | GND | Ground | 81 | GND | Ground |
| 32 | TC232_7 | EIA-232,Transmit Clock,TRIB7 | 82 | TC232_2 | EIA-232,Transmit Clock,TRIB2 |
| 33 | TD232_7 | EIA-232,Transmit Data,TRIB7 | 83 | TD232_2 | EIA-232,Transmit Data,TRIB2 |
| 34 | CTS232_7 | EIA-232,Clear to Send,TRIB7 | 84 | CTS232_2 | EIA-232,Clear to Send,TRIB2 |
| 35 | TD422B_7 | EIA-422,Transmit Data B(+),TRIB7 | 85 | TD422B_2 | EIA-422,Transmit Data B(+),TRIB2 |
| 36 | TD422A_7 | EIA-422,Transmit Data A(-),TRIB7 | 86 | TD422A_2 | EIA-422,Transmit Data A(-),TRIB2 |
| 37 | TC422B_7 | EIA-422,Transmit Clock B(+),TRIB7 | 87 | TC422B_2 | EIA-422,Transmit Clock B(+),TRIB2 |
| 38 | TC422A_7 | EIA-422,Transmit Clock A(-),TRIB7 | 88 | TC422A_2 | EIA-422,Transmit Clock A(-),TRIB2 |
| 39 | CTS422B7 | EIA-422,Clear to Send B(+),TRIB7 | 89 | CTS422B2 | EIA-422,Clear to Send B(+),TRIB2 |
| 40 | CTS422A7 | EIA-422,Clear to Send A(-),TRIB7 | 90 | CTS422A2 | EIA-422,Clear to Send A(-),TRIB2 |
| 41 | GND | Ground | 91 | GND | Ground |
| 42 | TC232_6 | EIA-232,Transmit Clock,TRIB6 | 92 | TC232_1 | EIA-232,Transmit Clock,TRIB1 |
| 43 | TD232_6 | EIA-232,Transmit Data,TRIB6 | 93 | TD232_1 | EIA-232,Transmit Data,TRIB1 |
| 44 | CTS232_6 | EIA-232,Clear to Send,TRIB6 | 94 | CTS232_1 | EIA-232,Clear to Send,TRIB1 |
| 45 | TD422B_6 | EIA-422,Transmit Data B(+),TRIB6 | 95 | TD422B_1 | EIA-422,Transmit Data B(+),TRIB1 |
| 46 | TD422A_6 | EIA-422,Transmit Data A(-),TRIB6 | 96 | TD422A_1 | EIA-422,Transmit Data A(-),TRIB1 |
| 47 | TC422B_6 | EIA-422,Transmit Clock B(+),TRIB6 | 97 | TC422B_1 | EIA-422,Transmit Clock B(+),TRIB1 |
| 48 | TC422A_6 | EIA-422,Transmit Clock A(-),TRIB6 | 98 | TC422A_1 | EIA-422,Transmit Clock A(-),TRIB1 |
| 49 | CTS422B6 | EIA-422,Clear to Send B(+),TRIB6 | 99 | CTS422B1 | EIA-422,Clear to Send B(+),TRIB1 |
| 50 | CTS422A6 | EIA-422,Clear to Send A(-),TRIB6 | 100 | CTS422A1 | EIA-422,Clear to Send A(-),TRIB1 |

**Table 2-13. Receive Aggregate Pin Assignments (J11)**

| J11 | RX Aggregate | |
|---|---|---|
| **Pin #** | **Circuit** | **Description** |
| 1 | RD422A_1 | EIA-422,Receive Data A(-),TRIB1 |
| 2 | RC422A_1 | EIA-422,Receive Clock A(-),TRIB1 |
| 3 | RD-A | EIA-422, Receive Data A(-) |
| 4 | RD+B | EIA-422, Receive Data B(+) |
| 5 | DMODE | DEMUX Mode |
| 6 | RD422A_2 | EIA-422,Receive Data A(-),TRIB2 |
| 7 | GND | Ground |
| 8 | RR+B | Receiver Ready B(+) |
| 9 | RC422B_2 | EIA-422,Receive Clock B(+),TRIB2 |
| 10 | RD422B_3 | EIA-422,Receive Data B(+),TRIB3 |
| 11 | RC422B_3 | EIA-422,Receive Clock B(+),TRIB3 |
| 12 | RD422B_4 | EIA-422,Receive Data B(+),TRIB4 |
| 13 | RC422B_4 | EIA-422,Receive Clock B(+),TRIB4 |
| 14 | RD422B_1 | EIA-422,Receive Data B(+),TRIB1 |
| 15 | RC422B_1 | EIA-422,Receive Clock B(+),TRIB1 |
| 16 | DSYNC | DEMUX SYNC |
| 17 | RT-A | EIA-422, Receive Timing A(-) |
| 18 | RT+B | EIA-422, Receive Timing B(+) |
| 19 | RD422B_2 | EIA-422,Receive Data B(+),TRIB2 |
| 20 | DF | DEMOD Fault (From MUX) |
| 21 | RC422A_2 | EIA-422,Receive Clock A(-),TRIB2 |
| 22 | RD422A_3 | EIA-422,Receive Data A(-),TRIB3 |
| 23 | RC422A_3 | EIA-422,Receive Clock A(-),TRIB3 |
| 24 | RD422A_4 | EIA-422,Receive Data A(-),TRIB4 |
| 25 | RC422A_4 | EIA-422,Receive Clock A(-),TRIB4 |

**Table 2-14. DEMUX T1 Through T4 Pin Assignments (J12)**

| J12 | DEMUX T1 through T4 | |
|---|---|---|
| **Pin #** | **Circuit** | **Description** |
| 1 | RD422A_1 | EIA-422,Receive Data A(-),TRIB1 |
| 2 | RC422A_1 | EIA-422,Receive Clock A(-),TRIB1 |
| 3 | RD232_1 | EIA-232,Receive Data A ,TRIB1 |
| 4 | RD422A_2 | EIA-422,Receive Data A(-),TRIB2 |
| 5 | RC422A_2 | EIA-422,Receive Clock A(-),TRIB2 |
| 6 | RD232_2 | EIA-232,Receive Data A ,TRIB2 |
| 7 | RD422A_3 | EIA-422,Receive Data A(-),TRIB3 |
| 8 | RC422A_3 | EIA-422,Receive Clock A(-),TRIB3 |
| 9 | RD232_3 | EIA-232,Receive Data A ,TRIB3 |
| 10 | RD422A_4 | EIA-422,Receive Data A(-),TRIB4 |
| 11 | RC422A_4 | EIA-422,Receive Clock A(-),TRIB4 |
| 12 | RD232_4 | EIA-232,Receive Data A ,TRIB4 |
| 13 | GND | Ground |
| 14 | RD422B_1 | EIA-422,Receive Data B(+),TRIB1 |
| 15 | RC422B_1 | EIA-422,Receive Clock B(+),TRIB1 |
| 16 | RC232_1 | EIA-232,Receive Clock,TRIB1 |
| 17 | RD422B_2 | EIA-422,Receive Data B(+),TRIB2 |
| 18 | RC422B_2 | EIA-422,Receive Clock B(+),TRIB2 |
| 19 | RC232_2 | EIA-232,Receive Clock,TRIB2 |
| 20 | RD422B_3 | EIA-422,Receive Data B(+),TRIB3 |
| 21 | RC422B_3 | EIA-422,Receive Clock B(+),TRIB3 |
| 22 | RC232_3 | EIA-232,Receive Clock,TRIB3 |
| 23 | RD422B_4 | EIA-422,Recive Data B(+),TRIB4 |
| 24 | RC422B_4 | EIA-422,Receive Clock B(+),TRIB4 |
| 25 | RC232_4 | EIA-232,Receive Clock,TRIB4 |

**Table 2-15. DEMUX T5 Through T8 Pin Assignments (J13)**

| J13 | DEMUX T5 through T8 | |
|---|---|---|
| PIN # | Circuit | Description |
| 1 | RD422A_5 | EIA-422,Receive Data A(-),TRIB5 |
| 2 | RC422A_5 | EIA-422,Receive Clock A(-),TRIB5 |
| 3 | RD232_5 | EIA-232,Receive Data A ,TRIB5 |
| 4 | RD422A_6 | EIA-422,Receive Data A(-),TRIB6 |
| 5 | RC422A_6 | EIA-422,Receive Clock A(-),TRIB6 |
| 6 | RD232_6 | EIA-232,Receive Data A ,TRIB6 |
| 7 | RD422A_7 | EIA-422,Receive Data A(-),TRIB7 |
| 8 | RC422A_7 | EIA-422,Receive Clock A(-),TRIB7 |
| 9 | RD232_7 | EIA-232,Receive Data A ,TRIB7 |
| 10 | RD422A_8 | EIA-422,Receive Data A(-),TRIB8 |
| 11 | RC422A_8 | EIA-422,Receive Clock A(-),TRIB8 |
| 12 | RD232_8 | EIA-232,Receive Data A ,TRIB8 |
| 13 | GND | GROUND |
| 14 | RD422B_5 | EIA-422,Receive Data B(+),TRIB5 |
| 15 | RC422B_5 | EIA-422,Receive Clock B(+),TRIB5 |
| 16 | RC232_5 | EIA-232,Receive Clock TRIB5 |
| 17 | RD422B_6 | EIA-422,Receive Data B(+),TRIB6 |
| 18 | RC422B_6 | EIA-422,Receive Clock B(+),TRIB6 |
| 19 | RC232_6 | EIA-232,Receive Clock,TRIB6 |
| 20 | RD422B_7 | EIA-422,Receive Data B(+),TRIB7 |
| 21 | RC422B_7 | EIA-422,Receive Clock B(+),TRIB7 |
| 22 | RC232_7 | EIA-232,Receive Clock,TRIB7 |
| 23 | RD422B_8 | EIA-422,Receive Data B(+),TRIB8 |
| 24 | RC422B_8 | EIA-422,Receive Clock B(+),TRIB8 |
| 25 | RC232_8 | EIA-232,Receive Clock,TRIB8 |

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# METRIC CONVERSIONS

## Units of Length

| Unit | Centimeter | Inch | Foot | Yard | Mile | Meter | Kilometer | Millimeter |
|---|---|---|---|---|---|---|---|---|
| 1 centimeter | — | 0.3937 | 0.03281 | 0.01094 | $6.214 \times 10^{-6}$ | 0.01 | — | — |
| 1 inch | 2.540 | — | 0.08333 | 0.2778 | $1.578 \times 10^{-5}$ | 0.254 | — | 25.4 |
| 1 foot | 30.480 | 12.0 | — | 0.3333 | $1.893 \times 10^{-4}$ | 0.3048 | — | — |
| 1 yard | 91.44 | 36.0 | 3.0 | — | $5.679 \times 10^{-4}$ | 0.9144 | — | — |
| 1 meter | 100.0 | 39.37 | 3.281 | 1.094 | $6.214 \times 10^{-4}$ | — | — | — |
| 1 mile | $1.609 \times 10^{5}$ | $6.336 \times 10^{4}$ | $5.280 \times 10^{3}$ | $1.760 \times 10^{3}$ | — | $1.609 \times 10^{3}$ | 1.609 | — |
| 1 mm | — | 0.03937 | — | — | — | — | — | — |
| 1 kilometer | — | — | — | — | 0.621 | — | — | — |

## Temperature Conversions

| Unit | ° Fahrenheit | ° Centigrade |
|---|---|---|
| 32° Fahrenheit | — | 0 (water freezes) |
| 212° Fahrenheit | — | 100 (water boils) |
| -459.6° Fahrenheit | — | 273.1 (absolute 0) |

| Formulas |
|---|
| C = (F - 32) * 0.555 |
| F = (C * 1.8) + 32 |

## Units of Weight

| Unit | Gram | Ounce Avoirdupois | Ounce Troy | Pound Avoir. | Pound Troy | Kilogram |
|---|---|---|---|---|---|---|
| 1 gram | — | 0.03527 | 0.03215 | 0.002205 | 0.002679 | 0.001 |
| 1 oz. avoir. | 28.35 | — | 0.9115 | 0.0625 | 0.07595 | 0.02835 |
| 1 oz. troy | 31.10 | 1.097 | — | 0.06857 | 0.08333 | 0.03110 |
| 1 lb. avoir. | 453.6 | 16.0 | 14.58 | — | 1.215 | 0.4536 |
| 1 lb. Troy | 373.2 | 13.17 | 12.0 | 0.8229 | — | 0.3732 |
| 1 kilogram | $1.0 \times 10^{3}$ | 35.27 | 32.15 | 2.205 | 2.679 | — |


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