TECHNICAL MANUAL

3DXD COMBINER

888-2600-001

T.M. No. 888-2600-001

Printed:

Returns And Exchanges

Damaged or undamaged equipment should not be returned unless written approval and a Return Authorization is received from HARRIS CORPORATION, Broadcast Systems Division. Special shipping instructions and coding will be provided to assure proper handling. Complete details regarding circumstances and reasons for return are to be included in the request for return. Custom equipment or special order equipment is not returnable. In those instances where return or exchange of equipment is at the request of the customer, or convenience of the customer, a restocking fee will be charged. All returns will be sent freight prepaid and properly insured by the customer. When communicating with HARRIS CORPORATION, Broadcast Systems Division, specify the HARRIS Order Number or Invoice Number.

Unpacking

Carefully unpack the equipment and preform a visual inspection to determine that no apparent damage was incurred during shipment. Retain the shipping materials until it has been determined that all received equipment is not damaged. Locate and retain all PACKING CHECK LISTs. Use the PACKING CHECK LIST to help locate and identify any components or assemblies which are removed for shipping and must be reinstalled. Also remove any shipping supports, straps, and packing materials prior to initial turn on.

Technical Assistance

HARRIS Technical and Troubleshooting assistance is available from HARRIS Field Service during normal business hours (8:00 AM - 5:00 PM Central Time). Emergency service is available 24 hours a day. Telephone 217/222-8200 to contact the Field Service Department or address correspondence to Field Service Department, HARRIS CORPORATION, Broadcast Systems Division, P.O. Box 4290, Quincy, Illinois 62305-4290, USA. Technical Support by e-mail: *tsupport@harris.com*. The HARRIS factory may also be contacted through a FAX facility (217/221-7096).

Replaceable Parts Service

Replacement parts are available 24 hours a day, seven days a week from the HARRIS Service Parts Department. Telephone 217/222-8200 to contact the service parts department or address correspondence to Service Parts Department, HARRIS CORPORATION, Broadcast Systems Division, P.O. Box 4290, Quincy, Illinois 62305-4290, USA. The HARRIS factory may also be contacted through a FAX facility (217/221-7096).

NOTE

The # symbol used in the parts list means used with (e.g. #C001 = used with C001).

Manual Revision History 3DXD COMBINER 888-2600-xxx			
Rev.	Date	ECN	Pages Affected

WARNING: Disconnect primary power prior to servicing.

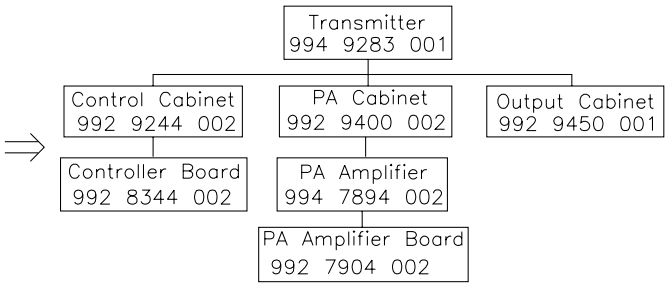
Guide to Using Harris Parts List Information

The Harris Replaceable Parts List Index portrays a tree structure with the major items being leftmost in the index. The example below shows the Transmitter as the highest item in the tree structure. If you were to look at the bill of materials table for the Transmitter you would find the Control Cabinet, the PA Cabinet, and the Output Cabinet. In the Replaceable Parts List Index the Control Cabinet, PA Cabinet, and Output Cabinet show up one indentation level below the Transmitter and implies that they are used in the Transmitter. The Controller Board is indented one level below the Control Cabinet so it will show up in the bill of material for the Control Cabinet. The tree structure of this same index is shown to the right of the table and shows indentation level versus tree structure level.

Example of Replaceable Parts List Index and equivalent tree structure:

Replaceable Parts List Index

Table 7–1.	Transmitter	994 9283 001	7–2
Table 7–2.	Control Cabinet	992 9244 002	7–3
Table 7–3.	Controller Board	992 8344 002	7–6
Table 7–4.	PA Cabinet	992 9400 002	7–7
Table 7–5.	PA Amplifier	994 7894 002	7–9
Table 7–6.	PA Amplifier Board	992 7904 002	7–10
Table 7–7.	Output Cabinet	992 9450 001	7–12



The part number of the item is shown to the right of the description as is the page in the manual where the bill for that part number starts.

Inside the actual tables, four main headings are used:

Table #-#. ITEM NAME - HARRIS PART NUMBER - this line gives the information that corresponds to the Replaceable Parts List Index entry;

HARRIS P/N column gives the ten digit Harris part number (usually in ascending order);

DESCRIPTION column gives a 25 character or less description of the part number;

REF. SYMBOLS/EXPLANATIONS column 1) gives the reference designators for the item (i.e., C001, R102, etc.) that corresponds to the number found in the schematics (C001 in a bill of material is equivalent to C1 on the schematic) or 2) gives added information or further explanation (i.e., “Used for 208V operation only,” or “Used for HT 10LS only,” etc.).

Inside the individual tables some standard conventions are used:

A # symbol in front of a component such as #C001 under the REF. SYMBOLS/EXPLANATIONS column means that this item is used on or with C001 and is not the actual part number for C001.

In the ten digit part numbers, if the last three numbers are 000, the item is a part that Harris has purchased and has not manufactured or modified. If the last three numbers are other than 000, the item is either manufactured by Harris or is purchased from a vendor and modified for use in the Harris product.

The first three digits of the ten digit part number tell which family the part number belongs to - for example, all electrolytic (can) capacitors will be in the same family (524 xxxx 000). If an electrolytic (can) capacitor is found to have a 9xx xxxx xxx part number (a number outside of the normal family of numbers), it has probably been modified in some manner at the Harris factory and will therefore show up farther down into the individual parts list (because each table is normally sorted in ascending order). Most Harris made or modified assemblies will have 9xx xxxx xxx numbers associated with them.

The term “SEE HIGHER LEVEL BILL” in the description column implies that the reference designated part number will show up in a bill that is higher in the tree structure. This is often the case for components that may be frequency determinant or voltage determinant and are called out in a higher level bill structure that is more customer dependent than the bill at a lower level.

HARRIS Broadcast Systems Division
P.O. Box 4290, QUINCY, IL 62305

PARTS ORDER FORM

HARRIS PHONE: 217-222-8200
HARRIS FAX: 217-221-7096

BILLING INFORMATION

CUSTOMER NAME: _____

ADDRESS: _____

_____

_____

_____

TELEPHONE NUMBER: _____

FAX NUMBER: _____

PREFERRED PAYMENT METHOD: _____

SHIPPING INFORMATION

SHIP TO: _____
(if different from billing information)

ADDRESS: _____

_____

_____

_____

TELEPHONE NUMBER: _____

FAX NUMBER: _____

SHIPPING METHOD PREFERRED: _____

FREQUENCY (If required): _____

EQUIPMENT NAME: _____

EQUIPMENT PART NUMBER: _____

EQUIPMENT SERIAL NUMBER: _____

GUIDE FOR ORDERING PARTS

Please use the following parts order form, filling is as much information as possible. The complete informaiton will allow double checking the part number for correctness or locating a substitude if the part is not available.
The equipment name, part number, and serial number will be found on the metal ID plate on the back of the unit. The serial number MUST be included for any parts ordered under warranty.
Describe the part using the description in the parts list if possible. Include the schematic information, schematic number, or number of next higher assembly. The next higher assembly is usually a 992-xxxx-00x type.

ITEM #	QTY ORD	HARRIS PART NUMBER	DESCRIPTION OF PART (PART'S NAME, DESCRIPTION, SPECIFICATION FROM PARTS LIST IF AVAILABLE)	SCHEMATIC REFERENCE REFERENCE NAME (e.g. C001, R100, etc)	ITEM USED ON (NEXT HIGHER ASSEMBLY IF KNOWN) (e.g. C001 used on 992 8025 001, SCHEMATIC 839 8099 991)	COMMENTS

WARNING

THE CURRENTS AND VOLTAGES IN THIS EQUIPMENT ARE DANGEROUS. PERSONNEL MUST AT ALL TIMES OBSERVE SAFETY WARNINGS, INSTRUCTIONS AND REGULATIONS.

This manual is intended as a general guide for trained and qualified personnel who are aware of the dangers inherent in handling potentially hazardous electrical/electronic circuits. It is not intended to contain a complete statement of all safety precautions which should be observed by personnel in using this or other electronic equipment.

The installation, operation, maintenance and service of this equipment involves risks both to personnel and equipment, and must be performed only by qualified personnel exercising due care. HARRIS CORPORATION shall not be responsible for injury or damage resulting from improper procedures or from the use of improperly trained or inexperienced personnel performing such tasks.

During installation and operation of this equipment, local building codes and fire protection standards must be observed. The following National Fire Protection Association (NFPA) standards are recommended as reference:

- Automatic Fire Detectors, No. 72E
- Installation, Maintenance, and Use of Portable Fire Extinguishers, No. 10
- Halogenated Fire Extinguishing Agent Systems, No. 12A

WARNING

ALWAYS DISCONNECT POWER BEFORE OPENING COVERS, DOORS, ENCLOSURES, GATES, PANELS OR SHIELDS. ALWAYS USE GROUNDING STICKS AND SHORT OUT HIGH VOLTAGE POINTS BEFORE SERVICING. NEVER MAKE INTERNAL ADJUSTMENTS, PERFORM MAINTENANCE OR SERVICE WHEN ALONE OR WHEN FATIGUED.

Do not remove, short-circuit or tamper with interlock switches on access covers, doors, enclosures, gates, panels or shields. Keep away from live circuits, know your equipment and don’t take chances.

WARNING

IN CASE OF EMERGENCY ENSURE THAT POWER HAS BEEN DISCONNECTED.

WARNING

IF OIL FILLED OR ELECTROLYTIC CAPACITORS ARE UTILIZED IN YOUR EQUIPMENT, AND IF A LEAK OR BULGE IS APPARENT ON THE CAPACITOR CASE WHEN THE UNIT IS OPENED FOR SERVICE OR MAINTENANCE, ALLOW THE UNIT TO COOL DOWN BEFORE ATTEMPTING TO REMOVE THE DEFECTIVE CAPACITOR. DO NOT ATTEMPT TO SERVICE A DEFECTIVE CAPACITOR WHILE IT IS HOT DUE TO THE POSSIBILITY OF A CASE RUPTURE AND SUBSEQUENT INJURY.

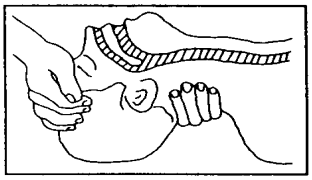
TREATMENT OF ELECTRICAL SHOCK

1. IF VICTIM IS NOT RESPONSIVE FOLLOW THE A-B-CS OF BASIC LIFE SUPPORT.

PLACE VICTIM FLAT ON HIS BACK ON A HARD SURFACE

(A) AIRWAY

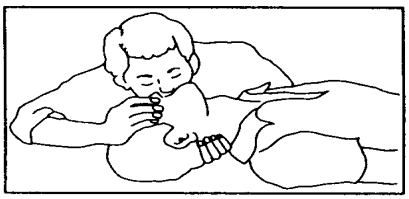
IF UNCONSCIOUS,
OPEN AIRWAY



LIFT UP NECK
PUSH FOREHEAD BACK
CLEAR OUT MOUTH IF NECESSARY
OBSERVE FOR BREATHING

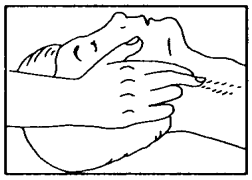
(B) BREATHING

IF NOT BREATHING,
BEGIN ARTIFICIAL BREATHING



TILT HEAD
PINCH NOSTRILS
MAKE AIRTIGHT SEAL
4 QUICK FULL BREATHS
REMEMBER MOUTH TO MOUTH
RESUSCITATION MUST BE
COMMENCED AS SOON AS POSSIBLE

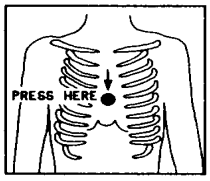
CHECK
CAROTID PULSE



IF PULSE ABSENT,
BEGIN ARTIFICIAL
CIRCULATION

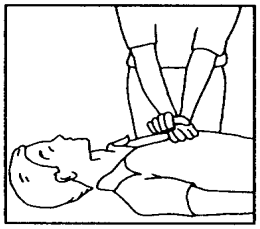
(C) CIRCULATION

DEPRESS STERNUM 1 1/2 TO 2 INCHES



APPROX. RATE OF COMPRESSIONS --80 PER MINUTE
- ONE RESCUER
- 15 COMPRESSIONS
- 2 QUICK BREATHS

APPROX. RATE OF COMPRESSIONS --60 PER MINUTE
- TWO RESCUERS
- 5 COMPRESSIONS
- 1 BREATH



NOTE: DO NOT INTERRUPT RHYTHM OF COMPRESSIONS
WHEN SECOND PERSON IS GIVING BREATH

CALL FOR MEDICAL ASSISTANCE AS SOON AS POSSIBLE.

2. IF VICTIM IS RESPONSIVE.

A. KEEP THEM WARM
B. KEEP THEM AS QUIET AS POSSIBLE
C. LOOSEN THEIR CLOTHING
D. A RECLINING POSITION IS RECOMMENDED

FIRST-AID

Personnel engaged in the installation, operation, maintenance or servicing of this equipment are urged to become familiar with first-aid theory and practices. The following information is not intended to be complete first-aid procedures, it is a brief and is only to be used as a reference. It is the duty of all personnel using the equipment to be prepared to give adequate Emergency First Aid and thereby prevent avoidable loss of life.

Treatment of Electrical Burns

1. Extensive burned and broken skin
   a. Cover area with clean sheet or cloth. (Cleanest available cloth article.)
   b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply any salve or ointment.
   c. Treat victim for shock as required.
   d. Arrange transportation to a hospital as quickly as possible.
   e. If arms or legs are affected keep them elevated.

NOTE

If medical help will not be available within an hour and the victim is conscious and not vomiting, give him a weak solution of salt and soda: 1 level teaspoonful of salt and 1/2 level teaspoonful of baking soda to each quart of water (neither hot or cold). Allow victim to sip slowly about 4 ounces (a half of glass) over a period of 15 minutes. Discontinue fluid if vomiting occurs. (Do not give alcohol.)

2. Less severe burns - (1st & 2nd degree)
   a. Apply cool (not ice cold) compresses using the cleanest available cloth article.
   b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply salve or ointment.
   c. Apply clean dry dressing if necessary.
   d. Treat victim for shock as required.
   e. Arrange transportation to a hospital as quickly as possible.
   f. If arms or legs are affected keep them elevated.

REFERENCE:

ILLINOIS HEART ASSOCIATION

AMERICAN RED CROSS STANDARD FIRST AID AND PERSONAL SAFETY MANUAL (SECOND EDITION)

TABLE OF CONTENTS

WARNING: Disconnect primary power prior to servicing.

Section I
Introduction

1.1 Scope and Purpose

This technical manual contains the information pertaining to the 3DXD COMBINER. The Manual contains the following sections:

- Section I, Introduction
  Provides general manual layout, equipment description, block diagram.
- Section II, Installation
- Section III, Operation
  All operator controls are built into the Combiner. All control is done via the Front Panel Control in the BCU.
- Section IV, Overall System Theory
  Provides block diagram and detailed theory of operation of the combiner and various sections that apply to the overall combiner. It includes the following:
  1. RF Switch Cabinet
  2. Combiner
  3. Reject loads
  4. Output Monitoring
  5. Combiner Cooling
  6. All PC Boards (Interface, Arc, Airflow, RF Sample)
- Section V, Maintenance and Alignments
  Provides mechanical maintenance and fine tuning adjustments as well as all board level adjustments. Also included here is the detailed procedure for accessing various areas in the combiner through the use of keylocks and interlocks.
- Section VA, Cabinet VIEWS
- Section VI, Parts List
- Section A, Transmitter/Combiner Controllers (UC2)

1.2 Equipment Description

The 3DXD COMBINER is a 2-way AM combiner used in DX/3DX systems needing to combine two equal power sources. The combiner will commonly be referred to as a 2-Way combiner indicating it combines two Transmitters.

The combiner consists of 2 main sections and 7 subsections: Front, which includes the Basic Control Unit Bay 2. Bay 1 contains the input switching contactor for Transmitter 1/A and Bay 4 contains the main RF combining section for Transmitter 1/A. Bay 3 contains the input switching contactor for Transmitter 2/B and Bay 5 contains the main RF combining section for Transmitter 2/B. The second main section is Rear which contains Bay 6 which contains the output switching, as well as a phase rotation network. The Bay 6 switching network allows various modes of operation, combined Transmitters on air, combined Transmitters into load, A Transmitter on air with B Transmitter into load, and B Transmitter on air with A Transmitter into test load. Also contained within Bay 6 is a phase rotation network. The purpose of the phase rotation network is to provide a phase shift that simulates the phase shift of the combiner. This feature allows the impedance sweep to remain similar whether the system is operating in the combined mode of operation or a single mode of operation. The phase rotation feature is very beneficial when operating into an antenna system that has less than desirable bandwidth and needs optimizing.

Bay 1 & Bay 3 sections have 1 RF input, each of which comes from a Low/Med power DX/3DX Transmitter. The contactors in Bay 1/3 route the RF either to the combiner section or directly to Bay 6. If the RF is routed to the combiner, from the combiner RF then proceeds to Bay 6, from which the RF is then sent to either the Antenna or Test Load. If the RF is not sent to the combiner, the Transmitter will be sent to the test load, and the other Transmitter will be sent through the phase rotation then to the antenna port.

The Combiner normal mode of operation is as a 2-way combiner. If one of the Transmitters is shut off for maintenance or due to a fault, the combiner will automatically switch the operational Transmitter to the antenna and the off or faulted Transmitter to the test load.

The Reject Load cabinet in Bay 7 houses the reject resistors to absorb any imbalances in the two inputs when in the combined mode.

1.3 Block Diagram

See Schematic 839-8464-012 for the Block Diagram. Block Diagram and Detailed descriptions are contained in Section IV, Overall System Theory.

1.4 Explanation of Terms

The following is a listing and explanation of some of the terms which will be used in this manual.

- CCU = Combiner Control Unit
- TCU = Transmitter Control Unit
- FPI = Front Panel Interface
- BCU = Basic Control Unit

1.4.1 Unit and Assembly Numbers

For the following discussion refer to drawing 817-2311-007, the Combiner Family Tree. The complete listing of all “A#”, or assembly numbers, is given in the Combiner Family Tree. Each Bay of the combiner is given an assembly number such as A1, A2 etc. The VIEW index, shows the A# for each of the combiner sections. The Combiner sections are labeled as follows:

Bay 1 = Transmitter 1/A Input Section = A1

WARNING: Disconnect primary power prior to servicing.

Bay 2 =BCU = A2

Bay 3 = Transmitter 2/B Input = A3

Bay 4 = Transmitter 1/A Combiner Section = A4

Bay 5 = Transmitter 2/B Combiner Section = A5

Bay 6 = Phase Rotation Network/Switch Cabinet = A6

Bay 7 = Reject Load = A7

As an example of how the family tree numbers are used:

Resistor R4 on the Combiner Interface board could be labeled, A1A2R4. Broken apart this simply means, resistor R4 on Assembly A2 (the Combiner Interface Board) in Assembly A1 (which is Bay 1 Combiner Cabinet) .

Stated another way, R4 is in Bay 1 Combiner Cabinet (A1), on the Combiner Interface Board (A2).

WARNING: Disconnect primary power prior to servicing.

2.1 Scope and Purpose

This section contains the mechanical and electrical information necessary for installation of the 3DXD COMBINER. This section of the manual also describes the incoming inspection and unpacking procedures that should be followed when the combiner is received. See Drawing 843-8464-014 Combiner Outline Drawing.

2.2 Incoming Inspection and Unpacking

The 3DXD COMBINER Low/Med Power DX/3DX 2-Way Combiner is normally delivered in 2 cabinet sections mounted on shipping skids. The Front/Rear Combiner Section is one of these cabinets the other is the Reject Combiner Section. See Combiner Outline drawing for shipping weights.

Smaller components are shipped in cardboard cartons. Any obvious damage should be noted at the time of receipt and claims filed with the carrier. Equipment capable of handling a ***5,000 pounds (2,270 kg)*** load will be needed to unload the combiner. Extreme care should be taken during the unloading operation to prevent injury to personnel or damage to the equipment. If the combiner is to be temporarily stored, all units require inside storage. Do not stack items except for small cardboard cartons.

Upon delivery, the shipping container should be examined for indications of possible mishandling. If damage has occurred, immediately notify the carrier and HARRIS CORPORATION, Broadcast Division (refer to paragraph 2.3, Returns and Exchanges).

When unpacking the shipping container, care should be exercised to prevent equipment damage. The control numbers on the Packing List should be checked to verify completeness of the shipment. Any discrepancy is to be reported immediately to HARRIS CORPORATION, Broadcast Division.

2.3 Returns And Exchanges

Damaged or undamaged equipment should not be returned unless written approval and a Return Authorization is received from HARRIS CORPORATION, Broadcast Division. Special shipping instructions and coding will be provided to assure proper handling. Complete details regarding circumstances and reasons for return are to be included in the request for return.

2.4 Installation

There is a packing list which shows all of the parts which were taken out of the combiner for shipping. It is imperative that this list is thoroughly checked against the actual inventory on site before proceeding.

2.5 Mechanical Installation

Prior to installation, all related technical manuals should be carefully studied to obtain a thorough understanding of the principles of operation, circuitry and nomenclature. This will facilitate proper installation and initial checkout.

Refer to the mechanical outline drawings in the drawing package and cabinet VIEWS in Section 5 for the mechanical and electrical installation information. An explanation of the terms used in this text is contained in Section 1, Introduction.

The combiner ships as two partial cabinets identified as follows:

- Shipping crate: Front/Rear Section 2-Way Switch Cabinet (Bay1,2,3,4,5, & 6)
- Shipping crate: Reject Load Cabinet (Bay 7)

2.5.1 Cabinet Placement

The following is a recommended installation procedure, as the site will tend to dictate the actual order of placement and installation. It is recommended that the Front/Rear portions of the combiner be set in position, leveled and bolted together first. Combiner Front & Rear section is shipped as one piece but can be separated if installation requires smaller sections. Leveling of the cabinets is very important when it comes to bolting the cabinets together.

2.5.1.1 2-Way Combiner Cabinet Placement

1. Uncrate the cabinet and check for any damages during shipment.
2. Locate and remove shipping pallet bolts.

NOTE:
The number and location of shipping pallet bolts may vary pallet to pallet. Always check completely the floor of the cabinet to be sure that all such bolts are removed before attempting to remove the cabinet from the shipping pallet.

3. Using crowbar(s) near one of the cabinet corners, raise the corner about 3/4 inch above the shipping pallet to allow placement of a roller bar (a two foot section of 1/2 inch or 3/4 inch rigid pipe is appropriate) diagonally across the corner of the cabinet. Repeat this process at each corner of the cabinet.
4. Once the cabinet is approximately positioned, refine the positioning footprint by using crowbar(s) near the corners to move the cabinet a small amount at a time.

2.5.1.2 2-Way Reject Load Cabinet Placement (Bay 7)

1. Place the Reject Load Section on top of the Front & Rear Sections of the Combiner.

NOTE:
Do not tighten the bolt/nut combinations until later.

WARNING: Disconnect primary power prior to servicing.

2. Layout the copper strap across the Bottom of the Rear Section already in place. Hardware for fastening these straps is located on the Studs on the Bottom of the Floor in the Rear Section.

2.5.2 RF Tubing Connections

Any of the RF interconnect tubing which extended between the 2-Way Combiner Cabinets has been removed for shipment and will have to be reinstalled. Each of the pieces of tubing has been marked on each end as the proper connection point. The Cabinet VIEWS drawings in Section VA will aid in component location and verification. No bending of the tubing should be necessary, and each of the pieces should be centered in the cabinet feed-thru holes. Each connection should be verified on the combiner-wiring diagram.

NOTE:

Normally all of the interconnect tubing sections must be installed after all of the Combiner Cabinets have been permanently positioned and secured together with hardware due to these tubing sections being routed between cabinets and not within a given cabinet. Normally, all intracabinet tubing connections are shipped in place and all fixed capacitors are shipped in place. If, in a rare situation, some fixed capacitors are removed for shipping purposes, there will be some intracabinet tubing reinstallation required at the customer site.

2.6 BCU Rack Installation

The BCU Rack is shipped with all inter-connect wiring in place. The connections to the Combiner will be rolled up into the adjacent cabinets. Connections to the Transmitters are made to the Combiner I/O Panel located on the top/front of Bay 2.

2.6.1 Filler Panels

Refer to drawing 822-1347-023 for DXD200 2 Dx100's combined.

Refer to drawing 822-1347-024 for 3DXD200 2 3DX100's combined.

Refer to drawing 843-5584-142 for 3DXD100 2 3DX50'd combined.

When combining DX100's a PIE Rack or equivalent space is required between the combiner and Transmitter "B". This is due to the Rear door of the DX100 on the Output Cabinet. This door when opened swings out past the Output Cabinet so a space is required between the Output Cabinet and any adjacent cabinet that is deeper than the Output Cabinet.

1" Filler panels are only required when combineing 2 3DX50's

The 3DXD Combiner has 2 1 " Filler panels that will need to be installed Prior to installing the 2 Transmitters next to the Combiner.

The Filler Panels provide a 1" spacing between the Combiner and the Transmitter so the Rear doors of the Transmitters can be fully opened. The Open side of the Filler panel faces the Transmitters.

2.6.2 Transmitter Installation

Once Filler panels are installed Located Transmitter 1/A, refer to installation instructions for the transmitter and mount to the Left side of the 3DXD Combiner. Slide the cabinet as close as possible to the combiner. RF Output coax line is provided with the 3DXD Combiner so placement of the transmitters is very important.

Locate Transmitter 2/B refer to installation instructions for the transmitter and mount to the Right side of the 3DXD Combiner (refer to system drawing for detailed descriptions). Slide the cabinet as close as possible to the combiner. RF Output coax line is provided with the 3DXD Combiner so placement of the transmitters is very important.

2.6.3 Transmitter Connections

Refer to System Interconnect Diagram.

839-8464-001 for 3DXD100 System Interconnect.

839-8132-063 for DXD200 System Interconnect.

839-8132-064 for 3DXD200 system Interconnect.

2.6.4 Local/Remote I/O Connections

There are remote control configurations available for implementation in a transmitter:

a. Local (Manual Pushbutton facilitated, located in the Basic Control Unit and always provided)

b. Serial Remote Control supplied as integrated subsystem of modem, controller, and PC.

c. Parallel Remote Control which parallels the functions of the Manual Local Control Functions.

2.6.4.1 Control/Monitoring Interface Data – Remote Control

Drawing 843-8464-013 Remote Control/Status System for the 3DXD. External equipment cables for Transmitter control, monitor, interlock and status, are routed into the transmitter at the Combiner I/O Panel. J20-J22 is always supplied and connected in a typical configuration. Connections to these points should use shielded cable and the shield connected to the chassis at the connector. The end destination of these connections is the Transmitter Control Board located in the Basic Control Unit. See interconnect schematic 839-8464-013.

Interlocks must be connected between pins 1 and 2 of Combiner I/O Panel. If interlock connections are not used, a jumper must be placed between J40, pins 1 and 2.

2.6.4.2 Remote Control/Monitoring Interface Circuits - General Discussion

For reference, below are denoted several types of electronic interface facilitation circuits used. Simple relay contact closures and opens and/or electronic voltage two state sources satisfy the particular requirements of these interfacing circuits.

Analog Meter Sample: The analog meter sample outputs present here are DC voltages.

2.6.5 RF Drive System Checkout

Verification of the RF drive system will be required prior to turning on the Combiner/Transmitters.

WARNING: Disconnect primary power prior to servicing.

2.6.5.1 Transmitter RF Drive Inputs

Measure the frequency on the External Interface on each Transmitter, the frequency measured should be the same as the operating frequency.

NOTE:

Refer to Transmitter's external RF Input connection.

2.7 Electrical Installation

Electrical installation is basically split into three groups

- AC Power Connections
- RF Connections

NOTE:

Use the supplied plastic channel around the inside of all holes that cabling must pass through to protect the cables from damage.

2.7.1 AC Power Connections

AC input connections should be made directly to Terminal Board A3TB1 inside the top-right of Bay 3. See 839-8464-013 in the System Drawing Package.

2.7.2 RF Connections

All RF tubing inside the combiner are rigid and some have break-away connectors where the tubing passes through from one cabinet to another. The break-away connector fastens to both conductors to form the continuous connection.

Typical external RF transmission line consists of 3-1/8,4-1/16 inch coaxial inputs from each transmitter and a 4-1/16,6-1/8 inch coaxial line output to the antenna and to the test load. See the Overall schematic RF interconnections in the system drawing package.

2.8 Combiner Checkout and Initial Turn On

2.8.1 Checking Contactor Movement

The following verifies that the mode commanded at the Front Panel Interface (FPI) and the status readbacks from the contactors agree

CAUTION

IF A CONTACTOR IS STUCK OR BEGINS TO CHATTER, BE READY TO SHUT OFF THE LVPS BREAKER.(A3CB1).

a. Turn on the LVPS breaker (A3CB1). Located in the upper front righr section of the Combiner. Be ready to turn the breaker off in case of a problem. This will apply +24VDC to the RF Contactors.

b. Go to the FPI.All contactors should be in the AIR position, and no flashing LED's on the FPI. If not, pressing the AB AIR button on the FPI.

c. Change TXA to the TEST position by pressing the B AIR button on the FPI.

d. Change TXB to the TEST position by pressing the A AIR button on the FPI.

2.8.2 General 2-Way Combiner Tuning

2.8.2.1 Overview

Note, this combiner is designed to be operated into a 50 j0 load at carrier frequency. It is necessary for either the Antenna or test load to provide a 50 ohm load. The combiner directly has no provisions to adjust for poor load sidebands or mismatch.

The combiner is basically a Wilkinson type hybrid, using #2 -45 degree L-networks. The L-networks have 2 individual inductors and a common output shunt C. The L-Networks transform the impedance from each transmitter from 50 ohms to 100 ohms, then when combined result in a 50 ohm Z. A load resistor/capacitor combination is placed across the input ports to complete the circuit.

A -45 degree phase rotation network is included in the combiner; this allows each of the individual transmitters to maintain a similar phase shift when operating in either a combined mode or single mode. The phase rotation network is especially useful for digital type transmission or with antennas of limited bandwidth that require phase rotation optimization.

Prior to checking or tuning, it will be necessary to move contactors, if the TCU is not installed, unhooking the motors from the contactors will allow for manual (by hand) switching of the contactors. Please reference RF schematic 839-8464-007 for the overall RF flow.

2.8.2.2 Main Combiner section

**Please note, the combiner has been preset at the factory. Given the system provides a 50 ohm load at carrier, minimal adjustments should be required at the combiner. The following steps should be considered more for reference than actual need.

Isolate C1, L1, L2, & C2 from the circuit, this will allow each of the components to be set at the base values.

C1= -50
C2= -50
L1 & L2 = 50

This will preset the components, temporarily mark the coils and use this for a base reference; strived to move both coils the same amount and direction for all future tuning.

Reconnect the Circuit, Place a 50 load on the output of the combiner (across the shorting switch seems to work well).

Place a 50 Ohm load on the feed of the input port on one side of the main combiner section, and a test device to measure complex impedance on the other port, adjust for 50 + j0 on each port using C1, L1, L2, & C2. The second part of this is to adjust for port-to-port isolation. This will require reverting from port to port until both ports read 50+j0 and isolation is at least –35db (-45db should be attainable) and the notch is centered. The use of a network analyzer will allow monitoring of impedance and isolation at the same time and will speed up testing. While a network analyzer is convenient, various combinations of equip-

ment are perfectly acceptable, as ultimately the goal is to measure impedance and isolation. Try to get within or better than +/- 1 for both R and jX; and better than -35 db of port to port isolation (with a clean notch).

General Tendencies while tuning the combined section; please note these are "tendencies" and all have a certain level of interaction that will need to be observed and adjusted for.

L1 & L2 should be tuned as one, once the reference is set both coils should be moved the some amount and same direction. Also these coils tend to Set the base R-value and center the isolation.

C1 will adjust the R and j value, this component seems to Raise or Lower both R and j in the same direction.

C2, will hit a base R then the j value will change signs, this can be especially helpful in the sense that it can add a negative j with an increase in R.

2.8.2.3 Phase Rotation Network

**Please note, the combiner has been preset at the factory. Given the system provides a 50 ohm load at carrier, minimal adjustments should be required at the combiner. The following steps should be considered more for reference than actual need.

Disconnect L3, C4, & L5 at the common point where all three connect, set each component by connecting an impedance meter from ground to the individual component, and also grounding the opposite end of the component. Ground L3 at the input of the circuit; ground L5 out the antenna output (the earthen ground will work for this) the shunt leg (C4) has very limited adjustment and is preset at the factory; simply insure that the value installed is close –71 ohms.

Set components to value in ohms as follows:

L3= 21
C4= -71 (this is factory present)
L5= 21

Reconnect the circuit, place a 50 load on the output, and adjust components (primarily L3 and L5) to align the input impedance to the same value as the combined mode.

NOTE

The load, be it the antenna or test needs to be as close to 50 j0 as realizable, the combining system has no direct provisions for correcting load impedance or overall system bandwidth.

2.8.3 Setting up the Combiner RF Sample Board

The following procedure is for on-site fine adjustment of the VSWR detection circuit on RF Power Sample Board A6A5. For the complete RF Sample board adjustment procedure refer to Section V, Maintenance and Alignment.

The RF Power Sample Board is located after all of the combiner tuning circuits, therefore combiner tuning will not effect the board outputs. The VSWR detector is reading the difference between the impedance of the factory load and the on-site load (or antenna). Fine Adjustment of the detector will null the VSWR detector output voltage, giving a VSWR reference for the on-site load. Any increase in the detector output after adjustment says that there has been a change in the load impedance. Proceed as follows:

NOTE:

The following procedure assumes the transmitter is operating into an antenna system which is presenting close to a 50 + j0 load to the combiner output.

a. Locate the RF Sample Board. It is in the rear section A6 to the right of the Earthing Switch
b. Turn on the transmitter.
c. Connect a scope probe to TP7. DC Couple the scope.
d. Adjust C15 (Fine Amplitude) and C17 (Fine Phase) for minimum signal at TP7. If there is not enough range on the capacitors then use the course adjustment switches S3 and S4 (note the setting of the switches before moving them so they can be returned to their original position if necessary). These switches are located on the side of the board facing the cabinet. If they need to be adjusted it may be necessary to remove the RF Sample Board to do so. If the load is close to 50 ohms, the course switches should not have to be changed.

The VSWR phase angle detector is now referenced to your load. Any change in the load impedance will cause an increased output from the detector, indicating presence of larger than normal VSWR.

WARNING: Disconnect primary power prior to servicing.

Table 2-1. Remote Control

	Pin #	Color		Function
	1	BLK	ON_CMD	Active Low will turn the System "ON"
	2	WHT	OFF_CMD	Active Low will turn the System "OFF"
	3	RED	HIGH_CMD	Active Low will turn the System to HIGH Power setting and Turn the System "ON"
	4	GRN	MED_CMD	Active Low will turn the System to MEDIUM Power setting and Turn the System "ON"
	5	ORN	LOW_CMD	Active Low will turn the System to LOW Power setting and Turn the System "ON"
	6	BLU	RAISE_CMD	Active Low will RAISE the Power of the System for 500 mS
	7	WHT/BLK	LOWER_CMD	Active Low will LOWER the Power of the System for 500 mS
	8	RED/BLK	RESET_CMD	Active Low will RESET any non-active Latched Faults in the System.
	9	GRN/BLK		
	10	ORN/BLK	COMB_MODE_B0	Active Low 3 Bit MODE Status See Chart Below
	11	BLU/BLK	COMB_MODE_B1	Active Low 3 Bit MODE Status See Chart Below
	12	BLK/WHT	COMB_MODE_B2	Active Low 3 Bit MODE Status See Chart Below
J20				
	13	RED/WHT	EXT_FLDBK_CMD	Active Low will FOLDBACK the System. Level and Modes configured on the TCU VT-100
	14	GRN/WHT	ARC_CMD	Active Low will Mute the System as long as this sisgnal is LOW. 3 Hits in 5 seconds will casue FOLDBACK
	15	BLU/WHT	RF_MUTE_CMD	Active Low will MUTE the System as long as this signal is LOW
	16	BLK/RED	SPARE	
	17	WHT/RED	NC	
	18	ORN/RED	NC	
	19	BLU/RED	GND	
	20	RED/GRN	GND	
	21	ORN/GRN	GND	
	22	BLK/WHT/RED	GND	
	23	WHT/BLK/RED	GND	
	24	RED/BLK/WHT	_+V_CMD	Common Side Voltage of OPTO COUPLERS use if Remote Control Equipment Requires Voltage other than 5 Volts
	25	GRN/BLK/WHT	_+V_CMD	Common Side Voltage of OPTO COUPLERS use if Remote Control Equipment Requires Voltage other than 5 Volts

NOTE J20 -12,11-10
1= HIGH; 0 = Active Low

J20-12	J21-11	J21-10	
1	1	1	NO MODE
1	1	0	AB AIR
1	0	1	A AIR
1	0	0	B AIR
0	1	1	AB TEST
0	1	0	FUTURE USE
0	0	1	FUTURE USE
0	0	0	FUTURE USE

WARNING: Disconnect primary power prior to servicing.

Table 2-2. Remote Status

	Pin #	Color		Function
	1	BLK	FUTURE USE	
	2	WHT	FUTURE USE	
	3	RED	FAULT_STAT	Active Low indicates a Non Critical or Critical Fault is Present in the System.
	4	GRN	LOW_STAT	Active Low indicates System is at the LOW Power Setting.
	5	ORN	MED_STAT	Active Low indicates System is at the MEDIUM Power Setting.
	6	BLU	HIGH_STAT	Active Low indicates System is at the HIGH Power Setting.
	7	WHT/BLK	OFF_STAT	Active Low indicates System is OFF.
	8	RED/BLK	ON_STAT	Active Low indicates System is ON.
	9	GRN/BLK	COMB_MODE_B0	Active Low 3 Bit MODE Status see Chart Below.
	10	ORN/BLK	COMB_MODE_B1	Active Low 3 Bit MODE Status see Chart Below.
	11	BLU/BLK	COMB_MODE_B2	Active Low 3 Bit MODE Status see Chart Below.
	12	BLK/WHT	FUTURE USE	
J21				
	13	RED/WHT	FUTURE USE	
	14	GRN/WHT	FUTURE USE	
	15	BLU/WHT	FUTURE USE	
	16	BLK/RED	FUTURE USE	
	17	WHT/RED	N/C	
	18	ORN/RED	GND	
	19	BLU/RED	GND	
	20	RED/GRN	_+V_STAT	
	21	ORN/GRN	_+V_STAT	
	22	BLK/WHT/RED	_+V_STAT	
	23	WHT/BLK/RED	_+V_STAT	
	24	RED/BLK/WHT	EXT_+V_STAT	Common Side Voltage of n_MosFets use if Remote Control Equipment Requires Voltage other than 5 Volts
	25	GRN/BLK/WHT	EXT_+V_STAT	Common Side Voltage of n_MosFets use if Remote Control Equipment Requires Voltage other than 5 Volts

NOTE J21 -11,10-9
1= HIGH; 0 = Active Low

J21-11	J21-10	J21-9	
1	1	1	NO MODE
1	1	0	AB AIR
1	0	1	A AIR
1	0	0	B AIR
0	1	1	AB TEST
0	1	0	FUTURE USE
0	0	1	FUTURE USE
0	0	0	FUTURE USE

Table 2-3. Remote Monitoring

	1	BLK	N/A
	2	WHT	N/A
	3	RED	N/A
	4	GRN	N/A
	5	ORN	FORWARD PWR
	6	BLU	REFLECTED PWR
	7	WHT/BLK	REJECT PWR
	8	RED/BLK	N/A
	9	GRN/BLK	N/A
	10	ORN/BLK	N/A
	11	BLU/BLK	N/A
	12	BLK/WHT	N/A
J22	13	RED/WHT	NC
	14	GRN/WHT	NC
	15	BLU/WHT	NC
	16	BLK/RED	NC
	17	WHT/RED	NC
	18	ORN/RED	NC
	19	BLU/RED	NC
	20	RED/GRN	GND
	21	ORN/GRN	GND
	22	BLK/WHT/RED	GND
	23	WHT/BLK/RED	GND
	24	RED/BLK/WHT	GND
	25	GRN/BLK/WHT	GND

WARNING: Disconnect primary power prior to servicing.

Forward Power Reading

Name	Abbreviation	Formula	Value
Dac Full Scale	**Ds**		4095
System Total Power	**SysTpo**		1000 = 100kw, 2000 = 200kw, 3000 = 300kw
Total System Power	**TotSysPow**	=120% * SysTpo	= 1200, = 2400, = 3600,
Scale Factor	**Sf**	= Ds/TotSysPow	= 3.4125, = 1.7062, = 1.1375
Transmitter Active Forward Power Reading			75kw ie 750 175kw ie 1750 275kw ie 2750
Dac Value	**Dv**	= Sf * Transmitter current Power Reading;	2559, 2985, 3128
Vref	**Vr**		4.096
Volts/Bit	**Vb**	= Vr/Ds	1.000244mV
Vout	**Vo**	= Vb * Dv	2.56vDc 2.98vDc 3.12vDc

Reflected Power Reading

Name	Abbreviation	Formula	Value
Dac Full Scale	**Ds**		4095
System Total Power	**SysTpo**	= SysTpo *2	2000 = 20kw, 4000 = 40kw, 6000 = 60kw
Total System Power	**TotSysPow**	=120% * SysTpo	= 2400, = 4800, = 7200,
Scale Factor	**Sf**	= Ds/TotSysPow	= 1.7062, = 0.8531, = 0.5687
Transmitter Active Forward Power Reading			7.5kw ie 750 17.5kw ie 1750 27.5kw ie 2750
Dac Value	**Dv**	= Sf * Transmitter current Power Reading;	1279, 1492, 1564
Vref	**Vr**		4.096
Volts/Bit	**Vb**	= Vr/Ds	1.000244mV
~Vout	**Vo**	= Vb * Dv	1.28vDc 1.493vDc 1.564vDc

WARNING: Disconnect primary power prior to servicing.

Reject Power Reading

Name	Abbreviation	Formula	Value
Dac Full Scale	**Ds**		4095
System Total Power	**SysTpo**	= SysTpo *3	3000 = 2.0kw, 6000 = 6.0kw, 9000 = 9.0kw
Total System Power	**TotSysPow**	=120% * SysTpo	= 3600, = 7200, = 10800,
Scale Factor	**Sf**	= Ds/TotSysPow	= 1.1375, = 0.5687, = 0.3791
Transmitter Active Forward Power Reading			750w ie 750 1750w ie 1750 2750w ie 2750
Dac Value	**Dv**	= Sf * Transmitter current Power Reading;	853, 995, 1042
Vref	**Vr**		4.096
Volts/Bit	**Vb**	= Vr/Ds	1.000244mV
~Vout	**Vo**	= Vb * Dv	0.853vDc 0.995vDc 1.042vDc

3.1 Scope and Purpose

This section contains the basic information pertaining to the operation of the Combiner, which is basically the use of the FPI (Front Panel Interface) Flipdown Panel The FPI is located in the BCU rack.

3.2 Front Panel Interface

The FPI is used for control and monitoring of all functions in the Combiner. The FPI utilizes a Elastomer Buttons for very simple, straight forward operation. The operation discussed here will be limited to the Basic Control Unit on the FPI which deals directly with the 2-Way Combiner.

3.3 FPI Front Panels

All Normal operation of the 3DXD combiner can be done with the buttons on Front. The main Buttons are :

a. Remote Enable/Disable
b. Power Raise/Lower
c. System Power Level…High/Med/Low
d. Mode Control AB AIR, A AIR,B AIR
e. Power Meter Select… Forward, Reflected, Reject

3.3.1 FPI Button Color Coding

The FPI screens follow a general color code system.

- Green buttons typically means OKAY
- Red typically means FAULT
- Yellow generally means WARNING.

The FPI Front Panel is broke up into 3 sections

CONTROL
METER SELECT
MODE CONTROL

3.3.1.1 CONTROL

The control section allows the user to select the Combiner to be in Remote Enable/Disable

Remote Enable allows Parralel, Serial Control to operate the Combiner.

Power Raise/Lower allows the user to raise and lower the power of the Transmitters that are routed to the antenna.

High,Med,Low & Off are the power levels of the Transmitters. When selected that signal is sent to the Transmitters that are routed to the Antenna.

3.3.1.1.1 Meter Select

The 3DXD Combiner has one Analog Meter that can be configured for 3 different reading. Forwared,Reflected, and Reject Power.

3.3.1.1.2 Mode Control

Allows the user to select the Combiner for 3 different modes (AB AIR, A AIR, B AIR) from the front panel. ABTEST is selected via the Flip Down Panel.

The FPI also has a flip down panel that has additional control. The Rear FPI is broken up into 4 different sections

Mode Control
Transmitter Select
Control
Fault Indications

3.3.1.1.3 Mode control

Is the same type of control that the front panel has but ABTEST is also selectable.

3.3.1.1.4 Transmitter select

This section allow the user to select a Transmitter (the System, Transmitter A/1 , Transmitter B/2). When selected you have control over that Transmitter. For example if System is selected and if the system is in ABAIR and MED is selected then both transmitters will go to Medium Power. If the system is in A AIR/B Test and the Transmitter Select is in the System then all the control buttons will be routed to the Transmitter A since it is the System that is ON AIR. Also if the Transmitter Select is in the XMTR 1 then again all of the control buttons will be routed to Transmitter 1/A.

If the Combiner is in ABAIR and the Transmitter select is in the XMTR 1 only the RAISE/LOWER control buttons will be routed to Transmitter 1/A for fine power level adjust when in a combined mode. To Rasie/Lower both transmitters at the same time the System Select must be active.

3.3.1.1.5 Control

The main purpose of this section is for fine tuning of power level of the individual transmitters and control over a transmitter when in the Test Port.

3.3.1.1.6 Fault indications

These faults when not active will be GREEN. When active they will be Flashing RED

4.1 Introduction

This section of the manual will present the overall principles of operation for the 3DXD COMBINER, It contains only block diagram level descriptions, as most of the combiner circuitry is very simple in nature.

4.2 Block Diagram Description

The combiner sums the outputs from two equal powered Transmitters to produce a single output. See the Combiner Block Diagrams, 839-8464-012 in the combiner drawing package. A reject load is used between the Transmitter RF outputs to absorb any imbalances in either the amplitude or phase of the individual Transmitter RF outputs. In normal operation, almost no power is dissipated in the reject load. The 2-Way Combiner has been designed to allow servicing of an individual Transmitter while the other Transmitter remains on the air.

The Combiner is made up of the RF Switch section and the Main Combiner section.. The RF Switches routes the two Transmitter inputs to the Main Combiner, from which the combined Transmitters can be routed to either the antenna or test load. The RF switching portion will also route the RF in a single source mode, whereas one Transmitter is sent to the test load and the other is sent through the phase rotation network then to the antenna port.

The cooling system is located in the Bay 6.

The Main Combiner section input switching for Transmitter combining is contained in the Front Section. The main RF output switching and phase rotation network for single Transmitter into the antenna is contained in Bay 6.

The remainder of this section is organized as follows:

- Basic Control Unit (BCU)
- Transmitter Control Unit (TCU)
- Combiner Control Unit (CCU)
- RF Switching
  1. Input Contactor Board
  2. Output Contactor Board
- Main Combiner
  3. Output Monitoring
  4. Main Combiner Cooling
- Combiner Control System (CCU)

4.3 Basic Control Unit

The Basic Control Unit is the main control point for the System. It consists of a Transmitter Control Unit that is the main operating interface to turn the transmitter on and off at the proper power level. The Front Panel Interface (FPI) Panel consists of a elastomer Button control panel that will allow control, status and metering of the entire transmitter including the combiner.

4.3.1 Transmitter Control Unit (TCU)

The TCU contains the specialized PC boards required for transmitter control which are not accommodated by the Micro Processor such as RF carrier control and audio control.

The TCU contains slide in PC boards connecting to a UC2(Universal Combined Controller) Board. Boards connected to a UC2 Board provide the connection points to all units in the transmitter. The slide in PC boards in the Card Cage are as follows:

4.3.1.1 TRANSMITTER INTERFACE BOARD

This Board contains all the logic needed to control 2 Transmitters via parrallel Control

4.3.1.2 RF Drive Unit (RFU)

The RFU contains the specialized PC Boards required for External RF input circuitry and the RF phasing circuits to ensure all Transmitters are combined properly.

4.3.1.3 Audio Drive Unit (ADU)

The ADU for the BCU does not contain any PC Boards. It is a simple resistive divider the has One Audio source and splits it to the Transmitters. The BCU does not monitor the Audio Level. The ADU can be an external part of the BCU.

4.3.2 Combiner Control Unit (CCU)

The Combiner Control Unit is the heart of the control system for the combiner. All control status and metering functions for the combiner are physically brought together on interface board. The Interface boards group all signals associated with Combiner. The Combiner Interface Board brings together all signals associated with the combiner. The signals (control, status, and metering) are sent to the TCU which is located in a compartment of the BCU. The CCU board provides an interface point between the combiner signals and the TCU. The main destinations for the combiner control signals are the Micro Processor and TCU. The PC boards in the CCU as follows:

4.3.2.1 Combiner Interface Board

This Board contains all the logic needed to control/Monitor the Combiner.

4.4 RF Switching

The function of the RF Switching is divided into two sections. The RF input contactors (K1, K2 & K3) receive the RF inputs from each of the two Transmitters. The K1 & K2 Contactors determine whether the two Transmitters will be routed to the combining network or kept separate. The K3 contactor determines which Transmitter will be routed to the antenna and which will be routed to the test load if K1 & K2 are in the non-combined mode. See Figure 4-1.

WARNING: Disconnect primary power prior to servicing.

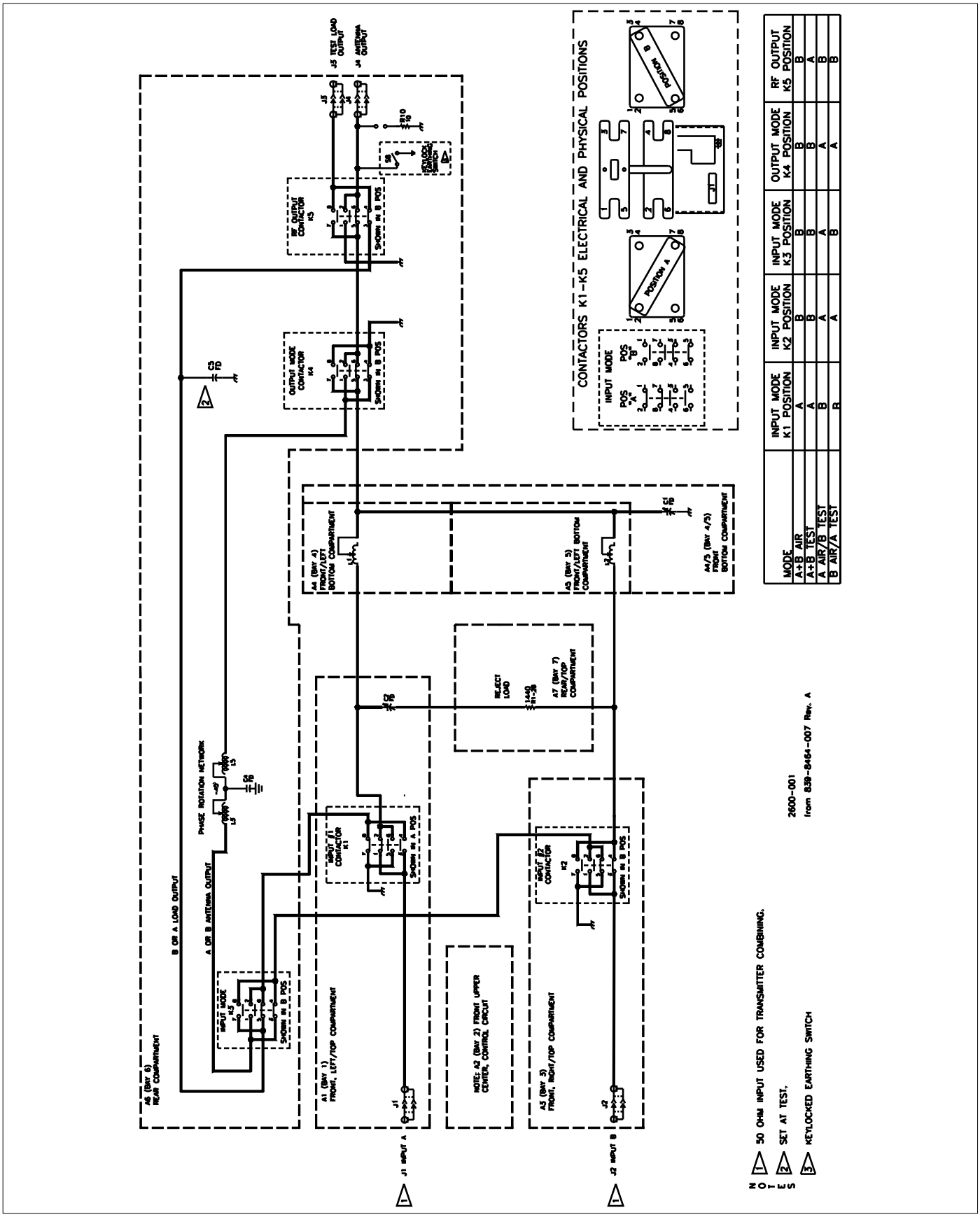


Figure 4-1
2-Way Switch cabinet and Combiner cabinet.

WARNING: Disconnect primary power prior to servicing.

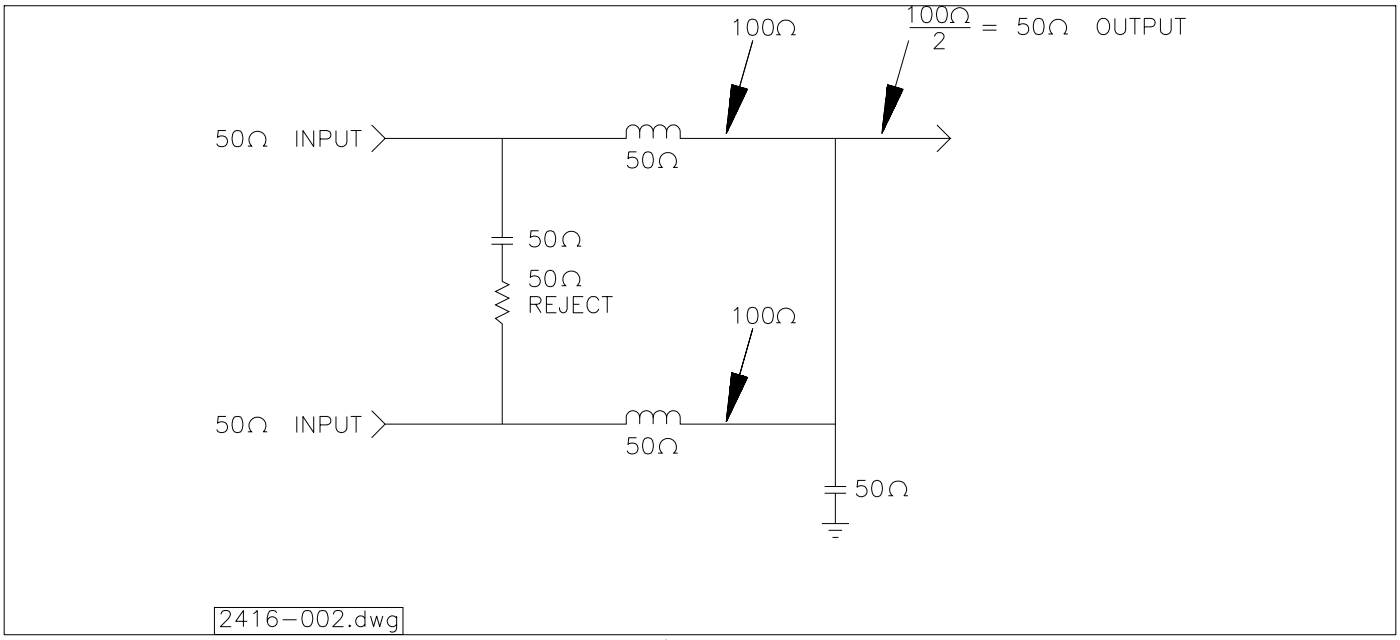


Figure 4-2
Combiner L Matching Networks

The RF Output contactors K4 and K5 will take the separate Transmitter outputs as determined by the input contactors or the combined output from the network and route it to the antenna or the test load. Note that both Transmitters can be sent to the dummy load if the load is sufficient to dissipate the total power sent. If the load is not sufficient for full power, some systems are configured for A+B Test but at a reduced power such that the test load is sufficient.

4.4.1 RF Contactor Control Board

The RF contactors used in the combiner utilize a linear actuator to move the contacts from position A to position B. Changing the polarity applied to the linear actuator will make it extend or retract. See 843-5491-001.

The voltage polarity applied to the linear actuator through TB1 is determined by K1. A constant +24VDC at J1-1 goes through R3, a resettable Polyswitch, which protects the circuit from over current. This +24VDC is applied to K1-3. An active LOW control signal enters the board at J1-3 or J1-4 to make K1 set or reset. The polarity applied to the linear actuator is determined be the state of the relay K1. The linear actuator will continue driving the RF contactor until the mechanical optical blinder interrupts the U1 or U2 causing Q3 or Q1 to energize, activating K2 or K3. This action stops the RF linear actuator.

4.5 Main Combiner Cabinet

The purpose of the Main Combiner is to combine 2 DX/3DX Transmitters into a single output. The combiner operates as an impedance transformer and combines the power in parallel. The combiner uses inductors and capacitors (lumped circuit components) to produce the required impedance transformations. The combiner is made up of two L Matching networks with a floating reject load.

4.5.1 Combining Network

The combining networks are “L” matching networks, which transform each of the 50-ohm combiner inputs up to 100 ohms at the combined point, See Figure 4-2. The combined point impedance (Z) will be the 100 ohms divided by the number of Transmitters combined (2) or Z = 100/2 = 50 ohms.

4.6 Phase Rotation Network

The Phase Rotation Network provides a phase shift of approximately 45 degrees that simulates the phase shift of the RF when combined. This feature allows the impedance sweep to remain similar whether the system is operating in the combined mode of operation to the antenna port or in the single Transmitter mode to the antenna port. The phase rotation feature is beneficial when operating into an antenna system that has less than desirable bandwidth and needs optimizing.

4.6.1 Reject Load

The Reject load absorbs any imbalances in either the amplitude or phase of the individual Transmitter RF outputs. The reject load is made up of 28 resistors in parallel, which in turn is connected in series with a variable capacitor, to form a floating load (not connected to ground). One end of the load is tied to one RF input and the other end of the load is connected to the other RF input. In normal operation, almost no power is dissipated in the reject load. An imbalance between the Transmitter outputs in either phase or amplitude will cause current to flow through the reject load, with minimal effect on the overall output. The reject load has an RF Current Sample Board used to detect any increase in

WARNING: Disconnect primary power prior to servicing.

reject load power. If substantial reject current is present for approximately 10 seconds, the control system will determine which Transmitter has a lower than normal power output and turn off that Transmitter. The blowers will also increase their speed to compensate for the extra heat being dissipated by the reject load. If any arc is sensed in the combiner, the Transmitters will be muted, but should come back on momentarily. If there are many consecutive arcs in a short period of time, the Transmitters will start folding back power. If enough arcs are sensed, the Transmitters will eventually be shut off. The reject load also has two temperature sensors mounted on the cabinet top in close proximity, which will mute the transmitter if the reject load temperature is too high.

4.6.2 Automatic Mode Switching

As was previously mentioned, the Main Combiner utilizes an air-cooled balancing load. In the event that a Transmitter would be removed for servicing or a failure were to occur, the combiner will sense an increase in reject load current. When the increase in reject current is present for approximately 5 seconds, the BCU circuitry will actuate the RF Contactors to route one Transmitter directly to the antenna without going through the combining network.

4.6.3 Combiner Interface Board

The Combiner Interface Board interfaces the following to the CCU Interface Board:

- Power and VSWR samples from the RF Power Sample Board.
- Both Air Flow Monitor Boards.
- Arc Detectors.
- RF Output Earthing Switch, status and interlock
- Door Compartment Interlock Switch, status and interlock.

4.6.4 RF Output Monitoring and VSWR Protection

There is an RF Power Sample board at the combiner output used for power output monitoring and VSWR protection.

For the following discussions refer to schematic #843-5523-756. The RF Sample Board is located after the combiner output-matching network and is considered the Antenna RF Sample Board. The Antenna RF Sample Board has a directional coupler, for forward and reflected power readings, and a phase angle detector for VSWR sensing. This board is only sensitive to VSWR which is occurring on the output of the combiner, perhaps at the antenna or ACU.

The VSWR circuitry operates identical to the VSWR circuit in the Transmitters except foldback commands initiated from this VSWR circuit will foldback both of the Transmitters in equal steps so that both Transmitters are still on the air and operational for maximum redundancy.

4.6.4.1 VSWR Circuitry

The VSWR Circuitry is made up of a phase angle detector. It detects the phase and amplitude of both the voltage and current on the RF line, and compares the two in the detector circuit. The current and voltage samples are adjusted for a null on the output of the detector under ideal conditions when there is a known good load attached to the combiner output and the system is properly tuned and loaded.

The phase angle detector on board will have to be re-nulled on site when the combiner is connected to the antenna system. This will set a reference. If the detector output increases from this reference point at a later time, the antenna system impedance has changed for some reason. If the detector output is increased significantly, the VSWR fault circuitry in the Cominer Interface will be tripped and the Transmitters will be folded back in power until the reflected power is below a safe level.

4.6.4.2 Directional Coupler

The directional coupler on the RF Sample board contains a FORWARD and a REFLECTED power output sample which is sent to the Combiner Interface Board.

4.6.5 Main Combiner Cooling

Main Combiner cooling is achieved by two, two speed fans operating in parallel to blow air directly into the Combiner and exhaust over the reject loads at all times. Air flow enters the bottom of Bay 6 and cools all RF components such as inductors and RF switches first. During normal operation the fans operate at low speed for cabinet flushing. When there is reject load current during a Transmitter failure, the fans switch to a higher speed to cool the reject loads. When the reject load current drops to normal, the fans will operate at high speed for 20 seconds, then resume low speed operation.

4.6.5.1 Blower Controller

The speed of the fans is controlled by the Blower Controller. This unit is in turn controlled by the Combiner Interface.

4.6.5.2 Blower Circuit Breakers

The AC input from A3FL2 passes through a Circuit Breaker before reaching the Blower Controller.

WARNING

BE SURE TO ROTATE THE DISCONNECT SWITCH TO THE OFF POSITION BEFORE ATTEMPTING TO SERVICE THE FUSES OR BLOWERS.

4.6.5.3 Air Flow Monitor

The Air Flow Monitor Boards connect directly to the Combiner Interface Board before being sent to the BCU. The Air Flow Monitor uses a temperature differential system of two sensors, one heated and one ambient. This way, with constant air flow the differential between the two sensors stabilizes. If air flow is reduced, for any reason, the temperature differential will increase between the two sensors. When it reaches the critical threshold, it will foldback power. If the differential continues to rise, the transmitter will be shut off.

4.7 Combiner Control Unit

The Combiner Control Unit (CCU) is the control system for the combiner and is part of the Basic Control Unit (BCU). All control status and metering functions for the combiner are physically brought together on the Combiner Interface Board, then sent to

CCU. The CCU is located in the Front upper left section of the Combiner The CCU is controlled by the TCU

4.8 External Drive Input and Operation

An external drive signal can be used to operate each transmitter through the Combiner. It is recommended that a 50-ohm generator and a 50-ohm transmission cable (RG58) be used to connect to I/O J24 on the top of the combiner. If a sine-wave signal is used, adjust the gain for a 10-volt rms signal.

If a square-wave signal is used, adjust the dc offset and gain so that the voltage excursions are between 0 and 6 volts. If the offset adjustment cannot be made, adjust the gain for a 20-volt p-p signal.

4.8.1 RF Drive/Phasing Board

NOTE:

Older Combiner uses 839-8073-003 while newer Combiner uses 801-0122-151. All of the details in this section refer to the older Combiner.

Refer to drawing 839-8073-003 for the following discussion.

The two functions of the RF Drive/Phasing Board are to provide automatic RF drive switching between External, TX A, and TX B drive signals, and to provide a mechanism by which the differences in the phase response through each transmitter can be adjusted out.

CAUTION

THE EXTERNAL DRIVE INPUT IS TERMINATED WITH 50 OHMS AND THEN DIODE CLIPPED TO PROVIDE A PROPER SIGNAL FOR THE TTL CIRCUITRY. DO NOT EXCEED 12.5 V RMS AT THE INPUT OR DAMAGE MAY RESULT.

The automatic RF Drive switching is accomplished by integrated circuits U2, U3, and U4. Each of the three TTL Level drive signals is connected to the input of a retriggerable multivibrator (U2, U4). When an RF drive signal is present at the input, the output of the multivibrators is high. Otherwise it is low. These three outputs are the address lines to an 8-input multiplexer (U3). This forms an RF drive priority as follows:

External Drive (highest)
A drive
B drive (lowest)

The output of the multiplexer is the highest priority drive signal present.

DESIRED AM CARRIER	RANGE SETTING SWITCHES			
(kHz)	1	2	3	4
500	C	C	C	C
600	0	C	C	C
700	0	C	0	C
800	0	0	0	C
900	C	C	0	0
1000	0	0	C	0
1100	0	C	0	0
1200	0	C	0	0
1300	0	C	0	0
1400	C	0	0	0
1500	C	0	0	0
1600	C	0	0	0
1700	C	0	0	0
O=Open				
C=Closed				

The achieving of RF drive A and drive B phase coherence is facilated by the inclusion of a capacitor bank consisting of capacitor C1, C2, C3, C4, range select switch S2, and phase adjust coil L3 inserted into the transmitter B drive circuitry.

The phase adjustment is accomplished by changing the resonant frequency of the tuned circuit. By moving the resonant frequency using coil L4, the phase of the B drive with respect to the A drive, may be altered by up to +30 degrees.

NOTE:

The phase adjust range set position indicated in the immdediately preceeding table are points from which to begin the phase adjustment process. The final switch positions may vary somewhat due to component tolerances and location of the carrier frequency within the predefined range. This adjustment is properly adjusted in the factory, but in the event of component changes on this board, replacement of the board, or a transmitter frequency change.

4.8.2 RF Splitter Phasing Board

Refer to drawing 801-0122-151 for the following discussion.

The two functions of the RF Splitter/Phasing Board are to provide automatic RF Drive switching of the External1,External2,Tx A, Tx B Drive signals and to provide a mechanism by which the differences in the phase response through each transmitter can be adjusted out.

The RF Splitter/Phasing board Has 4 RF inputs 2 are designated as the Transmitters synthesizer outputs and 2 are for digital/Ext RF Outputs.

The 2 External RF inputs have a series tuned filter that must be tuned up for proper operation. With a External RF signal present on J10 and/or J9 adjust S5, C109 for maximum peak to peak level at TP 38.

Repeat for External RF Input # 2 with S4 and C114 at TP 31.

All 4 RF inputs have a Low signal Comparator fault detection. This comparator level is adjusted by R103. Adjust R103 to the point where the signal is no longer valid.

All 4 RF Inputs run to a High speed Multiplexer U2. Depending on which RF input signal is present the Missing Clock CPLD U7 will control the 3 bits of addressing for this Multiplexer.

The purpose of the Missing Clock CPLD is to determine if the Digital/External RF Signal has degraded enough that it would provide a phase reversal signal to the transmitter. This usually

occurs when the digital RF signal is overdriven at the exciter stage. To prevent this phase reversal from continuing on to the transmitters the Missing clock CPLD will monitor the Digital/Ext RF to observe if the Digital/Ext RF is missing 2-3 clock cycles. When this happens the CPLD when change the 3 bit address to the TX B RF input if there is signal is not present then it when change to TX A RF input and provide a minimum of 7 clock cycles. As long as the Digital/Ext RF returns the CPLD will switch the multiplexer back to the Digital/Ext RF drive input.

If the Ext/Digital RF is not present for 500ms the CPLD will issue a 500ms Bypass command. This Signal usually connects up to the ePAL to tell the ePAL to switch to a different Audio Source other than the Digital RF.

The output of the Multiplexer feeds and External PLL board to make sure the Rf signal stays on frequency.

The output of the PLL board feed and integrator circuit at J3. This circuit creates a triangle waveform. This triangle waveform feeds 2 circuits. These circuits are used to create a phase delay between the 2 transmitters to cancel out any delay between the 2 transmitters.

R69 adjust the phase of Tx A and R80 adjust the phase of Tx B. Adjust these while observing the reject current on the combiner for minimum current.

The output of the phase delay circuits creates 4 signals RF1-POS, RF1_NEG, RF2_POS, & RF2_NEG. These signals feed the RF RECONSTRUCTION CPLD. This CPLD recreates the RF signal that is required to drive the Transmitters. The result of the CPLD will reproduce a 50/50 duty cycle.

This 50/50 duty cycle can be adjusted if the transmitter requires a different duty cycle. For example the 3DX50 operates better with a 45%-48% duty cycle.

The output of Duty cycle stage then runs to a RF Driver circuit that can be selected for 2 different power sources. +5 or +12 .

5.1 Introduction

This section provides adjustments and alignments to the individual boards in the BCU.

The BCU boards include;

a. Transmitter Control Unit (TCU)
b. RF Splitter/Phasing Board
c. Transmitter Interface
d. Front Panel Interface

The CCU boards include

a. Combiner Control Unit (CCU)
b. Combiner Interface

5.2 BCU Alignments

The following alignments are to be accomplished as needed when changing out a board. Refer to factory test data for initial settings of the controls on the boards being replaced.

5.2.1 Transmitter Controller Board

This board is the basically the same as the CCU control board. They are both UC2 boards but just have different software and different jumper settings

5.2.1.1 DipSwitch Settings

For Dual Power Supply Option Select Dipswitch 1 ON

For VSWR Foldback via VSWR Reading select DIPSWITCH 2 ON:

Jumpers JP4 7 5 should be in the 1-2 position because the Transmitter interface has no control over the MAIN Interlock String..

5.2.2 RF Splitter/Phasing Board

NOTE:
Older Combiner uses 839-8073-003 while newer Combiner uses 801-0122-151. New Combiner adjustment for Reject Current is R69 and/or R80.

5.2.2.1 RF Phasing of the Transmitters

The object of phasing the Transmitters together is to minimize the reject current between the Transmitters. Reject current indicates that there is either a power level difference between the Transmitters or there is a phase difference in the outputs. If excess reject current is present, first check that the power levels are as close to identical as possible. If, after power level matching, there is still reject current, matching of the input phasing of the Transmitters should be considered.

On the edge of the RF Switch and Phasing Board is a External Coil adjusment to control the RF phase of Transmitter 2/B.

While watching the reject current, adjust the External Coil for minimal Reject Power as read on the Analog Meter.

This is a tune by observation type adjustment. If an adjustment makes the reject current go higher, the adjustment is going in the wrong direction. This adjustment is only valid when the system is not running on an External Carrier Input (IBOC). Adjust this coil for minimal reject when not in IBOC Mode.

5.2.3 RF Splitter Board (older Combiners ONLY)

5.2.3.1 RF Spiltting of the External RF

The object of splitting the Ext RF is in Case of an IBOC signal. This signal must be split and sent to the transmitters where a DAB switch is located. If at anytime the IBOC is not present the DAB switch board will send a signal to the ePAL to change back to Normal RF mode and change the Audio Source to the System in case of IBOC. This adjustment is done by coax cable lengths located on the A4 Assembly in the Basic Control Unit. This adjustment is only valid when the system is running on an External Carrier Input (IBOC). Try different cable lengths for minimum reject when in IBOC Mode.

5.2.4 Combiner Interface Board

All jumpers are in. See schematic 801-0122-131 for functions.

5.2.4.1 Arc Detection

See 801-0122-101 for adjustments.

Adjust Detectors for 1VDC higher than Input Level. TP18, TP23, TP16, TP15, TP20, TP21, TP22, TP26.

5.2.4.2 Air Flow

Adjust for 1.5VDC at TP 14 and TP11.

5.2.4.3 Reject Thresholds

Adjust threshold at TP17 for about 2400W (3DXD100) (4500W for 3DXD200) of power in the reject load which should be safe to maintain on a continuous basis.

5.2.4.3.1 REJECT POWER TEST

To verify proper operation of the reject load power measurement, operate the transmitter at A+B with full output power without modulation (CW). While monitoring the Reject Power Meter, select Transmitter 2/B to Medium Power via the Transmitter 2/B Front Panel. Note Reading on Power Meter to be around 2400W/4500W.

From the Transmitter 2/B Front Panel Lower Power or Mute Transmitter A3S3 on 3DX Transmitter.

Since the detector used to sample the reject power is not a true directional coupler, the error on this signal can be as much as 20%, but typically within 10%. This type of error is OK in this application and the main intent is to ensure that the current sample components are producing an output accurate enough to indicate a reject current problem and/or turn on the reject fans. If the error of this measurement is greater than noted, check the reject current monitoring circuit.

5.2.4.4 Air Flow

Off threshold is set for 3.0VDC and Foldback threshold is set for 2.5VDC. Adjust Airflow samples on Combiner Interface board

WARNING: Disconnect primary power prior to servicing.

with R50, R28, & Test Points 4 & 11 for 1.5VDC. This will allow for one fan to be disabled and still allow the combiner to operate at Full Power. If the combiner senses more loss of air flow then a -6DB foldback will be issued to the transmitters and if more air flow loss continues to rise then an off command will be generated to the combiners and transmitters.

5.2.4.5 Antenna VSWR Detector Measurements and Considerations

VSWR detector measurements can be made with a Digital Multimeter (DMM) by monitoring the detector output test point alone, and/or by RF signal comparison of the amplitude and phase of the output network reference voltage and current samples on an oscilloscope if using an oscilloscope.

Before starting these procedures make sure that the vertical sensitivity of both vertical input channels of the scope are equal. Connect both scope probes to a common RF reference point and ensure that both traces are the same amplitude and phase. This coherence in amplitude and phase must exist in order for alignment measurements of VSWR Detectors to be of value.

Nulling the detector output to zero or near zero as monitored by DMM, for the VSWR detector is normally sufficient for detectors aligned previously at the factory into a test load.

For the sake of this discussion, it is assumed that this board has just been replaced in the field and requires a complete alignment.

NOTE:

This series of Antenna VSWR adjustments for a replacement board, will need to be accomplished initially at a lower output power than normal, (depending on whether the transmitter trips off due to excessive VSWR.). At higher power levels , the null adjustment per step (f.) will need to be checked and likely refined. At the High power level, the "final" adjustments may be performed. This null adjustment will need further refinement when switching from Test Load to Antenna Load operation. Also realize that after the "final" adjustment, any subsequent antenna load changes will lessen the depth of the null, requiring touch-up adjustments.

NOTE:

The following procedure assumes the transmitter combiner is operating into a 50 + j0 load.

5.2.4.6 Antenna VSWR Detector Adjustments - RF Power Sample Board

a. Locate the RF Sample Board. It is in the upper rear right compartment, Bay 6, just to the right of the Output RF Earthing Switch.

b. Turn on the transmitter.

c. Tune the Antenna VSWR Detector T1 primary circuit to resonance.

   1. Depress and hold the momentary VSWR Test pushbutton switch and select the appropriate combination of S5 positions for achieving maximum voltage at TP7 using a DMM. After the resonance condition has been achieved, release the VSWR Test switch, S2.

d. Equalize the amplitudes of the RF voltage and current samples.

   1. Using a dual trace oscilloscope connect the channel 1 probe to TP15 and the channel 2 probe to TP14. Set the Normal/Calibrate jumper JP3 and S7 to their NORM position. Adjust the scope time base to display two to four cycles of RF. Adjust the Fine Amplitude Adjust variable capacitor C26, and select the combination of S4 positions to equalize the signal amplitude of TP15 to that of TP14. Note that the two signals are probably not in phase with each other at this time.

e. Adjust the RF voltage and current sample phases to the condition of coherency.

   1. Adjust the combination of S6 positions and Fine Phase Adjust variable capacitor C25 to achieve zero or near zero phase difference between the signals at TP15 and TP14. It may be necessary to readjust Fine Amplitude Adjust variable capacitor C26 to reestablish amplitude equalization.

f. Accomplish a final adjustment of these Phase and Amplitude controls to minimize the DMM reading at TP7 to zero or near zero. To achieve the deepest null possible, several iterations of this process may be necessary, while viewing the nulled signal at TP7.
   The VSWR phase angle detector is now referenced to your load. Any change in the load impedance will cause an increased output from the detector, indicating larger than normal VSWR is present.

NOTE:

If the present load is a test load, some further adjustments will likely be required after switching to a nominal 50 + j0 antenna system impedance.

g. If matched amplitudes and coherant phases cannot be at least nearly achieved, switches, inductive and capacitive components must be checked for value accuracy and part integrity.

5.2.4.6.1 Antenna VSWR Threshold Set up on Combiner Interface

System TPO	1.5: VSWR	TP19 VDC
100kW	4kW	~1.24
150kW	6kW	
200kW	8kW	
250kW	10kW	
300kW	12kW	

Refer to factory test data.

5.2.4.6.2 VSWR SET UP

There is one VSWR detector on the 3DXD combiner. The antenna VSWR detector is at the output of the combiner and set for the equivalent of 1.5:1 at full power CW.

5.2.4.7 System Forward Power

Adjustments to the Forward Power assume a 50 Ohm load and the RF Sample has been Tuned up.

Connect a PC running Hyper Terminal to the CCU Controller in the A1 section of the UC2 board J25 located in the upper front left section.

Hyper Terminal Setup

WARNING: Disconnect primary power prior to servicing.

Configure Section

Bits per seconds	19200
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

Settings Section

Function, arrows, and ctrl keys act as Terminal Keys

Backspace key sends	Ctrl+H
Emulation	VT-100
Telnet Terminal ID	VT100
Backscroll buffer lines	500

Once HyperTerminal Is Set Up Select "ENTER" on the PC's Keyboard twice (Quick).

Select the Left/Right Arrow and navigate to Page 6.

Select "Ctrl z" on the keyboard and now observe at the top of the PARAMETER PAGE it reads (Enabled).

With the System Running at 100kW as read on an External Power. (CW Only).

Select "J" on the Keyboard and observe with the up/down arrow you can now change this value.

Change this value to 1000 for 100kW (1000 *100 = 100kW) and select Enter on the Keyboard. Observe on the Analog Meter on the Front of the Combiner that it nows reads 100kW. Make sure the Forward Power Sample is selected.

If it is slightly off Adjust R 431 on the CCU UC2 Board for the Correct Reading.

Also Observe that the FPI digital Display now reads 100 kW when the Forward Power Sample Scrolls by.

5.2.4.8 Reflected Power

• Select Transmitter to Low power and Lower Power to 10kW (CW Only)

Select the Switch on the RF Power Sample Board to the CAL Position.

Adjust R182 on the Combiner Interface Full CW

With the System Running at 10kW as read on an External Power

Launch the VT-100 as described above to "ENABLE" Parameter changes

Select "K" on the Keyboard and observe with the up/down arrow you can now change this value.

Change this value to 1000 for 10kW(1000 *10 = 10kW) and select Enter on the Keyboard. Observe on the Analog Meter on the Front of the Combiner that it nows reads 10kw. Make sure the Reflected Power Sample is selected.

Also Observe that the FPI digital Display now reads 10 kW when the Reflected Power Sample Scrolls by.

5.2.4.9 Reject Power

Select Transmitter to High power (CW Only)

Select transmitter 2 to Medium Power via the Transmitter 2's Front Panel.

Note

To calibrate the Reject power Reading R134 may need to be adjusted up in order not to exceed the threshold level.

There should now be 2140W across the reject Load.

With the System Running at 72.5kW as read on an External Power

Launch the VT-100 as described above to "ENABLE" Parameter changes

Select "L" on the Keyboard and observe with the up/down arrow you can now change this value.

Change this value to 2140 for 2140 W and select Enter on the Keyboard. Observe on the Analog Meter on the Front of the Combiner that it nows reads 2.1kW. Make sure the Reject Power Sample is selected.

Also Observe that the FPI digital Display now reads 2.1 kW when the Reject Power Sample Scrolls by.

Once the above is set Now Adjust R134 for TP 17 the same volts as read on TP10.

When Reject level exceeds this level for 5 seconds the Combiner will issue an AUTO SWITCH and shut off the lower Power of the 2 transmitter down.

5.2.4.10 Transmitter Forward Power

• Connect a PC running Hyper Terminal to the TCU Controller in the A2 section of the UC2 board J25 located in the front center section.

Once HyperTerminal Is Set Up Select "ENTER" on the PC's Keyboard twice (Quick)

Select the Left/Right Arrow and navigate to Page 6

Select "Ctrl z" on the keyboard and now observe at the top of the PARAMETER PAGE it reads (Enabled)

With the System Running at 100kW as read on an External Power. (CW Only)

Select "Q" on the Keyboard and observe with the up/down arrow you can now change this value.

Change this value to 500 for 50kW (500 *100 = 50kW) and select Enter on the Keyboard.

Select "S" on the Keyboard and observe with the up/down arrow you can now change this value.

Change this value to 500 for 50kW (500 *100 = 50kW) and select Enter on the Keyboard.

5.2.4.11 External Test Load Power

Launch the VT-100 as described above to "ENABLE" Parameter changes

Select "H" on the Keyboard and observe with the up/down arrow you can now change this value.

Change this value to The Test Load Total Power Out Rating at CW. For Example 750 for 75kW (750 *100 = 750kW) and select Enter on the Keyboard.

This parameter tells the system th maximum power allowed into the test load. For example if AB Test is selected at the Loads TPO is 75kW then the System will not allow High Power to be selected from the front of the combiner.

5.2.4.12 System TPO

Select "G" on the Keyboard and observe with the up/down arrow you can now change this value.

Change this value to 1000 for 100kW (1000 *100 = 100kW) and select Enter on the Keyboard.

5.2.4.13 VSWR OVLD

Select "E" on the Keyboard and observe with the up/down arrow you can now change this value.

Change this value to 150 for a 1.5 to 1 Ratio and Select Enter on the Keyboard.

5.2.4.14 VSWR FDBK

Select "G" on the Keyboard and observe with the up/down arrow you can now change this value.

Change this value to 140 for a 1.4 to 1 Ratio and Select Enter on the Keyboard.

5.2.4.15 MODEL TYPE

Select "A" on the Keyboard and observe with the up/down arrow you can now change this value.

Select the Model for which is being Tested.

5.2.4.16 EXT POWER REDUCTION

Note

This feature only works if the combining Transmitters have a parallel control foldback command.

Select 'M' or 'N' or 'O' or 'P' on the Keyboard and observe with the up/down arrow you can now change this value.

Select the Foldback Condition for your System.

For Example: Select "m" and change this value to "ON" so when J20-13 is active Low this will enable the Foldback Condition. For example connect this line to a dehydrator alarm or a Generator Active Alarm.

Select "n" for the mode in which the condition will cause a Foldback condition. For example if "COMB ONLY" is selected and the Signal at the Ext Foldback Line is active the System must be in the COMBINED mode either AB AIR or AB TEST for the Foldback signal to be registered.

Select "o" for the Power Level of the System in which the condition will cause a Foldback condition. For Example if "HIGH" is selected and the Signal at the Ext Foldback Line is active the System must be in the HIGH POWER mode for the Foldback signal to be registered.

WARNING: Disconnect primary power prior to servicing.

```
Page 1
"*******************************************************************************\r\n"// 1
"*              3DXD COMB   X (H/W REV:XXX S/W REV:XXXX CPLD REV:XXX)           *\r\n"// 2
"*******************************************************************************\r\n"// 3
"*    CONTROL(                                                  r: RESET)     *\r\n"// 4
"*******************************************************************************\r\n"// 5
"*  REJ POWER:       XXXX      XXX.X kW          *  VSWR LEVEL      XX.XX:1      *\r\n"// 6
"*  FWD POWER:       XXXX      XXX.X kW          *  AMBIENT TEMP:   XXXX  XXX.X C *\r\n"// 7
"*  RFLD POWER:      XXXX      XXX.X kW          *                                *\r\n"// 8
"************************************************                                *\r\n"// 9
"*                                              *                               *\r\n"// 10
"*                                              *                               *\r\n"// 11
"*                                              *                               *\r\n"// 12
"*                                              *                               *\r\n"// 13
"************************************************                                *\r\n"// 14
"*   INPUT SUPPLIES    *   REGULATED SUPPLIES  *                                *\r\n"// 15
"************************************************                                *\r\n"// 16
"*  +15V: XXXX  XX.X V *  +12V: XXXX   XX.XX V *                                *\r\n"// 17
"*  -15V: XXXX -XX.X V *  -12V: XXXX  -XX.XX V *                                *\r\n"// 18
"*  7.5V: XXXX  XX.X V *   +5V: XXXX   XX.XX V *                                *\r\n"// 19
"*                     *  3.3V: XXXX   XX.XX V *                                *\r\n"// 20
"*                     *  vRef: XXXX   XX.XX V *                                *\r\n"// 21
"*******************************************************************************\r\n"// 22
"*   Q(Quit)                                          L/R ARROWS: Change Pages   *\r\n"// 23
"*******************************************************************************",   // 24
Page 2
"*******************************************************************************\r\n"// 1
"*                          SYSTEM NON-CRITICAL FAULT STATUS                   *\r\n"// 2
"*  Note: The faults are warning only and they will not cause system shut down. *\r\n"// 3
"*******************************************************************************\r\n"// 4
"*  INVALID CAL:  XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 5
"*  THD OUT LMT:  XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 6
"*  MUTE ACTIVE:  XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 7
"*  VSWR FLDBCK:  XXXXX   K5 SWFLT:XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 8
"*  REJ ACTIVE:   XXXXX   K4 SWFLT:XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 9
"*  VSWR ACTIVE:  XXXXX   K3 SWFLT:XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 10
"*  COOL REDUCD:  XXXXX   K2 SWFLT:XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 11
"*  COOL FLDBCK:  XXXXX   K1 SWFLT:XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 12
"*******************************************************************************\r\n"// 13
"*  LVPS P12:     XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 14
"*  LVPS N12:     XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 15
"*  LVPS P15:     XXXXX   ARC FLT: XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 16
"*  LVPS N15:     XXXXX   AC FAIL: XXXXX   K5 MDFLT:XXXXX   SPARE:   XXXXX      *\r\n"// 17
"*  LVPS P7:      XXXXX   VCR1 AC: XXXXX   K4 MDFLT:XXXXX   SPARE:   XXXXX      *\r\n"// 18
"*  LVPS P5:      XXXXX   VCR1 DC: XXXXX   K3 MDFLT:XXXXX   SPARE:   XXXXX      *\r\n"// 19
"*  LVPS PVREF:   XXXXX   VCR2 AC: XXXXX   K2 MDFLT:XXXXX   SPARE:   XXXXX      *\r\n"// 20
"*  LVPS P3:      XXXXX   VCR2 DC: XXXXX   K1 MDFLT:XXXXX   SPARE:   XXXXX      *\r\n"// 21
"*******************************************************************************\r\n"// 22
"* STATE:XXXXX  MUTE:XXXXX              MODE:XXXXXX  L/R ARROWS: CHANGE PAGES   *\r\n"// 23
"*******************************************************************************",   // 24
Page 3
"*******************************************************************************\r\n"// 1
"*                          SYSTEM CRITICAL FAULT STATUS                       *\r\n"// 2
"*      Note:  Any of these faults occurred would cause system shut down.      *\r\n"// 3
"*******************************************************************************\r\n"// 4
"*  INT INTLK:    XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 5
"*  EXT INTLK:    XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 6
"*  SPARE:        XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 7
"*  SPARE:        XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 8
"*  SPARE:        XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 9
"*  SPARE:        XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 10
"*  SPARE:        XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 11
"*  SPARE:        XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 12
"*******************************************************************************\r\n"// 13
"*  SYS F-OFF:    XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 14
"*  CPLD FAIL:    XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 15
"*  FRONT PANEL:  XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 16
"*  AMBIENT TEMP: XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 17
"*  COOL F-OFF:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 18
"*  BUS INTLK:    XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 19
"*  CBL INTLK:    XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 20
"*  REJ TEMP:     XXXXX   SPARE:   XXXXX   SPARE:   XXXXX   SPARE:   XXXXX      *\r\n"// 21
"*******************************************************************************\r\n"// 22
"* STATE:XXXXX  MUTE:XXXXX              MODE:XXXXXX  L/R ARROWS: CHANGE PAGES   *\r\n"// 23
"*******************************************************************************",   // 24
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WARNING: Disconnect primary power prior to servicing.

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  Page 4
  "*****************************************************************************\r\n"// 1
  "*                          xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx                     *\r\n"// 2
  "*  xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx *\r\n"// 3
  "*****************************************************************************\r\n"// 4
"* CPLD REG0        XX                                                        *\r\n"// 5
"* CPLD REG1        XX                                                        *\r\n"// 6
"* CPLD REG2        XX                                                        *\r\n"// 7
"* CPLD REG3        XX                                                        *\r\n"// 8
"* CPLD REG4        XX                                                        *\r\n"// 9
"* CPLD REG5        XX                                                        *\r\n"// 10
"* CPLD REG6        XX                                                        *\r\n"// 11
"* CPLD REG7        XX                                                        *\r\n"// 12
"* CPLD REG8        XX                                                        *\r\n"// 13
"* CPLD REG9        XX                                                        *\r\n"// 14
"* CPLD REG10       XX                                                        *\r\n"// 15
"* CPLD REG11       XX                                                        *\r\n"// 16
"* CPLD REG12       XX                                                        *\r\n"
"* CPLD REG13       XX                                                        *\r\n"
"* CPLD REG14       XX                                                        *\r\n"
"* CPLD REG15       XX                                                        *\r\n"
"*                                                                           *\r\n"
  "*****************************************************************************\r\n"// 22
  "* STATE:XXXXX  MUTE:XXXXX              MODE:XXXXXX  L/R ARROWS: CHANGE PAGES   *\r\n"// 23
  "*****************************************************************************",   // 24
  Page 5
  "*****************************************************************************\r\n"// 1
  "*                          xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx                     *\r\n"// 2
  "*  xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx *\r\n"// 3
  "*****************************************************************************\r\n"// 4
"*                                                                           *\r\n"
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"*                                                                           *\r\n"
"*                                                                           *\r\n"
  "*****************************************************************************\r\n"// 22
  "* STATE:XXXXX  MUTE:XXXXX              MODE:XXXXXX  L/R ARROWS: CHANGE PAGES   *\r\n"// 23
  "*****************************************************************************",   // 24
 Page 6
 "*****************************************************************************\r\n"// 1
 "*                            PARAMETERS SETTING                             *\r\n"// 2
 "*****************************************************************************\r\n"// 3
 "*       CONFIGURATION/CALIBRATION       *                                   *\r\n"// 4
 "*****************************************************************************\r\n"// 5
 "*  (a)  :                  XXXXXXXX     *  (m)                              *\r\n"// 6
 "*  (b)  :                  XXXXX        *  (n)                              *\r\n"// 7
 "*  (c)  :                  XXXXX        *  (o)                              *\r\n"// 8
 "*  (d)  :                  XXXX         *  (p)                              *\r\n"// 9
 "*  (e)  :                  XXXX         ******************************************\r\n"// 10
 "*  (f)  :                  XXXX         *  (q)                              *\r\n"// 11
 "*  (g)  SYS TPO            XXXX         *  (r)                              *\r\n"// 12
 "*  (h)  :                  XXXX         *  (s)                              *\r\n"// 13
 "****************************************  (t)                              *\r\n"// 14
 "*  (j)  FORWARD POWER:     XXXX*100 W   *  (5)                              *\r\n"// 15
 "*  (k)  RFLECTED POWER:    XXXX*10 W    *  (6)                              *\r\n"// 16
 "*  (l)  REJECT POWER:      XXXX*1 W     *  (7)                              *\r\n"// 17
 "****************************************  (8)                              *\r\n"// 18
 "*  (x)  YEAR: 00  MONTH: 00  DATE: 00   *  (9)                              *\r\n"// 19
 "*       HOUR: 00  MIN:   00  SEC:  00   *                                   *\r\n"// 20
 "*****************************************************************************\r\n"// 21
 "*    (z): Restore Default Settings         (y): Save Settings as Default     *\r\n"// 22
 "*    U/D ARROWS: Adjust Value   RETURN: Save Data   L/R ARROWS: Change Pages *\r\n"// 23
 "*****************************************************************************",   // 24
```


WARNING: Disconnect primary power prior to servicing.

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Page 7
"*******************************************************************************\r\n"
"*                  OPERATION/EVENT/STATE LOG(r: Reset Log)                     *\r\n"
"*******************************************************************************\r\n"
"*  INDEX  FAULT                          ACTION                    TIME        *\r\n"
"*******************************************************************************\r\n"
"*                                                                              *\r\n"
"*                                                                              *\r\n"
"*                                                                              *\r\n"
"*                                                                              *\r\n"
"*                                                                              *\r\n"
"*                                                                              *\r\n"
"*                                                                              *\r\n"
"*                                                                              *\r\n"
"*                                                                              *\r\n"
"*                                                                              *\r\n"
"*                                                                              *\r\n"
"*                                                                              *\r\n"
"*                                                                              *\r\n"
"*                                                                              *\r\n"
"*                                                                              *\r\n"
"*******************************************************************************\r\n"// 21
"* STATE:XXXXX  MUTE:XXXXX              MODE:XXXXXX  L/R ARROWS: CHANGE PAGES   *\r\n"// 23
"*******************************************************************************",
```


WARNING: Disconnect primary power prior to servicing.

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Page 1
"*******************************************************************************\r\n"// 1
"*             3DXD COMB     (H/W REV:XXX S/W REV:XXXX CPLD REV:XXX)            *\r\n"// 2
"*******************************************************************************\r\n"// 3
"*    CONTROL(o: OFF   h: HIGH ON   m: MED ON   l: LOW ON          r: RESET)    *\r\n"// 4
"*******************************************************************************\r\n"// 5
"*  REJ POWER:                XXXX W           *  VSWR LEVEL      XX.XX:1       *\r\n"// 6
"*  FWD POWER:                XXX.X kW         *  AMBIENT TEMP:   XXXX  XXX.X C *\r\n"// 7
"*  RFLD POWER:               XX.XX kW         *                                 *\r\n"// 8
"************************************************                                 *\r\n"// 9
"*  XMTR1 FWD PWR:  XXXX      XXX.X kW         *                                 *\r\n"// 10
"*                                             *                                 *\r\n"// 11
"*  XMTR2 FWD PWR:  XXXX      XXX.X kW         *                                 *\r\n"// 12
"*                                             *                                 *\r\n"// 13
"************************************************                                 *\r\n"// 14
"*   INPUT SUPPLIES    *   REGULATED SUPPLIES  *                                 *\r\n"// 15
"************************************************                                 *\r\n"// 16
"*  +15V: XXXX  XX.X V *  +12V: XXXX   XX.XX V *                                 *\r\n"// 17
"*  -15V: XXXX -XX.X V *  -12V: XXXX  -XX.XX V *                                 *\r\n"// 18
"*  7.5V: XXXX  XX.X V *   +5V: XXXX   XX.XX V *                                 *\r\n"// 19
"*                     *  3.3V: XXXX   XX.XX V *                                 *\r\n"// 20
"*                     *  vRef: XXXX   XX.XX V *                                 *\r\n"// 21
"*******************************************************************************\r\n"// 22
"*   Q(Quit)                                    L/R ARROWS: Change Pages       *\r\n"// 23
"*******************************************************************************",   // 24
Page 2
"*******************************************************************************\r\n"// 1
"*                          SYSTEM NON-CRITICAL FAULT STATUS                   *\r\n"// 2
"*  Note: The faults are warning only and they will not cause system shut down. *\r\n"// 3
"*******TRANSMITTER CONTROL UNIT***************COMBINER CONTROL UNIT**************\r\n"// 4
"* INVLD CAL: XXX EXT FLBK:XXX SPARE: XXX * INVLD CAL:XXX SPARE: XXX SPARE: XXX *\r\n"// 5
"* THLD LMT:  XXX REM ARC: XXX SPARE: XXX * THLD LMT: XXX SPARE: XXX SPARE: XXX *\r\n"// 6
"* MUTE ACT:  XXX SPARE:   XXX SPARE: XXX * MUTE ACT: XXX SPARE: XXX SPARE: XXX *\r\n"// 7
"* VSWR FDBK: XXX SPARE:   XXX SPARE: XXX * VSWR FDBK:XXX K5 SW: XXX SPARE: XXX *\r\n"// 8
"* REJ ACT:   XXX SPARE:   XXX SPARE: XXX * REJ ACT:  XXX K4 SW: XXX SPARE: XXX *\r\n"// 9
"* VSWR ACT:  XXX SPARE:   XXX SPARE: XXX * VSWR ACT: XXX K3 SW: XXX SPARE: XXX *\r\n"// 10
"* COOL RDCD: XXX SPARE:   XXX SPARE: XXX * COOL RDCD:XXX K2 SW: XXX SPARE: XXX *\r\n"// 11
"* COOL FDBK: XXX SPARE:   XXX SPARE: XXX * COOL FDBK:XXX K1 SW: XXX SPARE: XXX *\r\n"// 12
"*******************************************************************************\r\n"// 13
"* LVPS P12:  XXX SPARE:   XXX SPARE: XXX * LVPS P12: XXX SPARE: XXX SPARE: XXX *\r\n"// 14
"* LVPS N12:  XXX SPARE:   XXX SPARE: XXX * LVPS N12: XXX SPARE: XXX SPARE: XXX *\r\n"// 15
"* LVPS P15:  XXX SPARE:   XXX SPARE: XXX * LVPS P15: XXX ARC:   XXX SPARE: XXX *\r\n"// 16
"* LVPS N15:  XXX AC FAIL: XXX SPARE: XXX * LVPS N15: XXX SPARE: XXX K5 MD: XXX *\r\n"// 17
"* LVPS P7:   XXX VCR1 AC: XXX SPARE: XXX * LVPS P7:  XXX SPARE: XXX K4 MD: XXX *\r\n"// 18
"* LVPS P5:   XXX VCR1 DC: XXX SPARE: XXX * LVPS P5:  XXX SPARE: XXX K3 MD: XXX *\r\n"// 19
"* LVPS VREF: XXX VCR2 AC: XXX SPARE: XXX * LVPS VREF:XXX SPARE: XXX K2 MD: XXX *\r\n"// 20
"* LVPS P3:   XXX VCR2 DC: XXX SPARE: XXX * LVPS P3:  XXX SPARE: XXX K1 MD: XXX *\r\n"// 21
"*******************************************************************************\r\n"// 22
"* STATE:XXXXX  MUTE:XXXXX REMOTE:XXXXX MODE:XXXXXX  L/R ARROWS: CHANGE PAGES   *\r\n"// 23
"*******************************************************************************",   // 24
Page 3
"*******************************************************************************\r\n"// 1
"*                          SYSTEM CRITICAL FAULT STATUS                       *\r\n"// 2
"*      Note:  Any of these faults occurred would cause system shut down.      *\r\n"// 3
"*******TRANSMITTER CONTROL UNIT***************COMBINER CONTROL UNIT**************\r\n"// 4
"* INT INTLK: XXX SPARE:   XXX SPARE: XXX * INT INTLK:XXX SPARE: XXX SPARE: XXX *\r\n"// 5
"* EXT INTLK: XXX SPARE:   XXX SPARE: XXX * EXT INTLK:XXX SPARE: XXX SPARE: XXX *\r\n"// 6
"* SPARE:     XXX SPARE:   XXX SPARE: XXX * EARTH SW: XXX SPARE: XXX SPARE: XXX *\r\n"// 7
"* SPARE:     XXX SPARE:   XXX SPARE: XXX * SPARE:    XXX SPARE: XXX SPARE: XXX *\r\n"// 8
"* SPARE:     XXX SPARE:   XXX SPARE: XXX * SPARE:    XXX SPARE: XXX SPARE: XXX *\r\n"// 9
"* SPARE:     XXX SPARE:   XXX SPARE: XXX * SPARE:    XXX SPARE: XXX SPARE: XXX *\r\n"// 10
"* SPARE:     XXX SPARE:   XXX SPARE: XXX * SPARE:    XXX SPARE: XXX SPARE: XXX *\r\n"// 11
"* SPARE:     XXX SPARE:   XXX SPARE: XXX * SPARE:    XXX SPARE: XXX SPARE: XXX *\r\n"// 12
"*******************************************************************************\r\n"// 13
"* SYS F-OFF: XXX SPARE:   XXX SPARE: XXX * SYS F-OFF:XXX SPARE: XXX SPARE: XXX *\r\n"// 14
"* CPLD FAIL: XXX SPARE:   XXX SPARE: XXX * CPLD FAIL:XXX SPARE: XXX SPARE: XXX *\r\n"// 15
"* FRT PANEL: XXX SPARE:   XXX SPARE: XXX * FRT PANEL:XXX SPARE: XXX SPARE: XXX *\r\n"// 16
"* AMB TEMP:  XXX SPARE:   XXX SPARE: XXX * AMB TMP:  XXX SPARE: XXX SPARE: XXX *\r\n"// 17
"* COOL FOFF: XXX SPARE:   XXX SPARE: XXX * COOL FOFF:XXX SPARE: XXX SPARE: XXX *\r\n"// 18
"* BUS INTLK: XXX SPARE:   XXX SPARE: XXX * BUS INTLK:XXX SPARE: XXX SPARE: XXX *\r\n"// 19
"* SPARE:     XXX SPARE:   XXX SPARE: XXX * CBL INTLK:XXX SPARE: XXX SPARE: XXX *\r\n"// 20
"* REJ TEMP:  XXX SPARE:   XXX SPARE: XXX * REJ TEMP: XXX SPARE: XXX SPARE: XXX *\r\n"// 21
"*******************************************************************************\r\n"// 22
"* STATE:XXXXX  MUTE:XXXXX REMOTE:XXXXX MODE:XXXXXX  L/R ARROWS: CHANGE PAGES   *\r\n"// 23
"*******************************************************************************",   // 24
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WARNING: Disconnect primary power prior to servicing.

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  Page 4
  "*********************************************************************************\r\n"// 1
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  "*  xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx *\r\n"// 3
  "*********************************************************************************\r\n"// 4
"* CPLD REG0        XX                                                             *\r\n"// 5
"* CPLD REG1        XX                                                             *\r\n"// 6
"* CPLD REG2        XX                                                             *\r\n"// 7
"* CPLD REG3        XX                                                             *\r\n"// 8
"* CPLD REG4        XX                                                             *\r\n"// 9
"* CPLD REG5        XX                                                             *\r\n"// 10
"* CPLD REG6        XX                                                             *\r\n"// 11
"* CPLD REG7        XX                                                             *\r\n"// 12
"* CPLD REG8        XX                                                             *\r\n"// 13
"* CPLD REG9        XX                                                             *\r\n"// 14
"* CPLD REG10       XX                                                             *\r\n"// 15
"* CPLD REG11       XX                                                             *\r\n"// 16
"* CPLD REG12       XX                                                             *\r\n"
"* CPLD REG13       XX                                                             *\r\n"
"* CPLD REG14       XX                                                             *\r\n"
"* CPLD REG15       XX                                                             *\r\n"
"*                                                                                 *\r\n"
  "*********************************************************************************\r\n"// 22
  "* STATE:XXXXX  MUTE:XXXXX REMOTE:XXXXX MODE:XXXXXX  L/R ARROWS: CHANGE PAGES   *\r\n"// 23
  "*********************************************************************************",   // 24
  Page 5
  "*********************************************************************************\r\n"// 1
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  "*  xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx *\r\n"// 3
  "*********************************************************************************\r\n"// 4
"*                                                                                 *\r\n"
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"*                                                                                 *\r\n"
"*                                                                                 *\r\n"
"*                                                                                 *\r\n"
  "*********************************************************************************\r\n"// 22
  "* STATE:XXXXX  MUTE:XXXXX REMOTE:XXXXX MODE:XXXXXX  L/R ARROWS: CHANGE PAGES   *\r\n"// 23
  "*********************************************************************************",   // 24
     Page 6
     "*********************************************************************************\r\n"// 1
     "*                            PARAMETERS SETTING                                 *\r\n"// 2
     "*********************************************************************************\r\n"// 3
     "*       CONFIGURATION/CALIBRATION       *          EXT POWER REDUCTION         *\r\n"// 4
     "*********************************************************************************\r\n"// 5
     "*  (a)  MODEL TYPE          XXXXXXXX     *  (m)  EXT PWR REDUCTION:  ON          *\r\n"// 6
     "*  (b)  :                                *  (n)  MODES:               COMB ONLY  *\r\n"// 7
     "*  (c)  MODULATION:         XXXXX        *  (o)  PWR LEVEL:           HIGH       *\r\n"// 8
     "*  (d)                                   *  (p)  REDUCTION LEVEL      -6DB       *\r\n"// 9
     "*  (e)  VSWR OVLD           X.XX         ****************************************\r\n"// 10
     "*  (f)  VSWR FDBK:          X.XX         *  (q)  XMTR1 FWD PWR:      XXXX*100W  *\r\n"// 11
     "*  (g)  SYS TPO:            XXXX*100 W   *  (r)                                   *\r\n"// 12
     "*  (h)  LOAD TPO:           XXXX*100 W   *  (s)  XMTR2 FWD PWR:      XXXX*100W  *\r\n"// 13
     "****************************************  (t)                                   *\r\n"// 14
     "*                                       *  (5)                                   *\r\n"// 15
     "*                                       *  (6)                                   *\r\n"// 16
     "*                                       *  (7)                                   *\r\n"// 17
     "****************************************  (8)                                   *\r\n"// 18
     "*  (x)  YEAR: 00  MONTH: 00  DATE: 00   *  (9)                                   *\r\n"// 19
     "*       HOUR: 00  MIN:   00  SEC:  00   *                                       *\r\n"// 20
     "*********************************************************************************\r\n"// 21
     "*    (z): Restore Default Settings         (y): Save Settings as Default       *\r\n"// 22
     "*    U/D ARROWS: Adjust Value   RETURN: Save Data   L/R ARROWS: Change Pages   *\r\n"// 23
     "*********************************************************************************",   // 24

   12345678901234567890123456789012345678901234567890123456789012345678901234567890
            1         2         3         4         5         6         7         8
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WARNING: Disconnect primary power prior to servicing.

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  Page 7
  "*******************************************************************************\r\n"
  "*                OPERATION/EVENT/STATE LOG(r: Reset Log)                        *\r\n"
  "*******************************************************************************\r\n"
"*  INDEX  FAULT                          ACTION                    TIME          *\r\n"
  "*******************************************************************************\r\n"
"*                                                                                 *\r\n"
"*                                                                                 *\r\n"
"*                                                                                 *\r\n"
"*                                                                                 *\r\n"
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"*                                                                                 *\r\n"
"*                                                                                 *\r\n"
"*                                                                                 *\r\n"
  "*******************************************************************************\r\n"// 21
  "* STATE:XXXXX  MUTE:XXXXX REMOTE:XXXXX MODE:XXXXXX  L/R ARROWS: CHANGE PAGES   *\r\n"// 23
  "*******************************************************************************",
 12345678901234567890123456789012345678901234567890123456789012345678901234567890
          1         2         3       4       5       6       7          8
  end of the tables
```

5.3 Combiner Cabinet Access

Safe access to various areas in the combiner is achieved through the use of latches, interlocks and keylocks(3DXD200 Only).

5.3.1 Grounding Hooks

There are grounding hooks available at all potentially hazardous areas of the combiner. The grounding hooks should be used to assure all components are discharged before being touched by any personnel. Do not use the grounding hooks until all power is shut off and the earthing switch in the EARTHED position.

5.3.2 Combiner Keylock Access Procedure (3DXD200 Only)

TO BE ADDED LATER.

5.3.3 Main Cabinet RF Access Panels:

Access doors on the rear of the combiner that provide access to the RF junction point are Intlerlocked therefore require the transmitters be turned off and made safe before the doors can be opened.

5.3.4 Main RF Output Earthing Switch Access

The main RF earthing switch is located in the upper rear compartment of Bay 6. Select to earth position when working inside Combiner.

5.4 Replacement of Parts

5.4.1 Vacuum Capacitor Replacement

Should one of the vacuum capacitors need to be replaced, the cyclometer (or counter) connected to the capacitor can be used to set the new capacitor to the same value as the old one.

5.4.1.1 Replacement Using the Counter

Two of the Vacuum capacitors in the Combiner Cabinet have a counter connected to them. If the capacitor fails and needs replaced, do the following:

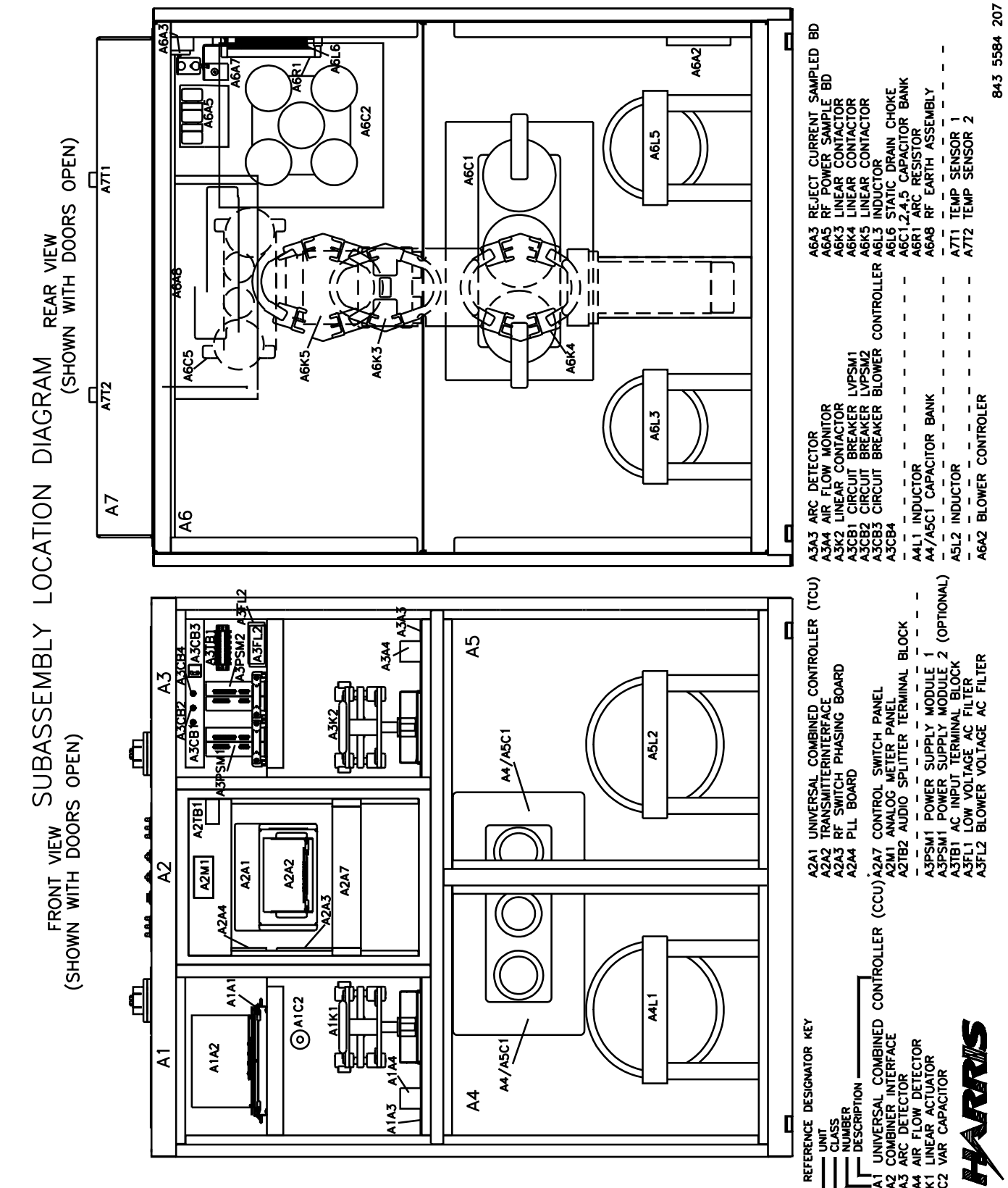
a. Write down the number on the counter which is connected to the capacitor to be replaced.
b. Remove the bad capacitor.
c. Set the counter to all zeros.
d. Turn the shaft on the new capacitor CW several turns. You should feel some resistance as you turn.
e. Now turn the shaft on the new capacitor CCW until the bell on top of the capacitor just becomes loose (you will no longer feel any resistance when turning the shaft). Do not turn the shaft more than one or two turns more, as you can damage the capacitor.
f. Turn the shaft CW just until the shaft tightens to the bell housing.
g. Install the capacitor and reconnect the counter and copper tubing (and/or strap).
h. Turn the capacitor CW until the counter reads the same as the original capacitor.

If done properly, no other tuning should be required.

5.4.2 Reject Load Replacement

If it is necessary to change a reject load or more likely, just some of the individual resistors, the values used in replacement can be critical to the proper balance between the reject loads. The load has 28 resistors with a nominal resistance of 1440 ohms each. Due to tolerance, these resistors can have any value between 1296 and 1584 ohms. The total resistor bank should measure 50 ohm's +/- 10%. Keep in mind that the reject loads normally dissipate very little power and should therefore have a very long MTBF (Mean Time Between Failure).

WARNING: Disconnect primary power prior to servicing.



REFERENCE DESIGNATOR KEY
UNIT
CLASS
NUMBER
DESCRIPTION

A1A1 UNIVERSAL COMBINED CONTROLLER (CCU)
A1A2 COMBINER INTERFACE
A1A3 ARC DETECTOR
A1A4 AIR FLOW DETECTOR
A1K1 LINEAR ACTUATOR
A1C2 VAR CAPACITOR

A2A1 UNIVERSAL COMBINED CONTROLLER (TCU)
A2A2 TRANSMITTERINTERFACE
A2A3 RF SWITCH PHASING BOARD
A2A4 PLL BOARD
A2A7 CONTROL SWITCH PANEL
A2M1 ANALOG METER PANEL
A2TB2 AUDIO SPLITTER TERMINAL BLOCK
- - - - - - - - - - - - - - - - - -
A3PSM1 POWER SUPPLY MODULE 1
A3PSM1 POWER SUPPLY MODULE 2 (OPTIONAL)
A3TB1 AC INPUT TERMINAL BLOCK
A3FL1 LOW VOLTAGE AC FILTER
A3FL2 BLOWER VOLTAGE AC FILTER

A3A3 ARC DETECTOR
A3A4 AIR FLOW MONITOR
A3K2 LINEAR CONTACTOR
A3CB1 CIRCUIT BREAKER LVPSM1
A3CB2 CIRCUIT BREAKER LVPSM2
A3CB3 CIRCUIT BREAKER BLOWER CONTROLLER
A3CB4
- - - - - - - - - - - - - - - - - -
A4L1 INDUCTOR
A4/A5C1 CAPACITOR BANK
- - - - - - - - - - - - - - - - - -
A5L2 INDUCTOR
- - - - - - - - - - - - - - - - - -
A6A2 BLOWER CONTROLER

A6A3 REJECT CURRENT SAMPLED BD
A6A5 RF POWER SAMPLE BD
A6K3 LINEAR CONTACTOR
A6K4 LINEAR CONTACTOR
A6K5 LINEAR CONTACTOR
A6L3 INDUCTOR
A6L6 STATIC DRAIN CHOKE
A6C1,2,4,5 CAPACITOR BANK
A6R1 ARC RESISTOR
A6A8 RF EARTH ASSEMBLY
- - - - - - - - - - - - - - - - - -
A7T1 TEMP SENSOR 1
A7T2 TEMP SENSOR 2

843 5584 207

WARNING: Disconnect primary power prior to servicing.

Section VI
Parts List

Introduction
This section of the technical manual contains a list of the repaceable parts for the 3DXD Two Way Combiner.

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WARNING: Disconnect primary power prior to servicing.

Table 6-1. COMBINER, RFC 100 - 981 0074 001 (E)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
003 4010 071	CU, STRIP .025 X 2"	3.5 LB	
003 8030 093	CU, TBG .875 OD .045 WALL	90 FT	
839 8464 007	SCHEMATIC, RF 2-WAYCOMBINER 3DXD 100/200 KW	0 DWG	
839 8464 008	FD CHART 2-WAY COMBINER, 3DXD 100	0 DWG	
971 0031 004	FRONT,COMBINER	1 EA	
971 0031 005	REAR, COMBINER	1 EA	

Table 6-2. FRONT,COMBINER - 971 0031 004 (G)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
358 1866 000	BUMPER, MOLDED	12 EA	
448 0884 000	LATCH, FLUSH, LIFT & TURN	4 EA	
448 1033 000	HINGE, CONCEALED	12 EA	
514 0240 000	CAP, VAR 2300PF 15KV TEST	2 EA	C1,C2
646 1662 023	NAMEPLATE, DXD100	1	
917 1377 002	CLIP, 80 AMP COIL	2 EA	
917 2150 537	WASHER	2 EA	
917 2150 538	WASHER	2 EA	
917 2413 321	SHAFT COUPLING .50 X .50	2 EA	
917 2413 322	SHAFT COUPLING.187 X .500	2 EA	
922 0980 561	CYCLOMETER ASSEMBLY	2 EA	
922 1238 036	ANGLE, AIRFLOW MTG.	2 EA	
922 1238 597	CLAMP, COIL	20 EA	
939 8154 706	STRAP, INDUCTOR 30"X2"	4 EA	
943 5143 098	COIL, HF26-80	2 EA	L1,L2
943 5584 028	CABINET WELDMENT	1 EA	
943 5584 031	BASE SHIELD	1 EA	
943 5584 032	SHIELD, LEFT SIDE	1 EA	
943 5584 034	SHIELD, RIGHT SIDE	1 EA	
943 5584 035	SHIELD, BOTTOM REAR	1 EA	
943 5584 036	DIVIDER, LOWER FRONT	1 EA	
943 5584 037	SHELF, FRONT	1 EA	
943 5584 038	SHIELD, TOP REAR	1 EA	
943 5584 039	SHIELD, TOP	1 EA	
943 5584 040	DIVIDER, TOP LEFT	1 EA	
943 5584 041	DIVIDER, TOP RIGHT	1 EA	
943 5584 042	MTG. ANGLE, LOWER	1 EA	
943 5584 043	TRIM, HORIZONTAL	1 EA	
943 5584 044	TRIM, BOTTOM VERTICAL	1 EA	
943 5584 045	TRIM, RACK MTG.	1 EA	
943 5584 047	TRIM, TOP VERTICAL	2 EA	
943 5584 049	ANGLE, RACK MTG.	2 EA	
943 5584 050	COVER PLATE, LOWER LEFT	1 EA	
943 5584 051	SHIELD, DOOR LATCH	4 EA	
943 5584 052	COVER PLATE, LOWER RIGHT	1 EA	
943 5584 053	COVER PLATE, UPPER LEFT	1 EA	
943 5584 055	COVER PLATE, UPPER RIGHT	1 EA	
943 5584 057	COLD COMPARTMENT, RIGHT	1 EA	
943 5584 061	COLD COMPARTMENT, LEFT	1 EA	
943 5584 063	SHIELD, CABLE	1 EA	

943 5584 065	SHIELD, CABLE	1 EA	
943 5584 067	SHIELD, CABLE	2 EA	
943 5584 068	SHIELD, CABLE	1 EA	
943 5584 070	SHIELD, CABLE	1 EA	
943 5584 083	COVER PLATE, REAR	1 EA	
943 5584 084	COVER PLATE, TOP	1 EA	
943 5584 085	FRONT PANEL, LOWER DOOR	2 EA	
943 5584 086	REAR PANEL, LOWER DOOR	2 EA	
943 5584 087	FRONT PANEL, UPPER DOOR	2 EA	
943 5584 088	REAR PANEL, UPPER DOOR	2 EA	
943 5584 089	PLATE, CAP CONNECTING	1 EA	
943 5584 090	PLATE, CAP MTG.	1 EA	
943 5584 091	PLATE, CAP CONNECTING	1 EA	
943 5584 092	PLATE, CAP MTG.	1 EA	
943 5584 094	ANGLE, CAP CONNECTING	4 EA	
943 5584 095	BRACKET, CAP MTG.	1 EA	
943 5584 096	SIDE PLATE, COIL FRAME	4 EA	
943 5584 097	END PLATE, COIL FRAME	4 EA	
943 5584 098	ANGLE, COIL FRAME	8 EA	
943 5584 099	ANGLE, COIL FRAME	4 EA	
943 5584 100	BRACKET, CYCLOMETER	1 EA	
943 5584 101	BRACKET, CYCLOMETER	1 EA	
943 5584 124	SHAFT, DRIVE	1 EA	
943 5584 151	DRIVE SHAFT	1 EA	
943 5584 152	PLATE, CAP SUPPORT	1 EA	
943 5584 153	STRAP, CAP CONNECTING	2 EA	
943 5584 154	STRAP, CAP CONNECTING	2 EA	
952 9198 004	CABLES, INTERNAL CONTROL	1 EA	
952 9198 005	CABLES, COAX, INTERNAL RF	1 EA	
952 9198 006	CABLES, INTERCONNECT	1 EA	
952 9198 008	CABLES, TCU/CCU INTERCONNECT	1 EA	
952 9198 009	CABLES, DXD COMBINER, CNTRL	1 EA	
952 9198 010	CABLES, BLOWER	1 EA	
952 9198 011	CABLES, DC PWR	1 EA	
952 9198 012	CABLES, 3DXD COMBINER	1 EA	
971 0002 012	BASIC CONTROL UNIT	1 EA	
971 0031 003	ASSY I/O PANEL	1 EA	
971 0031 009	ASSY, COLD COMPARTMENT, LEFT, COMB CNTRL	1 EA	
971 0031 010	ASSY, COLD COMPARTMENT, RIGHT, POWER SUPPLY	1 EA	
992 8363 001	AIR FLOW MONITOR	2 EA	
992 8677 004	PWA, ARC DETECTOR,	2 EA	
992 9063 001	PWA,RF CURRENT SAMPLE,ESD SAFE	1 EA	
992 9751 011	CONTACTOR, RF, HRFC-DL-100-10	2 EA	K1,K2

Table 6-3. BASIC CONTROL UNIT - 971 0002 012 (C)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
346 0711 000	CARD GUIDE, GROUNDED	8 EA	
358 1881 000	EJECTOR KIT CARD	4 EA	
358 3562 000	SPRING CLIP 0.75 DIA	2 EA	
632 1163 000	WATTMETER, 0-200KW, 4.5",[W]	1	
901 0122 111	PWA, XMTR INTERFACE	1 EA	A2A2
901 0122 131	PWA, UNIVERSAL COMBINED CONTROLLER	1 EA	A2A1
939 8221 031	PNL, 19.0X1.718X0.125 HF142	1 EA	
939 8221 032	PNL, 19.0X3.468X0.125 HF142	1 EA	

943 5584 102	BASE PLATE, CARD CAGE	1 EA	
943 5584 103	PLATE, PWB MTG.	1 EA	
943 5584 104	PLATE, CARD GUIDE MTG.	1 EA	
943 5584 105	FRAME, CARD CAGE	1 EA	
943 5584 121	DOOR, ACCESS	1 EA	
943 5584 122	HINGE, DOOR	1 EA	
943 5584 123	TRIM PLATE, DOOR	1 EA	
943 5584 144	PLATE, CARD GUIDE MTG.	1 EA	
943 5584 149	METER PANEL	1 EA	
943 5584 150	PLATE, METER MTG.	1 EA	
943 5584 166	HINGE	1 EA	
943 5584 167	FRAME, GND STICK PANEL	1 EA	
943 5584 168	PANEL, GND STICK MTG.	1 EA	
943 5584 169	HANDLE, GROUND HOOK	1 EA	
943 5584 170	ASSY, GROUND HOOK	1 EA	
943 5584 171	PLATE, CLIP MTG.	1 EA	
971 0002 013	ASSY, CONTROL PANEL	1 EA	
992 8471 001	RF SWITCH AND PHASING BD	1 EA	A2A3
992 8471 101	RF SWITCH & PHASING BD	1 EA	A2A4

Table 6-4. ASSY, CONTROL PANEL - 971 0002 013 (E)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
299 0040 000	TAPE, PVC FOAM,1"W X 0.062"TH	0.83 FT	
353 0313 000	STANDOFF, HEX 6MM M3 X 0.5 M/F 10MM	SPACING 4 EA	
358 2589 000	FLAT CABLE MOUNT	4 EA	
424 0688 000	GROMMET, 3/16" MTG DIA	2 EA	
447 0002 000	HANDLE, 1-PULL, BLACK, M4	2 EA	
458 0001 000	HINGE, 120 DEG , SELF CLOSING	2 EA	
598 0487 000	ELASTOMER, CONTROL BUTTONS, REAR	1 EA	
647 0003 000	ELASTOMER,CONTROL BUTTONS, FRONT	1 EA	
901 0210 031	*PWA, SWITCH BOARD	1 EA	
917 1335 267	WINDOW, FRT PNL	1 EA	
917 2558 066	BRACKET, DOOR STOP MTG	2 EA	
922 1325 166	BLOCK, HINGE MTG	2 EA	
922 1325 167	BLOCK, DOOR MTG	2 EA	
943 5547 211	CHASSIS, CONTROL UNIT	1 EA	
943 5584 002	FRONT PANEL, CONTROL	1 EA	
943 5584 014	PANEL, PWA COVER, REAR	1 EA	

Table 6-5. *PWA, SWITCH BOARD - 901 0210 031 (B)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
000 0000 010	B/M NOTE:	1 DWG	J3
396 0263 000	DISPLAY, 10 CHAR, GRN ESD	1 EA	DS122
566 0037 000	CONVERTER, DC/DC 5V .75W ESD	1 EA	U1
610 0877 000	HDR, STR, 2 PIN, SQ	3 EA	JP1,JP2,JP3
610 0902 000	HDR 10 PIN STRAIGHT	2 EA	J1,JP4
610 0982 000	*HDR 26C VERT 2ROW TOP LATCH	1 EA	J4
610 1070 000	HDR 6 PIN STRAIGHT	1 EA	J2
612 1184 000	SHUNT JUMPER 0.1" CENTERS	8 EA	1/JP1,1/JP2,1/JP3,5/JP4
801 0210 031	SCH, SWITCH BOARD	0 DWG	
901 0210 030	*PWA, SWITCH BOARD, SMT	1 EA	

Table 6-6. RF SWITCH AND PHASING BD - 992 8471 001 (E1)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
2520003000A	*WIRE, STRD 20AWG WHT	0.200 FT	
354 0309 000	TERM SOLDER	2 EA	E001,E002
380 0083 000	XSTR, 2N2369 ESD	3 EA	Q001,Q002,Q003
380 0578 000	XSTR, PN4258 ESD	1 EA	Q004
382 0081 000	IC, 7406 ESD	1 EA	U001
382 0581 000	IC, 74LS123 ESD	2 EA	U002,U004
382 0975 000	IC, 74LS151 ESD	1 EA	U003
384 0321 000	*DIODE 5082-2800 ESD	9 EA	CR001,CR004,CR005,CR006,CR007,CR008,CR009,CR010,CR011
386 0187 000	ZENER 1N5349A 12V ESD	1 EA	CR002
386 0297 000	ZENER 1N5338B 5.1V 5W 5% ESD	1 EA	CR003
404 0674 000	SOCKET, DIP, 14 PIN (DL)	1 EA	XU001
404 0675 000	SOCKET, DIP, 16 PIN (DL)	3 EA	XU002,XU003,XU004
492 0613 000	COIL, ADJ 1.6-3.1 UH	1 EA	L003
494 0395 000	CHOKE 40UH 2 AMP	2 EA	L001,L002
506 0232 000	CAP, 0.01UF 100V 5%	2 EA	C003,C010
506 0236 000	CAP, 0.0047UF 100V 5%	1 EA	C001
506 0237 000	CAP, 0.0068UF 100V 5%	1 EA	C002
506 0238 000	CAP, 0.015UF 100V 5%	4 EA	C004,C009,C015,C016
506 0244 000	CAP, 0.22UF 63V 5%	4 EA	C005,C006,C007,C008
516 0453 000	CAP .1UF 100V 20% X7R	4 EA	C011,C012,C013,C014
546 0295 000	RES 50 OHM 3.25W 5%	3 EA	R019,R25,R27
546 0311 000	RES 120 OHM 3W 5%	3 EA	R007,R008,R009
548 2400 169	RES 51.1 OHM 1/2W 1%	2 EA	R004,R010
548 2400 201	RES 100 OHM 1/2W 1%	1 EA	R006
548 2400 230	RES 200 OHM 1/2W 1%	2 EA	R003,R014
548 2400 258	RES 392 OHM 1/2W 1%	3 EA	R011,R016,R022
548 2400 269	RES 511 OHM 1/2W 1%	1 EA	R013
548 2400 281	RES 681 OHM 1/2W 1%	1 EA	R005
548 2400 285	RES 750 OHM 1/2W 1%	1 EA	R015
548 2400 330	RES 2K OHM 1/2W 1%	3 EA	R018,R26,R28
548 2400 401	RES 10K OHM 1/2W 1%	7 EA	R001,R002,R017,R020,R021,R023,R024
550 0947 000	TRIMPOT 1K OHM 1/2W 10%	1 EA	R012
604 0852 000	SW, RKR DIP 4-SPST	1 EA	S002
604 0856 000	SW, TGL SPDT	1 EA	S001
610 0679 000	PLUG, SHORTING, .25" CTRS	6 EA	P1,P2,P3,P4,P5,P6
612 0904 000	JACK, PC MT GOLD PLATED	18 EA	
614 0741 000	TERM BLK, 12C 1ROW	1 EA	TB001
839 8073 001	SCH, RF SW & PHASE BD, DXD100	0 DWG	
843 5241 001	PWB,RF SWITCH AND PHASING	1 EA	
917 2243 001	FAB RF SWITCH & PHASING	1 EA	
999 2786 001	HARDWARE LIST, RF SWITCH	1 EA	

Table 6-7. RF SWITCH & PHASING BD - 992 8471 101 (B)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
354 0309 000	TERM SOLDER	2 EA	E001,E002
380 0083 000	XSTR, 2N2369 ESD	3 EA	Q001,Q002,Q003
380 0578 000	XSTR, PN4258 ESD	1 EA	Q004
382 0081 000	IC, 7406 ESD	1 EA	U001
384 0321 000	*DIODE 5082-2800 ESD	5 EA	CR001,CR004,CR005,CR006,CR007
386 0187 000	ZENER 1N5349A 12V ESD	1 EA	CR002

386 0297 000	ZENER 1N5338B 5.1V 5W 5% ESD	1 EA	CR003
404 0673 000	SOCKET, DIP, 8 PIN (DL)	1 EA	XS002
404 0674 000	SOCKET, DIP, 14 PIN (DL)	1 EA	XU001
404 0675 000	SOCKET, DIP, 16 PIN (DL)	1 EA	XU003
492 0613 000	COIL, ADJ 1.6-3.1 UH	1 EA	L003
494 0395 000	CHOKE 40UH 2 AMP	2 EA	L001,L002
506 0232 000	CAP, 0.01UF 100V 5%	2 EA	C003,C010
506 0236 000	CAP, 0.0047UF 100V 5%	1 EA	C001
506 0237 000	CAP, 0.0068UF 100V 5%	1 EA	C002
506 0238 000	CAP, 0.015UF 100V 5%	1 EA	C004
506 0244 000	CAP, 0.22UF 63V 5%	4 EA	C005,C006,C007,C008
516 0453 000	CAP .1UF 100V 20% X7R	4 EA	C011,C012,C013,C014
546 0295 000	RES 50 OHM 3.25W 5%	1 EA	R019
546 0311 000	RES 120 OHM 3W 5%	3 EA	R007,R008,R009
548 2400 169	RES 51.1 OHM 1/2W 1%	2 EA	R004,R010
548 2400 201	RES 100 OHM 1/2W 1%	1 EA	R006
548 2400 230	RES 200 OHM 1/2W 1%	2 EA	R003,R014
548 2400 269	RES 511 OHM 1/2W 1%	1 EA	R013
548 2400 281	RES 681 OHM 1/2W 1%	1 EA	R005
548 2400 285	RES 750 OHM 1/2W 1%	1 EA	R015
548 2400 330	RES 2K OHM 1/2W 1%	1 EA	R018
550 0947 000	TRIMPOT 1K OHM 1/2W 10%	1 EA	R012
604 0852 000	SW, RKR DIP 4-SPST	1 EA	S002
614 0741 000	TERM BLK, 12C 1ROW	1 EA	TB001
839 8118 112	SCHEM, RF DRIVER/PHASING	0 DWG	
843 5241 001	PWB,RF SWITCH AND PHASING	1 EA	
917 2243 001	FAB RF SWITCH & PHASING	1 EA	

Table 6-8. ASSY, COLD COMPARTMENT, LEFT, COMB CNTRL - 971 0031 009 (B)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
346 0711 000	CARD GUIDE, GROUNDED	2 EA	
358 1881 000	EJECTOR KIT CARD	1 EA	
901 0122 101	PWA, COMB INTERFACE	1 EA	A1A2
901 0122 131	PWA, UNIVERSAL COMBINED CONTROLLER	1 EA	A1A1
943 5584 081	FRAME, COVER	1 EA	
943 5584 082	WINDOW, COVER	1 EA	
943 5584 106	PLATE, PWB MTG.	1 EA	
943 5584 107	MTG. FRAME, CONTROLLER	1 EA	
943 5584 143	GND PLATE, CONTROLLER	1 EA	

Table 6-9. PWA, COMB INTERFACE - 901 0122 101 (B)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
358 1928 000	JUMPER 1/4 LG 1/8H	4 EA	JP1,JP2,JP3,JP4
380 0125 000	XSTR, NPN 2N4401 ESD	2 EA	Q3,Q4
560 0121 020	POSISTOR 3 AMP 60VDC DISC	5 EA	R25,R60,R88,R105,R131
610 1235 000	HEADER, STRAIGHT 4 PIN	3 EA	J2,J7,J8
610 1236 000	HEADER, STRAIGHT 8 PIN	2 EA	J9,J13
610 1238 000	HEADER, STRAIGHT 16 PIN	5 EA	J17,J18,J19,J20,J21
610 1441 010	HDR, 10C 2ROW VERTICAL	4 EA	J3,J4,J5,J6
612 1351 000	RECP, SMB RT ANG PCB MT	3 EA	J10,J15,J16
612 1588 000	RECP, 120C 3ROW STRAIGHT	1 EA	J1

801 0122 101	SCH, COMB INTERFACE	0 DWG
901 0122 102	PWA, COMB INTERFACE,SMT	1 EA

Table 6-10. PWA, UNIVERSAL COMBINED CONTROLLER - 901 0122 131 (B)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
086 0001 010	*SEALANT GLYPTOL	0 QT	
300 1484 000	SCR, 4-40 X 1/4	5 EA	1/CR65,1/CR66,1/CR67,1/CR68,1/U72
302 0016 000	SCR, 2-56 X 1/2	2 EA	2/J18
304 0001 000	NUT, HEX 2-56	2 EA	2/J18
304 0087 000	NUT, HEX 4-40	5 EA	1/CR65,1/CR66,1/CR67,1/CR68,1/U72
310 0001 000	WASHER, FLAT #2	2 EA	2/J18
312 0045 000	WASHER, SPLIT-LOCK 4	5 EA	1/CR65,1/CR66,1/CR67,1/CR68,1/U72
314 0001 000	WASHER, SPLIT-LOCK 2	2 EA	2/J18
335 0254 000	WASHER, TEFLON #4	2 EA	2/J18
354 0846 000	TERMINAL, SOLDER	5 EA	1/CR65,1/CR66,1/CR67,1/CR68,1/U72
357 0037 000	SCREW 6-32 X .25 BHMS	2 EA	
357 0059 000	NUT, HEX 6-32	2 EA	
358 3789 000	STANDOFF, HEX 6-32 X 5/16 M/F	2 EA	
382 1638 000	IC 1085CT-5 ESD	1 EA	U72
384 1149 000	RECT, 30V 30A FAST ESD	4 EA	CR65,CR66,CR67,CR68
398 0583 000	FUSE, FAST CART 5A 250V	3 EA	F1,F2,F3
402 0198 000	CLIP, FUSE 5MM DIA FUSE	6 EA	2/F1,2/F2,2/F3
404 0908 000	*HEATSINK, VERTICAL, TO-220	5 EA	1/CR65,1/CR66,1/CR67,1/CR68,1/U72
406 0537 000	DISPLAY, ALPHANUMERIC, 1X8	1 EA	DS22
566 0037 000	CONVERTER, DC/DC 5V .75W ESD	1 EA	U39
610 0679 000	PLUG, SHORTING, .25" CTRS	1 EA	JP9
610 0877 000	HDR, STR, 2 PIN, SQ	4 EA	JP5,JP6,JP10,JP11
610 0900 000	HEADER 3 CKT STRAIGHT	6 EA	JP1,JP2,JP3,JP4,JP7,JP8
610 0902 000	HDR 10 PIN STRAIGHT	1 EA	J20
610 0991 000	HDR, STR, 6 PIN, 0.025 SQ	2 EA	J9,J11
610 1107 000	HDR,12PIN,1ROW,STRT,POL	1 EA	J12
610 1145 000	HDR, 6PIN, 1ROW, STRT,POL	2 EA	J8,J10
610 1371 000	PLUG, 120C 3ROW RT ANGLE	1 EA	J18
610 1423 012	HDR, 12C 1ROW VERTICAL	1 EA	J26
610 1424 004	HDR, 4C 1ROW RT ANGLE	1 EA	J2
610 1424 006	HDR, 6C 1ROW RT ANGLE	1 EA	J4
610 1424 008	HDR, 8C 1ROW RT ANGLE	1 EA	J5
610 1424 012	HDR, 12C 1ROW RT ANGLE	2 EA	J3,J6
610 1441 026	HDR, 26C 2ROW VERTICAL	1 EA	J13
612 0904 000	JACK, PC MT GOLD PLATED	3 EA	3/JP9
612 1499 003	D RECP 25C RT ANG METAL	1 EA	J7
612 1588 000	RECP, 120C 3ROW STRAIGHT	4 EA	J14,J15,J16,J17
612 2175 001	*RECP D RT ANG 9C MET SHELL	1 EA	J25
612 2243 025	RECP/RECP, D, 25C/25C, METAL	1 EA	J1
660 0068 000	BATTERY 3V LITHIUM COIN CELL	1	BT1
801 0122 131	SCH, UNIVERSAL COMBINED CONTROLLER	0 DWG	
901 0122 132	PWA, UNIVERSAL COMBINED CONTROLLER, SMT	1 EA	
992 7203 001	*PWA, 376 MICRO MODULE	1 EA	

Table 6-11. ASSY, COLD COMPARTMENT, RIGHT, POWER SUPPLY - 971 0031 010 (D)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
484 0477 000	FILTER, POWER LINE 1PH	1 EA	FL1
484 0517 000	FILTER, POWER LINE, 1PH, 20AMP	1 EA	FL2
606 0788 000	CB, 2 POLE, 5 AMP 250VAC	3 EA	CB1,CB2,CB3
606 1133 000	CB, 2 POLE, 10 AMP 250VAC	2 EA	CB4,CB5
614 0681 000	TERM BD 6 TERM	1 EA	TB1
943 5584 073	COVER, COLD COMPARTMENT	1 EA	
943 5584 108	PANEL, BREAKER MTG.	1 EA	
943 5584 114	MODULE RETAINER, RIGHT	1 EA	
943 5584 115	MODULE RETAINER, LEFT	1 EA	
943 5584 116	MODULE RETAINER, CENTER	1 EA	
943 5584 157	SHIELD, FILTER	1 EA	
943 5584 158	SHIELD, BREAKER PANEL	1 EA	
943 5584 159	SHIELD, TERMINAL BLOCK	1 EA	
971 0031 015	LVPS MODULE	1 EA	PSM1

Table 6-12. LVPS MODULE - 971 0031 015 (C)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
736 0315 000	SWITCHER, AUTORANGING 115/230V	1 EA	PS1
736 0442 000	PSU, 600W 24VDC 115/230VAC	1 EA	PS2
943 5584 109	PLATE, RT SIDE	1 EA	
943 5584 110	PLATE, LEFT SIDE	1 EA	
943 5584 111	SPACER	2 EA	
943 5584 112	SPACER	2 EA	
943 5584 113	HANDLE	1 EA	
952 9198 007	CABLES, DC PWR, MODULE	1 EA	

Table 6-13. AIR FLOW MONITOR - 992 8363 001 (H)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
356 0084 000	CABLE TY RAP	1 EA	
382 0428 000	IC, LM358 ESD	1 EA	U003
382 1199 000	IC, LM35 ESD	1 EA	U002
404 0673 000	SOCKET, DIP, 8 PIN (DL)	1 EA	XU003
516 0453 000	CAP .1UF 100V 20% X7R	6 EA	C001,C002,C003,C006,C007,C008
526 0050 000	CAP 1UF 35V 20%	2 EA	C004,C005
544 1662 000	RES 30 OHM 20W 2% TO-220	1 EA	R001
548 2400 142	RES 26.7 OHM 1/2W 1%	1 EA	R008
548 2400 185	RES 75 OHM 1/2W 1%	2 EA	R004,R005
548 2400 501	RES 100K OHM 1/2W 1%	2 EA	R003,R006
548 2400 589	RES 825K OHM 1/2W 1%	2 EA	R002,R007
610 0978 000	*HDR 10C RT ANG 2ROW TOP LATCH	1 EA	J001
839 7930 022	SCHEM, AIR FLOW MON	0 DWG	
843 5155 022	PWB, AIR FLOW MON	1 EA	
917 2542 001	ASSY, AIR SENSOR	1 EA	#R001,U001
999 2657 001	HARDWARE LIST	1 EA	

Table 6-14. PWA, ARC DETECTOR, - 992 8677 004 (A)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
335 0244 000	WASHER, SHLDR 5/16 SCREW	2 EA	XR001,XR002
358 1928 000	JUMPER 1/4 LG 1/8H	2 EA	JP001,JP002
516 0453 000	CAP .1UF 100V 20% X7R	4 EA	C001,C002,C003,C004
548 2400 142	RES 26.7 OHM 1/2W 1%	2 EA	R003,R004
610 0978 000	*HDR 10C RT ANG 2ROW TOP LATCH	1 EA	J001
670 0056 000	RESISTOR-PHOTO, UV SENSITIVE	2	R001,R002
839 7930 517	SCHEM, ARC DETECTOR BD	0 DWG	
843 5155 517	PWB, ARC DETECTOR	1 EA	

Table 6-15. PWA,RF CURRENT SAMPLE,ESD SAFE - 992 9063 001 (H)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
356 0106 000	CABLE CLAMP 1/2 D	2 EA	#T001
358 1928 000	JUMPER 1/4 LG 1/8H	4 EA	JP001,JP002,JP003,JP004
384 0612 000	DIODE 1N3070 ESD	1 EA	CR001
500 0756 000	CAP, MICA, 330PF 500V 5%	1 EA	C001
516 0453 000	CAP .1UF 100V 20% X7R	2 EA	C003,C004
516 0736 000	CAP .001UF 10% 100V X7R	1 EA	C002
540 1600 212	RES 300 OHM 3W 5%	2 EA	R001,R002
548 2400 101	RES 10 OHM 1/2W 1%	1 EA	R005
548 2400 142	RES 26.7 OHM 1/2W 1%	2 EA	R007,R008
548 2400 501	RES 100K OHM 1/2W 1%	1 EA	R004
548 2400 530	RES 200K OHM 1/2W 1%	1 EA	R006
610 1240 000	HEADER, RT ANGLE 8 PIN	1 EA	J001
670 0056 000	RESISTOR-PHOTO, UV SENSITIVE	1	R009
843 5458 141	SCH,RF CURRENT, SAMPLE BD	0 DWG	
843 5458 143	PWB, RF CURRENT SAMPLE BD	1 EA	
916 6270 001	XMFR COIL ASSY	1 EA	T001
922 0999 679	XFMR MTG SHIELD	1 EA	#T001
999 2827 001	HARDWARE LIST, RF CURRENT	1 EA	

Table 6-16. CONTACTOR, RF, HRFC-DL-100-10 - 992 9751 011 (G)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
302 0763 000	SCREW, SOCKET HEAD SHOULDER	1 EA	
306 0012 000	NUT, STOP 8-32	3 EA	
306 0056 000	NUT, CAP 1/4-20	12 EA	
306 0058 000	NUT, ACORN 5/16-18	2 EA	
335 0091 000	WASHER, SHLD .171 ID	6 EA	
590 0042 000	LINEAR ACTUATOR, 75# CAPACITY	1 EA	
612 1451 000	FEMALE CONNECTOR, 4C	0 EA	#J002
612 1460 000	FEMALE CONNECTOR RT ANGLE	0 EA	#J001
646 0665 000	INSPECTION LABEL	1 EA	
817 2413 035	SPEC, DESIGN, RF CONTACTOR	0 DWG	
817 2492 027	SPEC, ALTITUDE DERATING DATA	0 DWG	
822 1291 063	SPEC, RF CONTACTORS	0 DWG	
839 8154 471	SCH, RF CONTACTOR WITH LINEAR	0 DWG	
843 5491 019	OUTLINE DRAWING, RF CONTACTOR	0 DWG	
917 2492 009	ROD	1 EA	
917 2492 010	SPRING	1 EA	
917 2492 011	KIT, SLAVE RELAY OPTION	0 EA	
917 2492 015	KIT, MAINTENANCE, LINEAR	0 EA	

917 2492 025	KIT, SPARE PARTS, LINEAR	0 EA
922 1291 006	STANDOFF 1.25" X 2.0" GL	2 EA
922 1291 007	TUBE, GL 1.897 X 3.875	2 EA
922 1291 009	STUDS 5/16-18 SST X 7.25	2 EA
922 1291 027	RETAINER, CONTACT 100 AMP	8 EA
922 1291 035	CONTACT FINGER, 2"	16 EA
922 1291 038	JUMPER, CONTACT, 100-10	0 EA
922 1291 049	JUMPER, CONTACTOR, 100-10	0 EA
939 8186 003	CONTACT ARM ASSY	1 EA
939 8186 009	ASSY, CONTACT, 100 AMP	8 EA
939 8186 029	BRACKET, PIVOT	1 EA
939 8186 030	PIN, PIVOT	1 EA
939 8186 043	SHIELD	1 EA
939 8186 044	BRACKET, SHIELD	1 EA
939 8186 048	SUPPORT, UPPER	1 EA
939 8186 049	BRACKET & SHAFT ASSY	1 EA
939 8186 075	BASE, LINEAR ACTUATOR	1 EA
939 8186 076	BLINDER, OPTIC	1 EA
939 8186 077	BRACKET, OPTIC BLINDER	1 EA
939 8186 078	SUPPORT, BASE	1 EA
992 9770 005	PWA, RF CONTACTOR CONTROL	1 EA

Table 6-17. KIT, SLAVE RELAY OPTION - 917 2492 011 (A2)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
2520004000A	*WIRE, STRD 18AWG YELLOW	8 FT	
354 0005 000	TERM LUG RED SPADE 6	4 EA	
404 0707 000	SOCKET RELAY OCTAL	2 EA	
574 0513 000	RELAY DPDT 24VDC	2 EA	
817 2492 012	CADS, JUMPER LIST, SLAVE RELAY	0 DWG	
839 8154 471	SCH, RF CONTACTOR WITH LINEAR	0 DWG	

Table 6-18. PWA, RF CONTACTOR CONTROL - 992 9770 005 (F)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
2000000000000000980	SENSOR, TRANSMISSIVE ESD	2 EA	U001,U002
354 0309 000	TERM SOLDER	7 EA	TP001,TP002,TP003,TP004,TP005,TP006,TP007
358 1928 000	JUMPER 1/4 LG 1/8H	6 EA	JP001,JP002,JP003,JP004,JP005,JP006
358 2997 000	END PLATE,236 TERM MODULE	1 EA	TB001
380 0728 000	XSTR, NMOS IRL520 ESD	3 EA	Q001,Q002,Q003
382 0648 000	IC, LM339A ESD	1 EA	U004
382 1070 000	IC, ILQ-1 OPTO-ISOLATOR ESD	1 EA	U003
384 0357 000	RECTIFIER 1N4004 ESD	6 EA	CR004,CR005,CR006,CR007,CR008,CR009
384 0610 000	* LED, GREEN T-1 3/4 ESD	1 EA	DS001
384 0611 000	*LED, RED T1-3/4 ESD	2 EA	DS002,DS003
384 0679 000	*LED, YELLOW T1-3/4 ESD	2 EA	DS004,DS005
384 0838 000	TRANSZORB 1N6380 36V 5W ESD	1 EA	CR001
386 0135 000	ZENER, 1N4733A 5.1V ESD	1 EA	CR003
386 0336 000	ZENER, 1N5363B 30V ESD	1 EA	CR002
386 0472 000	DIODE, TVS 39V 600W ESD	1 EA	CR010
516 0419 000	CAP .05 UF 500V	1 EA	C001
516 0453 000	CAP .1UF 100V 20% X7R	3 EA	C006,C007,C008
516 0792 000	CAP NETWORK .1UF 10%	2 EA	C003,C004

526 0019 000	CAP 68UF 15V 10%	1 EA	C005
540 1367 000	RES NETWORK 2000 OHM 2%	1 EA	R001
540 1530 000	RES NETWORK 10 OHM 2%	1 EA	R002
540 1600 001	RES 1 OHM 3W 5%	1 EA	R005
540 1600 108	RES 20 OHM 3W 5%	1 EA	R011
540 1600 223	RES 820 OHM 3W 5%	2 EA	R007,R009
548 2400 101	RES 10 OHM 1/2W 1%	3 EA	R006,R015,R021
548 2400 334	RES 2.21K OHM 1/2W 1%	2 EA	R016,R018
548 2400 401	RES 10K OHM 1/2W 1%	2 EA	R012,R014
548 2400 485	RES 75K OHM 1/2W 1%	2 EA	R008,R010
548 2400 501	RES 100K OHM 1/2W 1%	2 EA	R013,R017
548 2400 559	RES 402K OHM 1/2W 1%	1 EA	R022
550 0947 000	TRIMPOT 1K OHM 1/2W 10%	1 EA	R020
550 0949 000	TRIMPOT 100K OHM 1/2W 10%	1 EA	R019
560 0121 011	POSISTOR 1.1 AMP 60VDC DISC	1 EA	R003
574 0523 000	RELAY, LATCHING, DPDT 24V COIL	2 EA	K001,K004
574 0524 000	RELAY, NONLATCHING, DPDT 24V	2 EA	K002,K003
604 0905 000	SW, PB MOMENTARY	1 EA	S001
610 1112 000	HDR 4C 2R STRT NP	1 EA	JP008
610 1235 000	HEADER, STRAIGHT 4 PIN	1 EA	J002
610 1238 000	HEADER, STRAIGHT 16 PIN	1 EA	J001
612 1184 000	SHUNT JUMPER 0.1" CENTERS	2 EA	
614 0790 000	TERM MODULE,1C PC MTG 236	2 EA	TB001
670 0056 000	RESISTOR-PHOTO, UV SENSITIVE	1	R004
843 5491 001	SCH, RF CONTACTOR CONTROL	0 DWG	
843 5491 003	PWB, RF CONTACTOR CONTROL	1 EA	
917 2492 004	STANDOFF, G-10, 1.125 X .375	1 EA	#R004

Table 6-19. REAR, COMBINER - 971 0031 005 (H)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
007 4030 023	BRZ, PH GND BAR 97-744-05	60 EA	
041 1310 035	GASKET, EMI 3/16 MAX COMP	29 FT	
358 3562 000	SPRING CLIP 0.75 DIA	4 EA	
402 0200 000	CLIP FUSE 1 INCH	2 EA	
410 0023 000	INSULATOR ROUND NS5W 0410	1 EA	
410 0026 000	INSULATOR ROUND NS5W 0420	2 EA	
448 1141 000	BALL, CARBON, ARC GAP	2 EA	
494 0523 000	COIL, AIR-WOUND 140UH	1 EA	
540 1490 000	RES 10.0 OHM 275W 10%	1 EA	
604 0893 000	SW, INTLK DPDT	4 EA	SW001,SW002,SW003,SW004
813 4999 034	STDOFF 6-32X2.00 1/4 HEX	4 EA	
813 5001 070	STDOFF 10-32X1-1/2 3/8 H	2 EA	
813 5013 069	STDOFF 1/4-20X1-1/4 1 RD	1 EA	
829 9009 102	PLATE, COIL MTG	2 EA	
901 0122 050	ASSY, AM RF SAMPLE 250KW	1 EA	
917 1377 004	CLIP, 80 AMP COIL	2 EA	
917 2150 537	WASHER	2 EA	
917 2150 538	WASHER	2 EA	
917 2413 607	INSULATOR, RESISTOR MTG	2 EA	
917 2413 608	SPACER, RESISTOR MTG	1 EA	
922 0900 418	BUSHING ALIGNMENT PIN	2 EA	
922 0999 598	STANDOFF	2 EA	
922 1238 149	SPACER, OUTPUT MONITOR	3 EA	
922 1238 150	SPACER, OUTPUT MONITOR	2 EA	

922 1238 476	JUMPER, CONTACTOR, 200-12	3 EA	
922 1238 597	CLAMP, COIL	20 EA	
922 1291 037	JUMPER, CONTACT, 200-12	4 EA	
922 1291 038	JUMPER, CONTACT, 100-10	6 EA	
922 1291 049	JUMPER, CONTACTOR, 100-10	6 EA	
943 5143 097	COIL, HF17-80	2 EA	L3,L5
943 5450 996	CHASSIS, CAPACITOR	1 EA	
943 5507 311	ASSY, GROUND HOOK	2 EA	
943 5507 547	WINDOW, COLD COMPARTMENT	1 EA	
943 5584 008	WELDMENT, COMBINER REAR	1 EA	
943 5584 022	BASE, REAR SHILED	1 EA	
943 5584 023	SHIELD, REAR LEFT	1 EA	
943 5584 030	SHIELD, REAR RIGHT	1 EA	
943 5584 033	SHIELD, REAR TOP	1 EA	
943 5584 048	CHANNEL, REAR LOWER	1 EA	
943 5584 054	ANGLE, REAR	2 EA	
943 5584 056	STIFFNER, REAR TOP	1 EA	
943 5584 058	SHIELD, OUTPUT MONITOR	1 EA	
943 5584 059	PANEL, ACCESS, OUTPUT MONITOR	1 EA	
943 5584 060	SHIELD, CABLE	1 EA	
943 5584 062	SHIELD, CABLE	1 EA	
943 5584 064	SHIELD, CABLE	1 EA	
943 5584 066	SHIELD. CABLE	1 EA	
943 5584 069	SHIELD, CABLE	1 EA	
943 5584 071	SHIELD, CABLE	1 EA	
943 5584 072	SHIELD, CABLE	1 EA	
943 5584 075	SHIELD, CABLE	1 EA	
943 5584 076	SHIELD, CABLE	1 EA	
943 5584 077	SHIELD, CABLE	1 EA	
943 5584 078	SHIELD, CABLE	1 EA	
943 5584 079	SHIELD, CABLE	1 EA	
943 5584 080	SHIELD, CABLE	1 EA	
943 5584 096	SIDE PLATE, COIL FRAME	4 EA	
943 5584 098	ANGLE, COIL FRAME	8 EA	
943 5584 099	ANGLE, COIL FRAME	4 EA	
943 5584 129	END PLATE, COIL FRAME	4 EA	
943 5584 131	PANEL, DIVIDER	1 EA	
943 5584 134	SPACER, GROUND BAR	60 EA	
943 5584 135	PLATE, CAP MTG.	1 EA	
943 5584 136	ANGLE, ARC GAP	1 EA	
943 5584 137	ANGLE, RESISTOR MTG.	1 EA	
943 5584 138	PLATE, CONTACTOR MTG.	1 EA	
943 5584 139	SHIELD, SWITCH	1 EA	
943 5584 140	SHIELD, SWITCH	1 EA	
943 5584 141	PLATE, GROUNDING	1 EA	
943 5584 160	MTG. PLATE, CURRENT SAMPLE	1 EA	
943 5584 162	BRACKET, CURRENT SAMPLE	1 EA	
943 5584 163	SHIELD, CABLE	1 EA	
943 5584 164	BRACKET, RF SAMPLE	1 EA	
971 0031 001	BLOWER CONTROL	1 EA	
971 0031 002	ASSY, REAR DOOR, RIGHT	1 EA	
971 0031 006	REJECT, COMBINER	1 EA	
971 0031 007	ASSY, SHORTING SWITCH	1 EA	
971 0031 011	ASSY, STATIC DRAIN CHOKE	1 EA	
971 0031 012	ASSY, ARC, RESISTOR	1 EA	

WARNING: Disconnect primary power prior to servicing.

971 0031 013	ASSY, REAR DOOR, LEFT	1 EA	
992 9038 009	PWA, RF POWER SAMPLE	1 EA	
992 9751 011	CONTACTOR, RF, HRFC-DL-100-10	1 EA	K3
992 9751 014	CONTACTOR, RF, HRFC-DL-200-12	2 EA	K4,K5

Table 6-20. ASSY, REAR DOOR, LEFT - 971 0031 013 (C)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
061 0046 000	FILTER, AIR 22.00 X 15.63 X 0.88	4 EA	
299 0014 000	TAPE, PVC VINYL CLOSED	0 RL	
430 0278 000	FAN BLADE, 20" DIA,	1 EA	
436 0329 000	MOTOR, 2 SPEED, 50/60HZ	1 EA	B1
448 0926 000	HINGE, CONCEALED - 120DEG	3 EA	
448 1128 000	LATCH, COMPRESSION	2 EA	
922 0900 407	PIN ALIGNMENT	1 EA	
922 1310 019	BLOCK, HINGE	3 EA	
943 5507 422	DOOR STIFFENER	2 EA	
943 5507 561	ASSY, FILTER FRAME	1 EA	
943 5584 015	WELDMENT, REAR DOOR WRAP	1 EA	
943 5584 016	ASSY, FAN GUARD	1 EA	
943 5584 018	WELDMENT, PANEL, REAR DOOR - LEFT	1 EA	
943 5584 146	PANEL, MOTOR MTG	1 EA	
943 5584 147	FRAME, MOTOR SUPPORT	1 EA	
952 9243 020	ASSY, CABLE FAN	1 EA	

Table 6-21. PWA, RF POWER SAMPLE - 992 9038 009 (B)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
354 0309 000	TERM SOLDER	6 EA	TP011,TP012,TP013,TP014,TP015,TP016
356 0106 000	CABLE CLAMP 1/2 D	4 EA	
358 1928 000	JUMPER 1/4 LG 1/8H	1 EA	JP016
384 0612 000	DIODE 1N3070 ESD	7 EA	CR001,CR002,CR003,CR004,CR008,CR010,CR012
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	2 EA	CR021,CR022
386 0123 000	ZENER, 1N4732A 4.7V ESD	1 EA	CR013
386 0430 000	ZENER 1N5365B 36V 2W 5% ESD	2 EA	CR005,CR006
492 0775 000	IND, FXD RF, 100MH	2 EA	L002,L003
494 0391 000	CHOKE RF 3.90UH	1 EA	L001
494 0413 000	CHOKE RF 330.0UH	1 EA	L005
500 0759 000	CAP, MICA, 100PF 500V 5%	1 EA	C011
500 0784 000	CAP, MICA, 300PF 500V 5%	2 EA	C029,C093
500 0829 000	CAP, MICA, 180PF 500V 5%	1 EA	C013
500 0837 000	CAP, MICA, 510PF 500V 5%	1 EA	C002
500 0840 000	CAP, MICA, 680PF 300V 5%	2 EA	C008,C016
500 0845 000	CAP, MICA, 2000PF 500V 5%	1 EA	C001
500 0852 000	CAP, MICA, 1000PF 500V 5%	1 EA	C005
500 0854 000	CAP, VAR, 300-1000PF 175V	4 EA	C023,C024,C025,C026
500 0883 000	CAP, MICA, 4700PF 500V 5%	1 EA	C014
500 0913 000	CAP, MICA, 1200PF 500V 5%	2 EA	C010,C021
500 1201 000	CAP, MICA, 2400PF 500V 5%	1 EA	C012
516 0453 000	CAP .1UF 100V 20% X7R	2 EA	C031,C094
516 0792 000	CAP NETWORK .1UF 10%	1 EA	C020
522 0591 000	CAP 47UF 25V 20%	1 EA	C030
540 1365 000	RES NETWORK 36 OHM 2%	1 EA	R076

540 1600 124	RES 91 OHM 3W 5%	4 EA	R003,R004,R006,R007
548 2400 069	RES 5.11 OHM 1/2W 1%	1 EA	R010
548 2400 137	RES 23.7 OHM 1/2W 1%	1 EA	R026
548 2400 268	RES 499 OHM 1/2W 1%	1 EA	R124
548 2400 330	RES 2K OHM 1/2W 1%	1 EA	R123
548 2400 389	RES 8.25K OHM 1/2W 1%	2 EA	R008,R012
548 2400 451	RES 33.2K OHM 1/2W 1%	3 EA	R018,R019,R022
550 0947 000	TRIMPOT 1K OHM 1/2W 10%	1 EA	R009
604 0852 000	SW, RKR DIP 4-SPST	2 EA	S005,S006
604 0859 000	SW, TGL DPDT	2 EA	S007,S008
604 0866 000	SW, PB SNAP ACTION SPDT	1 EA	S002
604 1064 000	SWITCH, ROCKER DIP 2-SPST	1 EA	S004
610 0679 000	PLUG, SHORTING, .25" CTRS	1 EA	JP003
612 0904 000	JACK, PC MT GOLD PLATED	3 EA	
612 1350 000	RECP, SMB PCB MT	3 EA	J001,J002,J003
843 5458 111	SCH, RF POWER SAMPLE BD	0 DWG	
843 5458 113	PWB, RF POWER SAMPLE	1 EA	
916 6270 001	XMFR COIL ASSY	2 EA	T002,T004
917 2150 656	SENSING PLATE	3 EA	C006,C007,C009
917 2413 455	STANDOFF, 0.375 X 3.25 X	3 EA	C006,C007,C009
922 0999 679	XFMR MTG SHIELD	2 EA	#T002,T004
929 9009 216	XFMR	1 EA	T001
999 2826 001	HARDWARE LIST, RF POWER	1 EA	

Table 6-22. CONTACTOR, RF, HRFC-DL-200-12 - 992 9751 014 (F)

Harris PN	*Description*	*QTY UM*	*Reference Designators*
302 0763 000	SCREW, SOCKET HEAD SHOULDER	1 EA	
306 0012 000	NUT, STOP 8-32	3 EA	
306 0056 000	NUT, CAP 1/4-20	8 EA	
306 0058 000	NUT, ACORN 5/16-18	2 EA	
335 0091 000	WASHER, SHLD .171 ID	6 EA	
590 0042 000	LINEAR ACTUATOR, 75# CAPACITY	1 EA	
612 1451 000	FEMALE CONNECTOR, 4C	0 EA	#J002
612 1460 000	FEMALE CONNECTOR RT ANGLE	0 EA	#J001
646 0665 000	INSPECTION LABEL	1 EA	
817 2413 035	SPEC, DESIGN, RF CONTACTOR	0 DWG	
817 2492 027	SPEC, ALTITUDE DERATING DATA	0 DWG	
822 1291 063	SPEC, RF CONTACTORS	0 DWG	
839 8154 471	SCH, RF CONTACTOR WITH LINEAR	0 DWG	
843 5491 019	OUTLINE DRAWING, RF CONTACTOR	0 DWG	
917 2492 009	ROD	1 EA	
917 2492 010	SPRING	1 EA	
917 2492 011	KIT, SLAVE RELAY OPTION	0 EA	
917 2492 026	KIT, SPARE PARTS, LINEAR	0 EA	
922 1238 476	JUMPER, CONTACTOR, 200-12	0 EA	
922 1291 024	TUBE	2 EA	
922 1291 028	RETAINER, CONTACT, 200 AMP	16 EA	
922 1291 033	STUDS	2 EA	
922 1291 034	STANDOFF, G-10	2 EA	
922 1291 036	CONTACT FINGER, 3 INCH	32 EA	
922 1291 037	JUMPER, CONTACT, 200-12	0 EA	
939 8186 020	ASSY, CONTACT, 200 AMP	8 EA	
939 8186 027	ASSY, CONTACT ARM	1 EA	
939 8186 029	BRACKET, PIVOT	1 EA	

939 8186 030	PIN, PIVOT	1 EA
939 8186 039	BRACKET & SHAFT ASSY	1 EA
939 8186 042	SUPPORT,CONTACTOR,UPPER 200AMP	1 EA
939 8186 043	SHIELD	1 EA
939 8186 044	BRACKET, SHIELD	1 EA
939 8186 075	BASE, LINEAR ACTUATOR	1 EA
939 8186 076	BLINDER, OPTIC	1 EA
939 8186 077	BRACKET, OPTIC BLINDER	1 EA
939 8186 078	SUPPORT, BASE	1 EA
992 9770 005	PWA, RF CONTACTOR CONTROL	1 EA

Section A
Transmitter/Combiner Controllers (UC2)

A.1 Introduction

This section covers the Transmitter/Combiner Controllers. The Transmitter & Combiner Controller Boards are the UC2 that is used in multiple applications. Discussion will focus on the individual circuitry that applies to the Transmitter & Combiner Controller Applications

A.2 Function

The primary Function of the Transmitter Controller is to interface between the FPI, Combiner Controller, and Transmitters. All control is decided in this board.

The secondary function of this board it to provide remote capability by either parallel or serial control.

A.3 Location

The Transmitter Controller is located in the center section of the combiner known as the Basic Control Unit (BCU) and the Combiner Controller is located in the upper front left section of the combiner. The Transmitter Controller is mounted on the back wall and has a slide card cage in which different boards slide into the UC2 for different applications

A.4 Transmitter Controller

The Transmitter Controller is the primary interface between the Combiner and the operator via the front panel Interface FPI. It is connected to both transmitter subsystems, both internal and external to the Combiner thru the CAN (Controller Area Network) bus and dedicated parallel control lines. The CAN bus and the parallel control lines are distributed on a single multi-conductor cable called the System Control Bus.

The Transmitter Controller is mounted directly behind the front control panel. It is directly connected to the front panel switchboard which is considered a “Mezzanine” board. The front panel switchboard uses a Computer Program Logic Device (CPLD) to serialize the I/O (the control lines and status signals) to and from the Transmitter Controller.

The Transmitter Controller is the central point for all system control, metering and diagnostics. It reports this information to the operator via the FPI and through several remote control options.

A.5 CPLD

The transmitter control boards with the micro module also incorporate a CPLD

(Complex Programmable Logic Device) with the exception of the module controllers.

The CPLD is not a microprocessor but is actually just programmed discrete logic and is therefore very stable and reliable. The CPLDs in the transmitter perform two vital functions in terms of control and transmitter monitoring:

Each Micro Module only has a limited number of Input/Output or I/O lines available.The CPLDs provide a way to easily expand the available I/O ports on each control board. Basically, the CPLDs are actually controlling and monitoring the I/O for each control board. The micro module is taking that information and relaying it, via the CAN bus, to the Main Controller for display on the front panel control screen or a remote control system. If the micro module wants to send a control command, it simply addresses the correct I/O line on the CPLD and it then sends out the command.

The CPLD on the UC2 board is programmed via the Micro-Module. The Micro Module gets the version of the CPLD upon boot up and if the version is different then the Micro Module will program the CPLD.

The CPLD contains all the logic necessary for fast signal processing. For example on the CCU UC2 board if a VSWR occurs the CPLD will generate a 150ms mute pulse to the transmitters. And latch this fault in the CPLD until the Micro reads the data register in the CPLD then resets the databit as long as the fault is no longer present.

A.6 Remote Digital Input/Output Conditioning

All Remote Control/ Status I/O are either opto-isolated or N-MOSFET driven to the Remote Control Connectors

The remote Control Inputs run thru 2 74HCT166 8-BIT Serial/Parallel In, Serial Out IC. The serial out is then sent to the CPLD where the data is stored until the micro module reads the data registers to determine what command was issued.

Same is true for the Remote Status output lines. The micro module constantly updates the CPLD Data Resister for the Remote Status Output Lines and this data is also sent on the SPI to 2 74HCT594 8-Bit Serial In, Parallel Out that drive N-Mosfets that connect to the Remote Status output lines.

A.7 Analog Buffers

The UC2 has 26 Analog signals to monitor each one has a buffer before it reaches the 4 analog Mux circuits. These circuits are constanly polled inside the micro module.

A.8 Power Supply Inputs

The UC2 board has 2 separate DC input connectors each connector requires +7.5, +15vdc and -15vdc. Both sets of the DC inputs are Diode OR together then run thru 3 fuses before the Voltage Regulators. The input Vdc also goes to each expansion Slot along with the +5 and 3.3 volts.

A.9 Interlock Matrix

The UC2 board has an Internal Interlock Matrix that has 2 relays that can be controlled by external equipment. One relay is controlled via the expansion slot and the other is controlled via the Interlock connector.

For the TCU/CCU system the Combiner Control unit examines all the cables in the combiner and if any connector becomes unseated this will open the Internal Interlock relay on the CCU UC2 board. The CCU UC2 board sends a open contact to the TCU UC2 board that then opens the External Interlock Relay that opens the Interlock to the Transmitters.

A.10 Micro Module

The heart of the system is the 376 Micro Module which is used in all of the transmitter systems for control, monitoring and protection. The Micro Module is used on each of the following controllers and sub-systems:

All of the control boards in the Combiner use the 376 Micro Module. The micro module is a daughter board with a standardized interface which is plugged into a motherboard. It contains Flash memory for storage of its programming and SRAM for program execution. The programming in the flash memory can be re-programmed or upgraded using In-System Programming or ISP (no hardware needs to be changed) via serial connection. In general the micro modules are responsible for control, monitoring and reporting, but have very little to do with transmitter protection which is handled mainly by the CPLDs.

Features of the 376 module include:

a. Built-in CAN (Controller Area Network) bus controller
b. 16 A/D inputs for analog metering
c. A serial EEPROM for non-volatile memory storage
d. A built in clock running at 4.194MHz which will let the micro run at 16-25MHz
e. Power failure detection
f. A watchdog which will reset the micro if it is not triggered at least every 1.6 seconds (this time interval will change depending on the application). A discrete logic device or CPLD is almost always provided on the motherboard to act as an I/O expansion device and in some cases as life support if the micro module fails.
g. Multiple I/O lines whose direction of signal flow is based on the flash memory programming. These could be control or status, inputs or outputs, depending on the particular use.

The main responsibility of the micro module is control of the CPLD and the reporting and receiving of information over the CAN bus. This means that the CPLD will continue to monitor and protect the systems to which it is connected even if the micro module fails. However, there will be no reporting of information to the rest of the transmitter system since access to the CAN bus is gone without the micro module.

A.11 Controller Area Network (CAN) Bus

The Controller Area Network or CAN bus is a high speed serial communications link which is used between the control boards for transmission of control, status, fault and metering information. The CAN bus is distributed as part of the System Control Bus. The CAN bus can operate at speeds up to 1Mbps and is designed to operate in hostile industrial environments. The transceivers feature cross wire, loss of ground, over voltage and over temperature protections. A CAN transceiver connected to the CAN bus is considered a Node. There can be up to 110 nodes on the bus with a maximum bus length of about 40 meters for 1Mbps operation. In a CAN system, data is transmitted and received using Message Frames. Message Frames carry data from a transmitting node to one or more receiving nodes. The messages transmitted from any node on a CAN bus do not contain addresses of either the transmitting node or of any intended receiving node.

Instead, the content of each Message Frame (e.g. ON, OFF, Forward Power etc.) is labeled by an identifier that is unique throughout the network. All other nodes on the network receive the message and each performs an acceptance test on the identifier to determine if the message, and thus its content, is relevant to that particular node. If the message is relevant, it will be processed; otherwise it is ignored.

The micro modules have a built in CAN controller which connects to a CAN Transceiver which becomes a node on the CAN bus. The CAN transceiver interfaces the single ended CAN controller to the differential CAN bus for high common mode noise immunity. All of the control boards can send and receive information over the differential CAN bus, however the Transmitter Controller determines what information is sent and when it is sent for this application.

All fault reporting and status and metering information displayed on the FPI is sent on the CAN bus to the Front Panel Switch Board. Transmitter control signals are also sent via CAN.

A.11.1 System Control Bus

The System Control Bus is a multi-conductor cable which distributes the CAN (Controller Area Network) bus and several parallel control lines to all controllers in the system. System Control Bus connection points include:

1. Transmitter Controller
2. Combiner Controller

A.11.1.1 Parallel Control Lines

The parallel control lines are used for quick actuation of critical functions, such as ON/OFF Status, Fault Off, RF mute, VSWR Active, Reject Active, Reject Temp, Cooling Flt, and Cooling reduced. The Combiner Controller activates the faults circuits and the RF MUTE and Fault Off while the Transmitter controller activates the System On/Off, blower Fast enable, Analog Meter Mux and the 3 bit combiner Mode. These parallel control signals are duplicated in the CAN messages. The following is a brief explanation of each of the parallel control lines included in the system control bus.

a. ON_/OFF

This command corresponds to the transmitter operator pushing the “ON” or “OFF” button, thereby turning the transmitter on or off respectively. This signal is high for ON and low for OFF. This is driven only by the Transmitter Controller and is a sense only line for the rest of the control boards.

b. /FLT_OFF

This command is initiated whenever a fault occurs that requires all RF to be shut off. This is a latching type signal that requires user input to clear the fault and turn the transmitter back on. This signal is active low. The Combiner Controller activates this line all other boards monitor it if necessary.

c. /RF_MUTE

The /RF_MUTE line shuts down all RF output temporarily until the fault condition is cleared. This is a non-latching signal. The Combiner Controller activates this line all other boards monitor it if necessary..

d. VSWR ACTIVE

The VSWR_ACTIVE line indicates that either a VSWR Fault or an ARC fault is occuring . The Combiner Controller activates this line, all other boards monitor it if necessary. The Combiner Controller will also issue an 150ms RF Mute pulse when this signal is active

e. REJECT ACTIVE

The REJECT ACTIVE line indicates that RF Current is present in the reject load above the set threshold that was set on the combiner Interface board. The Combiner Controller activates this line, all other boards monitor it if necessary. The Transmitter Controller will monitor this line and if the signal is present for more than 10 seconds an AUTO SWITCH sequence will occur.

f. REJECT TEMP

The REJECT TEMP line indicates the temperature of the reject load has gone above 100 degrees C. The Combiner Controller activates this line, all other boards monitor it if necessary. The Combiner Controller will also issue an RF Mute signal until the temperature goes below the Temp sensor setting.

g. AIR FLOW REDUCED

The AIR FLOW REDUCED line indicates the lack of Air Flow across 1 of the 2 Air Flow Monitors. The Combiner Controller activates this line, all other boards monitor it if necessary. The Transmitter Controller will also send a 3 bit foldback command to the Transmitters to Foldback power to prevent damage to the combiner.

h. AIR FLOW FAULT

The AIR FLOW FAULT line indicates the loss of Air Flow across 1 of the 2 Air Flow Monitors. The Combiner Controller activates this line, all other boards monitor it if necessary. The Combiner Controller will also send a FLT_OFF signal to shutdown the system.

i. ANALOG METER MUX

The ANALOG METER MUX is a 2 bit address line from the Transmitter Controller to the Combiner Controller. The transmitter Control determines the state of these line by the Front Panel Interface 3 button selection. The combiner control monitors this line and send the 2 bit address to the Meter Mux circuit to send the appropriate analog data to the Analog meter.

j. COMBINER MODE

The ANALOG METER MUX is a 2 bit address line from the Transmitter Controller to the Combiner Controller. The Transmitter Controller activates these lines, all other boards monitor it if necessary. The transmitter Control determines the state of these line by the Front Panel Interface 3 button selection. The combiner control monitors this line and send the 2 bit address to the Meter Mux circuit to send the appropriate analog data to the Analog meter.

k. BLOWER FAST ENABLE

The BLOWER FAST ENABLE line indicates the combiner needs to increase the FAN speed due to either REJECT ACTIVE for 5 seconds, REJECT TEMP SENSOR is active. The Transmitter Controller activates this line, all other boards monitor it if necessary. The combiner control monitors this line and send the Blower High Speed command to the Blower Controller to switch to the High side Tap on the Blower Motors.

Board # 901-0122-111

Schematic # 801-0122-111

B.1 Introduction

This section covers the transmitter interface Board. The Transmitter interface Board interfaces the Transmitters to the UC2 Controller. Discussion will focus on the individual circuits that apply to combining 2 Transmitters.

B.2 Function

The primary function of the Transmitter interface is to provide a parallel interface between the UC2 Controller and the transmitters.

The secondary function is to provide an Interlock matrix that routes the Antenna Interlock and Test Load interlock to the transmitters

B.3 Location

The Transmitter interface board is a plug-in board to the UC2 board in the TCU section of the combiner.

B.4 Transmitter Interface Control/Status

The Transmitter interface is the interface between the Transmitters and the Combiner. All control to the Transmitters is done thru N-Mosfets all status from the Transmitters to the Transmitter interface Board is done thru opto Couplers.

All Control and Status are Active Low type Logic.

Connections from the Transmitter interface are done thru (2) 25 pin D Type connectors that connect to the Combiners I/O panel on top of the Combiner.

B.5 Interlocks

The Antenna and Test Load interlocks also connect to the Transmitter Interface Board. The UC2 (TCU) determines the path of the Interlock String.

Refer to 801-0122-111 sheet 8 for Reference

The Interlock string is the same for Transmitter 1/A as it is for Transmitter 2/B.

The Antenna and Load Interlocks activate K1, K2.K7, and K8. Leds on the transmitter interface refer to the state of the Relay. RED = OPEN GREEN = CLOSED.

The K3 & K9 are controlled by the UC2.TCU controller to route either the Test load or the Antenna Interlock to the Transmitter.

K4, K10 are controlled by the UC2/TCU and UC2/CCU interlock Strings. For example if a Door, Earth Switch, Earth Stick, Cable Interlock is active in the Combiner this will open the K3,K9 relays and open the interlock string to the Transmitters.

K5, K11 are not currently used but for future applications.

K6, K12 these interlock relay are known as the interlock override relays. These relays are active during a Combiner Mode switch to disable the Interlock string so K3, K9 can be switched to the correct position and not open the interlock string. The override Relay is activated 500ms before the combiner mode command is issued.

B.6 Power Calibration

Forward Power is the only signal from the transmitter that is required for a combined system. R25 and R21 are used to Gain up the Voltage level from the transmitters Forward power Sample if Needed. Otherwise Forward power Calibration is done via the TCU VT100.

WARNING: Disconnect primary power prior to servicing.