AIRBORNE PRODUCTS

SAIC Airborne DataLink System
USER MANUAL

Troll Systems Corporation

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www.TROLLSYSTEMS.com

Troll Systems Corporation 24950 Anza Drive Valencia, CA 91355 Tel +01 (661) 702-8900

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24950 Anza Drive

Valencia, CA 91355, U.S.A.

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PREFACE

This *User Manual* is intended for use with the Skylink Mini Pod and Controller system designed and fabricated by Troll Systems Corporation. The sections and appendices that make up this manual are intended as a guide for installation and usage of this system.

NOTE: It is Troll Systems commitment to continually improve upon its products for greater functionality and ease of use. The images and references contained within this manual along with the accompanying specifications, drawings and supporting data received by the customer may differ from what is included herein.

This manual is based on the latest information available at the time of publication.

PACKAGING

Unpack the system components and all associated equipment with care. Verify that all equipment is included and free of any damage that may have occurred during shipping.

If you must return your product to Troll Systems Corporation for repair (and you no longer have your original box and packing materials), Troll will send you a packing box specifically designed to ship the product without damage.

If possible, notify the shipping carrier at the time of receipt that you are accepting any box (or boxes) as “damaged.” Most shipping carriers have time requirements for reporting damaged items.

Retain all boxes and packing materials should the need arise to return the controller to the factory for upgrades, repair, or configuration changes.

Re-use the original packaging material used for your system, if available and in good condition.

CONVENTIONS USED IN THIS DOCUMENT

Refer to the referential data in the final section of this manual for complete information in regard to the conventions and nomenclature used in this document.

SAFETY SUMMARY

General Safety Precautions

The following general safety precautions are not related to any specific procedures and therefore do not appear elsewhere in this publication. They are, however, precautions that personnel need to understand and apply when operating or repairing equipment. Installation, operation, and maintenance should be performed only by qualified personnel.

Hazard Advisory Placards/Signs

Read and heed all hazard advisory placards or signs affixed to the equipment or surrounding enclosures. They warn of potential hazards to personal safety and possible damage to equipment if correct maintenance practices are not followed. Ignoring hazard advisory placards (WARNINGS/CAUTIONS) places personnel at risk for serious injury or death.

Know and Comply with Local, State, and Federal Safety Requirements

You should be familiar with all local, state, and federal safety requirements applicable to the equipment, processes, and materials you use during maintenance. Before using any substances or materials marked toxic or hazardous, always refer to the Material Safety Data Sheets (MSDS) for that substance/material for any special protective equipment, handling, and/or disposal requirements.

Do Not Service or Adjust Alone

Do not start a maintenance or adjustment procedure if that procedure requires more than one technician to be safely performed. It is particularly important that such work not be performed in a remote area, away from other qualified personnel who may be needed to render assistance. When a maintenance task requires two or more personnel to be safely accomplished, delay the task until qualified personnel are available to assist you.

Electrical Power/Shock Hazards

WARNING: Potentially lethal voltage/current is present throughout many electrical installations. Maintenance personnel shall employ positive power lockout devices and post all required warning tags/signs when applicable to ensure that no unauthorized application of power can occur during maintenance. Failure to heed this warning could result in serious injury or death by electrocution.

Always verify that electrical power is disconnected and that applicable safety procedures have been followed before doing maintenance on any electrical/electronic equipment. High voltage electrical energy is stored in some electrical equipment (electrolytic capacitors, UPS batteries, etc.) even after the source of primary external power has been disconnected. Always remove external power, deactivate equipment, or discharge the potential to ground (when applicable) before working on the equipment.

If a high-potential insulation test is required, follow the procedures and precautions outlined in the appropriate National Electrical Manufacturing Association (NEMA) standards. Check with the area supervisor if unfamiliar with these standards, specific equipment, or procedures.

When electrical troubleshooting of a system must be accomplished with power applied, first verify that all personnel in the hazard area are advised, that the equipment is tagged, and/or that an assistant is posted at the point of power control.

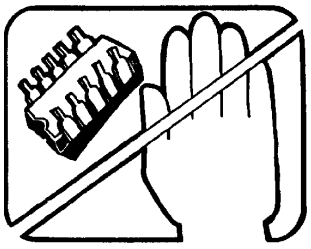
Be Familiar With Resuscitation Techniques

Personnel working with or near high voltages should be familiar with modern methods of resuscitation. It is beneficial to ensure that personnel are capable of performing Cardio-pulmonary resuscitation (CPR) should the need arise.

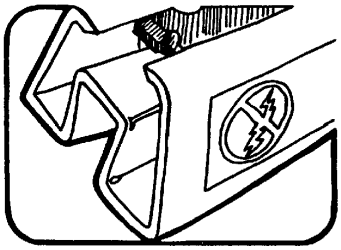
Electrostatic Discharge Sensitive (ESDS) Components

CAUTION: Beware of electrostatic buildup. Delicate solid-state Integrated Circuits (ICs) can be damaged by improper handling procedures. Use proper electrostatic safeguards when installing/removing circuit cards and handling ESD sensitive assemblies. As required, wear a grounded wrist strap, use antistatic floor and table mats, and minimize the handling of sensitive solid-state devices. Keep all ESD sensitive components in their original containers until ready for use. Always discharge personal static before handling ESD sensitive components and do not slide solid state devices over any surface. Handle plug-in card assemblies only by their non-conductive edges.

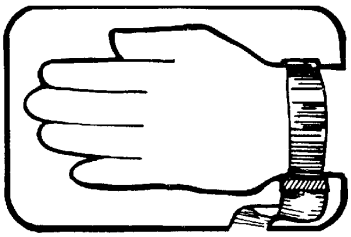
Computers, microprocessors, and other solid state components (circuit cards, I/O boards, etc.) which are not clearly marked with the ESDS symbol will be handled as ESD sensitive components until determined otherwise. Retain protective ESDS packing and shipping bags, containers, non-conductive foam pads, etc. for use in the return of repairable components.



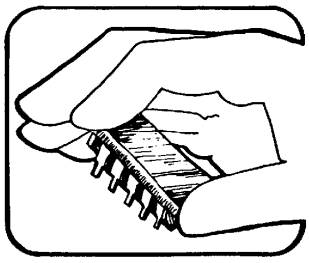
Minimize Handling



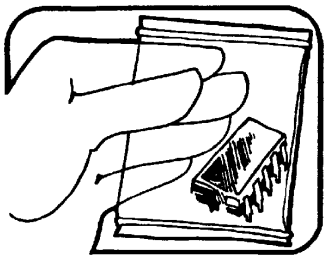
Keep parts in original containers until ready for use.



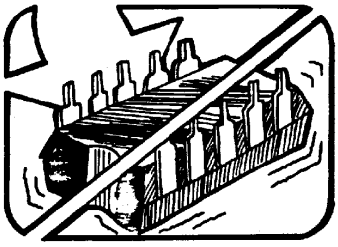
Discharge personal static before handling devices.



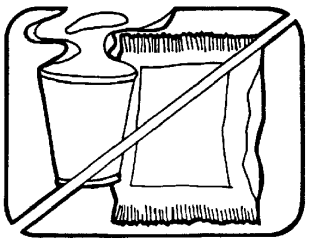
Handle each device by the devices' body, not the contacts



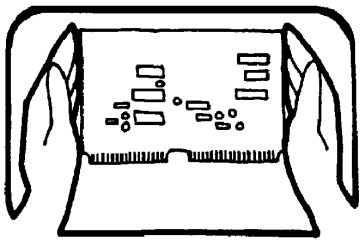
Use anti-static containers for handling and transport



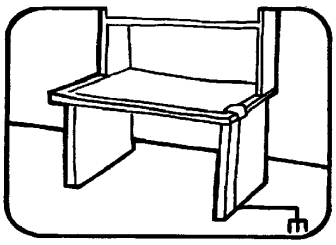
Do not slide devices over any surface



Avoid plastic, vinyl and styrofoam in work area



When removing plug-in assemblies, handle only by non-conductive edges and never touch open edge connector except at static-free work station. Placing shorting strips on edge connector usually provides complete protection to installed devices.



Handle devices only at a static-free work station.

Only anti-static type solder suckers should be used.

Only grounded tip soldering irons should be used.

CONTACT INFORMATION

Troll Systems Corporation is committed to providing its customers with quick and friendly service. If you have questions regarding your Troll product, or if you experiencing a technical problem, please contact us at:

Troll Systems
24950 Anza Drive
Valencia, CA 91355

Phone: (661) 702-8900
Fax: (661) 702-8901

Alternatively, you can contact us via e-mail at:

Sales
sales@trollsystems.com

Service
service@trollsystems.com

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SAIC Airborne RF Link System

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SECTION 1

SYSTEM OVERVIEW

1.1 INTRODUCTION

This system is comprised of four main components (see Figure 1–1):

- Two Skylink mini pods with a variable rotating horn transmitting antenna
- Data and Video Encapsulator (DAVIE) Unit
- Airborne Bi-directional Link Equipment (ABLE) Unit
- A C100 antenna controller with touchscreen GUI interface

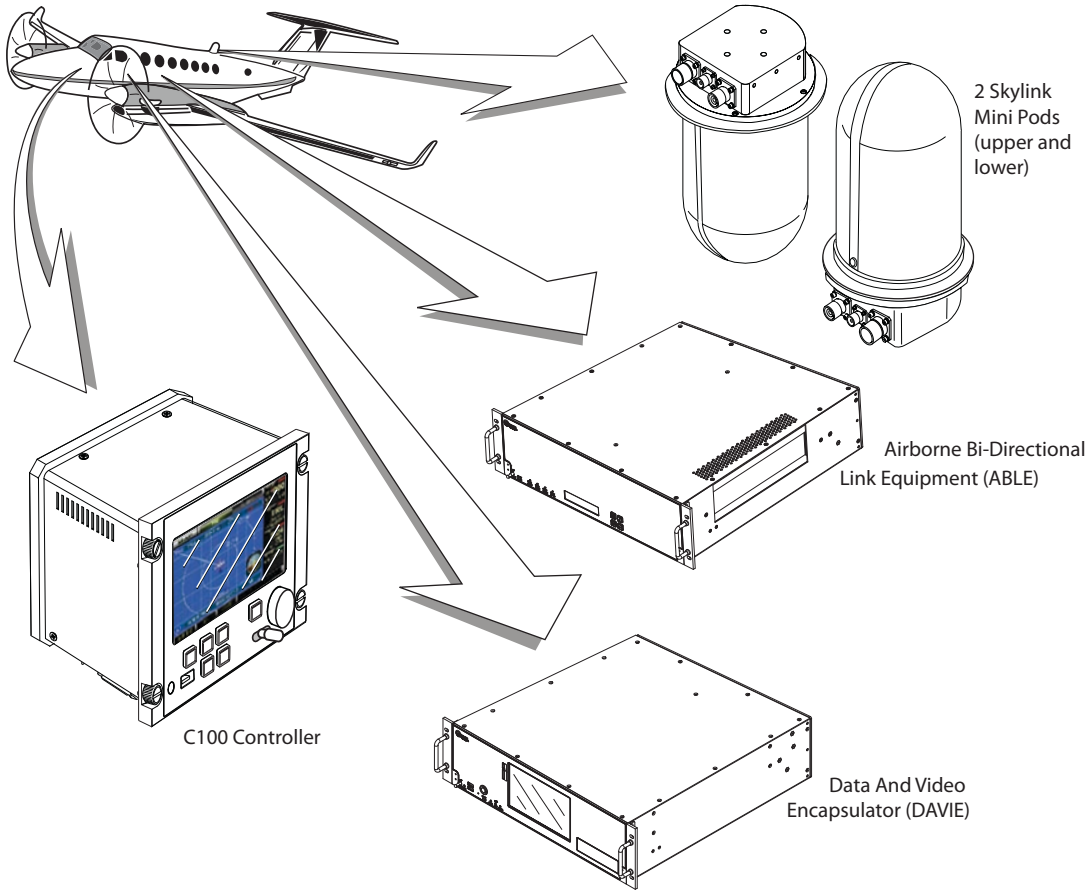


Figure 1–1. System Configuration

1.2 SYSTEM QUICK START

Push in the ON / OFF switches on each component (usually located on the bottom left corner of the component's front panel). Upon system start-up, the DAVIE and the C100 controller will boot-up to the default screen, however, the system may be in standby operational mode. This allows the user to configure the system to the required settings prior to mission start. Refer to the following paragraphs for DAVIE and C100 overview.

1.2.1 DAVIE: Data And Video IP Encapsulator

The onboard digital video and IP encapsulation unit utilizes a touchscreen with a graphical user interface (GUI) for all of the system controls and settings. The custom software created for this system utilizes and symbiotic operating protocol facilitated by the custom hardware utilizing high-performing subsystem components.

The software is designed to provide intuitive controls with easy access for efficient system operation and optimal performance of both the ground and airborne systems. The functions of the system are seamless and nearly instantaneous even when the RF and comms are encoded and decoded over long range transmission and reception.

Therefore the two DAVIE system components (airborne and ground) have nearly identical operational software interface. This section of the airborne manual details the GUI screens for the airborne DAVIE unit.

Figure 1–2. DAVIE (Data and Video IP Encapsulator)

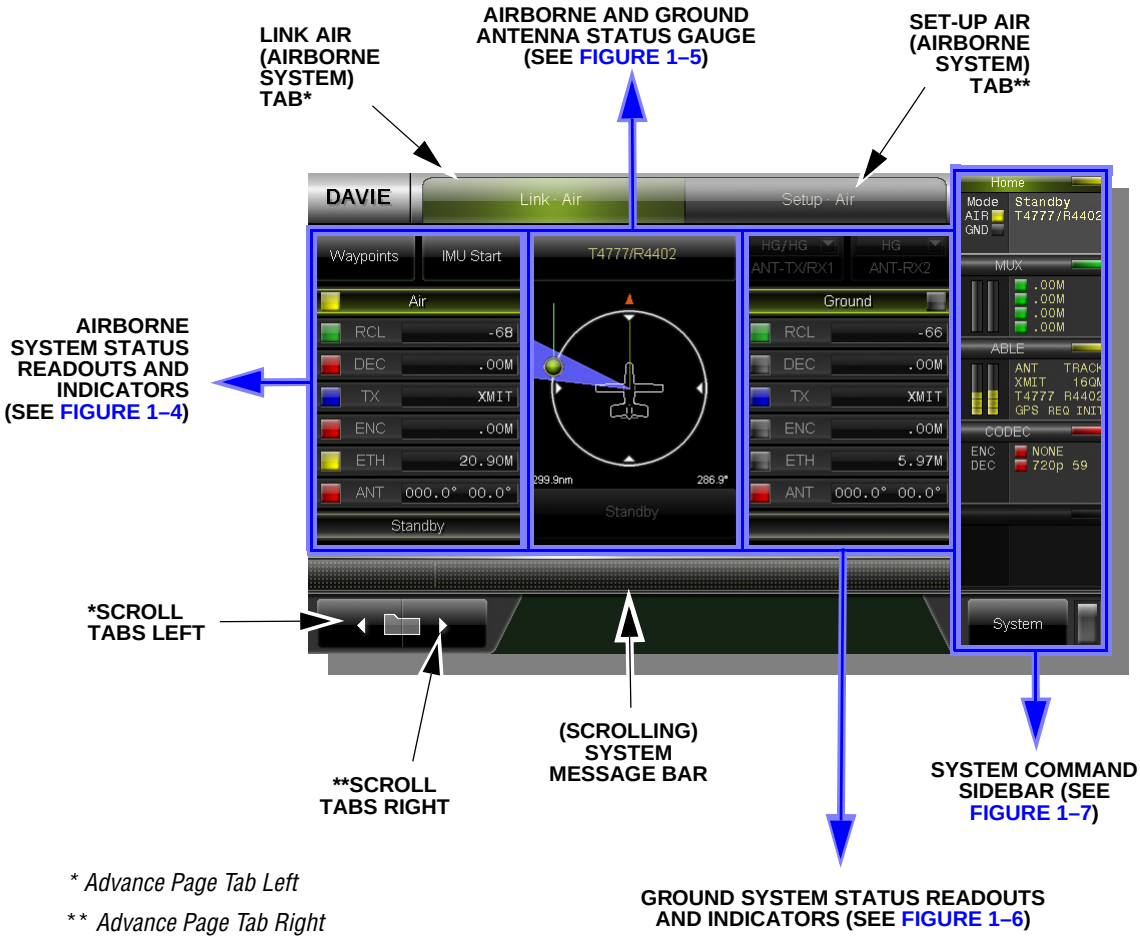
NOTE: The images herein may differ from those in the actual system. These images of the system GUI (and otherwise) are intended for reference only.

1.2.2 DAVIE: Data And Video GUI Software

The touchscreen GUI software provides the user with access to all of the airborne systems command functions including system status, faults, settings and operation. The system's GUI default screen shows the status of the RF and comms link as well as direct access to the other system settings and functions. Figure 1–3 reveals the software visual orientation and basic interface navigation.

1.2.3 DAVIE Home (Default) Screen Detail

The DAVIE Home (or default) screen provides the status of all of the airborne system and ground system operational status. Additionally, several system operational settings are accessible from the default screen including waypoints, IMU, antenna configuration, RF comms link, decoder, encoder, transmitter, receiver and ethernet comms status.



** Advance Page Tab Left*

*** Advance Page Tab Right*

Figure 1–3. DAVIE GUI Home (Default) Screen Orientation

1.2.3.1 Air Link - Airborne System Status

The GUI Air-Link screen includes the airborne system's comms indicators and read-out gauges providing at-a-glance status for the system's operation as well as touchscreen icon access to Waypoint settings and IMU configuration (see Figure 1–4).

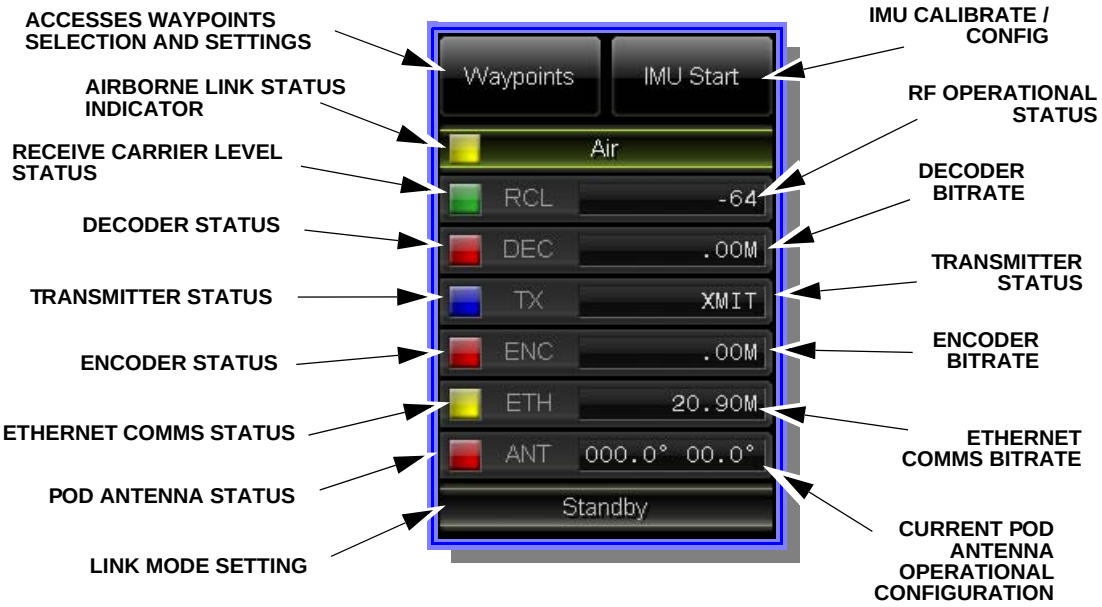


Figure 1–4. Airborne System Link Data Indicators

1.2.3.2 Antenna Transmission / Reception Gauge

The antenna gauge provides the current operational configuration of the aircraft transmitting pods and the A200 receive site antenna relative to each other (see Figure 1–5).

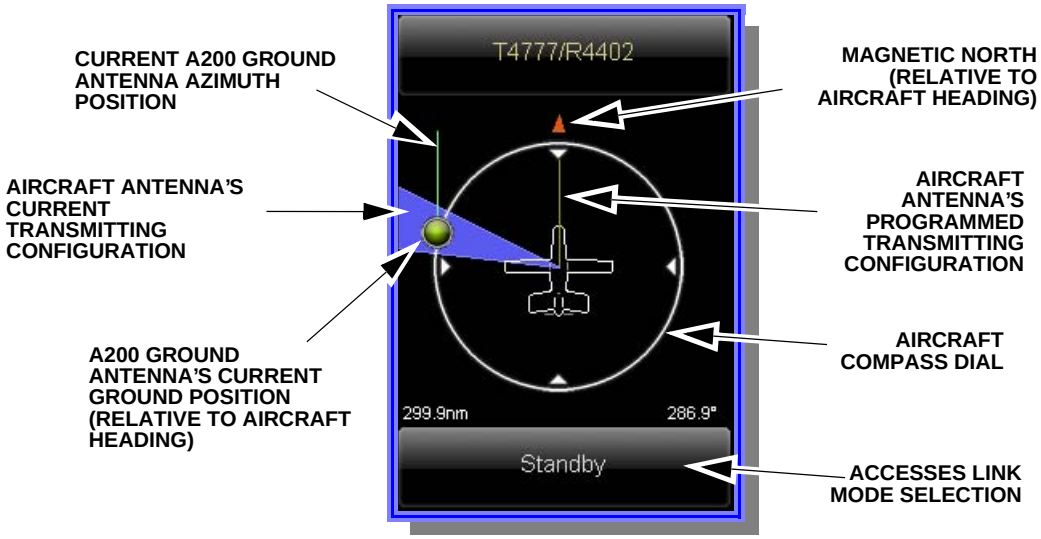


Figure 1–5. Transmitting and Reception Antenna Operation Gauge

1.2.3.3 Air Link - Ground System Status

The GUI Air-Link screen includes the ground system's comms indicators and read-out gauges providing at-a-glance status for the system's operation (see Figure 1–6)

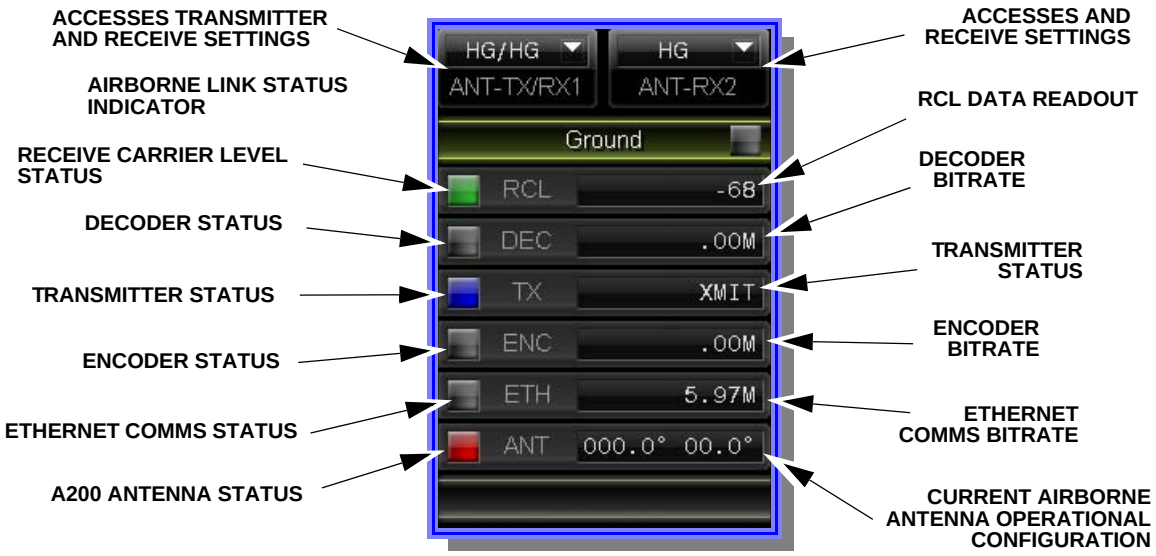


Figure 1–6. Ground System Link Data Indicators

1.2.3.4 System Command Sidebar

The GUI sidebar has four box icons as well as a "System" GUI button. These icons provide access to multiplexing (MUX), the ABLE (airborne bi-directional link) and the airborne encoder/decoder settings (see Figure 1–7).

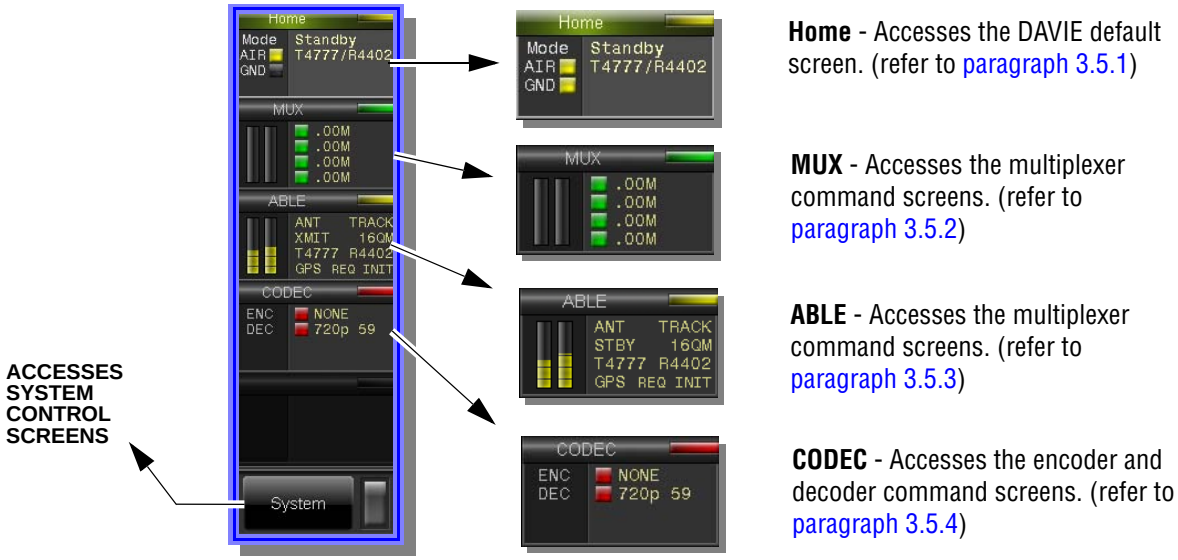


Figure 1–7. System Command Sidebar

1.2.4 C100 Controller

The C100 control functions are accessible through both the mechanical interface of the front panel controls as well as the touchscreen graphical user interface (GUI). The mechanical and software interfaces provide control and adjustment to every system function (refer to Figure 1–9).

Figure 1–8. C100 Controller with Default (MAP) Screen

1.2.4.1 C100 Controller Interface

Many of the commands for the C100 Controller can be executed via the GUI touchscreen of the controller as well as the mechanical controls on the front panel. These redundant mechanical controls provide immediate tactile access to primary control functions for aircraft pilots requiring more efficient and safe access to system control and command. Refer to the following information detailing the mechanical controls for the C100.

1.2.4.2 Mechanical Interface Controls

A summary of the hardware controls is provided below:

- Power (ON/OFF) switch (Push ON / Pull OFF)
- Soft Touch Action Keys (buttons 1, 2, and 3, VIEW, MSG and ESC)
- Variable Setting Adjustment Knob
- Rocker Switch

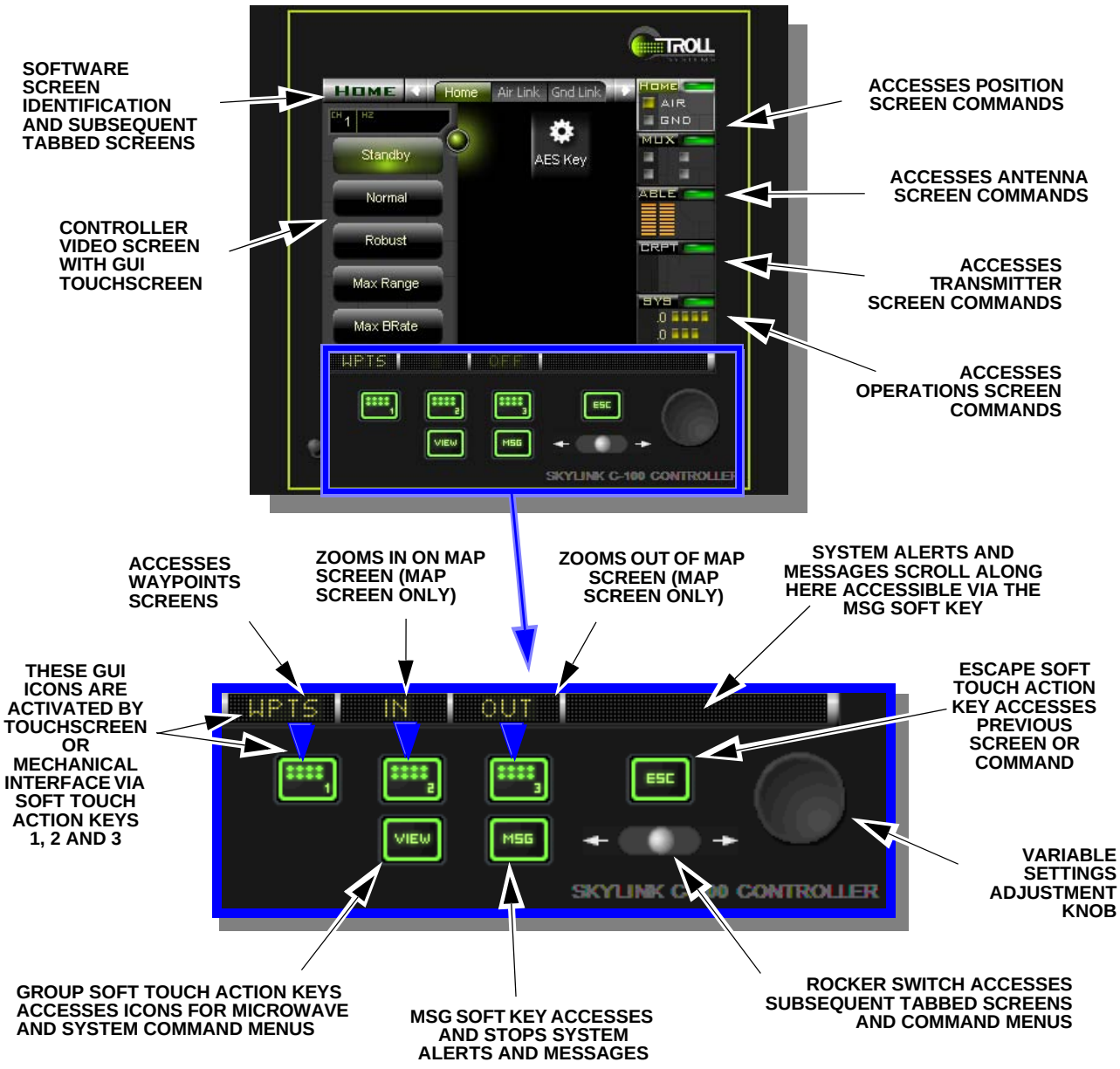


Figure 1–9. C100 Controller Functionality

1.2.4.3 Power (ON/OFF) Switch

Powers the system ON and OFF.

1.2.4.4 Soft Touch Action Keys

The soft touch action keys provide the user with direct access to several controls and functions. The numbered front panel soft touch action keys (buttons 1, 2, and 3) functions change for each panel and for many of the pages within the panel. When pushed, these buttons execute the corresponding function that is displayed on the Action Bar directly above the button (see Figure 1–9). The soft touch action keys are as follows:

- Numbered Keys:
  - — Key **1**
    - Provides direct access to Waypoints menus as well as Waypoint creation and editing for this system
    - Provides access to the system Test pages when “System” is selected
  - — Key **2**
    - TBD
  - — Key **3**
    - TBD
    - Provides access to the system CGF (config) pages when “System” is selected
- **VIEW** key:
  - — Accesses Microwave operations screen and System screens
- **MSG** key:
  - — Accesses and cycles through system messages for the user’s operational edification as well as current system status (see also paragraph 1.2.4.5).
- **ESC** key:
  - — Provides access to the previous screen or menu selection. Also provides direct access to the default MAP screen.

1.2.4.5 Message (MSG) Button

The Message (MSG) button includes a tri-state LED (red, yellow, green) installed behind the push button. The MSG button will illuminate “red” for all alarm conditions, and “yellow” for all warning conditions. The MSG button will flash “green” to indicate that a condition has been corrected (e.g., TX COM restored). The LED will always indicate the highest priority level (red, yellow, then green) and will continue to flash until the user pushes the MSG button to acknowledge the message.

In each of these conditions, a message will be displayed in the right portion of the Action Bar. It is possible to have multiple messages accumulate in the message buffer. Since several messages may be in the buffer, the user may have to push the button several times to clear the buffer of all of the messages.

The touchscreen allows the user to access information regarding different aspects of the system and controls by simply touching the corresponding command or icon on the screen.

1.2.4.6 Rocker Switch

The rocker switch (with 2 arrowheads pointing away from each other) is used to move among the tabbed selections for any of the panel pages (where tabbed selections appear) on the controller LCD monitor. The button is located in the center button of the TCC500.

The rocker switch is very useful for moving from one character position to another within a given field. Moreover, the toggle switch (when used to edit numeric data) can be used to increment or decrement the selected number in larger portions (e.g., incrementing by a factor of (5x) or more depending upon the active field).

1.2.4.7 Variable Adjustment Knob

The LCD screen touchscreen interface enables the user to alter screen data. Upon touching one of the icons, the corresponding command response becomes accessible.

The adjustment knob located on the lower left side of the controller’s front panel provides the user with the means to adjust controls that are variable or the applicable settings that require incremental changes such as the manual adjustment of the azimuth for the high-gain Skylink pod antenna. All such settings or adjustment functions are mapped to this knob for applicable adjustments and changes when required. To apply the settings adjustments, access the screen that includes the icon that for the required functional change and press the icon. Once activated, the icon’s radial dial will change to green. This indicates that this variable setting is ready to be adjusted. The user then simply turns the adjustment knob to execute the required change in that variable (refer to Figure 1–10).

1.2.4.8 Variable GUI Commands and Attributes

To adjust the onscreen command radial icons, select the icon of the variable requiring the adjustment and turn the lower knob to change or adjust that variable setting (refer to Figure 1–10) This, for example, provides manual adjustment of the high gain antenna.

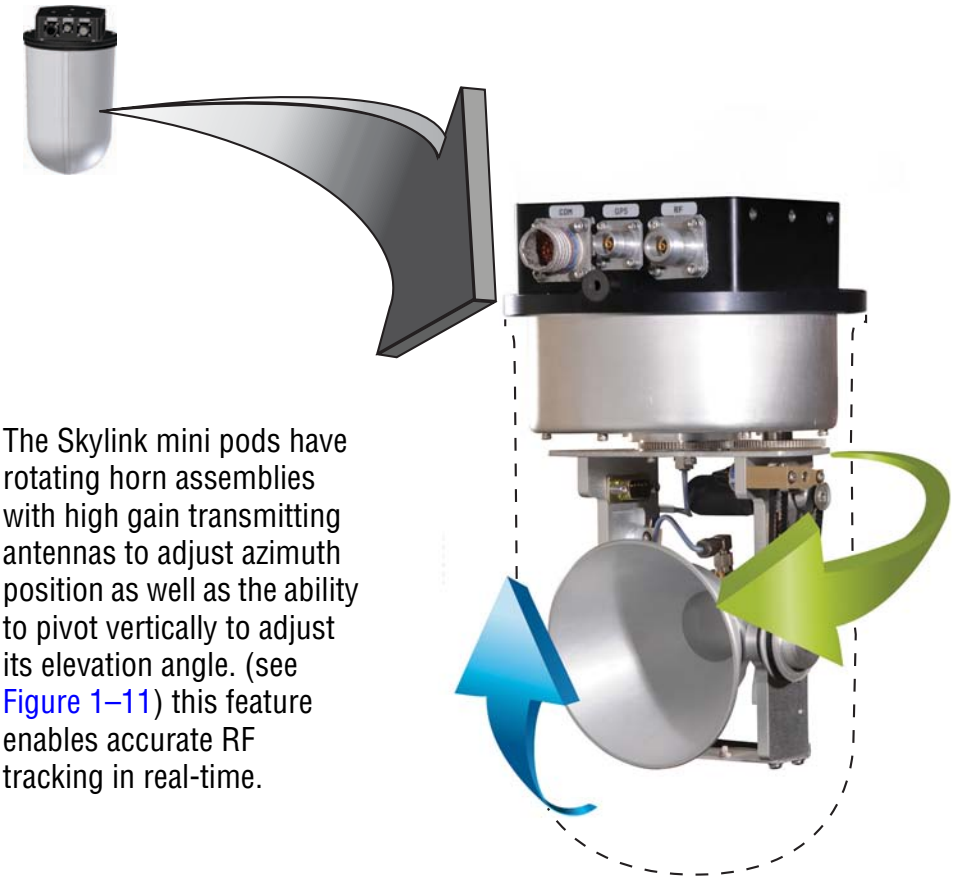
Figure 1–10. Onscreen Selection Control Adjustment

1.3 SYSTEMS COMPONENT OVERVIEW

The three system components work together to control the transmitter as well as transmit the video signal to a ground receive site. To achieve this, the C100 controller is the user interface to activate, program and control the transmitting Skylink Mini pods. When the transmitter is fixed on a pre-programmed target, or waypoint, the Digital IMU utilizes a gyroscopic mechanism and computer to keep the transmitter fixed on that location as the aircraft maneuvers.

1.3.1 Skylink Mini Pods

This system includes two Skylink Mini Pods mounted on the top and the bottom of the aircraft fuselage. With both pods operating in-sync, the airborne system is capable of maintaining constant contact with the ground transmit/receive site (see



The Skylink mini pods have rotating horn assemblies with high gain transmitting antennas to adjust azimuth position as well as the ability to pivot vertically to adjust its elevation angle. (see Figure 1–11) this feature enables accurate RF tracking in real-time.

Figure 1–11. Skylink Mini Pod

This system incorporates two separate skylink mini pods mounted onto the top of the airframe as well as the bottom. The lower mini pod will maintain contact with the ground system a majority of the time.

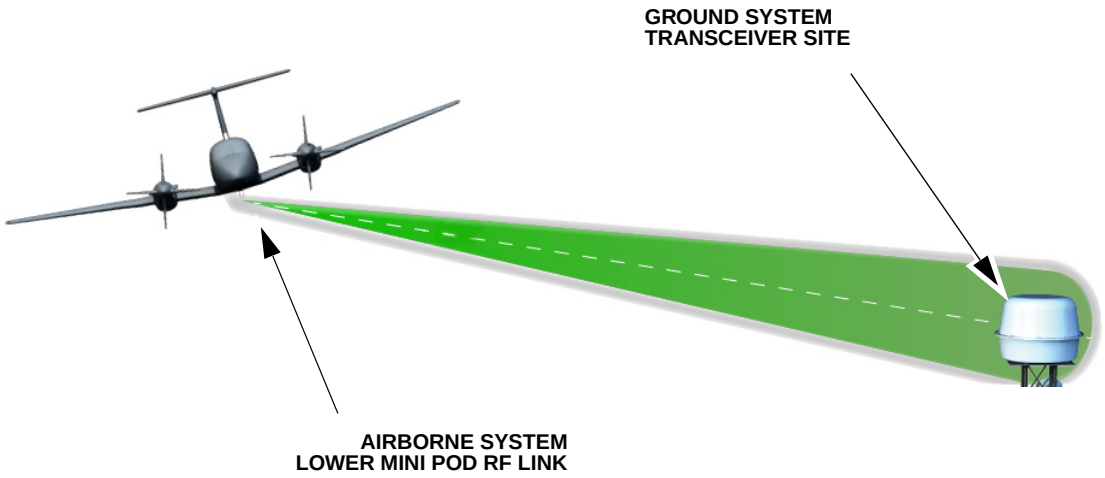


Figure 1–12. Lower Mini Pod Communications Configuration

Whenever the aircraft in banking towards the ground site, contact may be lost due to line of sight issues depending on the aircraft's proximity and range. Therefore the system's second mini pod is mounted onto the top of the aircraft's airframe to maintain consistent RF contact for the bi-directional IP data stream.

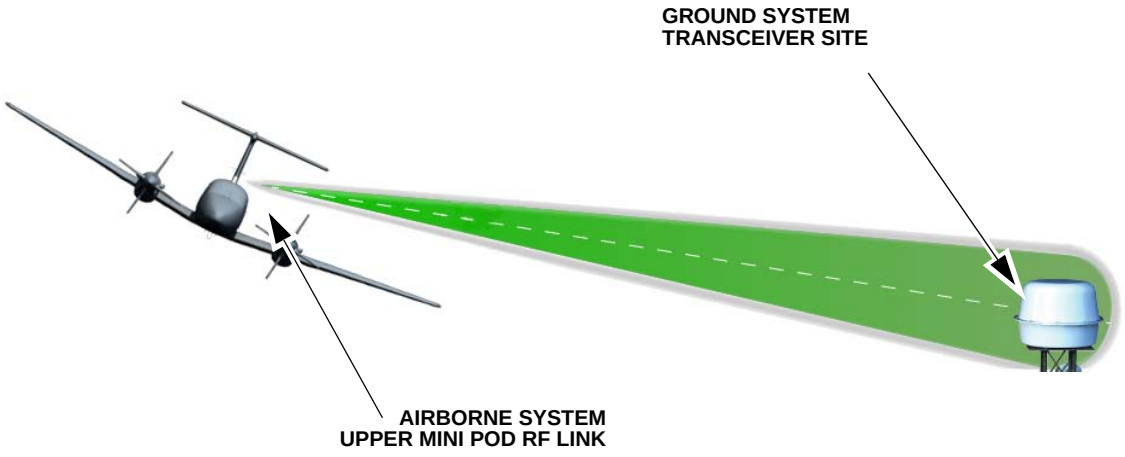


Figure 1–13. Upper Mini Pod Communications Configuration

1.3.2 C100 Controller

The C100 Controller provides a complete user interface for the system. It features soft-touch key buttons and a lateral lever as part of the mechanical interface coupled with a touchscreen GUI software interface. The software interface offers an intuitive mapping and control access for programming and status readings for ease of use while minimizing the need for calibration and updates. Additionally, the controller is completely programmable for automated control.

Figure 1–14. C100 Airborne RF Transmitting Antenna Controller

1.3.3 DAVIE: Data And Video IP Encapsulator

The DAVIE is an onboard digital video and IP encapsulation unit. The DAVIE encodes the video and data and downlinks the encoded data over an IP network through the Skylink mini pods. It also decodes the uplinked data from the ground system for on-board utilization by the airborne user.

Figure 1–15. DAVIE (Data and Video IP Encapsulator)

1.3.3.1 Airborne DAVIE provides the following critical functions:

Video Encoding from HD and/or SD video inputs

Encoded video converted to IP packets and multiplexed with user control data and files

Prioritize and route IP traffic to and from the aircraft along with the video data

Provide system control

Route data to and from ABLE for transmission and reception

1.3.4 ABLE: Airborne Bi-Directional Link Equipment

The ABLE is effectively the airborne “transceiver”. It contains all of the required RF and modulation equipment required for the bidirectional COFDM link. This system is supplied in C-BAND. Other bands or modulation types may be offered in future systems by simply replacing or upgrading this unit.

Figure 1–16. ABLE (Airborne Bi-directional Link Equipment)

The ABLE supports two parallel transmit and receive paths connected to two independent tracking antennas. The receiver is designed to “listen” to both inputs and then “pick” the best signal from each. This processing is done in real time and improves receiver performance by a minimum of 3dB. In addition, the locations of the tracking antennas are placed to minimize “shading”, typically caused by the aircraft at various operating attitudes, thus greatly improving data availability.

The transmitter output is routed to two independent power amplifiers and then to each antenna. This provides both redundancy and reduces dropouts due to blockage.

SECTION 2

SYSTEM CONFIGURATION AND SET-UP

2.1 INTRODUCTION

This system is designed and optimized for aircraft installation and operation. Each component requires mounting and connectivity prior to calibration and operation.

2.2 SYSTEM COMPONENT INSTALLATION

All of the systems components are to be mounted to the aircraft airframe and the pilot panel.

2.2.1 Skylink Mini Pod

The Skylink Mini Pods are mounted to the airframe on both the top and the bottom of the aircraft.

2.2.1.1 Skylink Pod Installation

2.2.2 C100 System Controller

The C100 Controller is a comprehensive control system that utilizes both a mechanical interface as well as a virtual touchscreen interface, both of which are accessible via the controller's front panel. The rear panel provides the required connectivity to connect the system to the antenna pod and the IMU (see Figure 2–1).

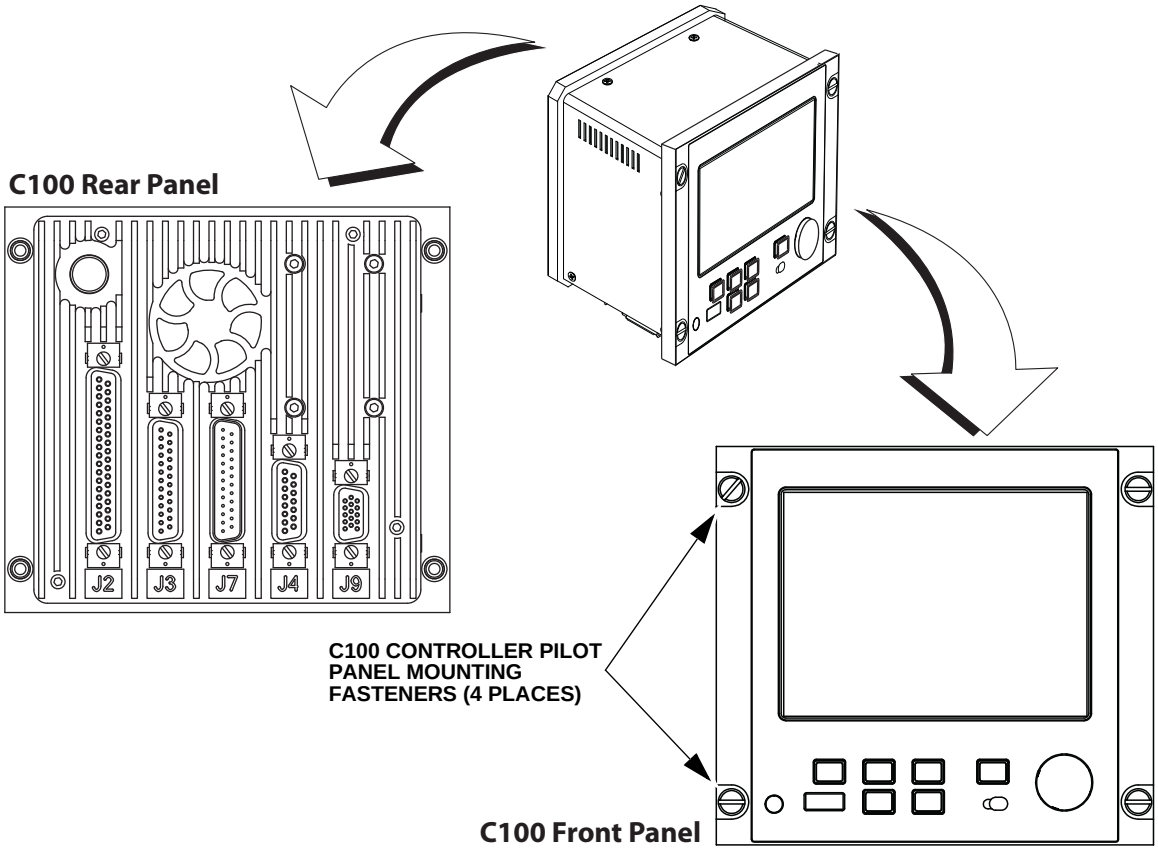


Figure 2–1. C100 Controller Front and Rear Panels

2.2.2.1 C100 Controller Installation

The C100 Controller form factor is standardized to FAA regulations. It is installed directly into the pilot panel of the aircraft. Simply insert it into the designated pilot panel opening, turn the four mounting fasteners (see Figure 2–1) until the threads catch and tighten each fastener.

NOTE: It may be necessary to connect all of the system cabling prior to installing the controller into the pilot panel.

2.3 SYSTEM CONNECTIVITY

The system components interface requires mechanical connectivity for Power, Control and RF. To connect the system components confirm that the following cables are available and connect them to the system components accordingly (see Figure 2–2 and Figure 2–3):

1. Using cable E-400-0173-00, connect the C100 controller (port J3) to the DAVIE Ethernet port.
2. Using cable E-400-0223-00, connect the DAVIE to the ABLE COMMS and power.
3. Using cable E-200-0434-01, connect the C100 controller (port J7) to the aircraft 28 VAC power source.

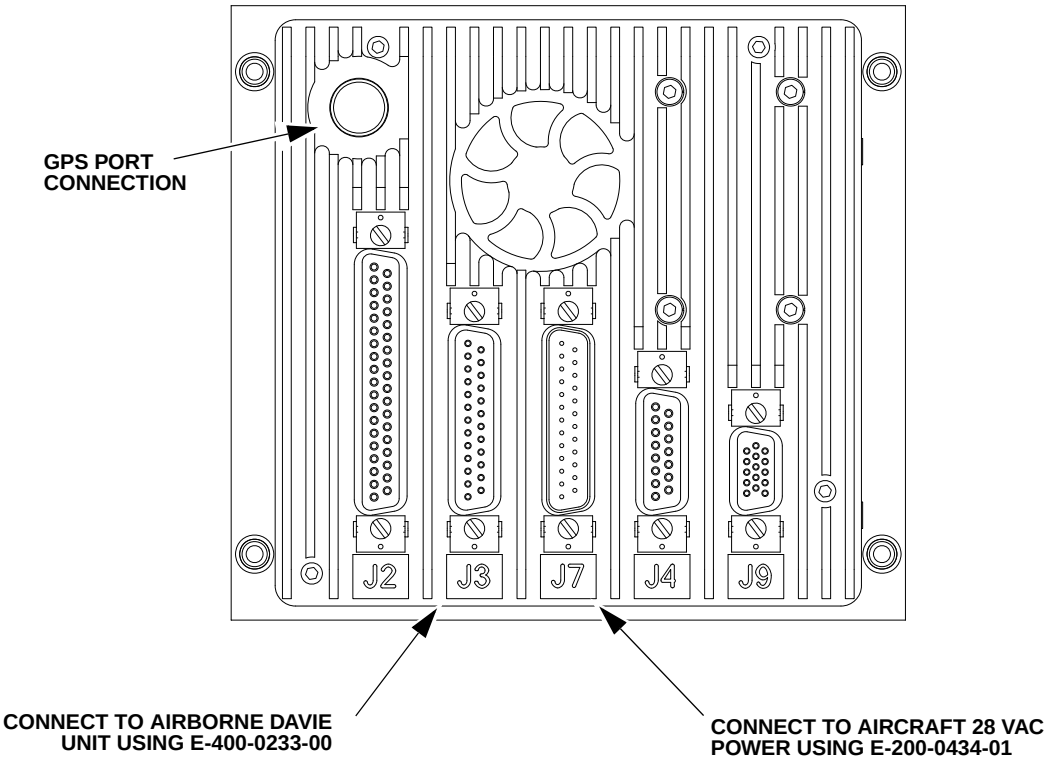


Figure 2–2. C100 Controller Rear Panel

4. Connect the GPS into the GPS port on the back panel of the ABLE
5. Connect the RF cable from the RF port of the upper Skylink pod to the J3 labeled RF port of the ABLE and the lower Skylink pod to the J5 labeled RF port of the ABLE

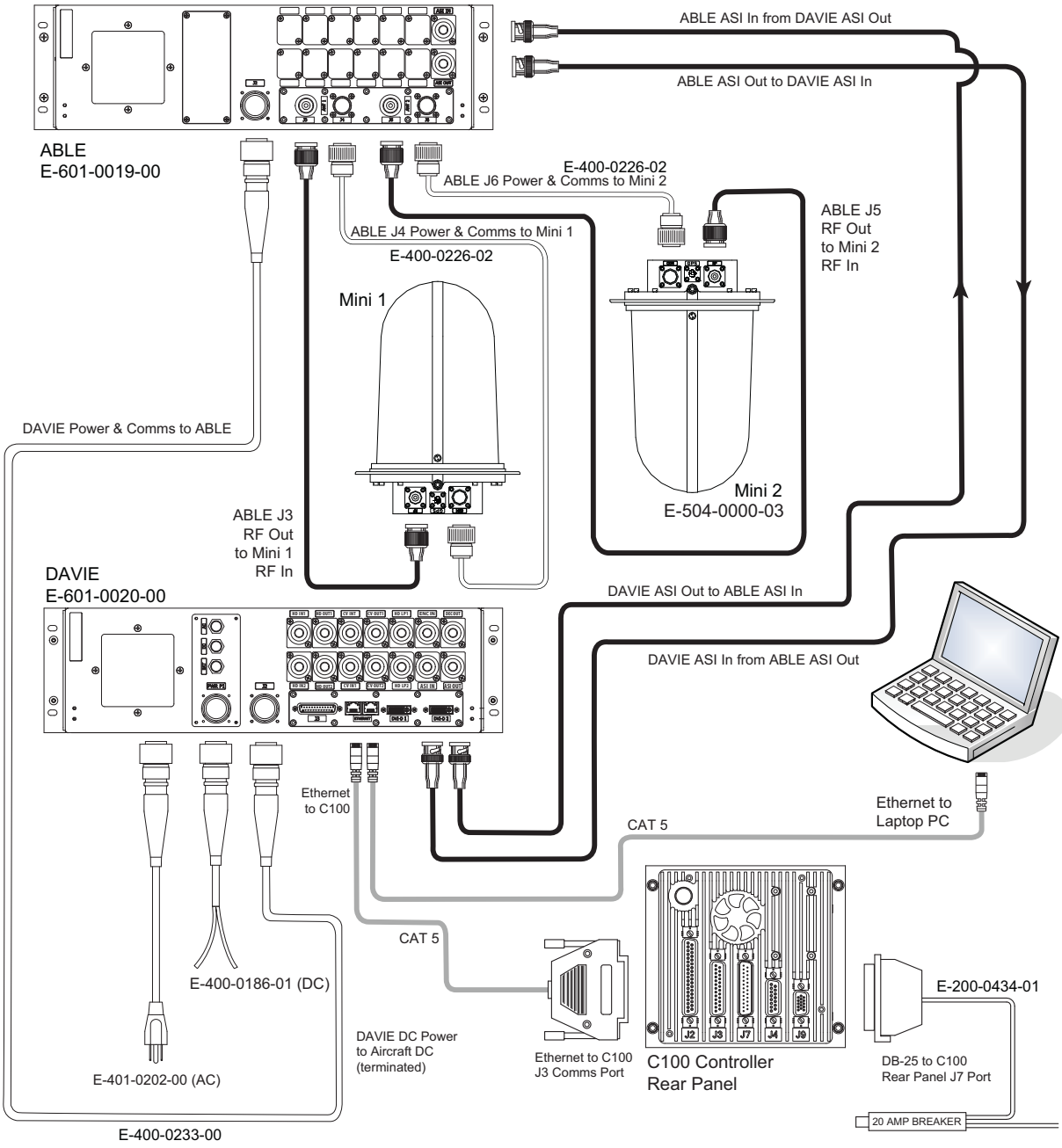


Figure 2–3. Airborne System Mechanical Connectivity

2.4 AIRBORNE SYSTEM ATP CHECKLIST

2.4.1 Connectivity Requirements

This system is comprised of the following components (see Figure 2–3):

- Skylink mini pod 1 (PN: E-504-0000-03)
- Skylink mini pod 2 (PN: E-504-0000-03)
- DAVIE Unit (PN: E-601-0020-00)
- ABLE Unit (PN: E-601-0019-00)
- C100 antenna controller (PN: E-601-0000-00)
- Monitors (x2)

The aforementioned components connectivity requires the following cables for proper functionality:

- DAVIE to ABLE power and comms (Cable PN: E-400-0233-00)
- C100 to DAVIE IP (ethernet) Comms (Cable PN: E-400-0173-00)
- ABLE to Skylink Mini Pod power and comms (Cable PN: E-400-0226-02)
- DAVIE to Laptop PC using CAT 5e ethernet cable with RJ-45 connectors
- Able to mini pod RF connections (RF N-type to N-type)
- ASI HD Video Between DAVIE and ABLE (BNC to BNC x4)
- AC power to DAVIE (Cable PN: E-401-0202-00)
  - DC power to DAVIE (Cable PN: E-401-0234-00)
- Aircraft 28 VDC to C100 power (Cable PN: E-200-0434-01)

2.4.2 Connectivity Instructional Checklist

Refer to Table 2–1 and Figure 2–3 for connectivity instructions.

Table 2–1. Airborne System ATP Set-up Checklist

	Item	Set-up Procedure
	1.	Connect J2 of DAVIE to J2 of ABLE
	2.	Connect J4 of ABLE to Mini Pod 1
	3.	Connect J6 of ABLE to Mini Pod 2
	4.	Connect J3 of ABLE to Mini Pod 1
	5.	Connect J5 of ABLE to Mini Pod 2
	6.	Connect the C100 controller to the DAVIE using cable E-400-0173-00
	7.	Plug the DAVIE into an AC outlet using E-401-0202-00 or into a DC power supply using cable E-401-0234-00
	8.	Connect the laptop to the DAVIE CAT 5e ethernet cable with RJ-45 connectors
	9.	Connect the GPS to the ABLE (not available for factory testing)
	10.	Connect source HD-ASI to the DAVIE HD-IN1 using video cable with BNC connectors
	11.	Connect the ASI OUT of the DAVIE to ASI IN of the ABLE using video cable with BNC connectors
	12.	Connect ASI OUT of the ABLE to ASI IN of the DAVIE using video cable with BNC connectors
	13.	Connect the C100 controller to a DC power supply using cable E-200-0434-01
	14.	Connect DEC OUT of the DAVIE to and HD -SDI monitor using video cable with BNC connectors
	15.	Apply power to the DAVIE, ABLE, C100, the laptop PC and the HD-SDI source (camera) as well as HD monitor
	16.	Confirm network connectivity and comms

2.5 SYSTEM CALIBRATION

The transmitter pod and the C100 controller are set and calibrated by the manufacturer and do not have periodic calibration requirements.

SECTION 3

SYSTEM OPERATION

3.1 INTRODUCTION

Once the system has been properly installed, powered up and calibrated, it is entirely operated from the C100 controller. This section contains operational instructions for the User Interface (UI) portion of the C100 controller.

3.2 THEORY OF OPERATION

The system is controlled through the use of the C100 controller and the Cyclops software, which is programmed into the controller. The controller is used to gather data from the built-in GPS, the IMU, the Skylink Mini transmitting high-gain antenna. Activation, set-up and control of the Skylink and the omni antennas is applied through the use of the C100 Controller. The Skylink Mini antenna, in turn, transmit the video signals via microwave the rotating high gain antenna to a receive site that the system tracks via the C100's software, GPS and the IMU.

3.3 POWERING THE SYSTEM UP

It is recommended that the system electrical, control and video connections be complete and secure prior to powering up the system (refer to Section 2 – System Configuration and Set-up). Once proper system set-up has been confirmed, powering the system on is achieved by pulling out the power switch located on the lower left corner of the C100 controller. The controller will then power-up followed by the IMU and the Skylink Mini pod. Upon system power-up, the IMU and pod will initiate and configure itself in accordance with the most recent set-up and calibration.

3.4 DAVIE: DATA AND VIDEO IP ENCAPSULATOR

The onboard digital video and IP encapsulation unit utilizes a touchscreen with a graphical user interface (GUI) for all of the system controls and settings. The custom software created for this system utilizes and symbiotic operating protocol facilitated by the custom hardware utilizing high-performing subsystem components.

The software is designed to provide intuitive controls with easy access for efficient system operation and optimal performance of both the ground and airborne systems. The functions of the system are seamless and nearly instantaneous even when the RF and comms are encoded and decoded over long range transmission and reception.

Therefore the two DAVIE system components (airborne and ground) have nearly identical operational software interface. This section of the airborne manual details the GUI screens for the airborne DAVIE unit.

Figure 3–1. DAVIE (Data and Video IP Encapsulator)

3.5 DAVIE: DATA AND VIDEO GUI SOFTWARE

The touchscreen GUI software provides the user with access to all of the airborne systems command functions including system status, faults, settings and operation. The system's GUI default screen shows the status of the RF and comms link as well as direct access to the other system settings and functions. Figure 3–2 reveals the software visual orientation and basic interface navigation.

3.5.1 Home Screen

The Home screen is, in fact, the system default screen and will be accessible upon successful system start-up. Whenever one of the icons in the command sidebar is pressed, the GUI will immediately access the correlating screen (regardless of the currently selected screen or tabbed page). Pressing the "Home" icon on the command sidebar will immediately access the this screen.

Figure 3–2. DAVIE Software Home (Default) Screen

The Home screen is the core of the system's operation and control. All of the key functions of the system can be monitored or changed from this screen (see Figure 3–3). Many of these items are detailed in Section 1, "System Overview". However, there are additional system functions accessible from the Home screen. These additional functions and settings include:

- IMU configuration
- Link Channel Pair selection
- Waypoint selection and editing.

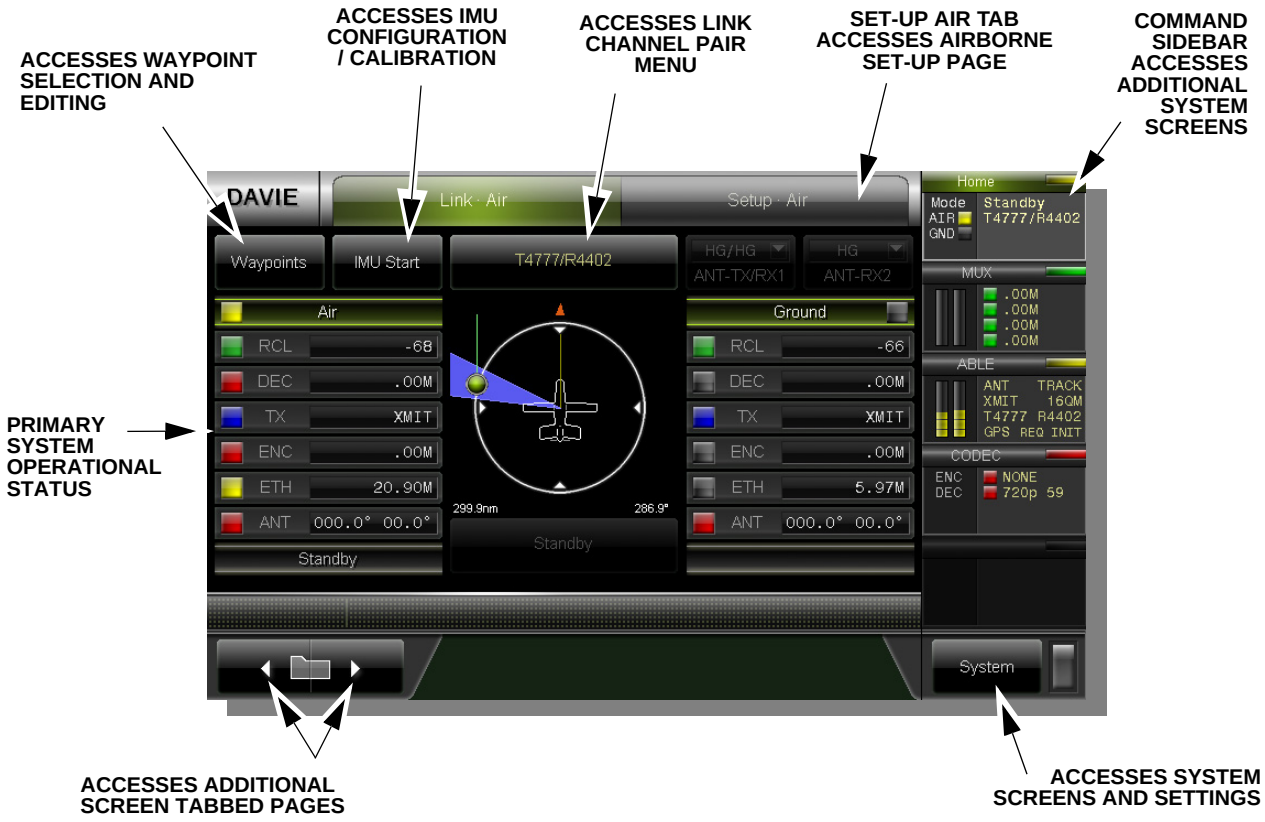


Figure 3–3. Home / Default Screen System Access Points

The following paragraphs provides additional details regarding access and altering theses system functions.

3.5.1.1 IMU Configuration

The IMU screen allows the user to configure and initialize the IMU. Press the Init Hdg icon to access the Initiation Heading virtual keypad.

Press the Init (Initiate) icon to toggle between air IMU initiation and land IMU initiation (refer to Figure 3–4).

If initiating the IMU while the system is airborne, key-in the current heading relative to North (0 to 360 degrees) using the aircraft's navigation equipment then press the ENTER key.

If initiating the IMU while the system is on land, acquire a compass reading of the current location and key-in the current waypoint direction relative to North (0 to 360 degrees) using the aircraft's navigation equipment then press the ENTER key.

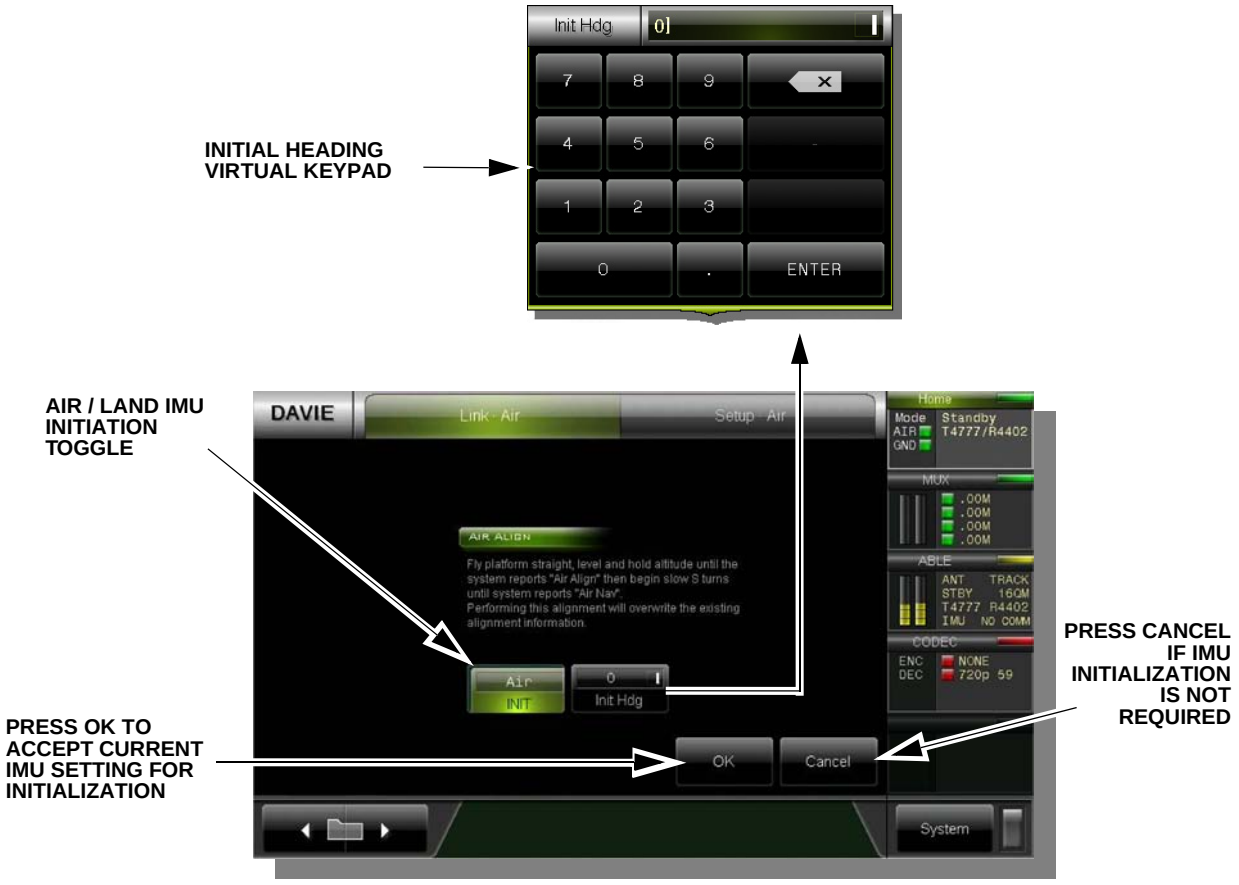


Figure 3–4. IMU Configuration Screens

3.5.1.2 Link Channel Pair

Pressing the Link Channel Pair Icon accesses the Link Channel Pair menu page. It is this page that includes the menu that offers the user linked channel pair combinations from which to select (refer to Figure 3–5).

Figure 3–5. Link Channel Pair Menu Page

3.5.1.3 Waypoints

The Waypoints screen provides access to waypoint selection creation and editing.

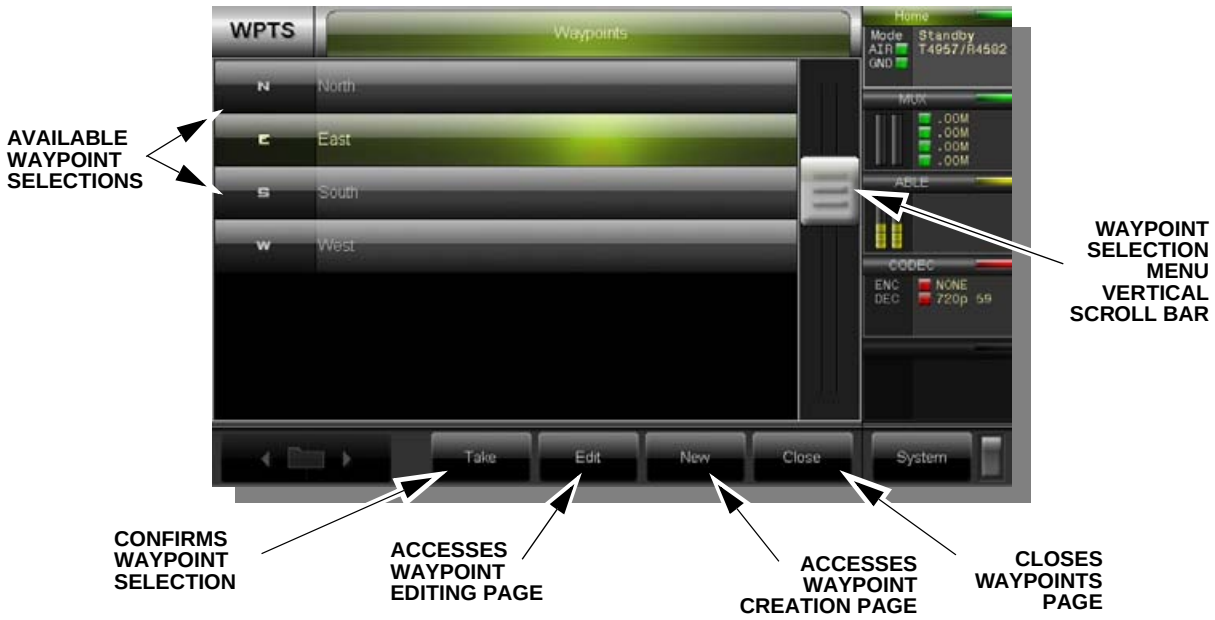
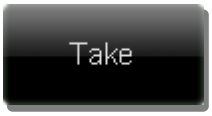


Figure 3–6. Waypoints Selection Page

3.5.1.4 Selecting Waypoints

1. Press the “Waypoints” icon on the Home / Default screen (see Figure 3–3).
2. Using the scroll bar, scroll down through the available selections (if necessary), refer to Figure 3–6.
3. Select the required Waypoint from the menu.
4. Press the Take Icon to confirm the selection.



3.5.1.5 Creating and Editing Waypoints

Both creating and editing of waypoints uses the same software utility. The user can select an existing waypoint on the waypoint page then press the” Edit” icon to access the waypoint programming utility to make the required changes to that waypoint.

The user can directly access the utility to create new waypoints or edit existing ones. Creating a new waypoint is achieved by accessing the Waypoint page (refer to Figure 3–6).

At the Waypoints page, press the “New” icon on the Home / Default screen to access the Waypoints creation utility.

Figure 3–7. Accessing the Waypoint Creation Software Utility

Pressing the “New” icon accesses the waypoint creation / edit page. From this page, the user programs all of the required data and coordinates for the new waypoint including:

- Name
- North or South Latitude
  - — Degrees
  - — Minutes, minutes
  - — Seconds, seconds
- Altitude
- Description
- East or West Longitude
  - — Degrees
  - — Minutes, minutes
  - — Seconds, seconds

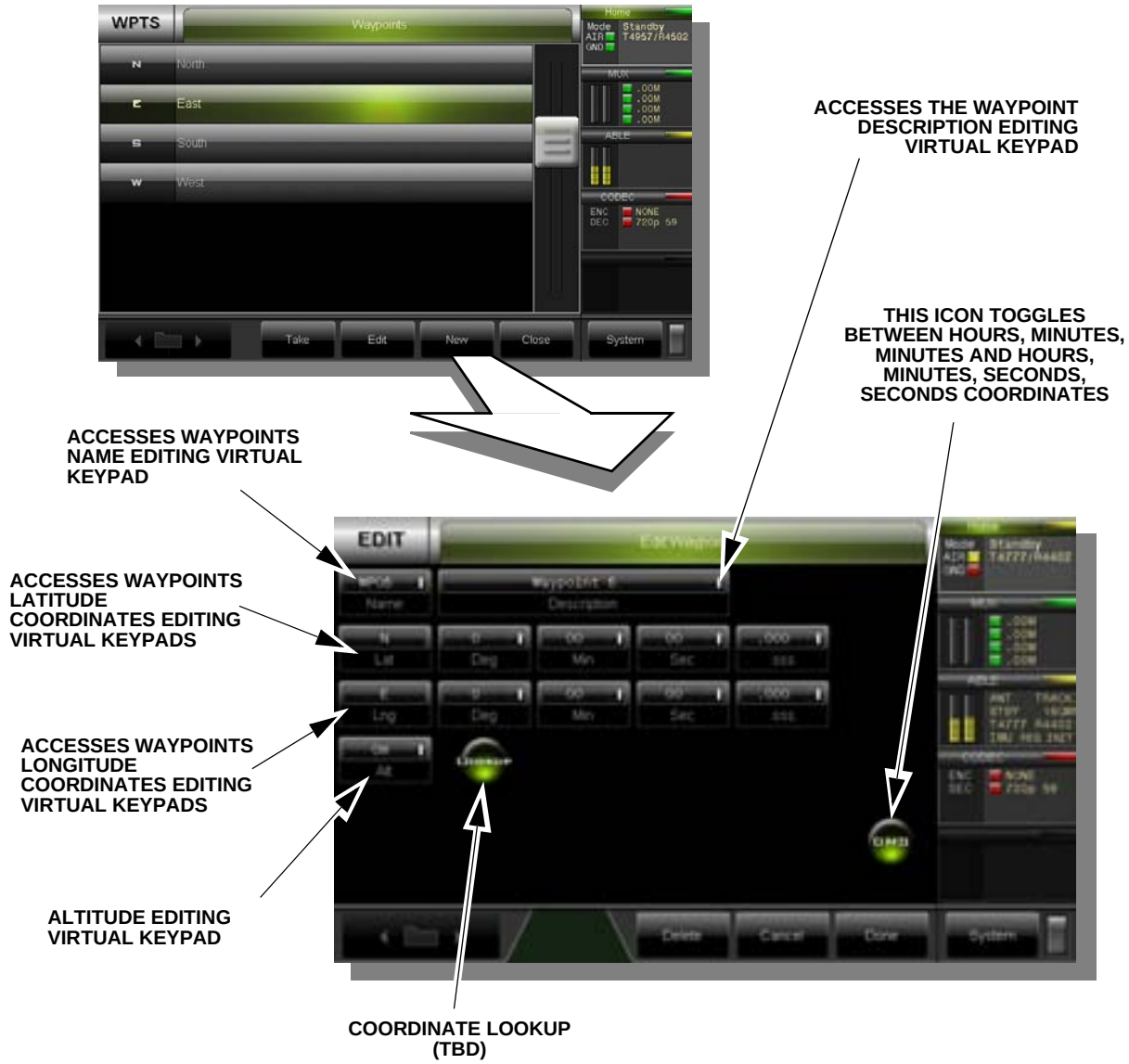


Figure 3–8. Waypoint Editing Page

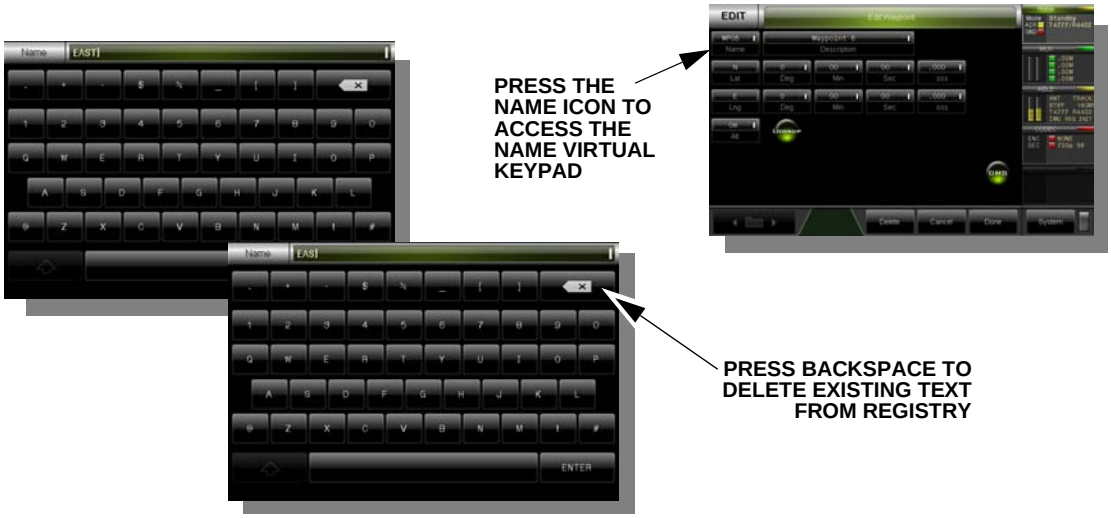
Refer to Figure 3–9 through Figure 3–12 for information regarding waypoint attribute editing.

- Perform the following steps to create a new, or edit an existing waypoint name (refer to Figure 3–9).

1. Select the waypoint to be edited by pressing that waypoint shown on the GUI screen panel.

2. Select the EDIT tab located on the bottom bar of the GUI overlay to access the editing functions.

3. The EDIT screen offers several different editing functions. To edit the waypoint name, press the NAME icon.



4. A virtual QWERTY style keyboard will appear on the GUI screen allowing access to change the target name. If editing an existing waypoint, use the Backspace key icon to erase the previous text.

5. Type in the new waypoint name and press enter to save the name change

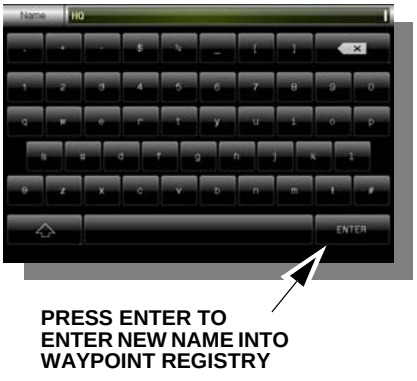


Figure 3–9. Waypoint Name Edit Screens

3.5.1.6 Editing Waypoint Coordinates

If it is required to edit the geographic coordinates of a waypoint location, the coordinates can be edited through the same editing screen.

- Perform the following functions to edit the waypoint latitude degree coordinate (refer to Figure 3–10)

NOTE: Be certain to enter the exact desired coordinates in the correct format for proper navigation functionality of the system IMU

1. Select the waypoint to be edited by pressing that waypoint shown on the GUI screen panel.

2. Select the EDIT tab located on the bottom bar of the GUI overlay to access the editing functions.

3. The EDIT screen offers several different editing functions. To edit the waypoint latitude coordinates, begin by pressing the button latitude Deg. icon to edit the degree coordinate.

4. A virtual numerical style keypad will appear on the GUI screen allowing access to change the waypoint latitude degrees coordinate. Simply type in the new waypoint latitude degree coordinate and press enter to save the coordinate change.

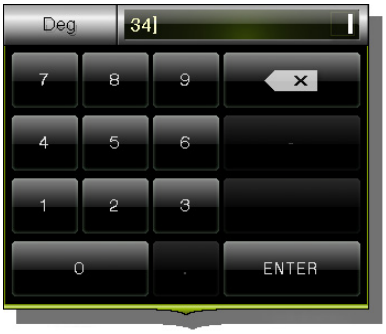


Figure 3–10. Editing Waypoint Coordinates (Latitude Degrees)

- Perform the following functions to edit the waypoint latitude minutes and seconds coordinates (refer to Figure 3–11)

1. To edit the waypoint latitude minutes and seconds coordinates, begin by pressing the Min. icon button.

2. The virtual numerical style keypad will appear on the GUI screen allowing access to change the waypoint latitude minutes coordinate. If using DSS coordinate protocol, simply type in the new waypoint latitude minutes coordinate and press enter to save the coordinate change, followed by the new.mmm coordinates and press enter to save.

3. If using DMS coordinate protocol, now press the latitude Sec, button icon on the screen.

4. The virtual numerical style keypad will appear on the GUI screen allowing access to change the waypoint latitude seconds coordinate. Simply type in the new waypoint latitude seconds coordinate and press enter to save the coordinate change.

5. Now press the latitude .sss, button icon on the screen for the latitudinal Seconds, seconds.

6. The virtual numerical style keypad will appear on the GUI screen allowing access to change the waypoint latitude seconds coordinate. Simply type in the new waypoint latitude seconds coordinate and press enter to save the coordinate change.

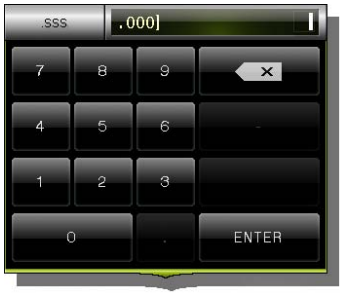


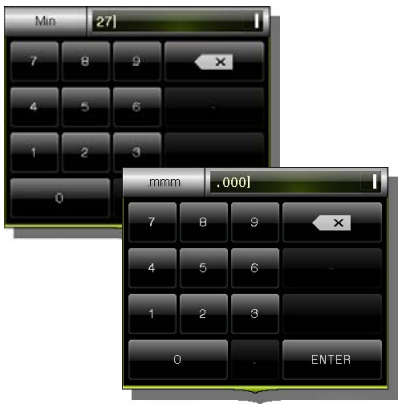
Figure 3–11. Editing Waypoint Coordinates (Latitude Minutes and Seconds)

- Perform the same procedure to edit each of the waypoint Degrees, Minutes and Seconds for the longitude coordinates (refer to Figure 3–12).

1. To edit the waypoint longitude degrees, minutes and seconds coordinates, begin by pressing the Deg icon button.

2. The virtual numerical style keypad will appear on the GUI screen allowing access to change the waypoint longitude degrees coordinate. Simply type in the new waypoint longitude degrees coordinate and press enter to save the coordinate change.

3. To change the waypoint longitude minutes, next press the Min. or the .mmm icon buttons



4. The virtual numerical style keypad will appear. Type in the new waypoint longitude minutes coordinate and press enter to save the coordinate change.

5. To change the waypoint longitude seconds, next press the Sec or the .sss icon buttons.

6. The virtual numerical style keypad will appear. Type in the new waypoint longitude seconds coordinate and press enter to save the coordinate change.

7. To change the waypoint longitude seconds, next press the sec icon button the edit the Sec.

- To edit the waypoint Altitude, perform the following procedure:

1. Press the Alt button icon on the screen.

2. The virtual numerical style keypad will appear. Type in the new waypoint altitude and press enter to save the coordinate change.

Figure 3–12. Waypoint Longitude Coordinates and Altitude Edit Functions

3.5.2 MUX - Multiplexing

The system's multiplexing functions can be accessed and monitored via the MUX pages. Pressing the MUX icon on the command sidebar of the GUI provides the user with this access (see Figure 3–13).

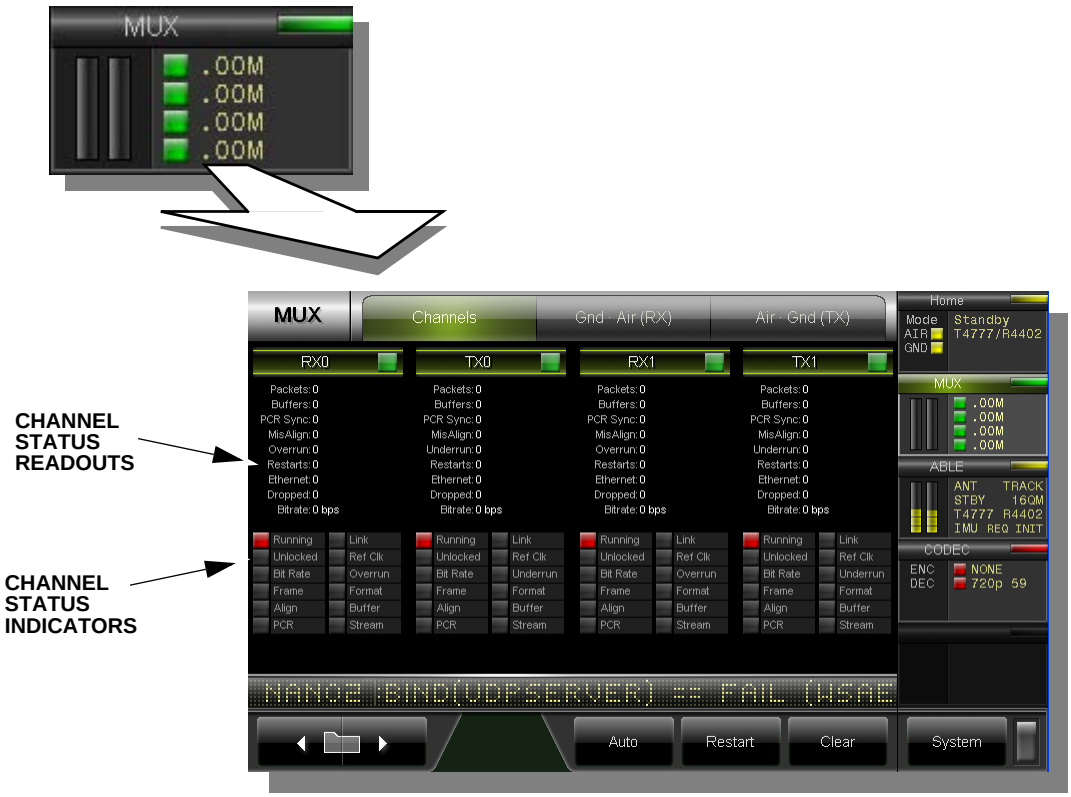


Figure 3–13. Mux Screen Channels Page

3.5.2.1 MUX- Channels Page

The MUX channels page provides status monitoring of the system's multiplexing functions for transmitter and receiver channels including:

- Packets
- Buffers
- PCR Sync
- Misalign
- Overrun
- Restarts
- Ethernet
- Dropped channels
- Bitrate

3.5.2.2 MUX - Ground to Airborne Page

The MUX Ground to Air page provides the status of the data transfer from the ground system to the airborne system including the status of the data transmitting and the data being received (see Figure 3–14)

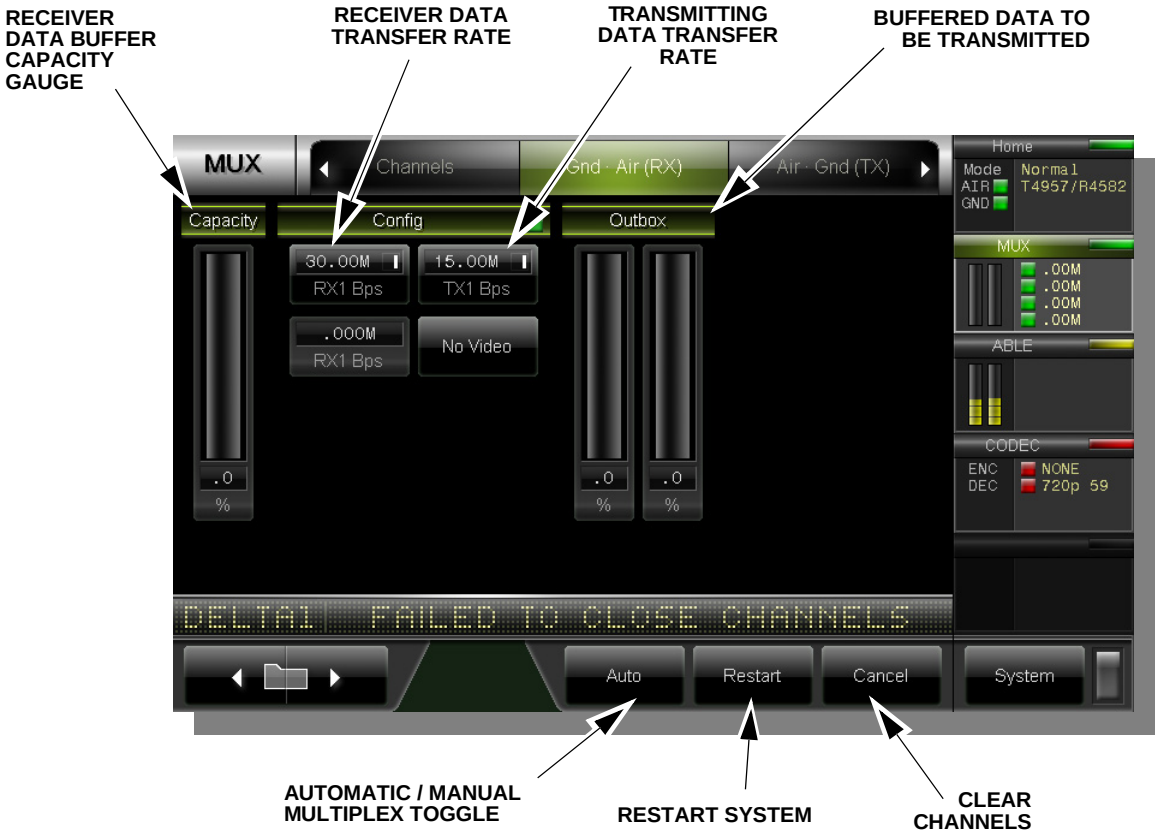


Figure 3–14. Multiplexing Ground to Air Status Page

3.5.2.3 MUX - Airborne to Ground Page

The MUX Air to Ground - page provides the status of the data transfer from the ground system to the airborne system including the status of the data transmitting and the data being received (see Figure 3–15).

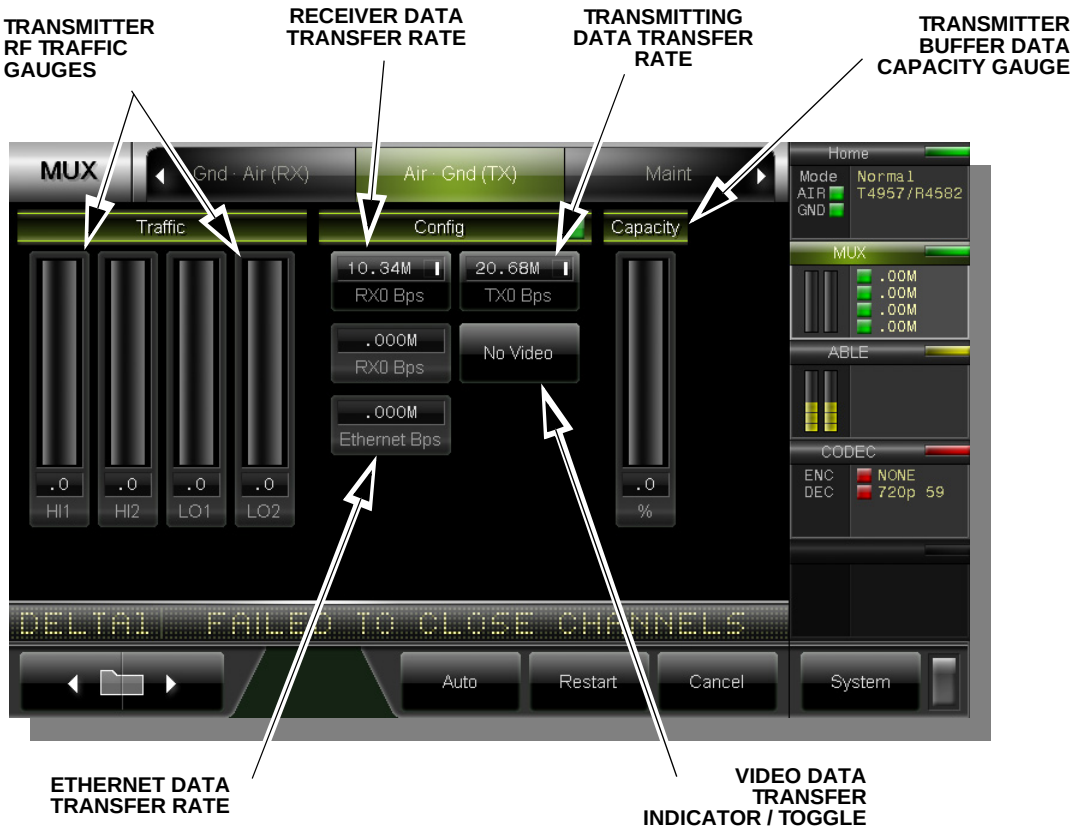


Figure 3–15. MUX Air to Ground Status Page

3.5.3 ABLE (Airborne Bi-Directional Link) GUI Screens

The ABLE GUI pages provide the user with the means to monitor the status of the aircraft position as well as the airborne mini pod antennas as well as the ground system position and status. Additionally, the user can manually adjust the airborne antenna configuration (refer to Figure 3–16).

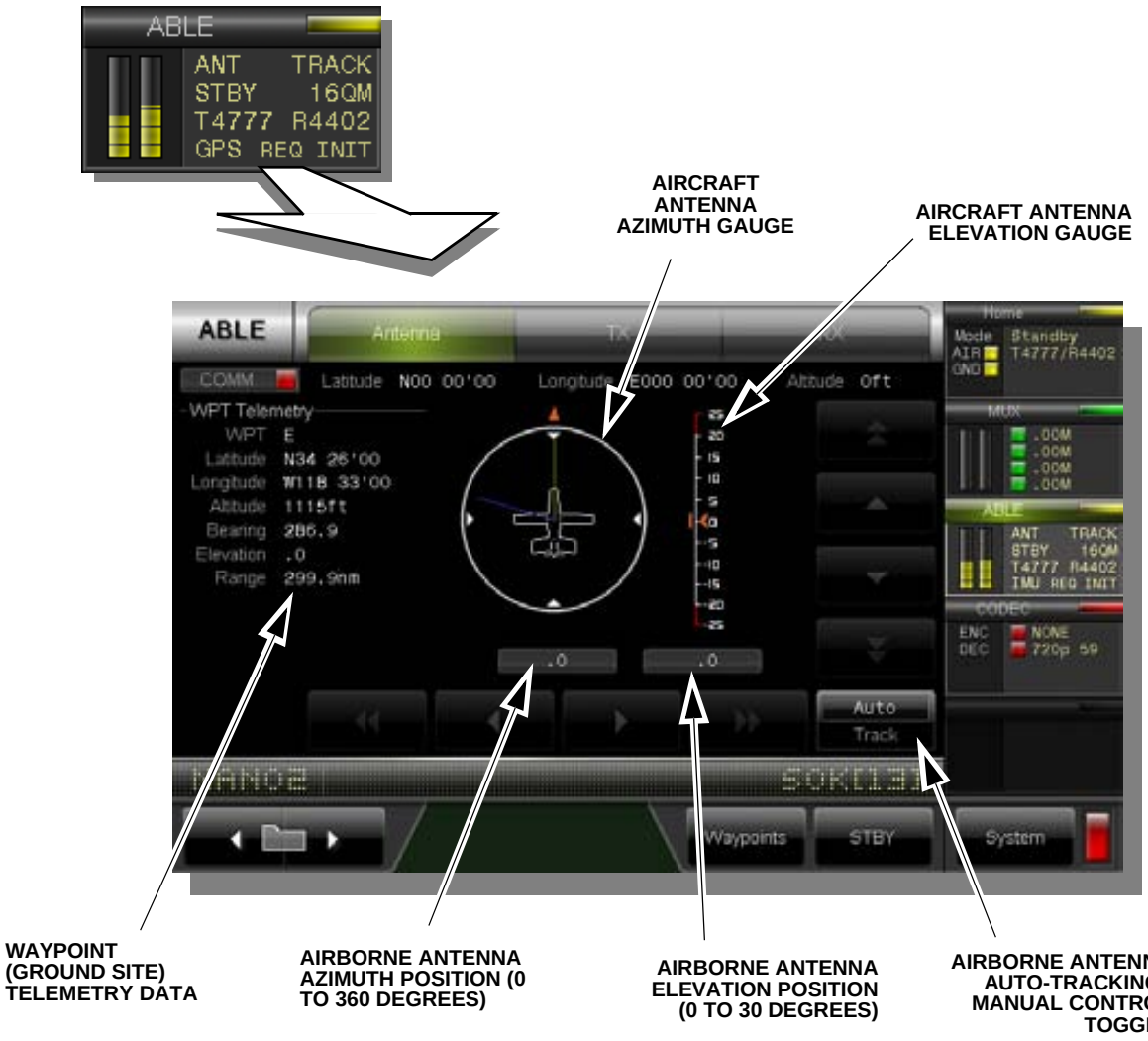


Figure 3–16. ABLE Airborne Antenna Status and Control Page

3.5.3.1 ABLE - Antenna Page

The ABLE antenna page offers the user complete access to the airborne system's antenna operational status and control functions. These include the waypoint (ground site) telemetry data, aircraft antenna status including azimuth position (relative to ground site as well as tracking data), antenna elevation position as well as access to manual control of the airborne antenna (refer to Figure 3–17).

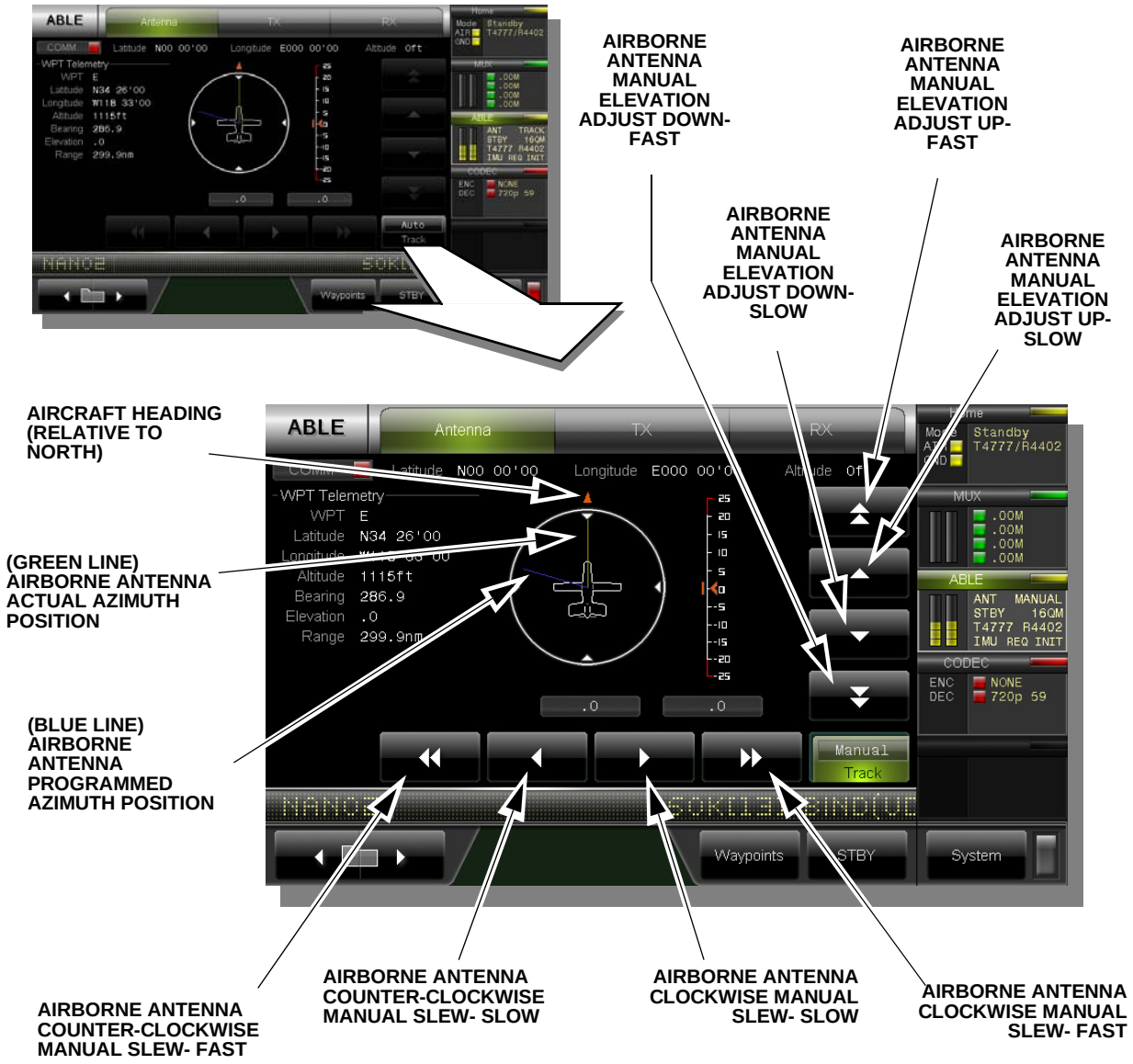


Figure 3–17. ABLE Antenna Page Functional Detail

3.5.3.2 ABLE - Transmitter Page

The ABLE transmitter page provides access to transmitter encryption protocols (refer to Figure 3–20 for encryption protocols) as well as several transmitter control settings including: Tx modulation, forward error correction, transmitter guard, Tx bandwidth, Transmission bitrate and transmitter power (see Figure 3–18).

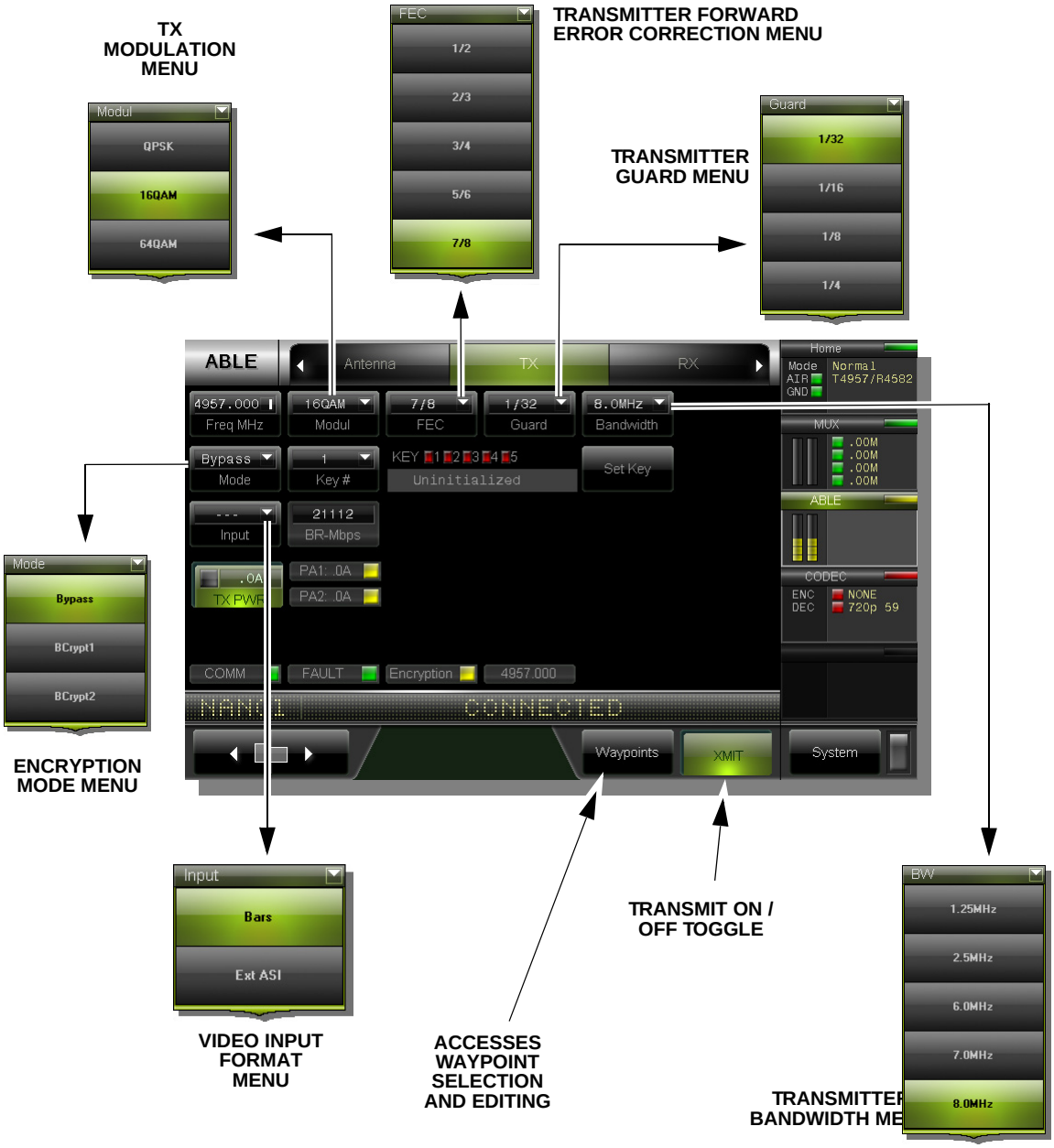


Figure 3–18. ABLE Transmitter Settings Page

3.5.3.3 ABLE - Receiver Page

The ABLE receiver page provides access to several receiver control settings including: Rx modulation, forward error correction, receiver guard, Rx bandwidth, receiver bitrate and receiver power (refer to Figure 3–20 for encryption key setup) as well as transmitter encryption protocols (see Figure 3–19).

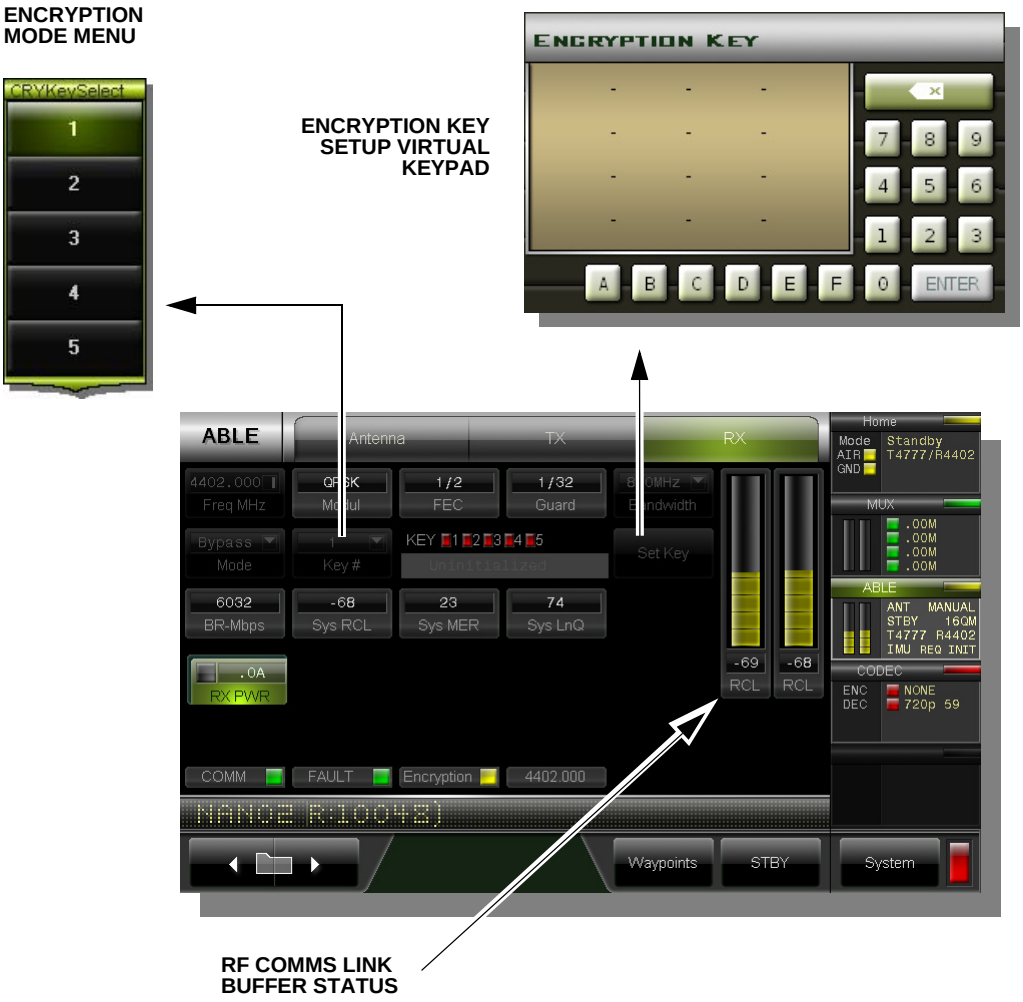


Figure 3–19. ABLE Receiver Settings Page

The security protocol for the transmitter of this system requires an encryption key. The encryption key is the passcode required for transmission encryption.

3.5.3.4 Creating Encryption Keys

The encryption protocols for this system utilizes the Advanced Encryption Standard (AES) and Data Encryption Standard (DES), depending on the user's encryption requirements (Figure 3–20).

Do the following to set a new encryption key:

1. Access the security tab and press the Key # icon.

AES128 AND 3DES REQUIRE 32-BIT ENCRYPTION KEYS

2. Press the Key number that requires new encryption (1 through 8).
3. Press the Encryption Mode icon.
4. Select the required encryption mode (see above - Bypass, AES128, AES192, AES256 or 3DES).
5. Press the Set Key icon to access the hexi-decimal virtual keypad.
6. Key-in the encryption code per the requirements of the selected encryption mode (32 to 64 bit - see above).
7. Press the ENTER key to record the new encryption.

AES256 REQUIRES A 64-BIT ENCRYPTION KEY

Figure 3–20. Programming a New Encryption Key

3.5.4 CODEC - System Encoding and Decoding

The CODEC screens access the video and audio data encoding and decoding settings. It is from these pages that the user can access and alter the encoding of the data for RF transmission and decoding once the data is received (see Figure 3–21).

Figure 3–21. DAVIE - CODEC GUI Pages

3.5.4.1 CODEC - Encoder Page

The CODEC encoder page provides access to the video and audio encoder settings including: video input format, input video scale, video data transmission bitrate, right and left channel audio transmission bitrate, transmitter bitrate, video test screen generator setting, frame, GOP and GOP mode and encoder power toggle (see Figure 3–22).

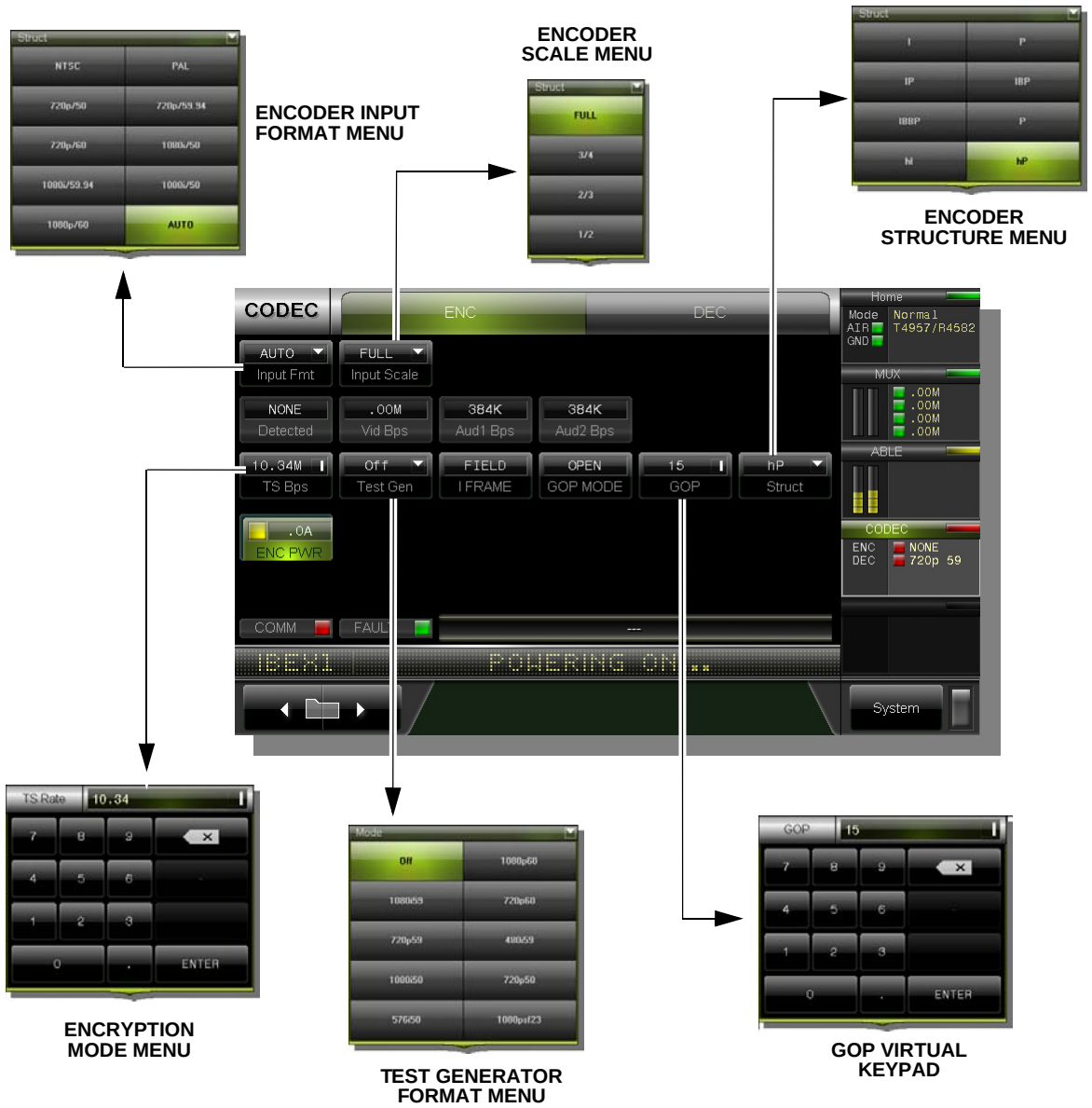


Figure 3–22. CODEC Encoder Page

3.5.4.2 CODEC - Decoder Page

The CODEC decoder page provides access to the video and audio encoder settings including: video resolution setting, video data transmission bitrate, right and left channel audio transmission bitrate, transmitter bitrate, and decoder power toggle (Figure 3–23).

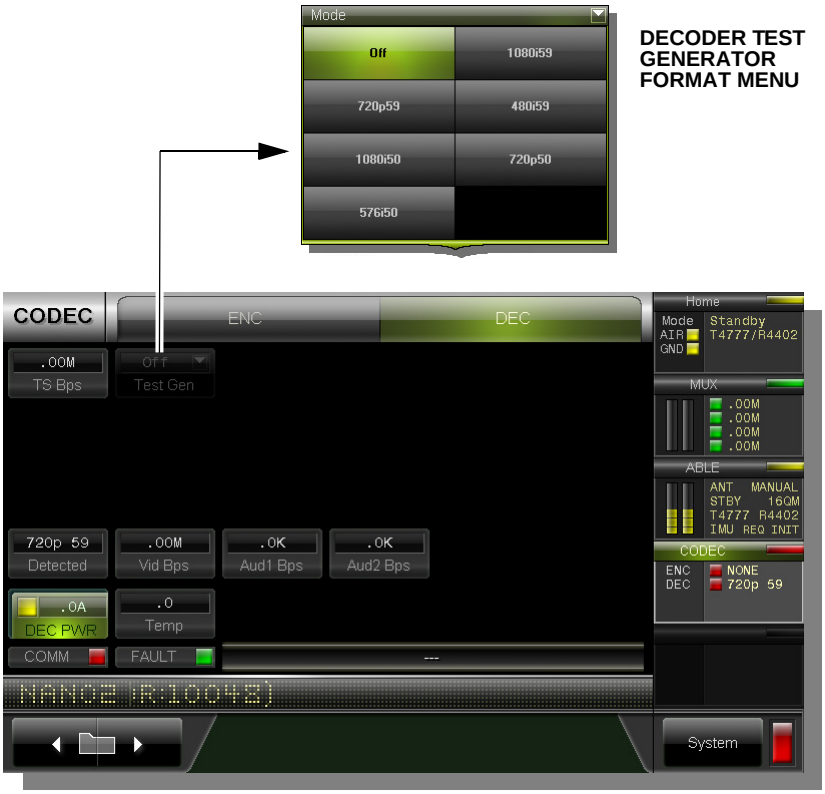


Figure 3–23. CODEC Decoder Page

3.5.5 System Screens

The system screens power settings for the airborne system as well as access the system status for the DAVIE and ABLE as well as the software referential data.

3.5.5.1 System - Power Page

The system power page provides the power status of various subsystems.

Figure 3–24. System Power Page

3.5.5.2 System - Software Page

The system software provides the user with the software version data and access to the software update utility.

Figure 3–25. System Software Page

3.5.5.3 System Remote 1 Software Page

The system remote software pages provide the user with the remote software version data and access to the software update utility.

Figure 3–26. System Remote 1 Software Page

3.5.5.4 System Remote 2 Software Page

Figure 3–27. System Remote 2 Software Page

3.5.5.5 System - CAL (Calibrate) - IMU Page

The system calibration pages access the status of the IMU and satellite tracking data

Figure 3–28. System Calibration IMU Page

3.5.5.6 System - CAL (Calibrate) - Satellites Page

Figure 3–29. System Calibration Satellite Page

3.5.5.7 System - CFG (Configuration) - Link Page

The system configuration pages provide the user with access system operational mode (user mode or maintenance mode), system clock settings, router data as well as access to link host settings

Figure 3–30. System Configuration Link Page

3.5.5.8 System - CFG (Configuration) - Clock Page

Figure 3–31. System Configuration Clock Page

3.5.5.9 System - CFG (Configuration) - Router Page

Figure 3–32. System Configuration Router Page

3.6 C100 CONTROLLER

The C100 Graphical User Interface (GUI) is comprised of software panels (dedicated functions) that utilize the following C100 interface components:

- Front Panel Controls
- LCD Screen

The C100 screen will cycle through its boot sequence as shown in the accompanying boot screens upon start-up. Once booted up the main MAP screen will show on the controller graphical user touchscreen interface (see Figure 3–33). To ensure safety to all personnel, note the warning that is displayed on the startup screen and repeated below:

WARNING: This device is intended for reference only. Do not use as Primary Navigation Device.

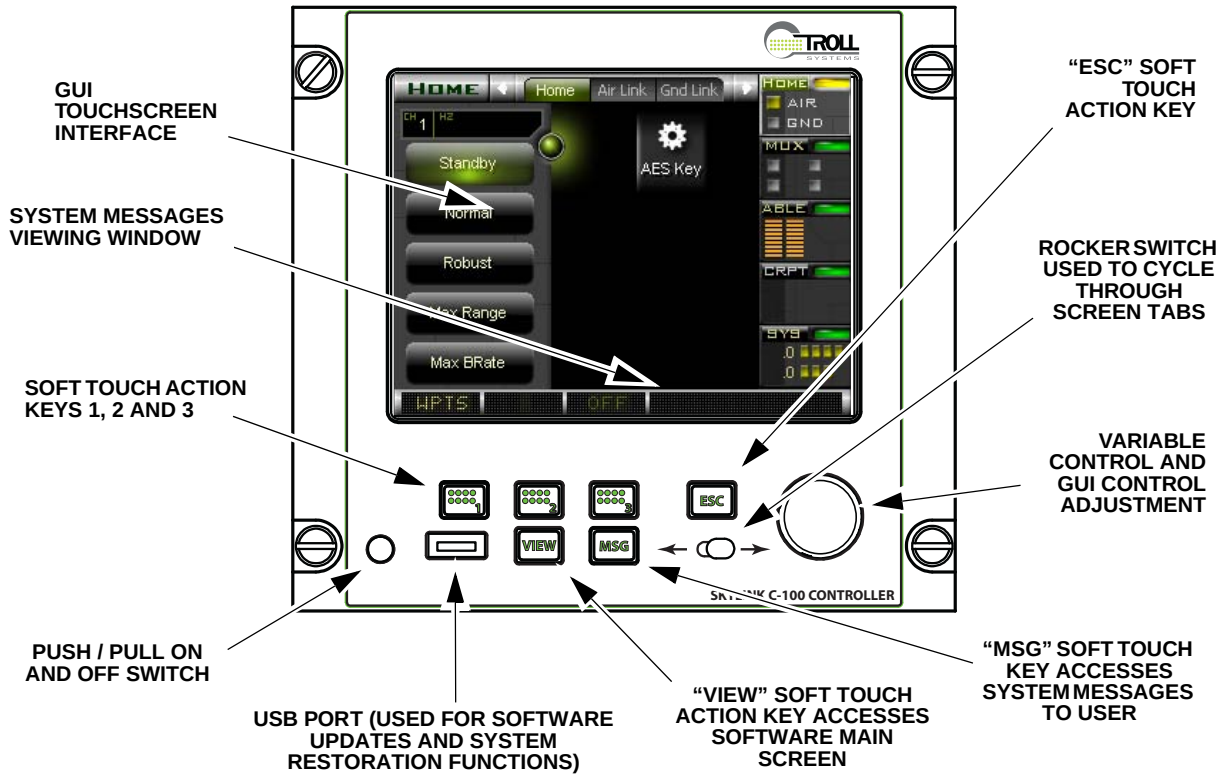


Figure 3–33. C100 Controller Front Panel Orientation

3.7 C100 CONTROLLER TOUCHSCREEN (GUI) INTERFACE

The LCD screen touchscreen interface enables the user to execute system commands, manipulate system functionality as well as access and alter screen data. Upon touching one of the icons, the corresponding command response becomes accessible.

3.7.1 Main Screen (Default)

The default boot-up screen for the C100 controller is the Map screen. From this screen the user has immediate access to the to all required functions to run the system. (refer to Figure 3–34).

3.7.2 System Screen Controls and Functionality

Along the right column of the GUI screen are three panel boxes which provide direct access to transmitter as well as system settings and operation (see Figure 3–34). The information contained within this section of this manual details all of the functions and settings for the transmitters and the controller system itself.

Figure 3–34. System Software Default Screen Orientation

3.7.3 System Control Functions Access and Status Bar

Along the right side of the GUI screen is a vertical sidebar showing the status of several of the systems functions (see Figure 3–35).

The status bar is segmented into three individual box-shaped icons representing the aircraft's onboard transmitters including RF transmission status, transmitter operational status and system operational data.

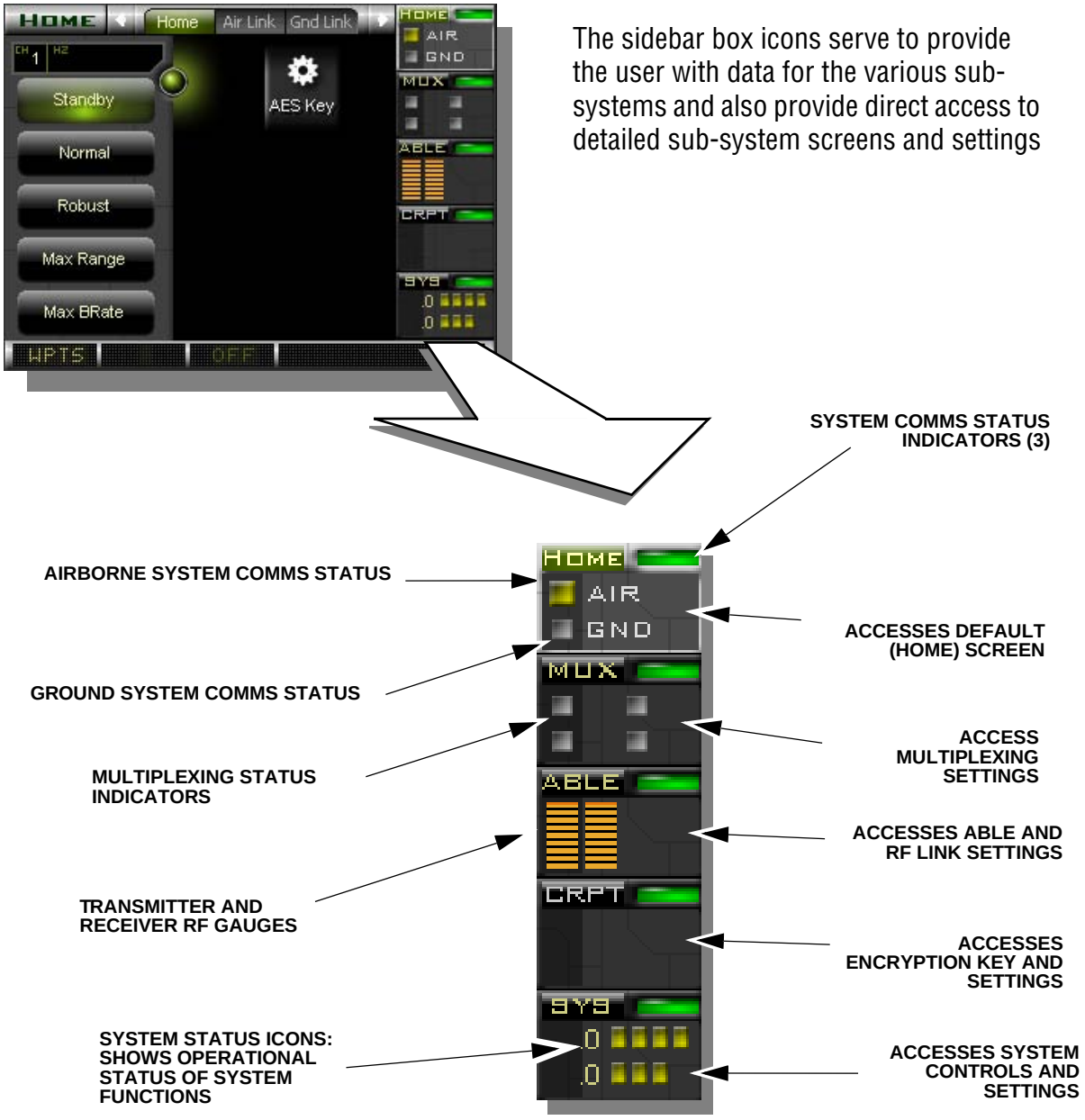


Figure 3–35. C100 Controller Operations Access Side-Bar

3.7.3.1 Programming Security Key

The security protocol for this system requires an encryption key. The encryption key is the passcode required for transmission encryption (see Figure 3–36).

Using the hexi-decimal keypad, key-in the 32 bit encryption code and press the enter key to confirm passcode entry into the system.

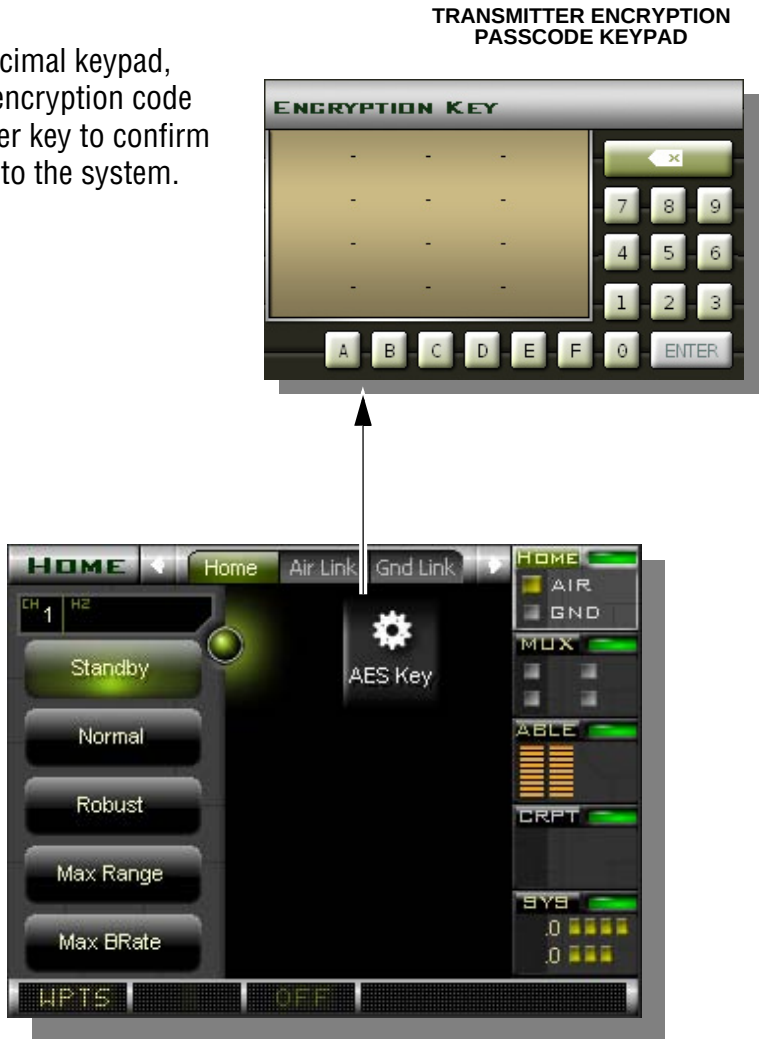


Figure 3–36. Transmitter Security Encryption

3.7.3.2 Creating Encryption Keys

The encryption protocols for this system utilizes the Advanced Encryption Standard (AES) and Data Encryption Standard (DES), depending on the user's encryption requirements. The encryption key mode requirements are as follows:

Creating Encryption keys can only be achieved when the controller is set to Maintenance Mode (refer to Figure 3–37).

Do the following to set a new encryption key:

1. Access the security tab and press the Key # icon.

2. Press the Key number that requires new encryption (1 through 8).

3. Press the Encryption Mode icon.

4. Select the required encryption mode (see above - Bypass, AES128, AES192, AES256 or 3DES).

5. Press the Set Key icon to access the hexi-decimal virtual keypad.

6. Key-in the encryption code per the requirements of the selected encryption mode (32 to 64 bit - see above).

7. Press the ENTER key to record the new encryption.

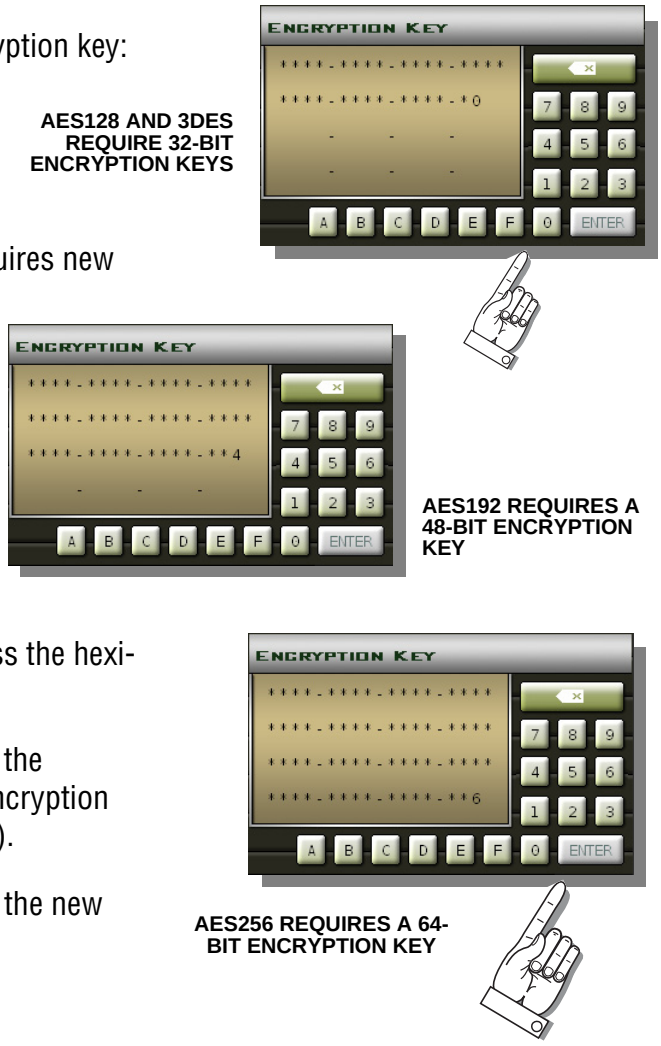
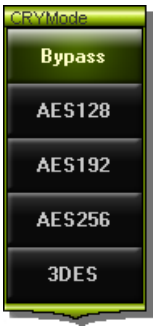


Figure 3–37. Programming a New Encryption Key

a.	Bypass	N/A
b.	AES128	Thirty-two (32) bit encryption
c.	AES192	Forty-eight (48) bit encryption
d.	AES256	Sixty-four (64) bit encryption
e.	3DES	Thirty-two (32) bit encryption



3.7.3.3 GUI On Screen Indicators

The virtual lamp indicators located around on various pages of the controller's GUI screen illuminate to notify the user of the operational status of key commands and functions. These indicators may vary in size and shape depending on what the system or functional requirements are; or the way in which the software in configured.

There are several indicators types in this system. The sidebar icons have large, rectangular indicators that are orients in a horizontal manner . The sidebar SYS (system) icon also utilizes additional small indicators to provide the user with instant system status "at a glance". Throughout the remainder of the system software screens are additional indicators that are similar in shape and size to the smaller indicators on the sidebar SYS (system) icon including Comm, Fault Encryption, PA Comm, Encryption Key status, Fan and some systems status.

When the indicators illuminate a specific color, the specific color provides the operational status fro which the indicator represents. The general meaning of the colors are as follows:

- Green - fully operational
- Yellow - fault is indicated
- Red - no communication
- Grey - no power or communications
- Blue - transmitting (transmitter only)

If the indicator is green then all aspects of that part of the system are operational and proceed as normal.

If an indicator is yellow, it indicates that a fault is detected with the connection or command and a correction of that fault may be required.

- Check the power and operational status as well as line connections of the part of the system that the particular indicator is showing is at fault. Doing so may reveal the cause of the anomalous reading by the indicator.
- With the proper safety precautions in mind, take the appropriate corrective action and verify that the indicator lamp reflects the correction by illuminating a green color. If the indicator still shows yellow, then more in-depth correction may be required by that part of the system. Refer to the Troubleshooting section of this manual or contact the manufacturer for assistance.

If the indicator is red, then that command function is completely inoperative and requires corrective action to re-establish communication between the controller and that part of the system.

The box icons on the right side of the screen provide access to additional status information, functional data and control commands.

3.7.4 Home C100 GUI Screens

Access the default screen by pressing the HOME icon on the top right corner of the GUI screen. Figure 3–38 shows an example of the GUI screen with some elements that are not part of an active system.

3.7.4.1 HOME - HOME Tab

The HOME tab provides access to the system transmitter and receiver settings, encryption activation as well as the available encryption keys. Pressing the HOME box icon on the right side of the GUI screen automatically accesses the HOME pages. From this screen the function tabs become accessible including airborne system RF link settings and the ground system RF link settings.

Along the top of the GUI screen are left and right TAB arrows straddling three labeled tabs (see below). The user can access the tab page by pressing the tab label on the GUI or press cycling through the tabs by press the right or left GUI arrow as well as the left/ right rocker switch on the front panel of the controller (see Figure 3–33).

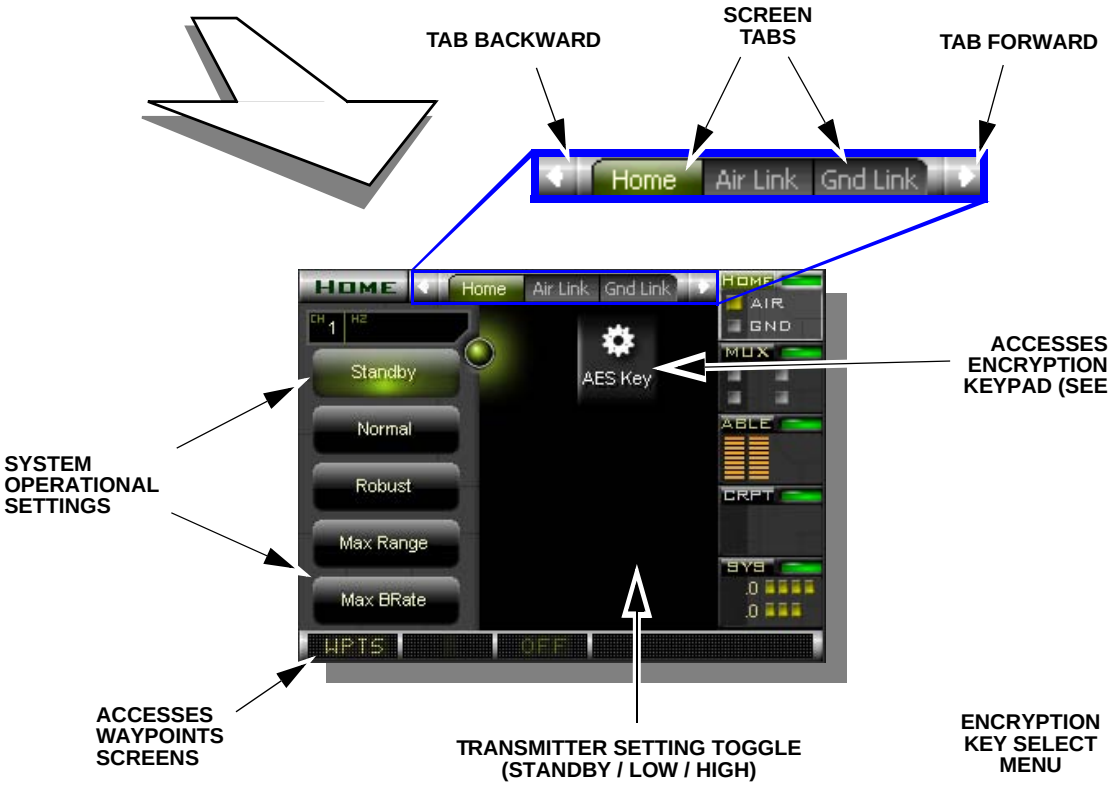


Figure 3–38. C100 Controller Home Screen Home Page

3.7.4.2 HOME - Air Link Page

The GUI Air-Link page includes the airborne system's comms indicators and read-out gauges providing at-a-glance status for the system's operation as well as touchscreen icon access to Waypoint settings and IMU configuration (see Figure 3–39).

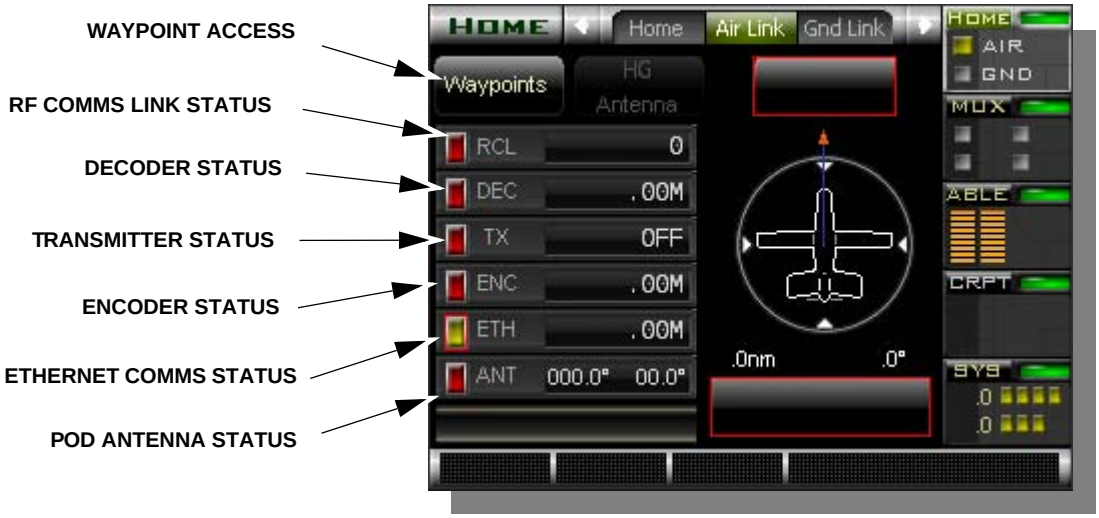


Figure 3–39. C100 Controller HOME Air Link Page

3.7.4.3 HOME - Ground Link Page

The GUI Ground Link page includes the airborne system's comms indicators and read-out gauges providing at-a-glance status for the system's operation (see Figure 3–40).

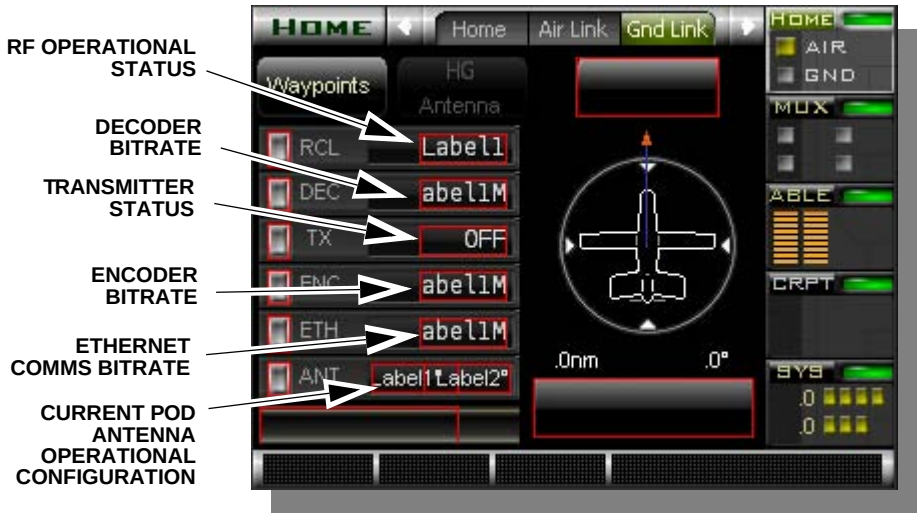


Figure 3–40. C100 Controller HOME Ground Link Page

3.7.5 MUX (Multiplexer) C100 GUI Screens

The MUX provide direct access to the system's multiplexing functions.

3.7.5.1 MUX - Air to Ground Page

The MUX Air to Ground - page provides the status of the data transfer from the ground system to the airborne system including the status of the data transmitting and the data being received (see Figure 3–14).

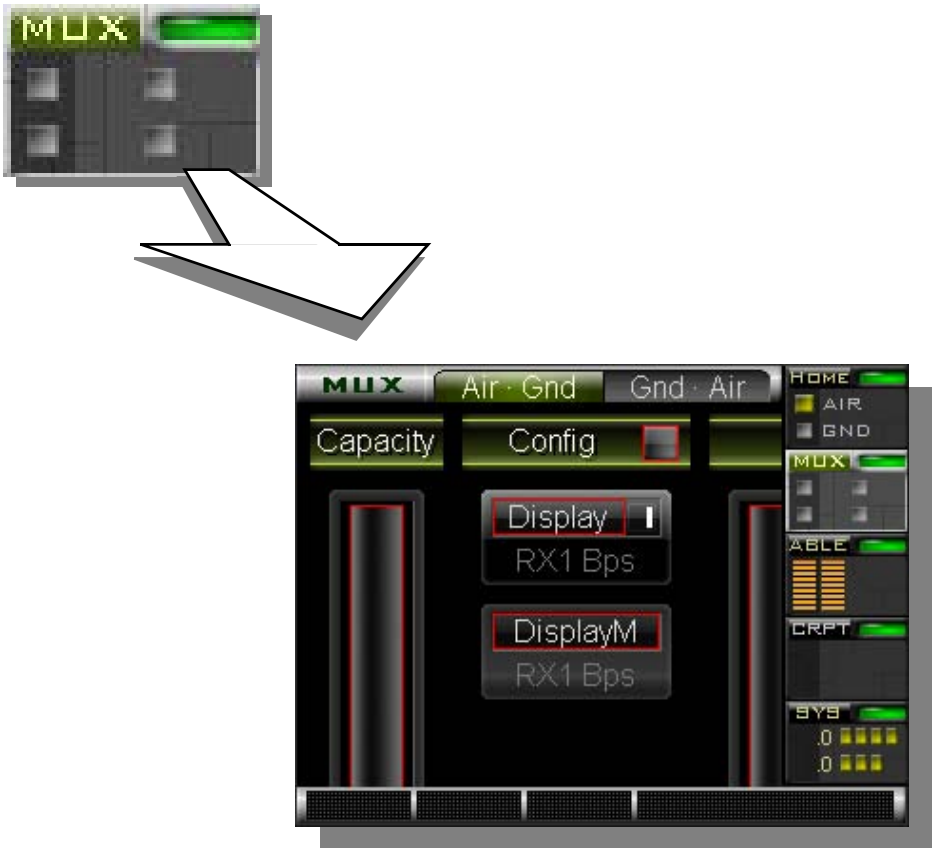


Figure 3–41. C100 Controller MUX - Air to Ground Page

3.7.5.2 MUX - Ground to Air Page

The MUX Ground to Air page provides the status of the data transfer from the ground system to the airborne system including the status of the data transmitting and the data being received (see Figure 3–42)

Figure 3–42. C100 Controller MUX Ground to Air Page

3.7.6 ABLE (Airborne Bi-Directional Link) C100 GUI Screens

The ABLE GUI pages provide the user with the means to monitor the status of the aircraft position as well as the airborne mini pod antennas as well as the ground system position and status. Additionally, the user can manually adjust the airborne antenna configuration.

3.7.6.1 ABLE - Antenna Page

The ABLE antenna page offers the user complete access to the airborne system's antenna operational status and control functions. These include the waypoint (ground site) telemetry data, aircraft antenna status including azimuth position (relative to ground site as well as tracking data), antenna elevation position as well as access to manual control of the airborne antenna (refer to Figure 3–43).

Figure 3–43. C100 Controller ABLE Antenna Page

3.7.6.2 ABLE - TX (Transmitter) Page

The ABLE TX tab provides access to the transmitter modulation setting, forward error correction setting, transmitter channel, transmitter bandwidth and guard settings (refer to Figure 3–44).

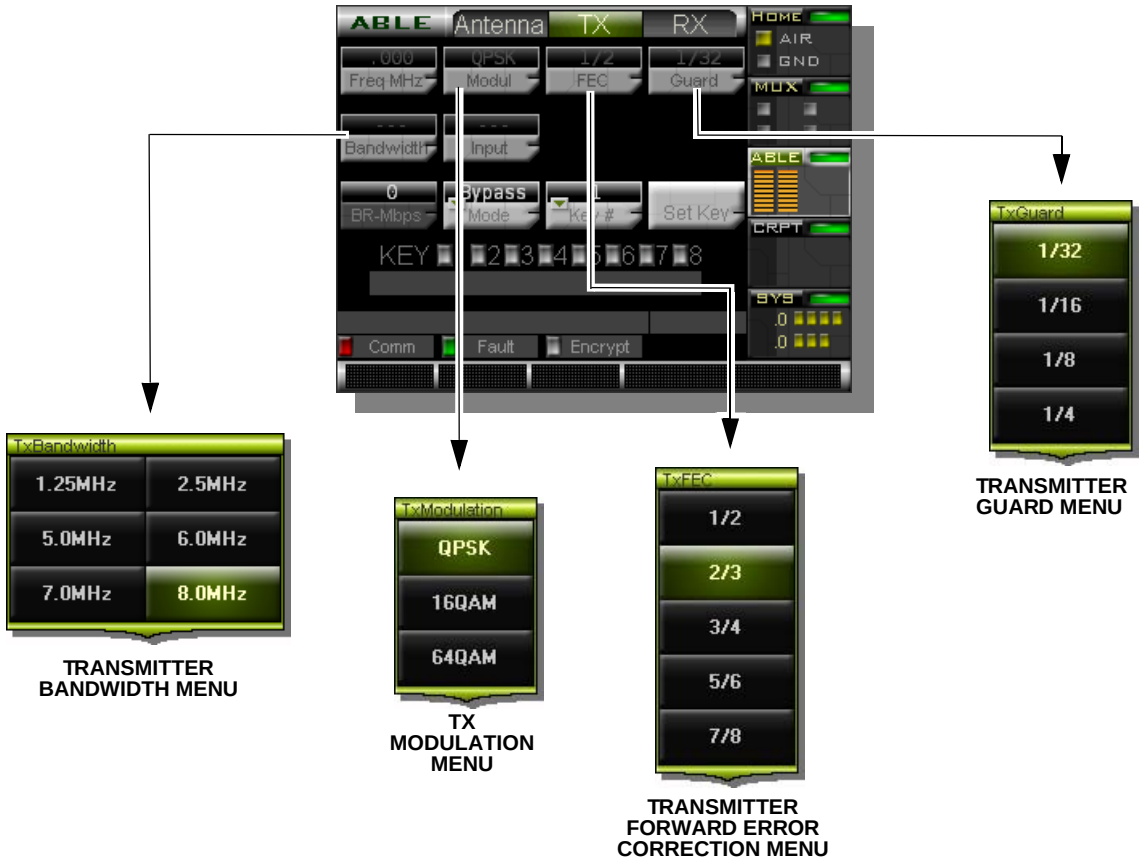


Figure 3–44. C100 Controller ABLE Transmitter Page

3.7.6.3 ABLE - RX (Receiver) Page

The ABLE receiver page provides access to several receiver control settings including: Rx modulation, forward error correction, receiver guard, Rx bandwidth, receiver bitrate and receiver power as well as encryption key access (see Figure 3–45).

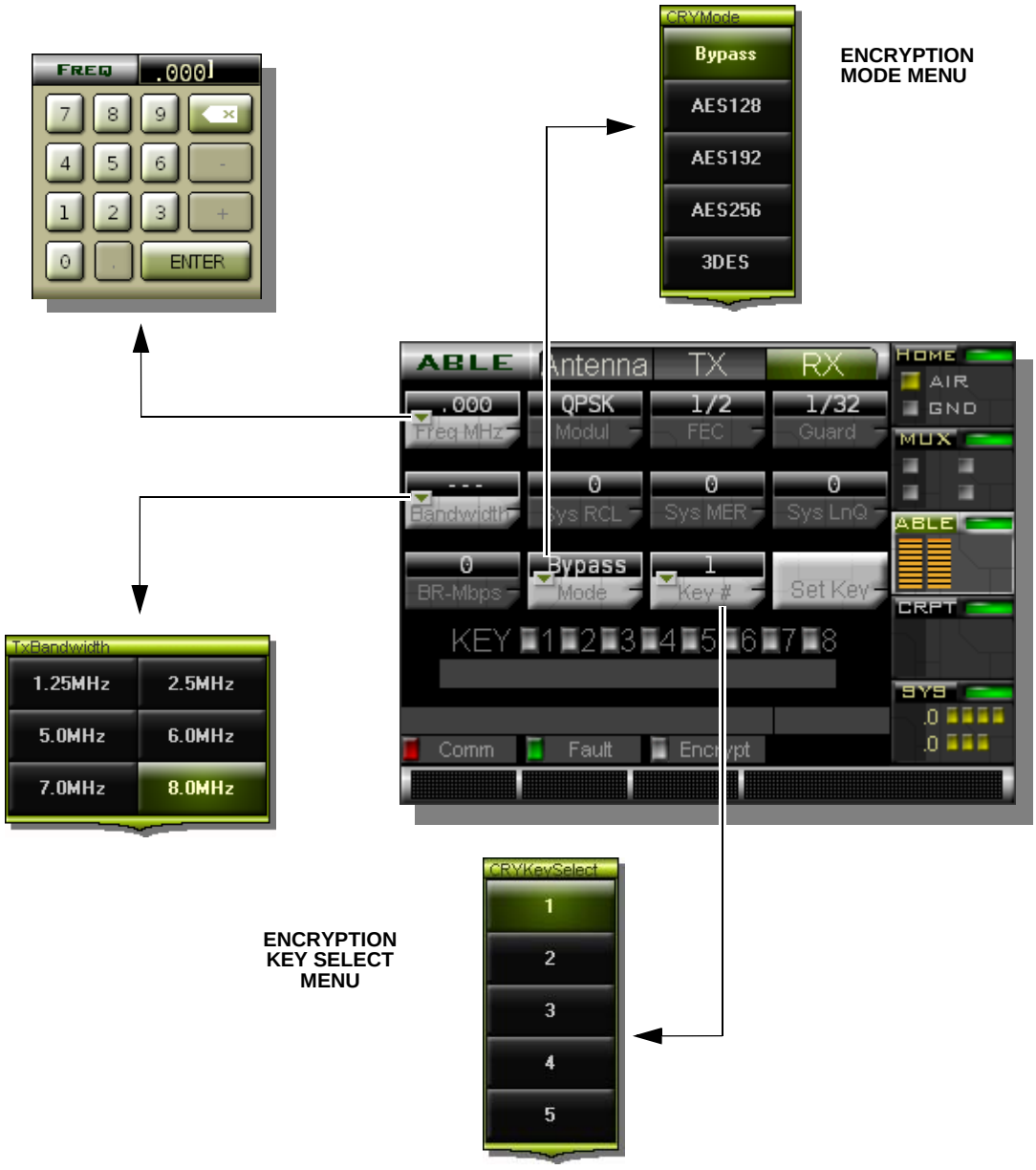


Figure 3–45. C100 Controller ABLE Transmitter Page

3.7.7 CRPT - C100 Controller Encryption GUI Pages

The CODEC screens access the video and audio data encoding and decoding settings. It is from these pages that the user can access and alter the encoding of the data for RF transmission and decoding once the data is received.

3.7.7.1 CRPT - Encryption Page

The CRPT encoder page provides access to the video and audio encoder settings including: video input format, input video scale, video data transmission bitrate, right and left channel audio transmission bitrate, transmitter bitrate, video test screen generator setting, frame, GOP and GOP mode and encoder power toggle (refer to Figure 3–46).

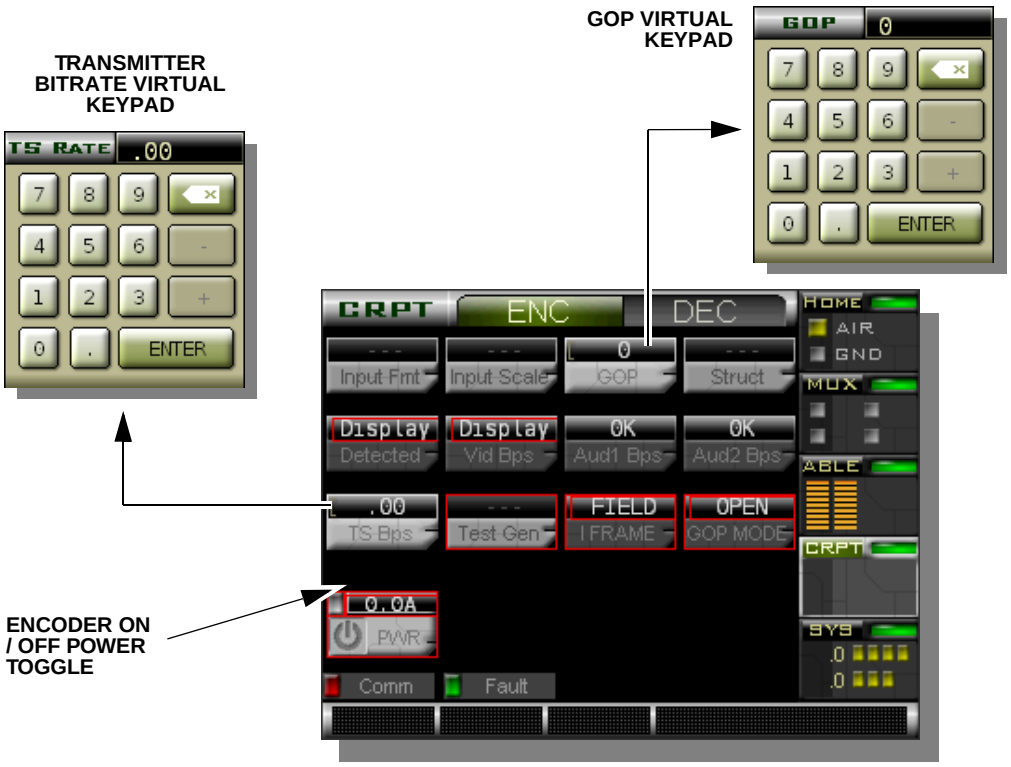


Figure 3–46. C100 Controller Encryption Encoder Page

3.7.7.2 CRPT - Decoder Page

The CRPT decoder page provides access to the video and audio encoder settings including: video resolution setting, video data transmission bitrate, right and left channel audio transmission bitrate, transmitter bitrate, and decoder power toggle (see Figure 3–47).

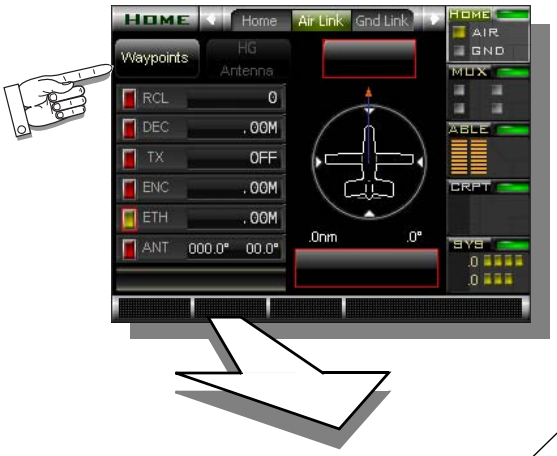
Figure 3–47. C100 Controller Decryption Encoder Page

3.7.8 Waypoints

Waypoints are pre-programmed locations by which the signal tracking, the IMU and the GPS combine to provide navigation and targeting related functionality and data.

3.7.8.1 Selecting, Editing and Creating Waypoints

Press the WPTS icon located at the bottom left corner of the screen to access the Waypoints screens.



To select a new waypoint, scroll down through the waypoint selection menu using the scroll bar, select the required new waypoint on the GUI screen then press the TAKE icon at the bottom of the screen (refer to Figure 3–48).

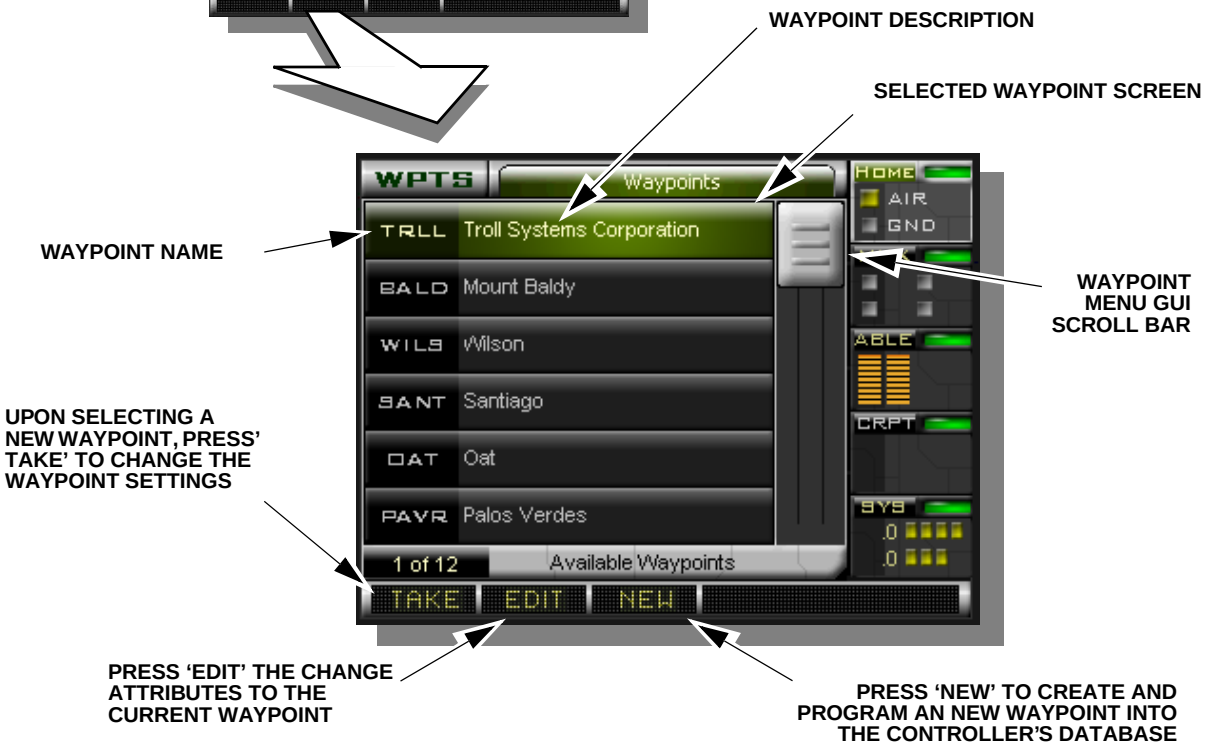


Figure 3–48. Accessing Waypoints

Upon selecting a waypoint, a new screen shows the name, description and the coordinates of the selected waypoint as well as heading. To select a different waypoint from the one that is currently in the system buffer, scroll through the selection of available waypoints on the waypoints menu screen (see Figure 3–49), press the required waypoint and then press the TAKE icon on the bottom left corner of the screen.

- Pressing EDIT accesses the edit screen to edit attributes of the current waypoint.
- Pressing NEW assesses the edit attributes screen to create a new waypoint.

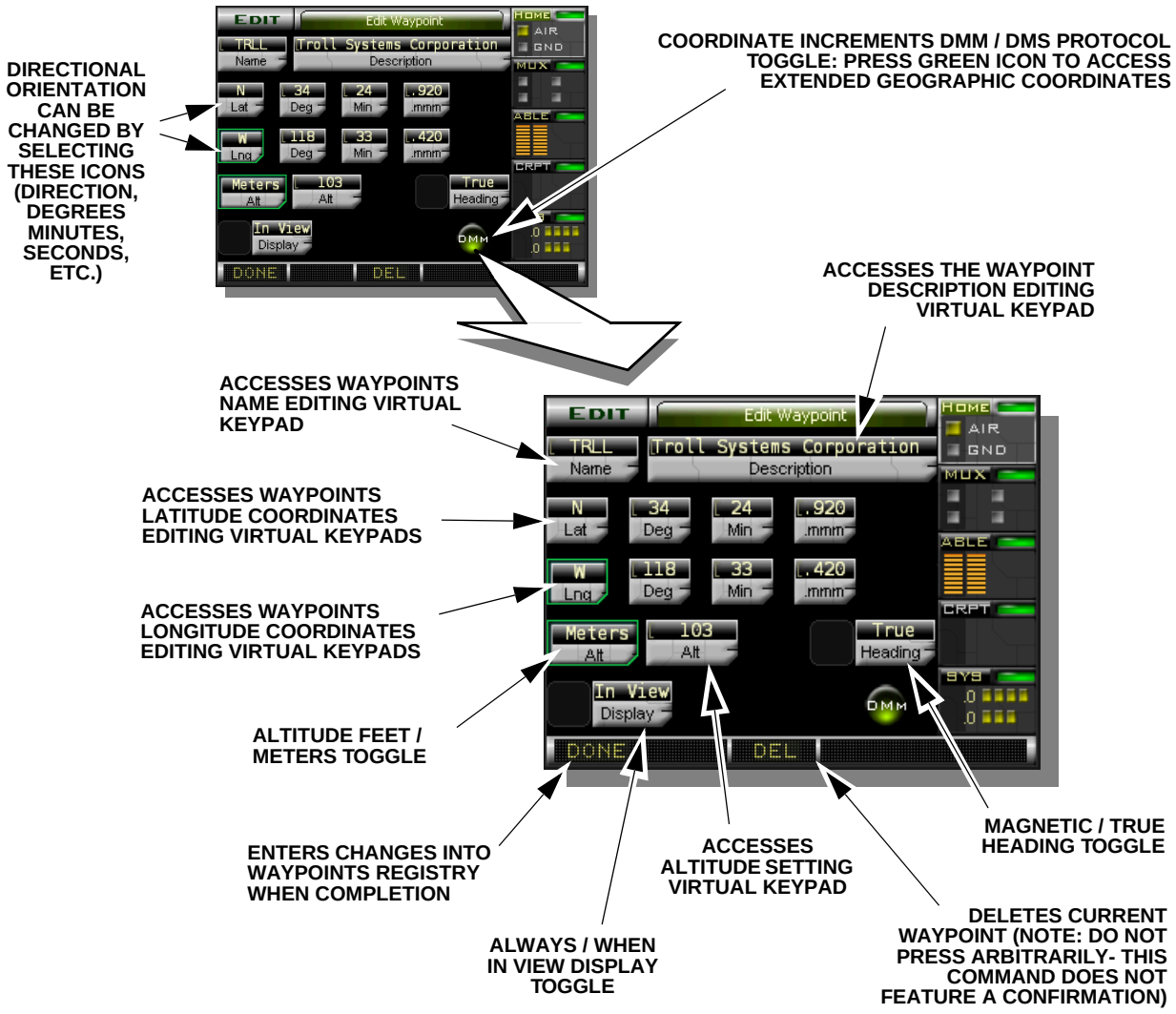


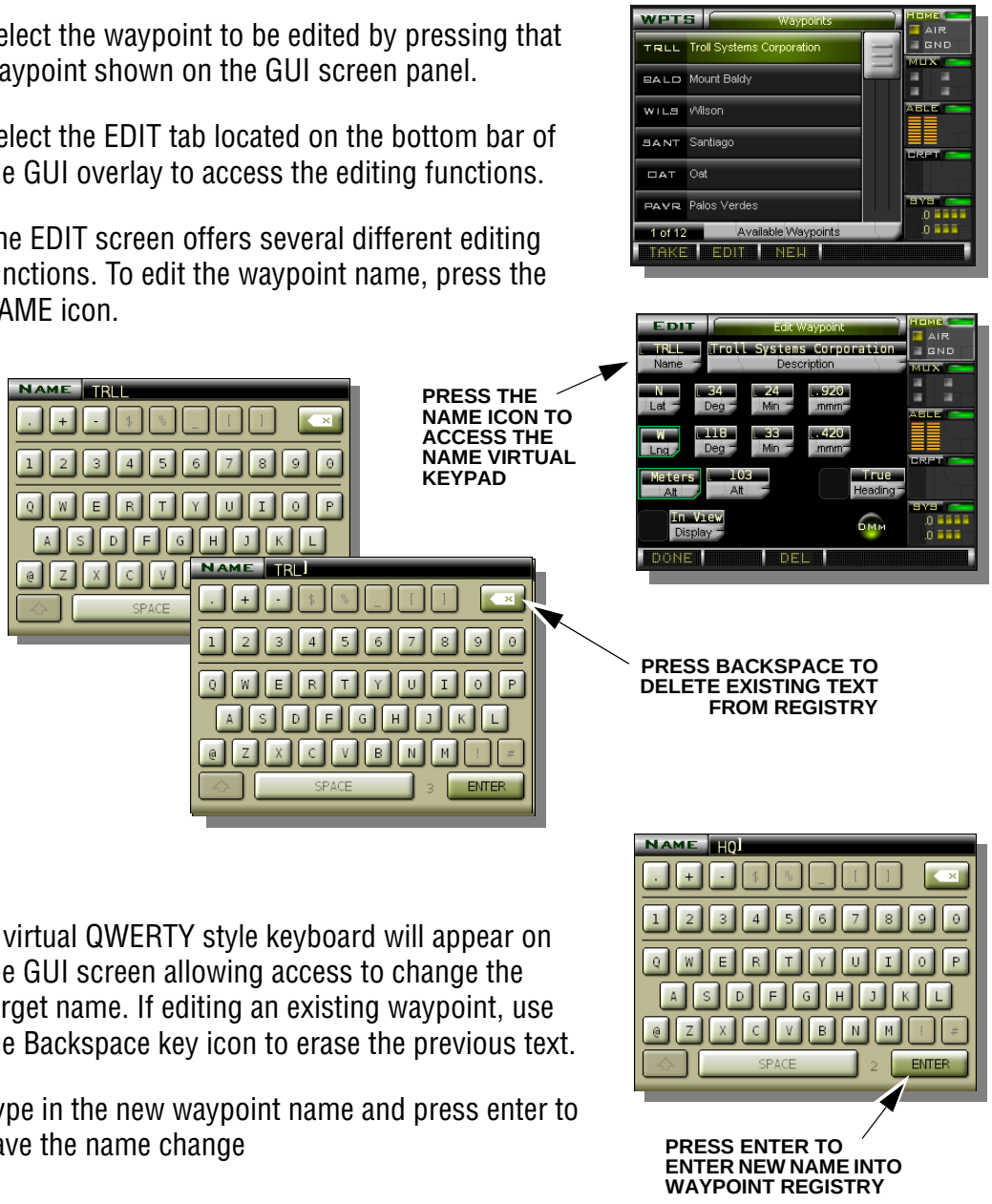
Figure 3–49. Waypoint Screen Variables

- Press the DONE on the edit screen when finished to return to the Waypoints screen.

Refer to Figure 3–50 through Figure 3–54 for information regarding waypoint attribute editing.

- Perform the following steps to rename a new, or edit an existing waypoint name (refer to Figure 3–50).

1. Select the waypoint to be edited by pressing that waypoint shown on the GUI screen panel.
2. Select the EDIT tab located on the bottom bar of the GUI overlay to access the editing functions.
3. The EDIT screen offers several different editing functions. To edit the waypoint name, press the NAME icon.



4. A virtual QWERTY style keyboard will appear on the GUI screen allowing access to change the target name. If editing an existing waypoint, use the Backspace key icon to erase the previous text.
5. Type in the new waypoint name and press enter to save the name change

Figure 3–50. TCC500 IMU Waypoint Name Edit Screens

It is also possible to edit the waypoint description to add more detailed information about the waypoint.

- Perform the following functions to edit the waypoint description (refer to Figure 3–51)

1. Select the waypoint to be edited by pressing that waypoint shown on the GUI screen panel.
2. Select the EDIT tab located on the bottom bar of the GUI overlay to access the editing functions.
3. The EDIT screen offers several different editing functions. To edit the waypoint description, press the DESCRIPTION icon.

4. A virtual QWERTY style keyboard will appear on the GUI screen allowing access to change the waypoint description. If editing an existing waypoint, use the Backspace key icon to erase the previous text.
5. Type in the new waypoint and press enter to save the name change.

Figure 3–51. Waypoint Description Editing Procedure Screens

3.7.8.2 Editing Waypoint Coordinates

If it is required to edit the geographic coordinates of a waypoint location, the coordinates can be edited through the same editing screen.

- Perform the following functions to edit the waypoint latitude degree coordinate (refer to Figure 3–52)

NOTE: Be certain to enter the exact desired coordinates in the correct format for proper navigation functionality of the system IMU

1. Select the waypoint to be edited by pressing that waypoint shown on the GUI screen panel.

2. Select the EDIT tab located on the bottom bar of the GUI overlay to access the editing functions.

3. The EDIT screen offers several different editing functions. To edit the waypoint latitude coordinates, begin by pressing the button latitude Deg. icon to edit the degree coordinate.

4. A virtual numerical style keypad will appear on the GUI screen allowing access to change the waypoint latitude degrees coordinate. Simply type in the new waypoint latitude degree coordinate and press enter to save the coordinate change.

Figure 3–52. Editing Waypoint Coordinates (Latitude Degrees)

- Perform the following functions to edit the waypoint latitude minutes and seconds coordinates (refer to Figure 3–53)

1. To edit the waypoint latitude minutes and seconds coordinates, begin by pressing the Min. icon button.

2. The virtual numerical style keypad will appear on the GUI screen allowing access to change the waypoint latitude minutes coordinate. If using DSS coordinate protocol, simply type in the new waypoint latitude minutes coordinate and press enter to save the coordinate change, followed by the new.mmm coordinates and press enter to save.

3. If using DMS coordinate protocol, now press the latitude Sec, button icon on the screen.

4. The virtual numerical style keypad will appear on the GUI screen allowing access to change the waypoint latitude seconds coordinate. Simply type in the new waypoint latitude seconds coordinate and press enter to save the coordinate change.

5. Now press the latitude .sss, button icon on the screen for the latitudinal Seconds, seconds.

6. The virtual numerical style keypad will appear on the GUI screen allowing access to change the waypoint latitude seconds coordinate. Simply type in the new waypoint latitude seconds coordinate and press enter to save the coordinate change.

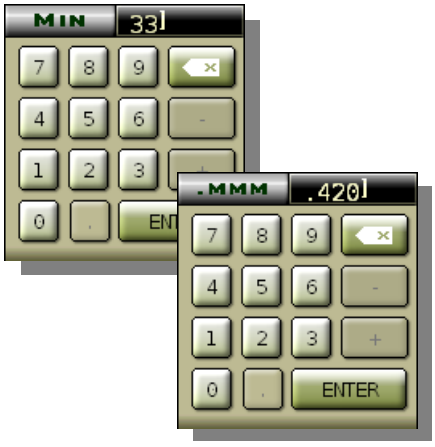
Figure 3–53. Editing Waypoint Coordinates (Latitude Minutes and Seconds)

- Perform the same procedure to edit each of the waypoint Degrees, Minutes and Seconds for the longitude coordinates (refer to Figure 3–54).

1. To edit the waypoint longitude degrees, minutes and seconds coordinates, begin by pressing the Deg icon button.

2. The virtual numerical style keypad will appear on the GUI screen allowing access to change the waypoint longitude degrees coordinate. Simply type in the new waypoint longitude degrees coordinate and press enter to save the coordinate change.

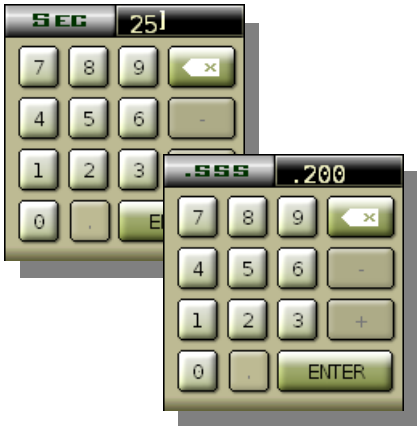
3. To change the waypoint longitude minutes, next press the Min. or the .mmm icon buttons



4. The virtual numerical style keypad will appear. Type in the new waypoint longitude minutes coordinate and press enter to save the coordinate change.

5. To change the waypoint longitude seconds, next press the Sec or the .sss icon buttons.

6. The virtual numerical style keypad will appear. Type in the new waypoint longitude seconds coordinate and press enter to save the coordinate change.



7. To change the waypoint longitude seconds, next press the sec icon button the edit the Sec.

- To edit the waypoint Altitude, perform the following procedure:

1. Press the Alt button icon on the screen.

2. The virtual numerical style keypad will appear. Type in the new waypoint altitude and press enter to save the coordinate change.

Figure 3–54. Waypoint Longitude Coordinates and Altitude Edit Functions

3.7.9 SYS- System Screens

The SYS icon on the bottom right of the GUI screen (Figure 3–55) accesses the system operational and configuration settings. This screen shows all of the elements which are dynamic and the user can select the exact operational configuration that is required.

Figure 3–55. C100 Controller GUI System Pages

3.7.9.1 System Configuration Screens - Clock Screen

The clock screen accesses the controller date, time, time zone, daylight and standard time settings and GPS synchronization.

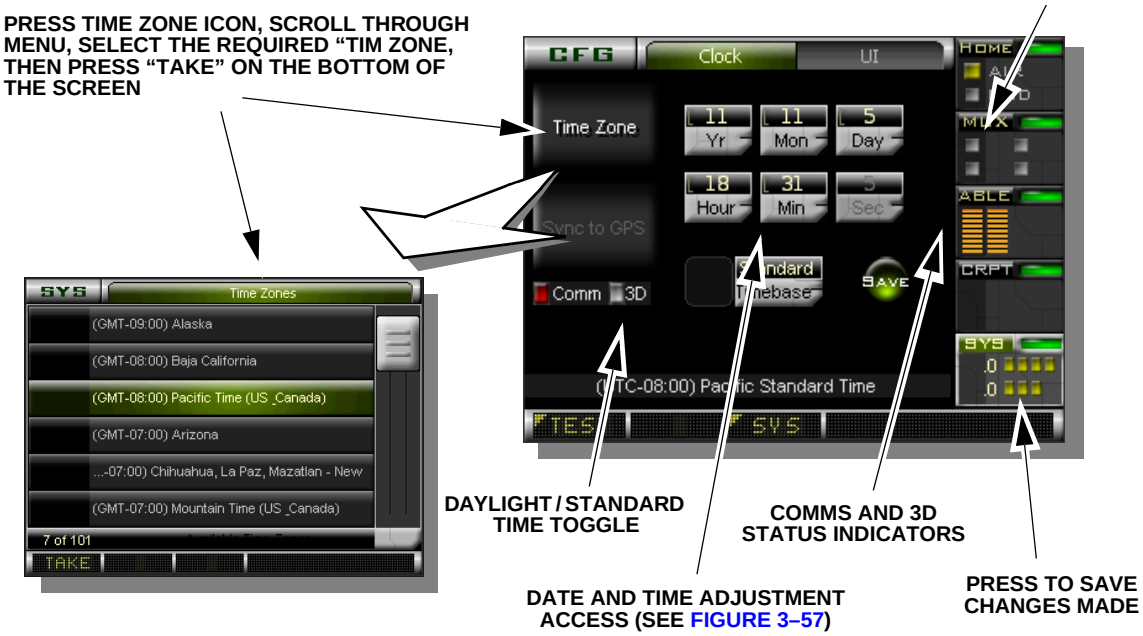


Figure 3–56. System Configuration Clock Settings Screen

Pressing the Date and Time adjustment icons accesses a virtual keypad allowing the user to change those specific settings (see Figure 3–57). Key-in the new setting and press enter.

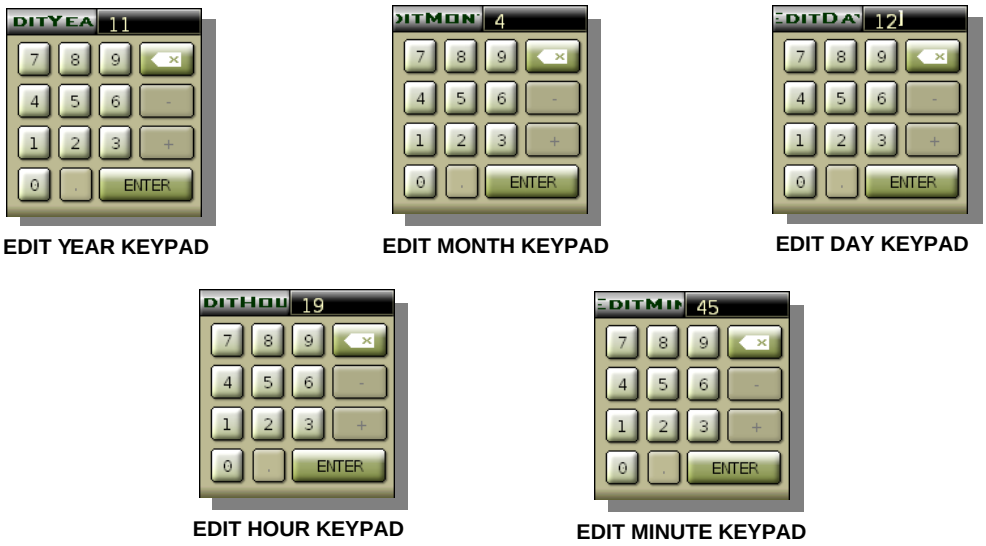


Figure 3–57. Date and Time Settings Virtual Keypads

3.7.9.2 System UI (User Interface) GUI Page

The C100 controller system user interface page allows the user to adjust the display settings for the C100 controller display (see Figure 3–58).

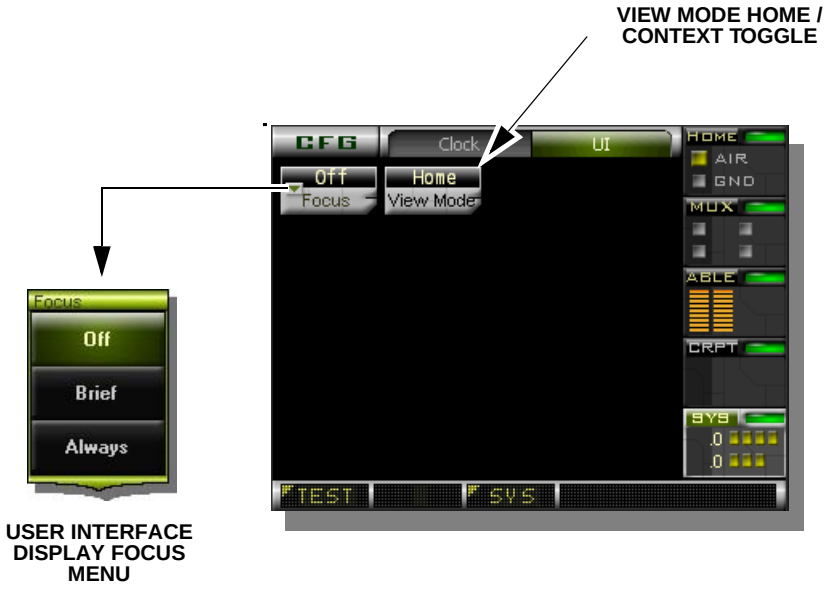


Figure 3–58. C100 Controller System Configure User Interface page

SECTION 4

MAINTENANCE AND TROUBLESHOOTING

4.1 INTRODUCTION

In the event of a malfunction, this section contains information and procedures for the maintenance and troubleshooting of issues that could occur that may effect the proper operation of the system. Refer to the following sections herein to address these potential issues and the suggested procedures to correct them. In the event that the issue is not addressed in the Troubleshooting section, or the suggested action does not correct the problem, contact the manufacturer at the contact information listed within the manual herein.

4.2 TROUBLESHOOTING

If a malfunction or operational anomaly occurs during usage of the airborne system, refer to the following Troubleshooting table to identify and possibly correct the problem.

Troubleshooting information is summarized in Table 4–1.

Table 4–1. Troubleshooting the C100 (1 of 3)

Symptom	Probable Cause	Suggested Action
The C100 screen is blank, front panel indicators are not illuminated.	• Power is not being supplied to the C100.	1. Check 20A aircraft circuit breaker. Reset if necessary. 2. The C100 controller is not turned ON.
C100 is not controlling the transmitter (not responding).	• Transmitter is not Online (i.e., Online indicator on RX Page is red). • Transmitter is not properly configured on the C100.	1. Verify that the transmitter is powered ON. Turn the transmitter ON via the TX Page (if powered OFF). 2. Check transmitter configuration. Correct configuration issues as necessary.

Table 4–1. Troubleshooting the C100 (2 of 3)

Symptom	Probable Cause	Suggested Action
C100/DAVIE is not controlling the transmitter (not responding).	• Transmitter is not Online (i.e., Online indicator on RX Page is red). • Transmitter is not properly configured on the C100/DAVIE.	1. Verify that the transmitter is powered ON. Turn the transmitter ON via the RX Page (if powered OFF). 2. Check transmitter configuration. Correct configuration issues as necessary.
The C100/DAVIE is not controlling the antenna.	• IMU module is not online. • Bad connection between C100/DAVIE and antenna.	1. Open the IMU page. Confirm that the C100 reports the IMU module as online. Perform the following test to confirm that the C100 is communicating with the antenna system: 1. Activate the Antenna (ANT) Panel. 2. Set the antenna to Manual (MAN) control. 3. Configure the antenna for Slew (SLW) operation by pushing softkey 3 (below MAN on the Action Bar) for approximately one (1) second. 4. Confirm that SLW operation is active. 5. Rotate the selection knob on the front panel in either direction to manually move the antenna. 6. If manual control of the antenna was accomplished, then the problem exists with the AHR module itself or the connections between it and the C100 controller. Check all connections. Restart C100 or DAVIE if possible. 7. Power cycle the C100 controller or the DAVIE (i.e., turn the unit OFF and then back ON again).

Table 4–1. Troubleshooting the C100 (3 of 3)

Symptom	Probable Cause	Suggested Action
The antenna is not pointing in the right direction.	• Azimuth not properly calibrated. • Magnetic interference near gyro. • An offset may be programmed and producing adverse effects. • Magnetic variance may be incorrect.	1. Re-calibrate azimuth setting. 2. Remove/relocate item(s) causing magnetic interference. 3. Check all programmed offsets and adjust as necessary.
NavTrack function is not working.	• Modem level is too low.	1. Return unit to Troll Systems. Troll will reprogram modem for a minimum level of 60.
Unable to control the antenna.	• AHR is not online. • Antenna set to Manual (MAN).	1. Check the ANT status button. If the antenna is set for manual operation (MA). 2. Return antenna control to NavTrack (NV).
Unable to “quick switch” waypoint when the Antenna Panel (status button) is active.	• Antenna (ANT) set to Manual (MAN).	1. Set antenna to NavTrack (NAV).

SECTION 5

REFERENTIAL DATA

5.1 INTRODUCTION

The data included in this section provide referential information regarding the system or this document such as system specifications and cross reference to common specific nomenclature such as acronyms or abbreviations.

Additional documents that may follow this section, such as vendor component data may also be included such as:

- Component user manuals
- Data sheets
- White papers
- Operator instructions
- Specification sheets
- Engineering drawings
- Product listings

5.2 CONVENTIONS USED IN THIS DOCUMENT

Function Key Selections

Text appearing on the bottom line of the front panel display (just above the function keys) of the HD system assembly, the HD Interface or the HD Controller (i.e., commands associated with function keys A, B, C, D, and E) appear in the font, **Arial Rounded MT Bold**, used in the following example:

Emphasis

Text and terms that are emphasized to draw the reader's attention (due to their significance within the text) appear in italics. See the example below.

The camera system can be operated in *local* or *remote* modes.

5.3 WARNINGS, CAUTIONS, NOTES, AND HINTS

Warnings

Warnings are included to alert the user that possible hazards are associated with the processes/procedures described. These may cause death or injury in any form, if the instructions in the operational or procedural task are not followed precisely. Warnings describe the potential hazards and possible impact that could occur if the warnings are not observed.

WARNING: This format is used for general warnings.

WARNING: This format is used for electrical warnings.

WARNING: This format is used for mechanical warnings.

WARNING: This format is used for warnings which include the risk of fire.

Cautions

Cautions are included to alert the user that damage to the equipment (e.g., HD Controller) is possible if the instructions in the operational or procedural task are not followed precisely. Cautions describe the hazards and possible impact that could occur if the cautions are not observed.

CAUTION: This format is used for all cautions.

Notes

Notes are included to provide the user with supplemental information, which is helpful but does not necessarily belong in the core text. Many operational and procedural tasks are easier with the addition of notes.

NOTE: This format is used for all notes.

Hints

Hints are generally included to inform the user of special features and/or methods of performing various tasks. These are usually unique features/methods that provide streamlined use of the equipment and/or user interface.

Hint: This format is used for all hints.

5.3.1 Abbreviations, Acronyms, Terms

Abbreviations, acronyms, and terms used throughout this manual are defined in the following list.

Term	Definition
AC	Alternating Current
ALT	Altitude
ANT	Antenna
AUX	Auxiliary
Az	Azimuth
BAS	Broadcast Auxiliary Service
CAL	Calibrate
CAM	Camera
Ch	Channel
COMM	Communication
COTS	Commercial-Off-The-Shelf
CPU	Central Processing Unit
dB	Decibel
DC	Direct Current
DMM	Digital Multimeter
e.g.	Latin: exempli gratia, meaning “for example”
EMI	Electro-Magnetic Interference
ENG	Electronic News Gathering
ESD	Electro-Static Discharge
et al	Latin: et alia, meaning “and others”
FM	Frequency Modulation
GPS	Global Positioning System
GUI	Graphic User Interface
HD	High Definition
Hz	Hertz
H/W	Hardware

Term	Definition
I/O	Input/Output
i.e.	Latin: id est, meaning “that is”
LAT	Latitude
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LNA	Low-Noise Amplifier
LNG	Longitude
MICOWV	Microwave
NEMA	National Electrical Manufacturing Association
NIC	Network Interface Card
nm (NM)	Nautical Mile (note: 1 nautical mile equals 1.150782 miles)
NTSC	National Television System Committee
NV	NavTrack
PC	Personal Computer
PED	Pedestal
POL	Polarization
PRSETS	Presets
RAM	Random Access Memory
RF	Radio Frequency
RFI	Radio Frequency Interference
ROM	Read Only Memory
RPC	Remote Procedure Call
RX	Receiver/Receive
S/W	Software
SDI	Serial Digital Interface
SV	System Variable
TX	Transmitter/Transmit
V	Volt
VAC	Volts Alternating Current
VDC	Volts Direct Current
W	Watt

5.4 WARRANTY

Troll warrants, to the original Customer only, that the product is free from defects in material and workmanship and conforms to the specification, if any. If no specification is listed, the items are warranted to conform to our currently published specification for the product. The warranty period is for a period of one year from the date of shipment. Troll will repair or replace (at its option) any such device which is returned to the Troll factory office, with transportation charges prepaid and within the warranty period. The liability of Troll shall be limited to the repair or replacement of the device and shall not include installation, or any other charge or expense incurred. This warranty shall not apply to any unit or part thereof which, in the opinion of Troll, has been installed or used improperly; damaged by accident, corrosion, misused, or negligence; or altered or repaired in such a manner as to impair performance. Troll must receive written notice of the defect within the warranty period. Customer must pay packing, crating and transportation costs to and from the factory. At the Customer's request, Troll will make reasonable efforts to provide warranty service at the Customer's premises, provided that Customer pays Troll's then current rates for field service and the associated travel and living expenses. If a fault has been caused by improper installation, maintenance or use, or by abnormal conditions of operation, those repairs will be billed at normal rates. Troll shall have the right of final determination as to the existence and cause of any such defect.

5.5 DO-160 TESTING

The SkyLink-Mini pod has passed DO-160 tests in both the mechanical and electrical categories.

5.5.1 DO-160 Mechanical Testing Categories

- Temperature and Altitude
- Temperature Variation
- Humidity
- Vibration
- Waterproofness
- Sand and Dust
- Salt Spray
- Lightning Direct Effects

5.5.2 DO-160 Electrical testing with EMI

- Magnetic Effects
- Power Input
- Voltage Spike
- Audio Frequency Conducted Susceptibility
- Induced Signal Susceptibility
- Radio Frequency Susceptibility
- Emission of Radio Frequency Energy
- Electrostatic Discharge

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Table 5–1. RTCA DO-160E / DO160F Test Summary

Test Description	Section	Category
Temperature and Altitude	4	B3
Temperature Variation	5	B
Humidity	6	A
Operational Shocks and Crash Safety	7	B & D
Vibration	8	U2
Magnetic Effects	15	A or B
Power Input	16	Z
Voltage Spike	17	A
Audio Frequency Conducted Susceptibility	18	B
Induced Signal Susceptibility	19	CC
Radio Frequency Susceptibility	20	T
Emission of Radio Frequency Energy	21	M
Lightning Direct Effects	23	N.A.
Electrostatic Discharge	25	A

5.6 SYSTEM SPECIFICATIONS

The following data are the specification for the components of this system

5.6.1 Skylink Mini Pod

5.6.1.1 SkyLink Mini Pod Physical Characteristics

- Size: 6.094” L x 6.094” W x 10.728” H
- Frontal Area: 54 in²
- Weight:< 6 lbs (excluding mounting bracket)
- Input Voltage:18-32 VDC
- Input Current: 1 A nominal
- Azimuth Steering: Continuous rotation, 100 degrees / second
- Elevation Steering:+/- 30 degrees
- Control: Full digital (RS-485/422/232) control interface
- Drag:23 lbs @ 120 knots

5.6.1.2 Antenna Characteristics

- Type: Horn
- Frequency: 6.5 GHz
- Frequency Band: C Band
- Beamwidth Az/El (-3dB): 46°
- Antenna Gain: 15 dBi
- Polarization: Vertical
- Az Accuracy: 0.1 deg
- El Accuracy: 0.1 deg

5.6.2 C100 Controller

5.6.2.1 C100 Controller Physical Characteristics

- Size: 5“ X 5” Aircraft Panel Mount (DZUS), 3.5” deep
- Weight: 4 pounds
- Input Voltage: 18-32 VDC
- Input Current: 1 A nominal, 24 A max with external loads
- Output Voltage:
  - 4 X 28 VDC (up to 7 A each or 20 A total)
  - 3 X 12 VDC (9 A total)

5.6.2.2 C100 Controller Technical Characteristics

- Video Display: Backlit TFT LCD, 320 X 240 pixels with 64,000 colors
- Operating System: Windows CE
- Program Storage: Type 1 Compact Flash
- Data Ports:
  - 6 Serial Ports (RS-232/RS-422)
  - 1 Ethernet 10/100
  - 2 USB

5.6.2.3 C100 Controller Features

Scrolling Map: Local region moving map showing receive site locations, major landmarks, terrain and obstruction information and microwave radiation patterns.

Input Controls: System controlled via touchscreen, rotary knob and shortcut keys. USB keyboard can be used for data entry.

BIT (Built In Test): Comprehensive internal testing including monitoring input/output voltages and currents, internal temperature and serial port status, settings and error rates.

5.6.2.4 C100 Controller Options

GPS: Built in 16-Channel GPS. Drivers available for external GPS (Consult factory).

Compass System: Analog ARINC-407 compass input available.

Tracking Data: Internal tracking data encoder RS-232 or audio output available. Supports NavTrack, LogicTrack I and II. (Other protocols, consult factory).

Video Input: Supports two SDI inputs (live video) displayed either in a window or as an overlay. Video is full motion with frame capture capability.

Video Output: Output available to support a single LCD monitor (1280 X 1024). Display will be unique with live video, overlay and mapping capabilities.

5.6.3 DAVIE: Data And Video IP Encapsulator

The DAVIE provides the following features:

3U rack-mounted controller

115VAC power (DC optional)

100W (1amp nominal)

HD-SDI/SDI video inputs (2)

Composite video inputs (2)

HD video outputs (2 HD-SDI, HDMI) at any resolution from 480i to 1080P/60 (full HD)

Down converted outputs of above signals (2 composite)

PIP (picture in picture) capability allowing two additional images to be composited on one screen

Annotation overlay allowing text and graphics to be added to images

Video Encoding using ultra-low latency H.264 compression (Mpeg4)

Optional (not included) second Encoder to multiple simultaneous streams

Video Decoding of H.264 video streams

10/100/1000 Ethernet inputs for transferring user data

Mux video, control data and file data.

Control of ABLE and GBLE microwave link equipment

Front panel 7” touchscreen monitor for system control

May also be controlled remotely with C100 and/or Cyclops software on computer

Optional (not included) DVR capable of recording up to two streams and playback simultaneously. 100 hours of capacity per cartridge.

5.6.4 ABLE: Airborne Bidirectional Link Equipment

The ABLE provides the following features:

3U rack-mounted bidirectional link radio with built-in Power amplifiers.

28VDC power (AC optional).

200W (8 amps nominal 28vdc)

Two channel diversity COFDM receiver

COFDM transmitter

AES256 encryption/decryption

Dual 38dBm power amplifiers

Diplex filtering (continuous transmit and receive)

ASI Input/Output (serial data containing multiplexed video and data).

RF Input/Output (two N connectors, one to each antenna).

Control (two control connectors, one to each SkyLink-Mini antennas).

Active cooling

SECTION 6

ENGINEERING DRAWINGS

6.1 INTRODUCTION

This section contains top level engineering drawings, such as assembly drawings, schematics, and interconnect diagrams that define the configuration of the equipment used in this system.

6.2 DRAWING LIST

The drawings contained in this section are filed in alpha-numeric order. Digital versions of this document may not include the engineering drawings, but may be included as separate digital files for efficiency and accessibility.