



**PCS 10 MHz
(2 UMTS Channel) LLC
Operating Instructions**

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1 Introduction

1.1 Purpose

This manual contains information and procedures for the setup, tuning, testing / operation, maintenance, and troubleshooting of the PCS Band Two Contiguous UMTS (10 MHz) Channel Tunable Narrow Guard Band Low Loss Combiner (or PCS 10 MHz LLC) which can be used in conjunction with CCI's RX-AIT (Receive Antenna Interface Tray) solution. The PCS 10 MHz LLC is utilized to share a feed-line between different technologies, or the same technology without the need to add coaxial cable or other equipment to the cell site.

This manual will also include sections on Safety and Pre-Installation, as well as appendices containing Component Specifications, and CCI's Return Policy as well as an RMA (Return Material Authorization) form.

Please note that when applicable Installation and Integration of the LLC within an RX-AIT solution will be covered within CCI's RX-AIT System Integration Manual.

1.2 Abbreviations

Abbreviation	Definition
AC	Alternating Current
Bias-T	DC Injector used to power TMA's
BTS	Base Transceiver Station
CDMA	Code Division Multiple Access
DAB	Dual Amplifier Booster
DAC	Dual Amplifier Combiner
DC	Direct Current
DDI	Dual Diplexer Unit (a.k.a. Cross-Band Combiner)
DDP	Dual Diplexer
DUP	Diplexer Unit
ESD	Electro-Static Discharge
EDGE	Enhanced Data Rates for GSM Evolution
GSM	Global System for Mobile Communications
IMD	Intermodulation Distortion
LLC	Low Loss Combiner
LTE	Long Term Evolution
Rx	Receiver
RX-AIT	Receive Antenna Interface Tray
RMA	Return Material Authorization
RMC	Receive Multicoupler
TMA	Tower Mounted Amplifier
TTMA	Tower Top Masthead Amplifier
Tx	Transmitter
UMTS	Universal Mobile Telecommunications System

1.3 Product Overview

CCI's Model Number LLC-1900-IN-10 "PCS Band 2 Contiguous UMTS (10 MHz) Channel Narrow Guard Band Low Loss Combiner" (PCS 10 MHz LLC) combines a 20 MHz band pass port with a synchronously tuned band stop port (allows combining of multiple technologies) onto a single feeder without the insertion loss normally associated with passive combiners. Specifications for the PCS 10 MHz LLC can be found in Appendix A of this manual. A precisely matched UMTS filter (Band Pass) allows the dual channel 10.0 MHz UMTS carrier to be positioned anywhere in the band and provides high rejection of unwanted spurious signals and noise. Transmit paths are fully isolated to prevent intermodulation distortion.

Multiple LLC's can be utilized for deployment of additional UMTS, LTE, CDMA or GSM channels for additional feeder reduction. When tuning is not being performed, no power is required, effectively becoming a pure passive low-loss filter combiner. The "BANDPASS TX ONLY" port allows only TX signals to pass, but the "BANDSTOP TX/RX" port is fully duplexed, and allows Tx/Rx signals to pass. Please note that tuning frequencies are available in 100 kHz increments. The unit is housed in a single 19" rack mounted assembly 1.5u (2.625") in height. See the Block Diagram in Figure 1.1 for signal path identification. Also note that the PCS 10 MHz LLC provides a DC/AISG path between the Bandstop (Tx/Rx) and ANT (Tx/Rx) ports. DC Power and AISG Control for TMA's and RET Actuators can be provided via this path.

Tuning is performed via an Ethernet connection utilizing TCP/IP requiring only a computer with a web browser. All software is resident internally. If the PCS 10 MHz LLC is tuned individually, no extra software or controller is required. If it is desired to tune multiple PCS 10 MHz LLC's and/or AWS 10 MHz LLC's at the same time, this can be performed utilizing an Ethernet Switch with enough ports to connect a total of 10 LLC's and the PC being used to control the LLC's.

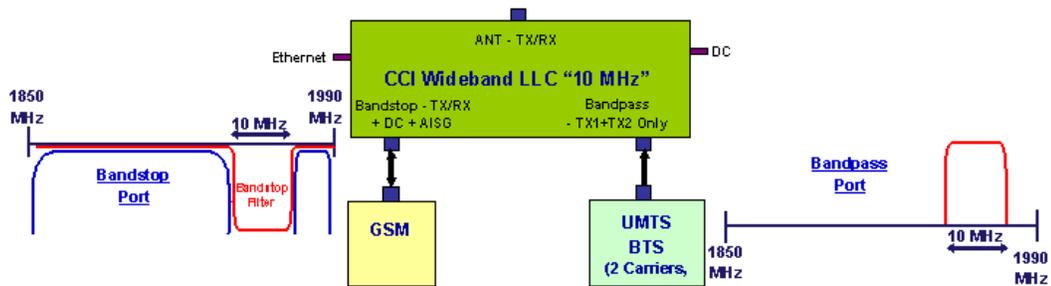


Figure 1.1 – Low Loss Combiner Block Diagram

1.3.1 Application

CCI's Model Number LLC-1900-IN-10 "PCS Band 2 Contiguous UMTS (10 MHz) Channel Narrow Guard Band Low Loss Combiner" can be utilized for combining of two (2) carriers onto a single feeder line without the insertion loss normally associated with passive combiners. CCI's PCS 10 MHz LLC can be used to combine multiple technologies as follows:

- 1) Combining of UMTS and GSM requires 700 kHz Guard Band on each side of the Bandpass spectrum.
- 2) Combining of UMTS with UMTS requires "0" Guard Band on each side of the Bandpass spectrum.
- 3) Combining of LTE with UMTS requires "0" Guard Band on each side of the Bandpass spectrum for 10 MHz or greater LTE carrier.
- 4) Combining of LTE with LTE requires "0" Guard Band on each side of the Bandpass spectrum for 10 MHz or greater LTE carrier.
- 5) Combining of CDMA with LTE requires "0" Guard Band on each side of the Bandpass spectrum for 10 MHz or greater LTE carrier.

1.3.2 PCS 10 MHz Low Loss Combiner (LLC) Combining Scenarios

1.3.2.1 GSM/UMTS Combining

CCI's PCS 10 MHz LLC reduces the guard band requirement to only 700 kHz on either side of the 2 Contiguous UMTS Carriers, when performing GSM/UMTS combining. The GSM signals must be placed outside of the 11.4 MHz (5.7 MHz on each side of the center frequency (f_c) of the 2 UMTS channels). See figure 1.2 below for an example of the Spectrum availability at the Bandstop and Bandpass ports.

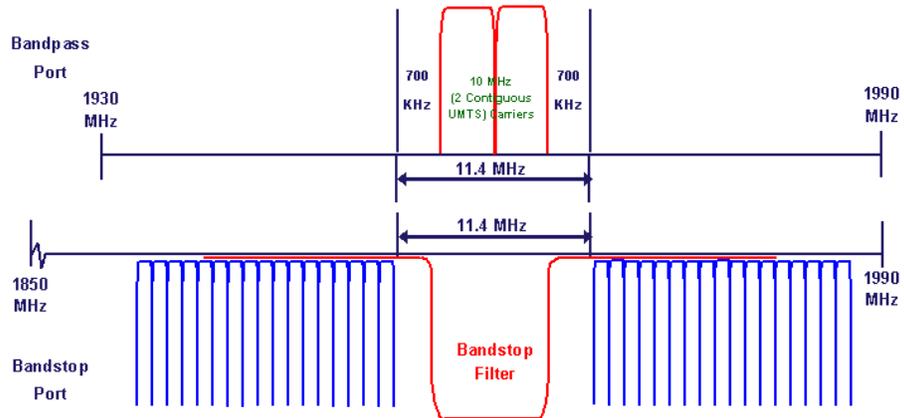


Figure 1.2 – GSM/UMTS Combining: 700 KHz Guard Band (each side) Required

1.3.2.2 UMTS/UMTS Combining

CCI's PCS 10 MHz LLC does not require any guard band on either side of the 2 Contiguous UMTS Carriers, when performing UMTS/UMTS combining ("0" Guard Band required). See figure 1.3 below for an example of the Spectrum availability at the Bandstop and Bandpass ports.

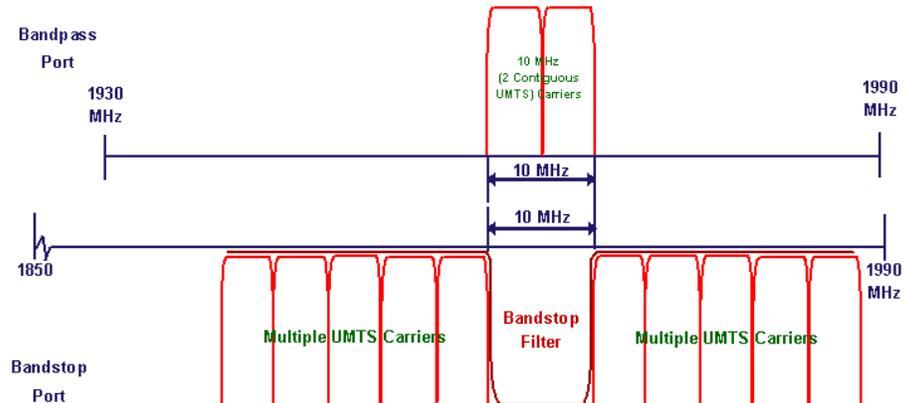


Figure 1.3 – UMTS/UMTS Combining: "0" Guard Band Required

1.3.2.3 UMTS/LTE Combining

CCI's PCS 10 MHz LLC does not require any guard band on either side of the 2 Contiguous UMTS Carriers, when performing UMTS/LTE combining ("0" Guard Band required for LTE carriers of 10 MHz or greater). See figure 1.4 below for an example of the Spectrum availability at the Bandstop and Bandpass ports.

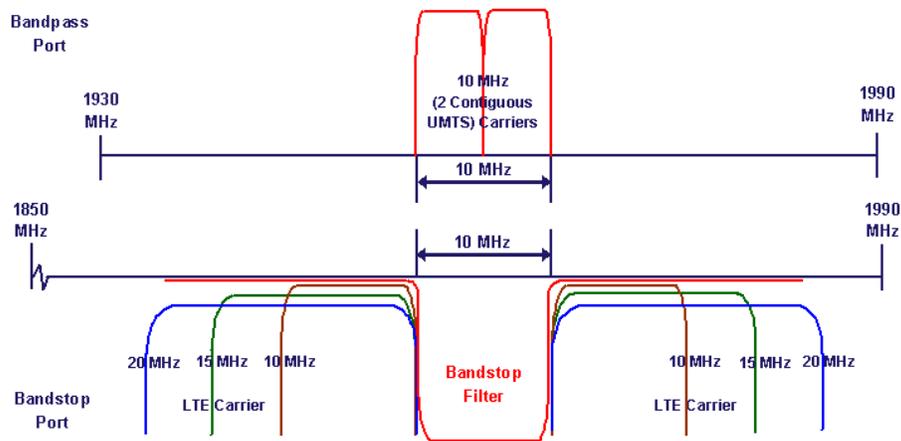


Figure 1.4 – UMTS/LTE Combining: "0" Guard Band Required

1.3.2.4 LTE/LTE Combining

CCI's PCS 10 MHz LLC does not require any guard band on either side of the 10 MHz LTE Carrier, when performing LTE/LTE combining ("0" Guard Band required for LTE carriers of 10 MHz or greater). See figure 1.5 below for an example of the Spectrum availability at the Bandstop and Bandpass ports.

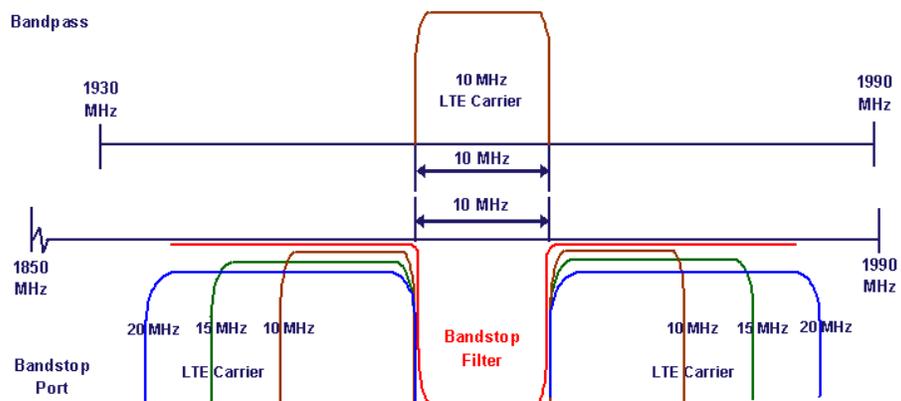


Figure 1.5 – LTE/LTE Combining: "0" Guard Band Required

1.3.2.5 CDMA/LTE Combining

CCI's PCS 10 MHz LLC does not require any guard band on either side of the 6 x CDMA 1.25 MHz Carriers, when performing CDMA/LTE combining ("0" Guard Band required for LTE carriers of 10 MHz or greater). See figure 1.6 below for an example of the Spectrum availability at the Bandstop and Bandpass ports.

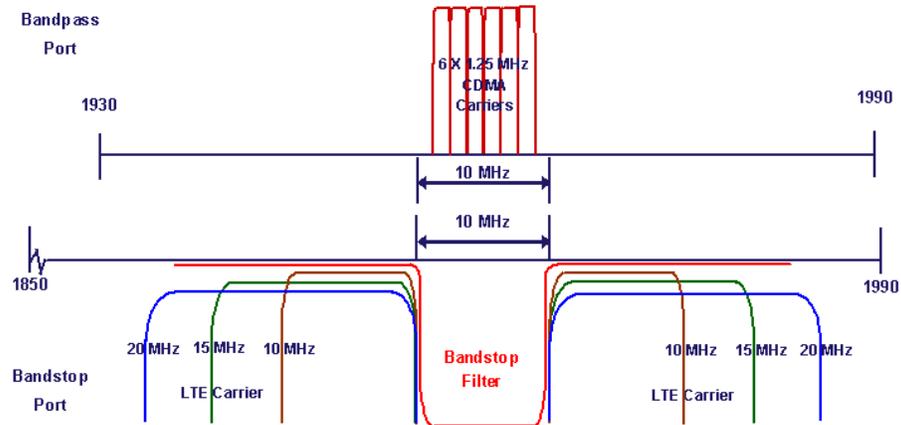


Figure 1.6 – CDMA/LTE Combining: "0" Guard Band Required

1.3.3 Functional and Physical Specification

Electrical and mechanical specifications for the CCI PCS 10 MHz LLC product line components can be found in Appendix A.

1.3.4 Equipment Changes

CCI reserves the right to make changes to the equipment, including but not necessarily limited to component substitution and circuitry changes. Changes that impact this manual may subsequently be incorporated in a later revision of this manual.

2 Safety

2.1 Safety Instructions

This section illustrates the systems used for presenting safety information.

Note: Reduce the risk of accidents by studying all of the instructions carefully before starting work. If questions arise regarding the safety instructions, contact your supervisor or CCI Technical Support (information below).

Where local regulations exist, these are to be followed first. The safety information in this manual is a supplement to local regulations.

It is your responsibility to make certain that local regulations are known and followed.

This manual including safety information and specific instructions supplied by CCI personnel must be followed in any work performed on these products. A sufficient knowledge of English or any other languages in which the manuals or instructions are printed is required.

The safety information in this manual presupposes that any person performing work on CCI products or systems has the necessary education, training, and competence required to perform that work correctly. For certain work, additional training may be required.

2.2 Warnings

Warnings are used to indicate hazardous activities. The warnings are preceded by the common hazard symbol.



Hazard Symbol

Danger



Danger means that an accident may occur if the safety precautions are neglected. This type of accident is likely to be fatal.

Warning



Warning means that an accident may occur if the safety precautions are neglected. This type of accident may be fatal or cause serious injury. Product damage can occur.

Caution



Caution means that an accident may occur if the safety precautions are neglected. This type of accident may cause serious injury. Product damage can occur.

The following special symbols are used to indicate the risk of radio frequency radiation, electrical hazards, and ESD:



Radio frequency radiation



Electrical hazard



Electrostatic discharge

Warnings are used throughout this manual to alert the reader to special instructions concerning a particular task or operation that may be hazardous if performed incorrectly or carelessly. Therefore, read the instructions carefully.

Strict compliance with the special instructions while performing a task is the best way to prevent accidents.

2.3 Electrical Hazards

High Voltage

<p>Danger</p> 
<p>High Voltage is used in the operation of this equipment. Either direct contact with the mains power or indirect contact via dampness or collected moisture can be harmful and/or fatal</p>

The AC Installation must be carried out according to local regulations. These regulations may require the work to be carried out by a qualified and authorized electrician.

Remove metal objects from your person that may come in contact with the equipment.

Switch off power if the equipment becomes wet or damp.

Prevent damp or water from entering the equipment in bad weather.

Electrical

Danger



Improper electrical installation may cause fire or electrical shock. Approved circuit breakers for the AC mains and the cable's cross sectional areas must always be selected in accordance with local laws and regulations. Only a qualified and authorized electrician is permitted to install or modify the electrical installation.

Cable marking – Verify cable markings correspond before connecting cables

2.4 ESD

Caution



Sensitive Components such as Integrated Circuits (ICs) can be damaged by discharges of static electricity

2.5 Working at Heights

Caution must be taken when working at heights installing racks. Please ensure that you are trained and have the appropriate equipment for this type of installation.

2.6 Radio Frequency Radiation

Danger



Radio Frequency (RF) Radiation from antenna systems can endanger your health

3 Pre-Installation

3.1 Introduction

Preparation of the site, unpacking, inspection and installation instructions for PCS 10 MHz Low Loss Combiner equipment will be detailed herein.

3.2 Unpacking and Inspection

Once the PCS 10 MHz LLC has arrived at the site for installation carefully unpack each container and remove the equipment. Be sure to retain all of the packing material, in the event that any piece of equipment must be returned to the factory.

Visually inspect each piece of equipment at the time it is unpacked. Be sure to check for any physical damage to the frames, faceplates, connectors, indicators, handles as well as all wiring and harnesses. Damage to any of these items could impede the installation or operation of the LLC. Additionally be sure to perform checks for water damage and loose hardware. Finally, all miscellaneous parts supplied should be inspected to insure that nothing is missing or damaged as well.

It is preferred that inspection be performed in the presence of the delivery person. If any damage to equipment is found the claim should be made with the carrier first. Note: When it is not possible, inspection should be performed as early as possible after delivery. When equipment is damaged and must be returned to the factory fill out the website form or if no internet access is available then call the factory to obtain a material return authorization. Please note that an RMA number must be assigned before an LLC can be returned to CCI. An RMA form can be found in Appendix C.

4 Operating Instructions

4.1 Introduction

This section contains operating instructions for CCI's PCS 10 MHz Low Loss Combiner (LLC). Front and Rear Panel controls, indicators, and connections will be described herein.

4.2 Low Loss Combiner (LLC) Controls, Indicators and Connections

The locations of the Controls, Indicators and connections on the PCS 10 MHz Low Loss Combiner (LLC-1900-IN-10) are shown in Figure 4.1 for the front panel and figure 4.2 for the rear panel. The functions of the indicators are detailed in the following paragraphs. *Note that the figures are not to scale.*



Figure 4.1 – LLC-1900-IN-10 Front Panel Controls, Indicators and Connectors

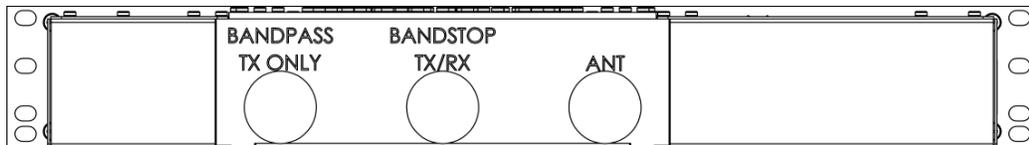


Figure 4.2 – LLC-1900-IN-10 Rear Panel Controls, Indicators and Connectors

4.2.1 Front Panel Status Indicators

4.2.1.1 “POWER” LED Indicator

When lit, the “POWER ON” indicator (Green LED) indicates that the supply voltage is present and greater than or equal to ± 18 VDC, and less than or equal to ± 76 VDC (+24 VDC nominal or -48 VDC nominal).

4.2.1.2 “Busy” LED Indicator

Not Available.

4.2.1.3 “NON CRITICAL ALARM” LED Indicator

Not Available.

4.2.1.4 “CRITICAL ALARM” LED Indicator

Not Available.

4.2.2 Controls

The PCS 10 MHz LLC Tuning is controlled via an Ethernet connection to a PC.

4.2.3 RF Connections

The PCS 10 MHz LLC provides Bandpass and Bandstop input ports (on the rear panel) via DIN connectors (labeled “BANDPASS TX ONLY” and “BANDSTOP TX/RX” respectively). The two signals are then combined and output to the Antenna (antenna path) via another DIN connector (on the rear panel) labeled “ANT.”

4.2.4 DC/AISG Path

Note that there is a DC/AISG path from the Bandstop (TX/RX) port to the ANT port on the PCS 10 MHz LLC. TMA's and/or RET Actuators can be biased and controlled via the input to the Bandstop port.

4.2.5 DC Connections

A DC connector (on the front panel) provides power to the PCS 10 MHz LLC. This connection is only required during tuning. The supply voltage should be greater than or equal to ± 18 VDC, and less than or equal to ± 76 VDC (+24 VDC nominal or -48 VDC nominal).

4.2.6 TCP/IP (Ethernet) Data Connections

An RJ45 (Ethernet) connector on the PCS 10 MHz LLC front panel provides a TCP/IP data path to control and monitor the LLC. This connection is only required during tuning.

4.2.7 IP ADDR RESET Button

An IP Address Reset (IP ADDR RESET) button is provided in case the PCS 10 MHz LLC has been harvested from another location and set to a different IP Address than the Standard IP Address.

4.2.8 Alarm Out Connector

Not Available.

5 Initial Startup and Operating Instructions

5.1 Initial Setup and Connection to a Single PCS 10 MHz LLC

The instructions for setup and connections are for connection to a single PCS 10 MHz LLC.

5.1.1 Ethernet Connection

Connect a Standard CAT5 or better Ethernet cable from the PC being used to the PCS 10 MHz LLC. See figure 5.1 to view the Ethernet connector. *When connecting directly to a PC, an Ethernet “Crossover” cable is required for older PC’s which do not have auto-detect Ethernet cards.* Newer PC’s which incorporate auto-detect Ethernet cards generally have auto crossover functionality which allow for the use of a standard Ethernet cable.

5.1.2 IP Address Reset Button

There is an IP ADDR RESET button on the front panel that can be depressed to reset the IP Address to the factory setting, if the user believes that the IP Address on the PCS 10 MHz LLC has been changed to some other IP Address. If the IP ADDR RESET button is pressed and held for 10 seconds or more, the IP Address will be reset to DHCP Protocol and the LLC can be reached via ccihost.local. *IP ADDR RESET button must be depressed for a minimum of 10 seconds to activate factory default.*

5.1.3 Power Connection

Connect the factory supplied DC Power cable from the PCS 10 MHz LLC to a Power Supply capable of delivering 2 ADC at +24 VDC or 0.5 ADC at -48 VDC. See figure 5.1 to view the Power connection. A 5A breaker is recommended.



Figure 5.1 – Front Panel of the PCS 10 MHz LLC showing Ethernet, Alarm and Power Connections

5.1.4 RF Connections

If the LLC is to be tested after tuning is performed, connect RF cables (DIN Male to N-type Male) with the DIN Male connectors to the “BANDPASS TX ONLY,” “BANDSTOP TX/RX,” and “ANT” ports of the PCS 10 MHz LLC. Connect the N-Male connectors to the Anritsu or other Network Analyzer being used as appropriate to view the desired response before, during and after tuning. See Figure 5.2 to view the RF connectors on the rear of the PCS 10 MHz LLC.



Figure 5.2 – Rear Panel RF showing RF Connections

5.2 Setup of Computer to Access LLC Software via HTML over TCP/IP

Instructions and figures that follow use Microsoft's Internet Explorer as the Web Browser used to control and monitor the 1900 MHz Low Loss Combiner (LLC).

5.2.1 Turn on PC

Turn on the PC that will be used to access the PCS 10 MHz LLC.

5.2.2 Go To Control Panel

Get to the "Control Panel" from the Main PC Screen, by clicking the selection for Control Panel from the Main Screen as seen in Figure 5.3 below.

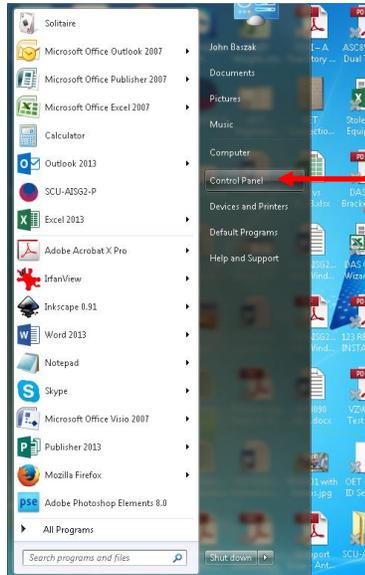


Figure 5.3 – Select “Control Panel”

5.2.3 Selection of Network and Sharing Center

Once in the Control Panel use the PC's mouse to select the "Network and Sharing Center" icon as seen in figure 5.4 below. Continue by clicking on the "Network and Sharing Center" icon to open the Network and Sharing Center.

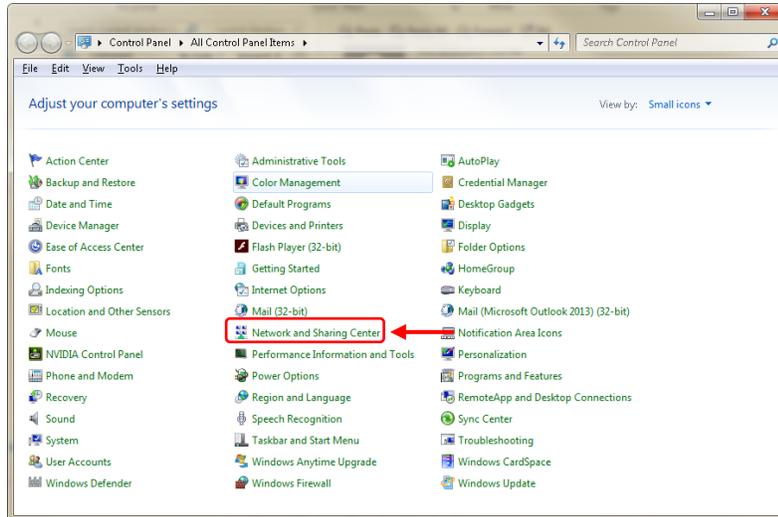


Figure 5.4 – Select "Network and Sharing Center"

5.2.4 Select "Local Area Connection" Icon

After the step taken in paragraph 5.1.2.3 the Network and Sharing Center window will appear. Using the PC's mouse, select the "Local Area Connection" icon and text (see figure 5.5) within the "Network and Sharing Center" window.

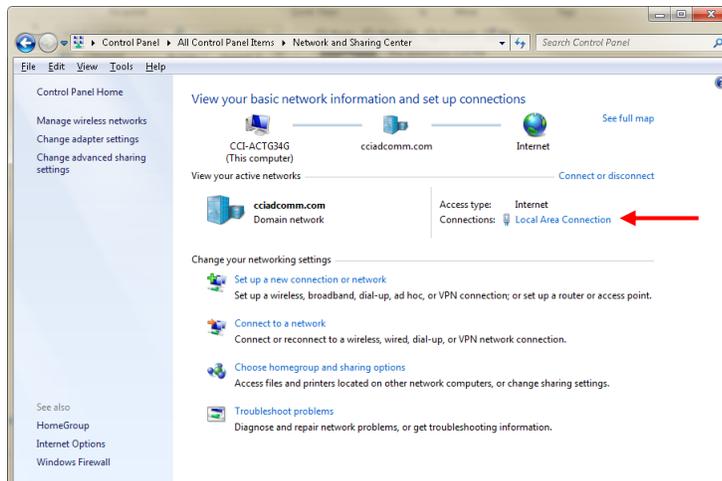


Figure 5.5 – Local Area Connection highlighted within the Network and Sharing Center window

5.2.5 Select “Local Area Connection Properties”

Next, left-click the mouse on the “Local Area Connection” icon and text. This opens up the pop-up menu shown in figure 5.6 below. Move the PC’s mouse over the pop-up menu to highlight the “Properties” label within the Local Area Connection Status pop-up window.

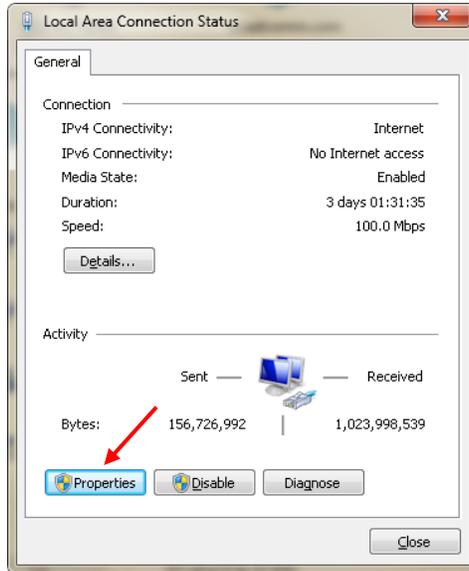


Figure 5.6 – “Local Area Connection Status” Window Display

5.2.6 Select “Internet Protocol Version 4 (TCP/IPv4) Connection Properties”

Use the PC’s mouse (left click) on the “Properties” selection from the menu on the previous figure. This will open up the pop-up window shown in figure 5.7 below . Next, select (left click) the “Internet Protocol Version 4(TCP/IPv4)” label from the menu in the “Local Area Connection Properties” window .

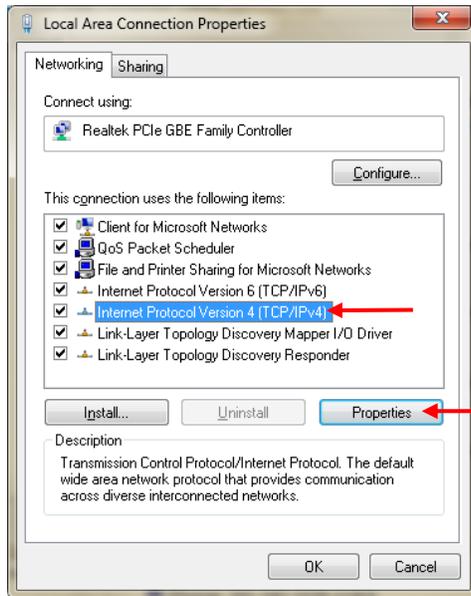


Figure 5.7 – “Local Area Connections Properties” Window

5.2.7 Select “Use the following IP address:”

Use the PC’s mouse (left click) on the “Properties” button on the previous figure. This will open up the window shown in figure 5.8. Next, select (left click) the “Use the following IP address:” radio button on the upper portion of the “Local Area Connection Properties” window .

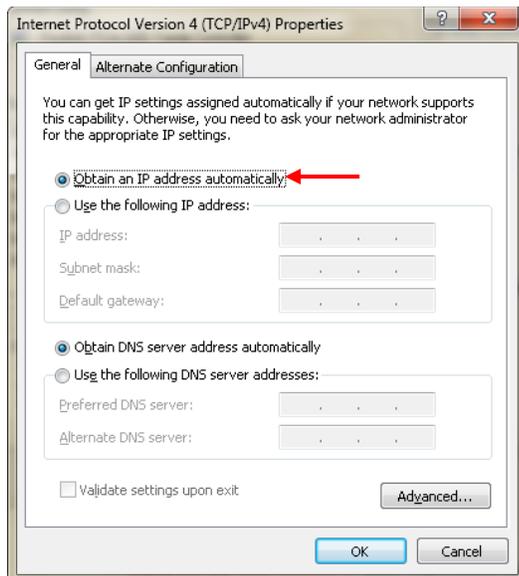


Figure 5.8 – “Obtain an IP address automatically” Window Display

5.2.8 Setting the “TCP/IP Address”

Once you have selected the “Use the following IP address:” radio button in the previous step, this will now make the address entry fields within the window “available” for data entry. See figure 5.9.

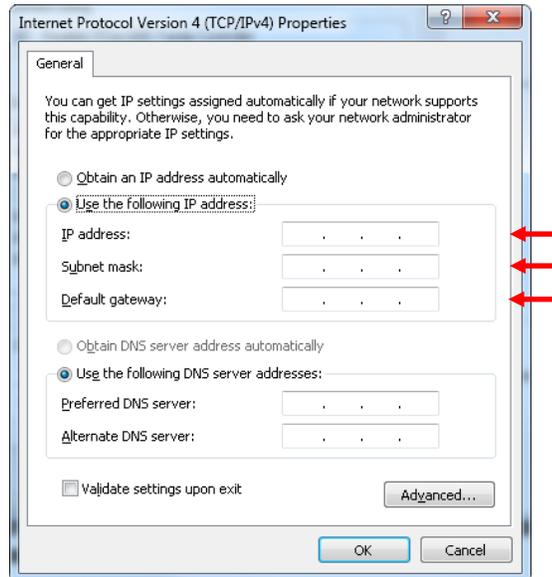


Figure 5.9 – “Use the following IP address:” portion of the Window Display with address fields “available” for data entry

5.2.9 TCP/IP Address Entry

The “IP address:” field will show the blinking cursor after completion of the previous step. Enter “192” into the 1st position in the field. This will move the cursor into the 2nd position in the field. Enter “168” into this 2nd position in the field. This will move the cursor into the 3rd position in the field. Enter “0” into this 3rd position in the field. This will automatically populate the “Subnet mask:” field with “255.255.255.0,” and the “Default gateway:” field with “0.0.0.0.” Go back and enter “1” into the 4th position within the “IP address:” field. See figure 5.10.

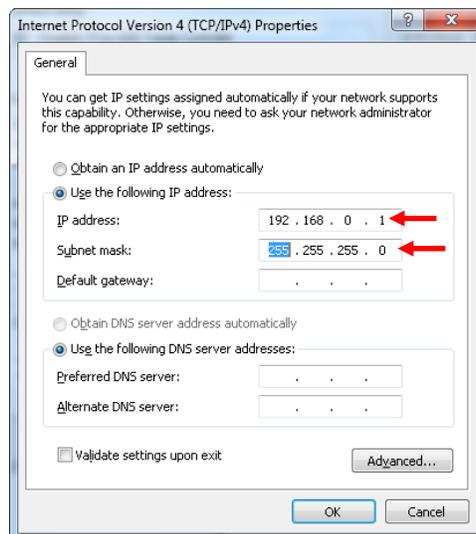


Figure 5.10 - “Use the following IP address:” portion of the Window Display with data entered into the “address” fields

5.2.10 Accept the modified “Local Area Connection Properties”

To accept the “Local Area Connection Properties” changes on the PC select the “OK” button for each of the previously opened pop-up windows. Finally, close the “Network and Sharing Center” window.

5.2.11 Finalize PC Setup

To finalize the PC setup, open up the Internet Explorer Browser window and enter “http://192.168.0.3” in the address portion in the Internet Explorer window. See figure 5.11.

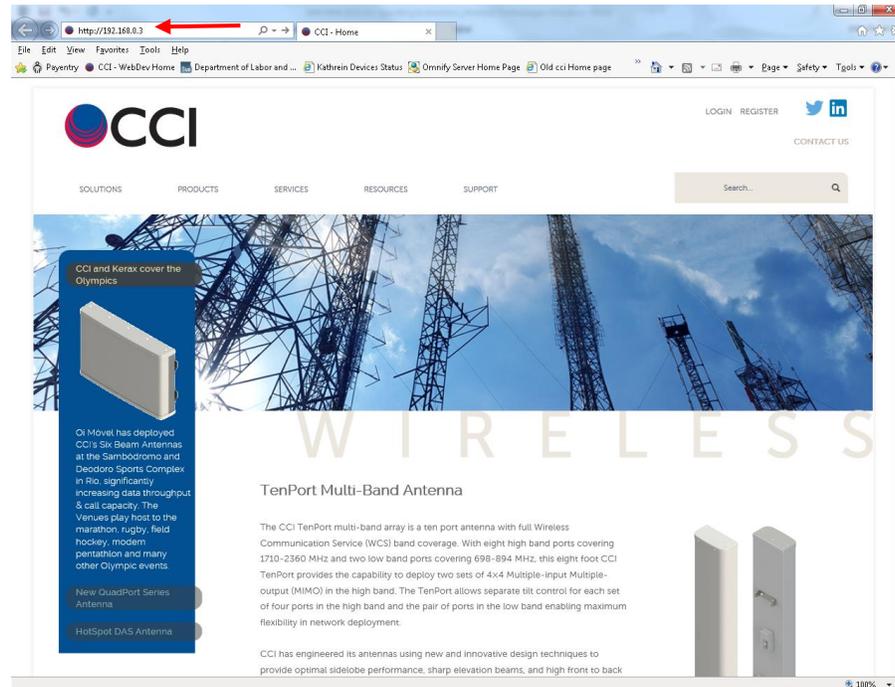


Figure 5.11 – Internet Explorer window with “Address:” field highlighted

5.3 Application of Power to the LLC and Initial Screen

5.3.1 Apply Power to the LLC

Apply +24 VDC or -48 VDC to the PCS 10 MHz LLC which is to be tuned.

5.3.2 Initial Screen on Browser

Upon application of power to the 1900 MHz LLC the Browser screen should appear per figure 5.12. The Browser screen will show a "Status" screen for the 10 MHz LLC.

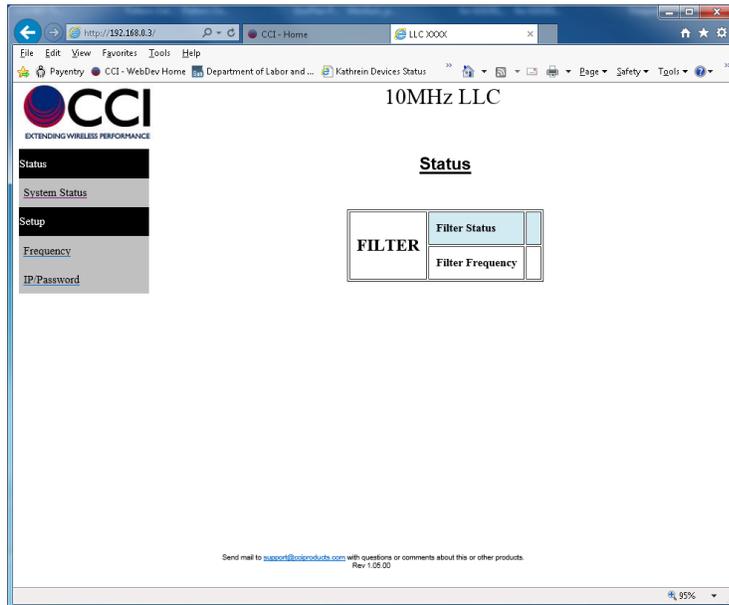


Figure 5.12 – Initial screen on Browser upon application of power to LLC

5.3.3 When No Response Occurs on Initial Browser Screen

If the Initial Browser Screen does not appear as shown for the PCS 10 MHz LLC there are **five** possible problems that may require action by the "User" as listed below in paragraphs 5.3.3.1 thru 5.3.3.5.

5.3.3.1 LLC Power Issues

The first possible problem is that the PCS 10 MHz LLC is not powered properly. To fix this issue first please verify that the DC Power cable is connected to the PCS 10 MHz LLC. Second, verify that the voltage to the LLC is between 18 VDC and 76 VDC of either polarity (+24 VDC to -48 VDC is preferred). Finally verify that the power source for the PCS 10 MHz LLC is not being "current limited."

5.3.3.2 "Network Connection" Issues

Another possible problem is that the "Network Connection" is not responding. In this case the "Network Connection" must be disconnected (disabled) and then reconnected (enabled). This may be accomplished by opening the "Control Panel," and then finding and opening the "Network Connections" icon. Now find the "Local Area Connection" icon and open it. Once "Local Area Connection" is opened then you must click on the "Disable" button (refer to the screenshot found in figure 5.6). This action will disconnect the network connection. After this action has been performed wait a few seconds or more, and then "right" click on the "Local Area Connection" icon to bring up the list of actions to select from. Please select the "Enable" function and left click on it. This will cause the "Local Area Connection" to be reconnected if a proper connection exists between the PC and the LLC. *Please note that depending on the operating system there may be other ways to reach the "Network Connections" icon. This may be available from the "Settings" icon on the "Start" Button on the "Taskbar." There may be other ways to reach "Network Connections" as well.*

5.3.3.3 Ethernet Cable Issue

A third possible problem is that an Ethernet cable of the wrong type has been used to connect the PC to the Ethernet Switch and the Ethernet Switch to the LLC(s). A **standard Ethernet Cable** should be utilized if the LLC is being controlled via a PC which has an Ethernet Card which does have Auto MDI/MDI-X (Media Dependent Interface) functionality. Remember that an **Ethernet “Crossover” Cable** should **only be utilized** when connecting from the LLC to a PC which has an Ethernet Card that does not have Auto MDI/MDI-X (Media Dependent Interface) functionality.

5.3.3.4 “User” Entry / IP Address Issues

Another possible problem is that the incorrect IP address was entered into the Web Browser Screen. Be sure to use the IP Address “<http://192.168.0.3>” If this does not work, than either someone has changed the IP Address of the PCS 10 MHz LLC, or one of the other problems listed is the cause of the error.

Additionally, if the PCS 10 MHz LLC has been harvested from another site, the previous contractor (or other personnel) may have changed the IP Address of the PCS 10 MHz LLC. If this is felt to be the case, then the User’s should depress the **IP ADDR RESET** button as found on the front panel of the PCS 10 MHz LLC to reset the IP Address to the Factory Default IP Address. If the IP ADDR RESET button is pressed and held for 10 seconds or more, the IP Address will be reset to the default address <http://192.168.0.3>.

5.3.3.5 Firmware Issues

Another problem could possibly be that the firmware within the PCS 10 MHz LLC is not able to communicate with the Web Browser selected by the User. If unable to communicate with MS Explorer, then you may need to attempt to connect with Google Chrome, Firefox or other web browser. If you are still unable to communicate with the PCS 10 MHz LLC after all of the above steps, please contact “Support” at CCI to report the problem and to determine if any other solutions are available.

5.3.4 System Status Tab

5.3.4.1 Viewing the LLC System Status

When the “**System Status**” Tab is selected the screen will show the information for the LLC shown in the Tune Tab shown in figure 5.13 below. The screen shows detailed information for this LLC as follows:

1) Filter Frequency

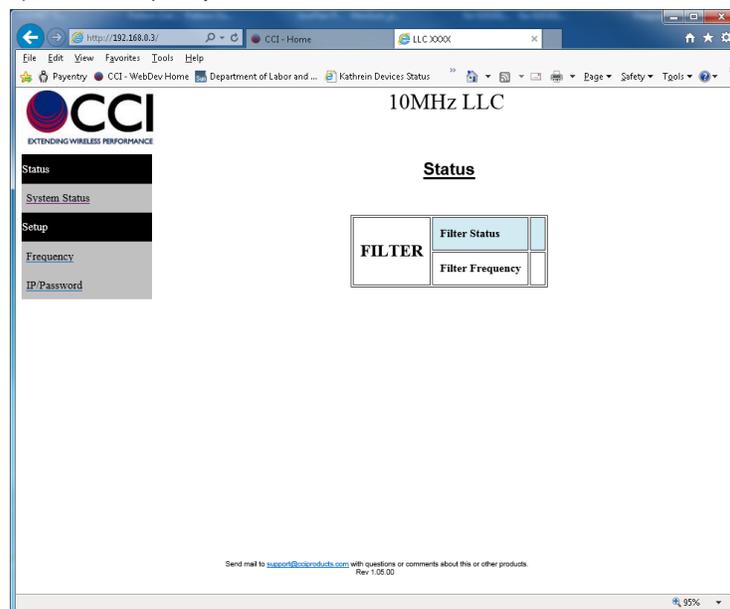


Figure 5.13 – LLC Status window

5.3.5 IP/Pass Word Tab

Site Information, Time and Date, and Network configuration properties can be changed if so desired.

5.3.5.1 Changing IP/Pass Word Properties

IP/Pass Word Properties which can be changed include Site Information (Site ID, Site Location and Notes) Network Settings (IP Address, Net Mask, Host Name, and New Password) and Submit/Reset. See Figure 5.14 below.

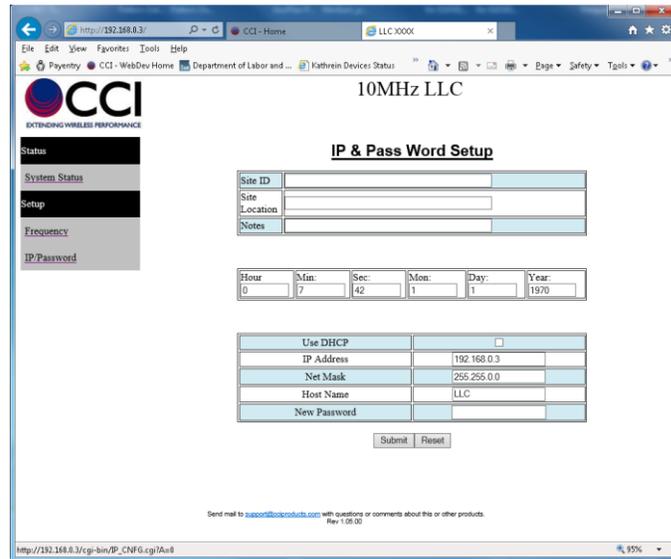


Figure 5.14 – Network Configuration Browser Screen (old address information shown)

5.3.5.1.1 System Information

In the **System Information** portion of the Configuration page the Description and Date can be changed. The fields to identify the “**Site ID**” and “**Site Location**,” and “**Notes**” are text fields. Enter the information as required, and press the “**Submit**” button found under the **IP & Pass Word Setup** information. See figure 5.15 for an example of data entry into the System Information blocks.

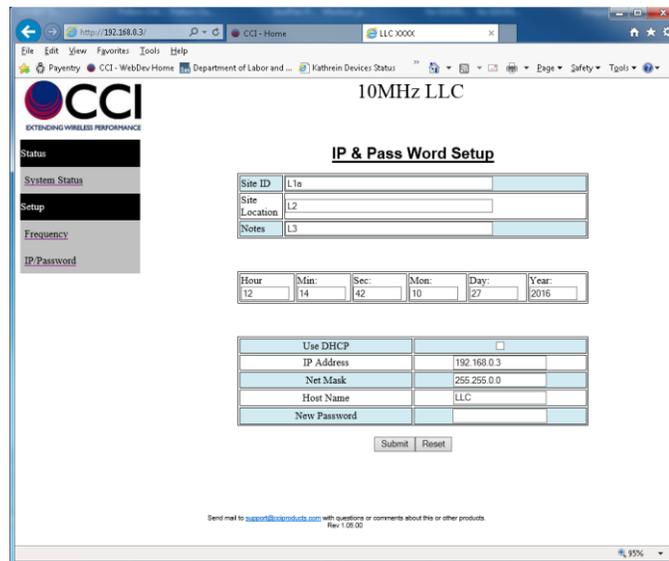


Figure 5.15 – Description (Site Data) and Date (Site Data) Entered

5.3.5.1.2 Change Time and Date

To change the Time and Date Enter the Time in the sequence **Hours, Minutes, and Seconds**, and then enter the Date in the sequence **Month, Day and Year**. Then press the **"Submit"** button found under the **IP & Pass Word Setup** information, as shown in Figure 5.15 above.

5.3.5.1.3 Changing Network Configuration Properties

To change the Default IP Address of the LLC, use the PC mouse to highlight (left click on) the "IP/Passw ord" link on the browser screen. There are two ways of assigning an IP address to the LLC. One method involves using a "Dynamic Host Control Protocol" (DHCP) server to assign an IP Address to the unit. To use the DHCP Protocol, click on the check box to the right of the **"Use DHCP"** description, and press the **"Submit"** button found under the **IP & Pass Word Setup** information, as shown in Figure 5.15 above. The other method allows the assignment of a "Static IP Address" to the LLC. To assign an alternate Static IP Address to the LLC, use the PC mouse to select the **"IP Address," "Net Mask,"** and **"Host Name"** fields to enter the desired addresses and Host Name for the LLC being utilized. Then click the **"Submit"** button to perform the desired changes. See figure 5.15 for details.

Note: It is extremely important to record any changes made, to ensure future access to the PCS 10 MHz LLC.

5.3.5.1.4 Change Password

When desired the LLC's password can be changed by using the **"New Password"** field of the IP & Pass Word Setup page. Enter the New Password, and then press the **"Submit"** button. Again see figure 5.16 to see where this is performed. **Note: It is extremely important to record these changes to ensure future access to the PCS 10 MHz LLC.**

5.3.6 Frequency Tab

When **Frequency** is selected, the PCS 10 MHz LLC which is connected and powered will be shown in this window (see figure 5.17 below). The information visible in this window includes **Filter Status, Current Filter Frequency** and **New Filter Frequency 1935.00 to 1985.00 MHz Frequency (0.10 MHz step)**. The first two items inform you of the current status of the LLC, while the third item allows you to tune the filter to a new frequency if desired. **The PCS 10 MHz LLC can be tuned to any frequency in 100 kHz increments within the operating band and will remain at the set frequency after the power has been removed.**

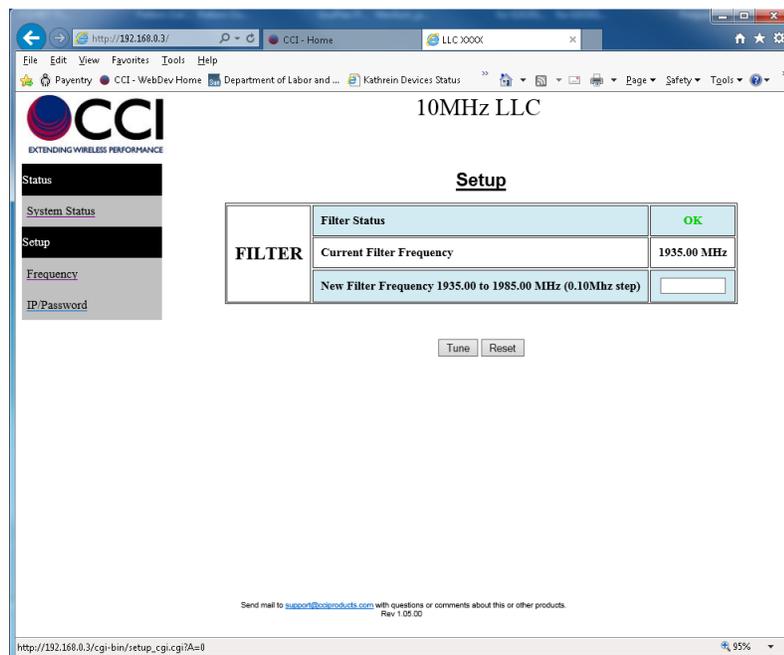


Figure 5.16 – Frequency Window

5.3.6.1 Enter a New Frequency

Enter a “new” frequency that you wish to tune the LLC to. In the example below, the LLC is to be tuned to 1952.00 MHz (see figure 5.17).

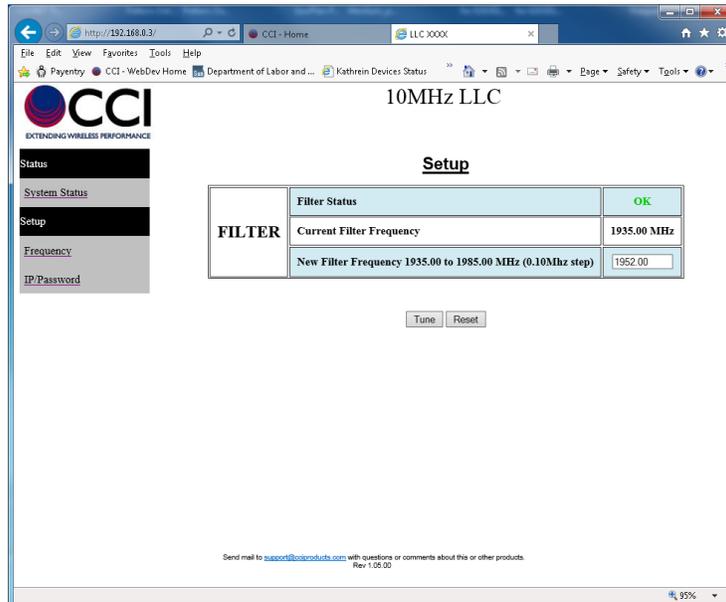


Figure 5.17 - New Frequency Entry in Frequency Window

5.3.6.2 Tune Function

Depress the “Tune” button and allow the LLC to perform the “tuning” process. Note that while tuning the window shows the message “Working... This Can Take Up To 8 Min.”

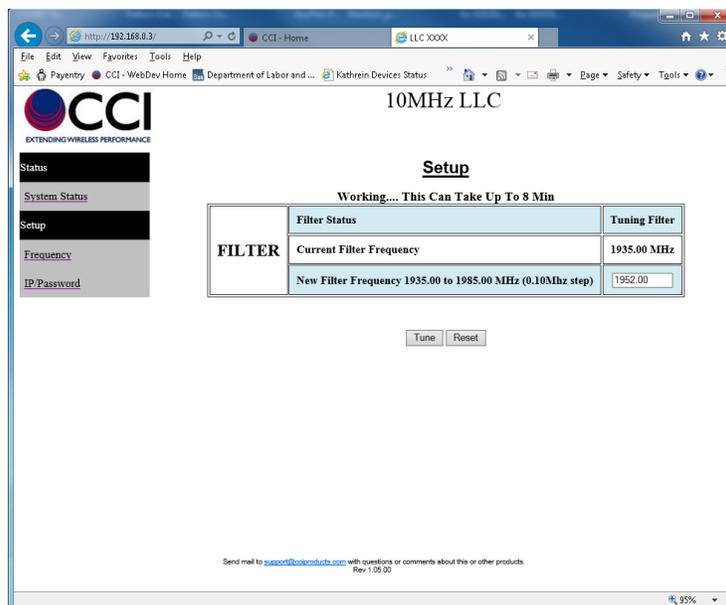


Figure 5.18 – New Frequency Window showing Status “Working... 8 Min”

5.3.6.3 Tuning Completed

Note that when the “tuning” process is completed the screen will show the new frequency. Please note that in this example the LLC was set to tune from 1952.00 MHz (figure 5.17), it was then tuned an extra 1.00 MHz. The final “Tuned” frequency here is 1953.00 MHz (see figure 5.19).

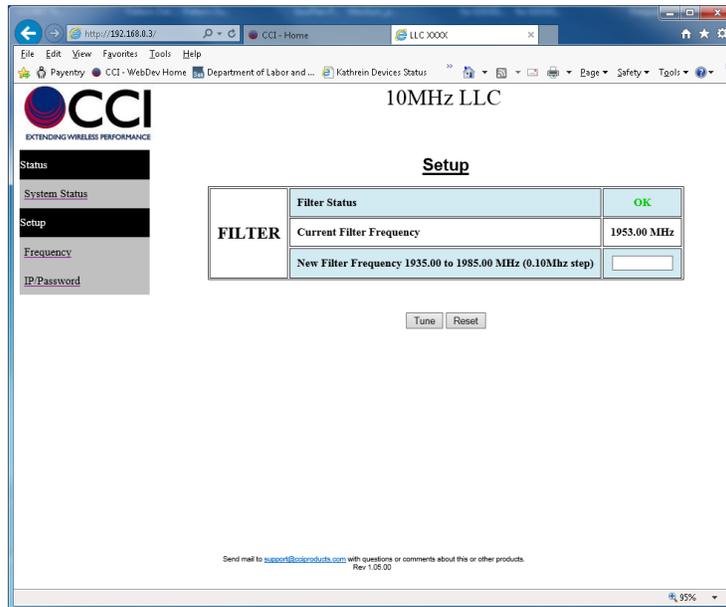


Figure 5.19 – Frequency Window Showing Frequency at Tuning Completion

6 Maintenance

6.1 Introduction

There is no requirement for periodic maintenance on an LLC.

6.2 Periodic Maintenance

Not applicable.

6.3 Test Equipment Required for Test

Equipment required for test includes a spectrum analyzer and any additional equipment such as cabling, attenuators, couplers, etc.

6.4 Performance Test

A performance test should be performed to insure that the LLC meets the specifications listed in Appendix A.

6.5 Field Replaceable Parts and Modules

Parts and modules within an RX-AIT solution that can be replaced by a qualified technician in the field include the Low Loss Combiner (LLC).

6.5.1 Low Loss Combiner (LLC) Replacement

To replace an LLC within an RX-AIT solution, perform the following steps:

- 1) Ensure that all RF sources are "Off."
- 2) Set the appropriate circuit breaker (associated with the RX-AIT in the affected sector) on the BTS to "Off."
- 3) Remove the Input and Output RF Cables from the LLC. Also remove the DC and Ethernet (RJ45) cables from the LLC. Ensure that the cables are properly labeled for later reconnection.
- 4) Remove the hardware holding the LLC on the 19" rack.
- 5) Remove the LLC from the 19" rack.
- 6) Reverse the order of the procedure to install a new LLC.

7 Troubleshooting (Component Level)

7.1 Introduction

This section will cover the troubleshooting of CCI LLC's which have LED Indicators, as well as RF measurements that can be performed.

7.2 Troubleshooting

The troubleshooting covered herein contains details as described in a Flow Chart (see Figure 7.1). Please note that the Flow Chart will indicate what paragraphs in this manual cover the details needed to determine whether the LLC has failed or not. In the event of a suspected failure please see section 7.3 "Return for Service Procedures."

7.2.1 Low Loss Combiner (LLC) Troubleshooting per LED Status and RF Test

The following paragraphs describe the LED state, trigger conditions and corrective actions for failures of the LLC. The LLC Tuning Manual can also be found on CCI's website at www.cciproducts.com.

7.2.1.1 "POWER ON" LED Not Illuminated

If the "POWER ON" (green) LED is illuminated, this indicates that the unit is powered (only required when "tuning" is being performed) and is operational. If the green LED is off, check the condition of DC input cable, the associated circuit breaker, and that the DC input cable is properly connected to the DC Input connector on the LLC.

7.2.1.2 "Busy" LED Not Illuminated

Not Available.

7.2.1.3 "Non-Critical Alarm" LED Illuminated

Not Available.

7.2.1.4 "Critical Alarm" LED Illuminated

Not Available.

7.2.1.5 Test

Troubleshooting of the Low Loss Combiner is performed by testing the LLC with a Network Analyzer. This testing validates the "Bandpass" frequencies, the "Bandstop" frequencies, the Return Loss of the "Bandpass," and the Return Loss of the "Bandstop." The values for these tests can be found in Table A-1 herein for the Low Loss Combiner.

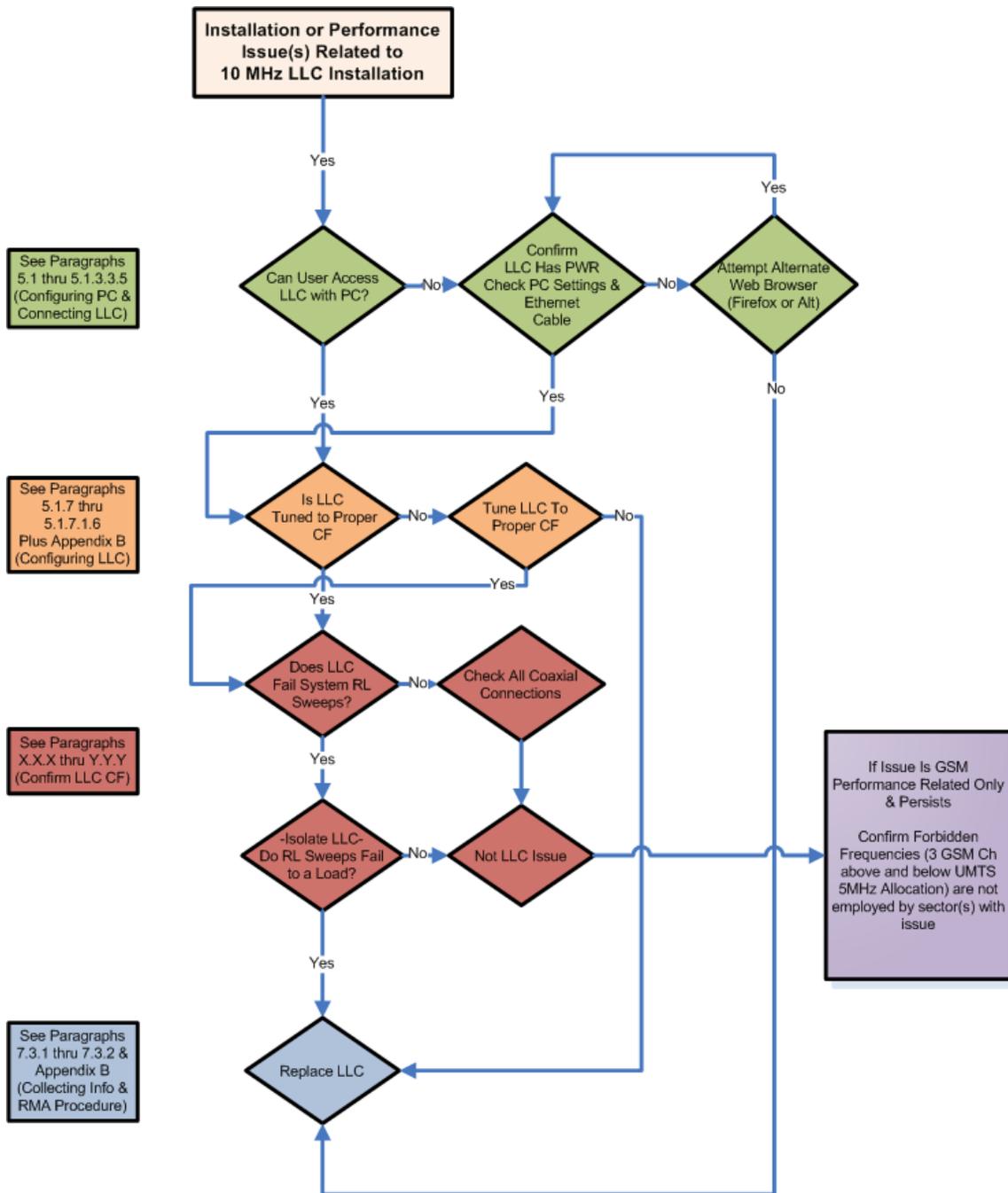


Figure 7.1 - CCI Low Loss Combiner Troubleshooting Flow Chart

7.3 Return for Service Procedures

7.3.1 Obtaining an RMA

When equipment is damaged and must be returned to the factory be sure to fill out the website form or if no internet access is available then call the factory to obtain a material return authorization. Please note that an RMA Number (#) must be assigned before RX-AIT equipment can be returned to CCI. Please note that CCI's return policy and an RMA form can be found in Appendix C.

The following information is required to obtain an RMA:

- 1) Serial number of the unit in question. Serial number is found on the silver label next to the bar code.
- 2) Model number of the unit in question. Model number is also found on the silver label.
- 3) Name and phone number of a contact at your company.
- 4) Detailed description of the reason for return.
- 5) Date Code. Date Code is found either on the silver label as D/C, or on a separate label. Date code is required to determine warranty status. The standard warranty period extends to 1 year after the date shown on the date code label.

7.3.2 Repacking for Shipment

Be sure to retain all of the packing material, in the event that any piece of equipment must be returned to the factory.

A Appendix A Specifications

A.1 PCS 2 Contiguous Channel (10 MHz) LLC; P/N – LLC-1900-IN-10

Table A-1 PCS 2 Contiguous Channel LLC; (P/N – LLC-1900-IN-10) Specifications

Model #	LLC-1900-IN-10
Electrical Specifications	
BANDPASS TX ONLY Port	
Bandwidth	Any 10 MHz within 1930 - 1990 MHz
Channel Positioning	100 kHz steps
Insertion Loss	0.6 dB typ.
Return Loss all port	18 dB min.
BANDSTOP TX/RX Port	
Bandwidth	1930-1990 MHz except 6 MHz
Insertion Loss	0.15 dB typ.
Return Loss all port	18 dB min.
Isolation	
Bandpass port to Bandstop port (Bandpass Frequencies)	25 dB min. / 28 dB typ.
Bandpass port to Bandstop port (Bandstop Frequencies)	30 dB min. / 35 dB typ.
General Characteristics	
Impedance	50 Ohms
Guard Band	
GSM/UMTS Combining	700 kHz each side of Bandpass required
UMTS/UMTS Combining	"0" Guard Band Required
UMTS/LTE Combining	"0" Guard Band Required for 10 MHz or greater LTE Carrier
LTE/LTE Combining	"0" Guard Band Required for 10 MHz or greater LTE Carrier
CDMA/LTE Combining	"0" Guard Band Required for 10 MHz or greater LTE Carrier
Group Delay Variation	50 nS typ.
Continuous Average Power	500 W max. (all ports)
Peak Envelope Power	2 kW max. (all ports)
IMD	-110 dBm (-153 dBc) typical (2x +43 dBm tones) all bands
DC Pass Current/AISG Pass (BS port to ANT port)	3A/AISG signal (2.176 MHz) per AISG 2.0
Reconfiguring the combiner	
Mechanism	Stepper Motor
Control	Any web enabled computing device with a 10/100 or greater RJ-45 Ethernet Port
DC Supply	
Current	2 A at +24 V
Voltage	± 18 to ± 76 V
Mechanical	
Connectors	
RF Ports	3 x 7/16 DIN-female
Control Port	1 x RJ45 Ethernet
DC Input	1 x 2 Pin Molex (Mini-Fit Jr.) – male, .165" Pitch (4.2 mm))
Alarm Output	1 x 6 Pin Molex (Mini-Fit Jr.) – male, .165" Pitch (4.2 mm))
Weight	25 Lbs. (11.34 Kg)
Dimensions (Body Only) (H x W x D)	2.59 x 17.5 x 13.41 in. (65.79 x 444.5 x 340.61 mm)
Dimensions (Including Connectors and Handles) (H x W x D)	2.59 x 19.0 x 15.3 in. (65.79 x 482.6 x 388.62 mm)
Indicators	
Power LED	Green LED (±18 VDC to ±76 VDC present)
Busy LED	Not Available
Non Critical Alarm LED	Not Available
Critical Alarm LED	Not Available
Environmental	
Operating Temperature:	0°C to +55°C
Enclosure	Indoor (IP20 Minimum)
Lightning Protection	Surge > 30KA, 20 KA Mult., Res. Pulse < 250 µJ
MTBF	>5000Khrs

B Appendix B Detailed LLC Testing

B.1

