

## Ultra Max® Phasing Tool

### User Guide



**AMX-1000**

### If you need assistance...

Contact your Technical Support.

## About this guide

This guide provides you with information on how to use the Phasing Tool. This tool eliminates the need to use an oscilloscope when wirelessly phasing and synchronizing systems.

## About the product

### Part numbers

Table 1. AMX-1000 Phasing tool kit with case

Item	Qty	Part Number
Phasing Tool	2	0304-0152-01
Brackets for Sense Coil	2	0400-1182-01
Sense Coils	2	0300-2274-01
Cable RG58A 12ft	1	6003-0313-01
Cable USB A/Micro B 6ft	1	6003-0148-01
Antenna 2.4GHz	2	3411-0024-01

## Spare parts

A complete parts list is available online at: <http://www.sensormatic.com/support/techsupport/>. Login, and then click the Part Information link on the Tech Support home page.

Part Number / Product Code	Description	9U*	FRU**
0352-0706-01	3dB Transceiver Antenna	No	Yes
0352-0707-01	Pickup Coil and Bracket	No	Yes
0352-0708-01	Phasing Tool Transceiver Module	No	Yes*

\* Repairable unit

\*\* Field replaceable unit.

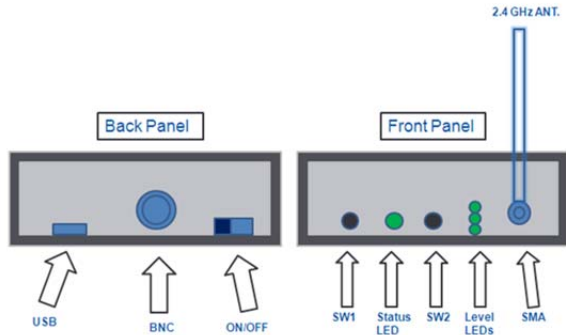
\*\*\* Outside North America only.

## Key features

Two identical phase modules are used. One is set as a transmitter and the other is set as a receiver. Both the receiver and transmitter are battery operated. When the unit is connected to the laptop via USB cable it switches to USB power.

The sense coils pick up a 58kHz signal from the antenna. An application on the laptop shows the phase delta between the systems. No oscilloscope is required to complete phasing.

## Front Panel functions



### RSSI Signal Strength Reading

Press and release SW2 once. This shows the strength of the RSSI signal on the level LEDs, with LED 1 indicating the weakest and LED 3 indicating the strongest 2.4GHz RSSI signal strength.

### Battery Level Indication

Press and release SW2 twice in succession. This displays the battery level on the three level LEDs, with 1 indicating a low battery level, 2 indicating a medium battery level, and 3 indicating a high battery level.

### 58KHz Signal Lock Status

No button press required. The status LED flashes red with no 58 KHz present, and flashes green at a rate of approximately once per second as soon as a 58 KHz signal lock is achieved.

### Setting the unit as transmitter or receiver

Pressing and holding down SW1 displays the current configuration. Pressing and holding down SW1, while pressing and releasing SW2, one time, toggles the unit between transmitter and receiver mode. The setting is indicated by the 3 level LEDs. The level LED 1 indicates the receiver function, while the level LED 3 indicates a transmitter.

### Power Save Mode

The phasing tool goes into power save mode to preserve the battery when no 58 kHz signal is detected for five consecutive seconds. All LEDs turn off when it enters power save mode. The phasing tool wakes up from power save mode once a 58 kHz signal is detected. The mode is disabled when the USB cable is connected between the phasing tool and the computer.

### System Synchronization Test Function

When the phasing tool is set to receiver mode, and has a signal lock on the 58 kHz of a system whose phase is being checked, it indicates the phase

relationship to the reference system on the level LED's. The LEDs flash as follows:

LED Number	Phase Indication Relative to Reference
LED #1	System Phase is Lagging by more than 50 $\mu$ sec
LED #2	System Phase is Between plus or minus 50 $\mu$ sec
LED #3	System Phase is Leading by more than 50 $\mu$ sec

**Note:** 1 millisecond (msec or ms) = 1000 microseconds ( $\mu$ sec or  $\mu$ s).

To convert to milliseconds, divide microseconds by 1000. A shortcut is to shift the decimal point to the left three places, which is the same as dividing by 1000.

$$0.050. (\mu s) = 0.05 (ms)$$

$$\text{For example, } 50\mu s = 0.0$$

$$5ms, 100\mu s = 0.1ms$$

### 58kHz Field Strength Mode

When the phasing tool is set to receiver mode, and a laptop computer is connected the 58 kHz field strength quality can be seen by typing "2" in the command line of the laptop console window. This starts the "PLL summary print" function that continuously prints to the screen the lock or unlock state of the phase lock loop and a relative signal strength quality rating system represented by groups of stars.

The displayed signal strength is based on the level of the previous reading. Moving from a weaker field to a stronger field results in an increase in the star rating, and moving from a stronger field to a weaker field would result in a decrease in the star rating.

\*\*\*|\*\*\*|\*\*\*|\*\*\*: Very Strong

\*\*\*|\*\*\*|\*\*\*|000: Strong

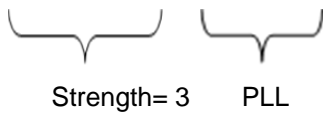
\*\*\*|\*\*\*|000|000: Moderate

\*\*\*|000|000|000: Weakest

The field strength quality can be useful to locate the point where the field is the strongest on concealed antennas systems or some deactivators.

Below is an example of the PLL summary print showing the PLL is "Locked" and a field strength quality of "3":

\*\*\*|\*\*\*|\*\*\*|000:-10: LOCKED: (-77:54:131)!99-5556



The “2” command is a toggle. Typing “2” again turns the mode off.

### Enable Boot Loader Mode

Ensure the power switch is off. Press and hold SW1 and SW2 simultaneously while sliding the power switch to the ON position. Continue pressing SW1 and SW2 until all 3 level LEDs are flashing. At this point SW1 and SW2 may be released. The unit is now ready to receive a flash download via USB.

## Phasing Tool Transmitter Setup

At the reference system location:

1. Attach one of the 2.4GHz SMA antennas to the SMA connector on the phase tool.
2. Slide the power switch to the on position.
3. To set this unit as a transmitter, hold down SW1 while pressing and releasing SW2. This toggles the unit between transmitter and receiver mode.

- LED 1 indicates receiver
- LED 3 indicates transmitter

4. Attach the coaxial cable to one of the sense coils.
5. Hang the sense coil using the hanging bracket on the reference system antenna.

**Important:** Move the bracket along the top of the antenna until it locks. The location for the coil varies on the different antennas.

6. Attach the other end of the coaxial cable from the sense coil to the BNC connector on the phasing tool.

**Note:** The status LED initially blinks red. When it has locked onto the 58 kHz signal from the pedestal the status LED blinks green.

Figure 1. Primary Transmitter Setup

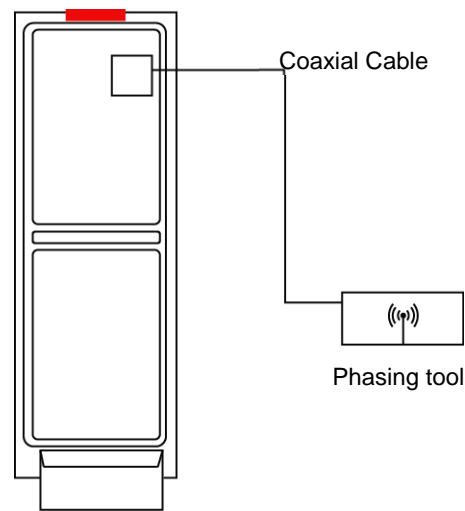
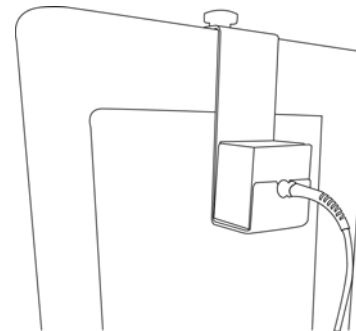


Figure 2. Pickup Coil on Bracket



**Note:** Move the coil along the antenna until the phasing locks to the signal. The location varies on the different antennas.

## Phasing Tool Receiver Setup

1. Repeat Steps 1-4 from the Phasing Tool Transmitter Setup section and set the unit to receiver.
2. Hang the sense coil using the hanging bracket on the antenna of the system to be phased. .
3. Attach the other end of the coax cable from the sense coil to the BNC connector on the phase tools.

**Note:** The status LED initially blinks RED, and once it has achieved a lock on the 58 KHz signal from the pedestal, the status LED starts blinking GREEN

4. Observe the Level LEDs to determine the system phase
  - If LED 1 is lit system being checked is lagging greater than 50usec

- If LED 2 is lit system being checked is within the +/- 50usec window considered to be in-phase
- If LED 3 is lit system being checked is leading greater than 50usec

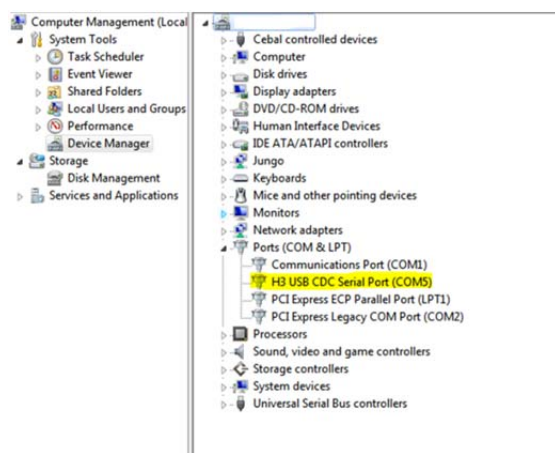
## Laptop Setup and Use

1. Connect the included Micro-USB to USB-B cable to the phasing tool. Then connect the other end to a laptop. If the H3 USB Serial driver is already installed, the laptop assigns a Com port to the phasing tool. To determine which port was assigned, open the computer management screen and observe the port list. The list updates as the port is added. In the example below, Com port 5 was assigned to the tool when the cable was plugged in.

To navigate to the **Computer Management** screen:

- a. Right click **Computer** on the Start menu.
- b. Select **Manage**. The **Computer Management** window opens.
- c. Click on **Device Manager**. A list of device types displays.
- d. Expand the **Ports** list to display the port numbers.

Figure 3. Computer Management Window Settings



2. PuTTY is used to talk to the tool and the System Configurator is used to perform the phase adjustment.

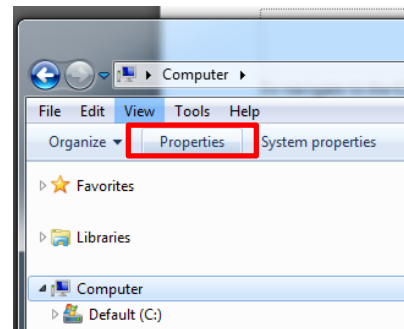
The phasing tool displays the phase delta and other information on the laptop using PuTTY as the interface.

1. Install the provided USB driver. This is included in the ADS4 bundle available on [www.sensormatic.com](http://www.sensormatic.com).

To install the USB driver, perform the following steps.

- a) In windows explorer navigate to your C drive and select **System Properties** from the top menu.

Figure 4. System Properties

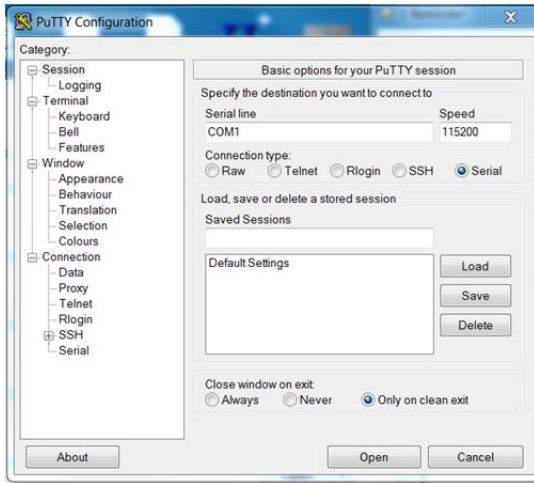


- b) Select **Device Manager** and expand the **Ports** menu. You see a question mark icon beside the **Communications Port**.
- c) Right click and select **Update Driver Software**.
- d) Select **Browse my computer for driver software**.
- e) Navigate to C:\Program Files (x86)\Sensormatic\ADS4 Platform Software\Release XXXX\Driver.
- f) Click the installation file and follow the wizard to install the driver.

2. Launch PuTTY. It can be downloaded at the following address. <https://the.earth.li/~sgtatham/putty/latest/x86/putty.exe>
3. Select **Serial Communication** and enter the com port which corresponds to the USB port that the phase tool is connected to.
4. Enter the **Speed** manually as 115200.

5. Select **Open** to open the console window. Below is an example of the PuTTY initialization screen.

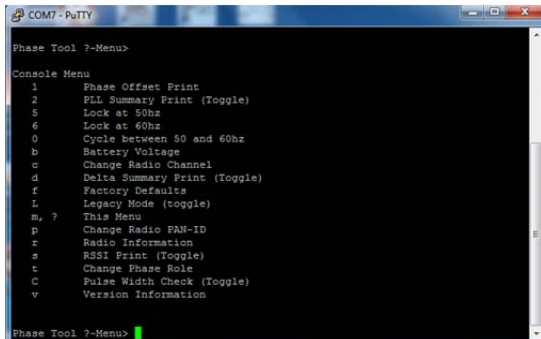
Figure 5. PuTTY Configuration



6. **Note:** To query the PuTTY, select ? as shown below.

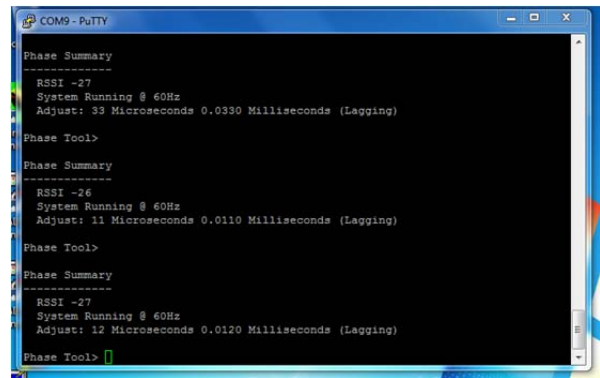


The Console Menu displays again. See image below.



7. The PuTTY screen launches. Figure 6 shows an example of the PuTTY input screen.

Figure 6. Example of PuTTY screen



8. To display the phase delta, press enter, and then type 1 in the command line. This shows if the signal from the system being phased is leading or lagging from the reference system. The value is displayed in microseconds and milliseconds for convenience.

**Note:** Refer to the appendix for a list of PuTTY commands.

## Adjusting the Phase

1. Open the standard configurator (eg. ADS4, UltraPost) for the system which is being phased. Use the phase adjustment slider on the configurator to adjust the phase by the amount indicated on the phase delta display.

**Note:** For Legacy equipment see Phasing steps for Legacy M4K controller in the Appendix.

2. Check the phase delta again by typing “d” on the command line of the PuTTY interface. If the delta in microseconds is close to zero (within plus or minus 50µS), then the phasing is complete. If not, adjust the phase again and recheck.
3. Repeat for each system which requires phasing.



## Appendix

### List of PuTTY Commands

Command	Syntax
1	Phase Offset Print (Toggle)
2	PLL Summary Print (Toggle)
5	Lock at 50hz
6	Lock at 60hz
0	Cycle between 50 and 60hz
b	Battery Voltage
c	Change Radio Channel
d	Delta Summary Print (Toggle)
f	Factory defaults
L	Legacy Mode (toggle)
m	This Menu
p	Change Radio PAN-ID
r	Radio Information
s	RSSI Print (Toggle)
t	Change Phase Role
C	Pulse Width Check (Toggle)
v	Version Information

\*If you encounter a system which doesn't lock to the Tx signal, enter the **c** (uppercase C) command in the PuTTY screen and the tool locks to other equipment with a shorter pulse width.

### PAN ID Setup

The same PAN ID and radio channel must be set on the phasing tools for them to communicate. Connect to a laptop and use PuTTY to adjust the PAN ID or channel if necessary.

Type **p** in the command line to change the PAN ID. Enter the new PAN ID and press enter.

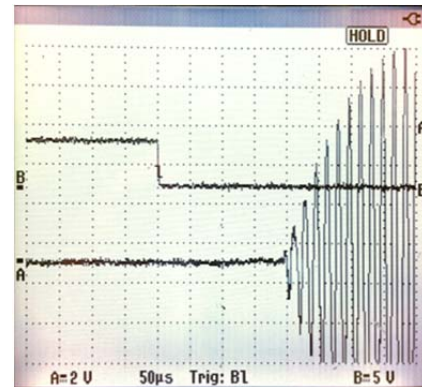
### Channel selection set up

To change the radio's channel, type **c** in the command line. Enter the new channel number and press enter.

The channels selections are between 11-25.

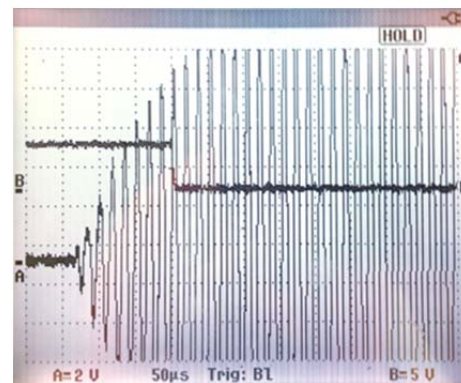
## Phasing Tools Comparison

Figure 10. Phase Lagging Reading on the Oscilloscope



The scope image in figure 7 shows the system that is being phased is lagging behind the reference system. The AMX-1000 phasing shows that a negative adjustment value is required to phase the system.

Figure 11. Phase Leading Reading on the Oscilloscope.



The scope image in figure 8 shows the system being phased is leading the reference system. The AMX-1000 phasing tool shows that the system is leading and shows that a positive adjustment value is required to phase the system.

## Phasing steps for Legacy M4K controller

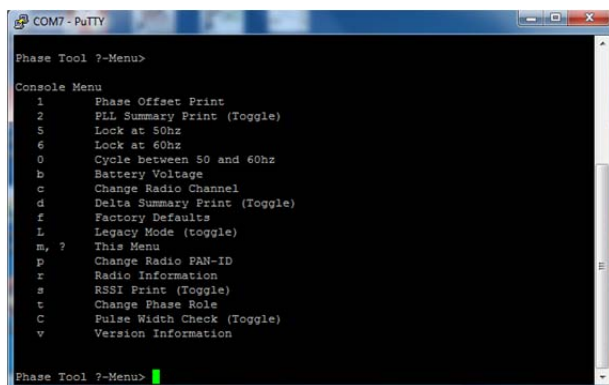
1. Enable the Line Sync switch on the M4K controller by flipping the switch up.
2. Turn the potentiometer 10 turns counter clockwise (left) or until you hear a click.
3. Turn the potentiometer 3.5 turns clockwise (right).

Figure 7. M4K Controller

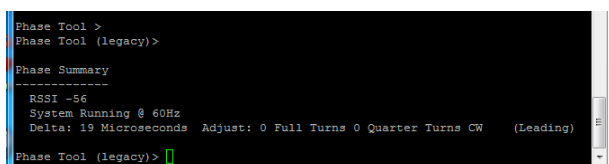


4. Open the PuTTY screen. The Console Menu will display. See Figure 8.

Figure 8. PuTTY Screen

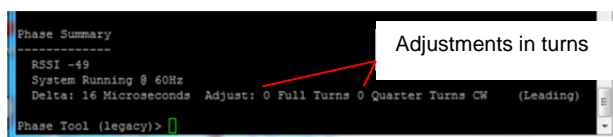


On the PuTTY screen, enter the capital letter L for Legacy mode. The screen will display Phasing Tool (Legacy) >. See image below.



5. Enter number 1 for Phase Summary display information. See Figure 9.

Figure 9. PuTTY screen



6. Make adjustments to the potentiometer as per turns on the PuTTY Phase Summary display. Continue to enter 1 to get the system Phased.

### LED Status Indications

Led Status	Phasing State
LED 1 On	Phasing is leading
LED 2 On	System is In-phased
LED 3 On	Phasing is lagging

**Note:** If Level LED 2 is On, the system is In-Phased and the procedure is complete.

**Note:** If Level LED 1 or 3 are On, press 1 on PuTTY and continue to make adjustments.

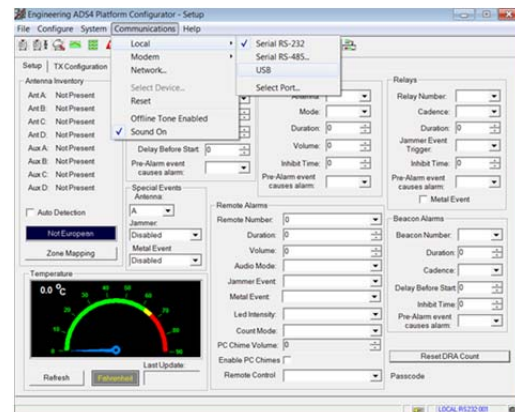
## Phasing tool firmware update procedure

### Upgrading the Phasing tool application (.s19 file)

**Note:** Restart the ADS4 configurator between the update for the application and the radio.

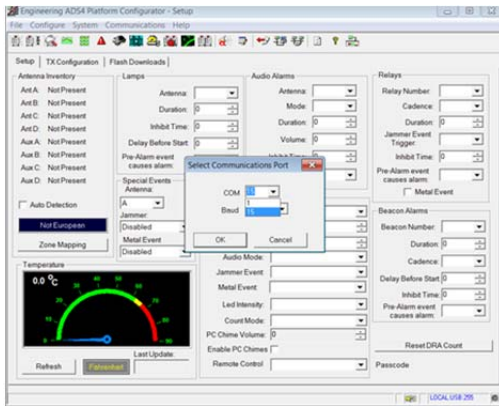
1. Open the ADS4 Configurator before powering on the phase tool.
2. If this is the first time running the configurator with the phasing tool, create a USB endpoint. Select **Communications>Local>USB**. In the **New USB Name** field enter "Test Port 255". Click **OK**.

Figure 10 Configurator screen



3. Connect the USB cable to the phasing tool and power on the phasing tool in boot loader mode. Press both sw1 and sw2 simultaneously to power on in boot loader mode; the three level LED's will be flashing.
4. Choose the COM port. Select **Communications>Local>Select Port**. Port varies on each computer check device manager.

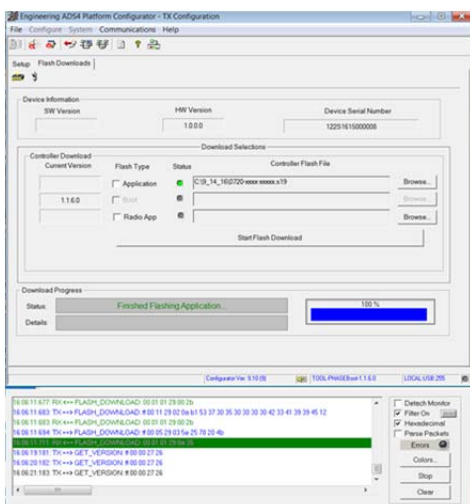
Figure 11. COM port selection



5. Wait for the configurator to connect, this can take up to twenty seconds. When connection is made to the unit it will say "Boot utility is running, please select a file." By default this is the phasing tool application. Use **Browse** to select the application ".s19 image". The application will upgrade automatically.

- If a dialogue box does not display with the message "Boot utility is running", select **Communications>Local>USB** to prompt the configurator to attempt a new connection.
- If the configurator displays an error when the port opens do the following: Power off the phasing tool and power it on again in boot loader mode. Next select **Communications>Local>USB** to prompt the configurator to attempt a new connection.
- Close the configurator on completion of the firmware upgrade. This is to prevent the phasing tool from resetting and locking the comm port.

Figure 12. Configurator screen

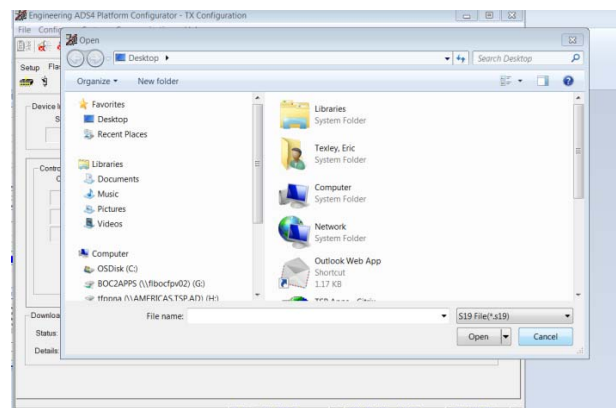


6. The phasing unit will always reset after a flash download.

### Upgrading the Radio Image (.hex file)

- Close the configurator application and restart.
- Start the phasing tool in boot loader mode as outlined above.
- Select **Communications>Local>USB** as outlined above.
- When the connection is made to the target the configurator displays a dialogue box asking for a radio application. Click **Cancel**.
- Click the checkbox for **Radio App**. Browse to the radio application file.

Figure 13. Browse for file



- If the flash download doesn't start automatically click **Start Flash Download**.
- When the download is complete close the configurator. Restart the phasing tool and open PuTTY and check the software versions.

## Declarations

### Regulatory Information

#### Radio

#### Frequency of Operation

Model: AMX-1000

Type..... AMX-1000  
 Frequency band.....2400-2483.5 MHz  
 Maximum power ..... 4.5 mW EIRP

If frequency is selectable for your model, select only the country in which you are using the device. Any other selection will make the operation of this device illegal.



**Approved Antennas**

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada.

Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

This radio transmitter *IC: 3506A-AMX1000* has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio *IC: 3506A-AMX1000* a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

**Pulse/Larsen W1027**

- Polarization .....Vertical
- Composite gain ..... 3.2 dBi
- Impedance .....50 ohms

**Pulse/Larsen W1038**

- Polarization .....Vertical
- Composite gain ..... 5.0 dBi
- Impedance .....50 ohms

**L-Com model HG2403RD-RSF**

- Polarization .....Vertical
- Composite gain ..... 3.0 dBi
- Impedance ..... 50 ohms

**L-Com model HG2405RD-RSP**

- Polarization .....Vertical
- Composite gain ..... 5.0 dBi
- Impedance .....50 ohms

**FCC ID: BVCAMX1000**

This device complies with part 15 of the FCC Rules. *This device complies with Industry Canada's licence-exempt RSSs.* Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**México NOM 121: AMX1000**

La operación de este equipo está sujeta a las siguientes dos condiciones:

- 1) es posible que este equipo o dispositivo no cause interferencia perjudicial y
- 2) este equipo debe aceptar cualquier interferencia, incluyendo la que pueda causar su propia operación no deseada.

**INTERNATIONAL ID: AMX1000**

- EMC ..... 47 CFR, Part 15  
 EN 300 328  
 EN 301 489-1  
 EN 301 489-3  
 EN 301 489-17  
 RSS 210

- Safety ..... UL 60950-1 (second edition)  
 CSA C22.2.60950-1  
 EN 60950-1



**EQUIPMENT MODIFICATION CAUTION:** Equipment changes or modifications not expressly approved by Sensormatic Electronics, LLC, the party responsible for FCC compliance, could void the user's authority to operate the equipment and could create a hazardous condition.

See 'About the product' on page 1.

**Other Declarations**

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