

# The ICARC FOX Transmitter Operating in the HF bands

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# Outline



Overview

Fox Transmitter Limitations

HF Amplifier

Precise Timing

HF Beacon

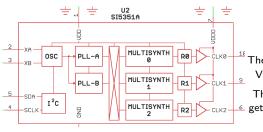
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#### Overview



#### Can we make our Fox Transmitter operate in the HF band???



The SI5351 internal VCO covers from 600MHz to around 900MHz

The 1st. MultiSynth (PLL-A) disciplines the VCO to run between 600MHz to 900MHz

The second MultiSynth (MULTISYNTH-0)

gets us further down towards HF frequencies

There is also an output divider (R0) to get the rest of the way down

The mainboard RF filter is tuned for 2M operation, is transparent at HF frequencies



#### Fox Transmitter Limitations



The mainboard LPF is tuned for 2M operation.

Additional filtering will be required

Antenna matching is an issue

Much longer wavelength at HF

Must build base loaded antenna that is easily portable

Poor antenna performance

Small enough to hand carry to the hide

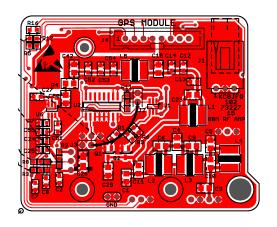
Limit length to around 3' to 6'





# **HF** Amplifier





Larger daughtercard

Retains mechanical and electrical interface

Soft-Start power switch

On-board Low Pass Filter

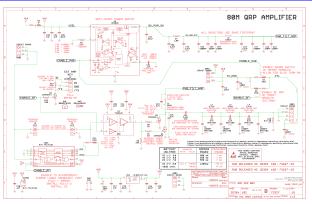
Optional GPS Module for precise timing

Accommodation for ICS525 boards (divide by 16)



# **HF Amplifier Schematic**





#### Basic Class-C Amplifier

MP5035 power switch provides soft-start

External amplifier keying

Produces about 750mW

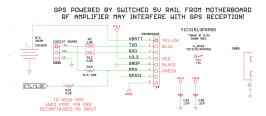
74LVC161 installed only for ICS525





#### **GPS** Module





Just enough to get serial traffic and PPS from the GPS Module CR1025 backup battery

GPS powered only when RF module is powered

Commands added to Fox Transmitter to read and decode NMEA traffic

.



# **Antenna Calculations**



	BASE	LOADE	D f	ANTENNA	PA	RAME'	TERS
FREQUENCY	H1 LEN DIA	L:	1 DIA	TURNS	COIL O.D.	FORM LEN	Henards 2 1/2" x 28' Hodel: PUC848258688
Mod	del: 11395		PIPE		2.375 2.88	2.58	SKU: 6698629  Menards 2 1/2" x 1" BUSHING  Model: L17835YP  SKU:
Menards	del: 11482		PIPE		2.375 2.88	2.29 1.83	Menards 2 1/2" x 3/4" BUSHING Hodel: F01226C SKU:
Mod	del: 11396		PIPE		2.375 2.88	2.58 2.00	
Mod	del: 11405 J: 2279994	2.5" PVC	PIPE		2.375 2.88	2.29 1.83	
			(				
	3.550 Henards Holiston Solution Henards Kitk Kitk Kitk Kitk Kitk Kitk Kitk Kitk	FREGUENCY LEN DIA  3.090 34.0 8.080  Tenards 7/2 3.05*  Tenards 7/2 3.05*  Tenards 1.1305  SEL 279991  3.050 48.0 8.080  Tenards 1.4 2.05*  SEL 279992  SEL 279993  SEL 279993  SEL 2799994  SEL 2799994	FREGUENCY LEN DIA AND 3.599 34.0 8.898 420 Tenerds 7/2 ** 36" DOG 11.3390 2.5" POW 3.750 AND 3.7	FREGUENCY LEW DIA AGO IN A CONTROL OF THE CONTROL O	## L1  PRECIDENCY LEN OIN	## L1 COLL FREQUENCY LEW DIA ## SO DIA TURNS O.D.  3.58	FREQUENCY LEN   DIA   AND   DIA   TURNS   CO.   LEN

#### Base loaded antenna calculations





# **Precise Timing**



New command, GPST, to manage GPS

 $GPST\ ON\ turns\ on\ power\ to\ the\ daughtercard\ (RF\ carrier\ remains\ off)$ 

GPST OFF removes power from the daughtercard

GPST PPSn synchronize system time with PPS signal n indicates edge direction (1 or 0)

 $\begin{tabular}{ll} GPST\ TIME\ CNT=&n\ synchronize\ system\ time\ with\ GPS\ time\ message\ CNT\ roughly\ sets\ a\ timeout\ in\ seconds \end{tabular}$ 

DONE GPS Sends the DONE message but leaves the daughtercard powered

The GPST commands usually appear at the end of the INI= file



# Time Management



Time management is unchanged, everything still runs off of the system clock

All we do with the **GPST** command is to set the system clock very close to UT (within 30 to 50 mSec).

Time is set in the same way as the **TIME** command

The **GPST PPS** command clears the sub-seconds field and the loads the current system time back into the DS1672 (this resets the DS1672 sub-second counter to zero).

The **GPST TIME** command decodes the NMEA GPRMC/GNRMC sentence to update the system seconds field.



#### HF Beacon



# The sequencing language may also be used to implement an HF beacon

We can send message traffic (CW) on a defined schedule

The time (GPST TIME) can be updated after each message to minimize the effects of drift in the system clock

We can power a beacon transmitter from almost anything that provides between around 6.5V to 28V

QRP-Labs 10W power amplifier, if needed PA enable active only when carrier present

#### Done



We are finished!

Indented Line



#### **Scary Notes for the Presenter**

These are my crib notes. I sure hop I rememberd to print them off and bring them along...