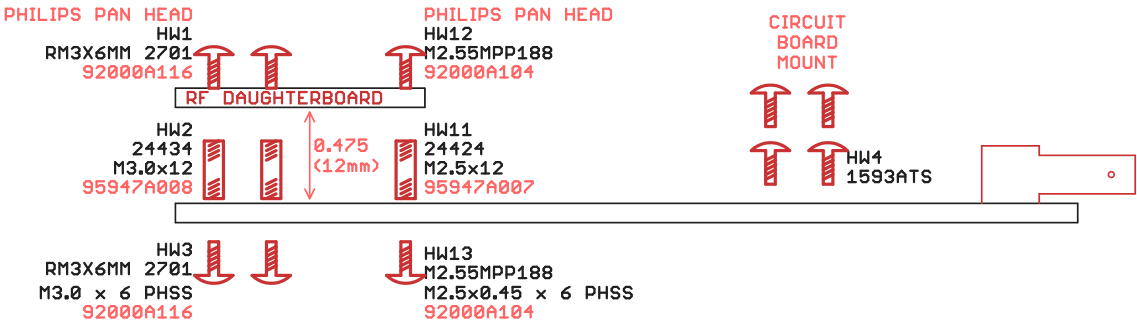
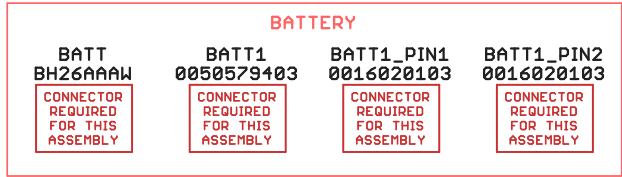
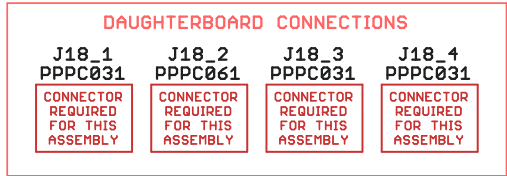
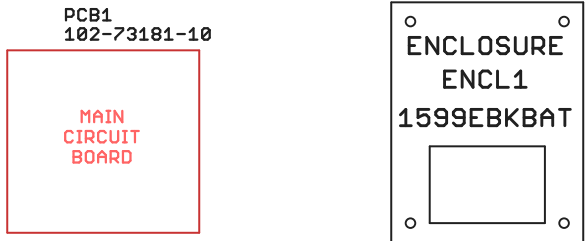


73181 UPDATES/CHANGES ICARC FOX FINDER


KC0JFQ

ADDITIONAL HARDWARE

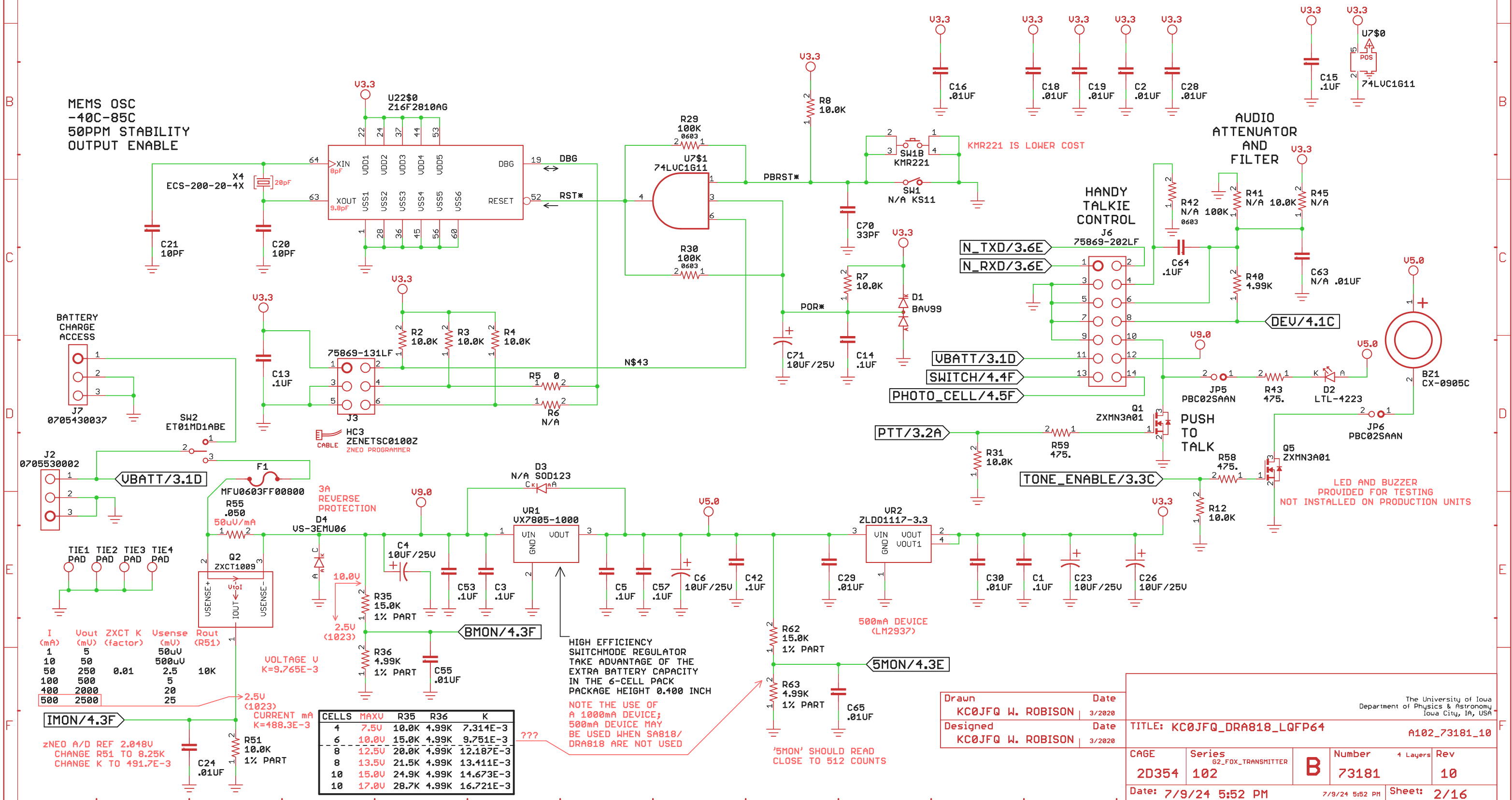
- _0: INITIAL RELEASE
_0: "HI_PWR" HAYWIRE TO CONTROL SA818/DRA818 POWER
_0: 3/30 ADD NOTES FOR SA818/DRA818 DAUGHTERBOARD
_0: 3/31 ADD KEYSTONE JACK PART NUMBERS
- _1: ADD 1N3595 TO CHARGE BACKUP BATTERY
_1: ADD HI_PWR NET PB3 TO DAUGHTERBOARD
_1: ADD TXD/RXD TO J6 (J6 IS NOW 14 PINS)
- _2: ADD J5B TO ELIMINATE FT232RL (J5 AND U6)
J5B IS VERTICAL TO ALLOW ACCESS THROUGH BATTERY DOOR
_2: ADD DZ1 TO LIMIT VOLTAGE IN THE EVENT OF BT2 FAILURE
- _3: CHANGE TO SKYWORKS CLOCK SYNTHESIZER
- _4: ADD U24; I2C FLASH/EEPROM
CHANGE BATTERY TO ALLOW ML-1220 or CR1225
MOVE J5B TO PROVIDE CONNECTOR CLEARANCE THROUGH BATTERY DOOR
D5 CHANGED TO SOT23-3
- _5: VR1 PINOUT WAS BACKWARDS (???),
LAYOUT ACCOMMODATES EITHER ORIENTATION
ADD "5MON" 5V MONITOR (R62, R63, C65)
- _6: CHANGE TO 64 PIN PACKAGE
PF6->PF7 CHANGE FORCED BY PACKAGE PINOUT
REMOVE NETWORK TIME PORT AND MOVE 3.5mm HOST PROGRAMMING
PORT TO J4 TO ALLOW HOST ACCESS WITHOUT DISASSEMBLY
ADD FUSE F1 TO PROTECT PWB FROM REVERSE POLARITY DAMAGE
ADD R58 AND R59 TO GATE OF Q1 AND Q5 TO REDUCE SWITCHING NOISE
CHANGE ROUTING OF CLK0 SIGNAL FROM SI5351 SO IT CONNECTS
DIRECTLY WITH THE SINGLE-ENDED CLOCK ON RF_DB\$2
REPLACE VR2 WITH HIGHER POWER DEVICE TO BETTER
ACCOMMODATE THE SI5351
- _7: BUFFER SERIAL CHANNEL TO 3.5mm JACK TO PROTECT zNEO
ADD U1 (74LVC1617)
- _8: REWORK RF PATH FROM SI5351 TO DAUGHTERBOARD CONECTOR
REMOVE 74LVC1604 (U4) BUFFER (LEAVING ONLY U9)
CHANGE C51 (WAS .1UF) TO .18UF. LOWER AUDIO CUTOFF A BIT.
ADD PULLUP (R65) TO EXTERNAL RxD
ROUTE FILTERED AUDIO (i.e. DEV NET) TO HANDIE-TALKIE HEADER
- _9: CHANGE SERIAL CONNECTION TO HANDIE-TALKIE (SHARE WITH DRA818)
- _10: ADD DB_PWR TO ALLOW POWER SWITCHING OF THE SA818 MODULE



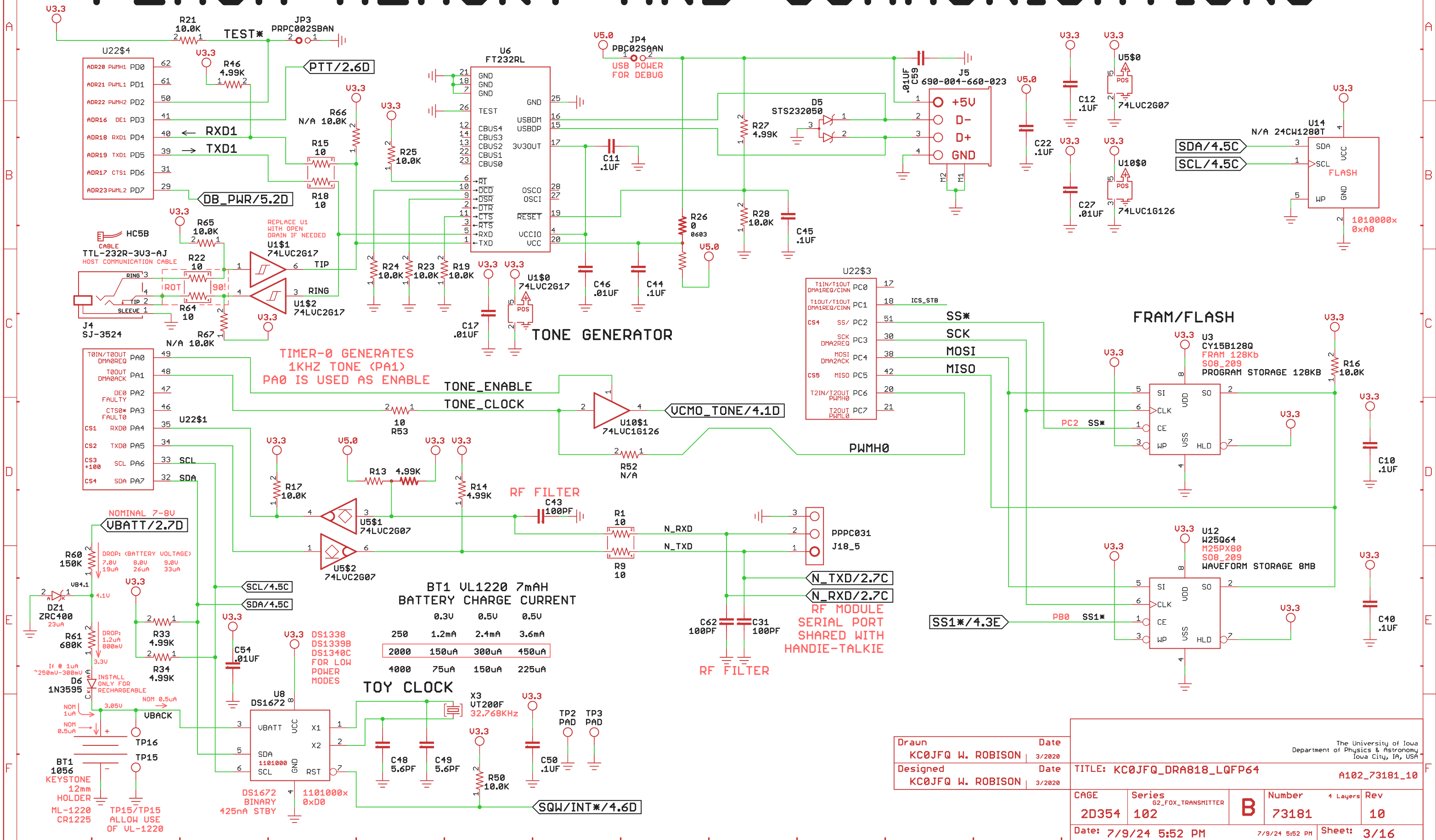
KC0JFQ

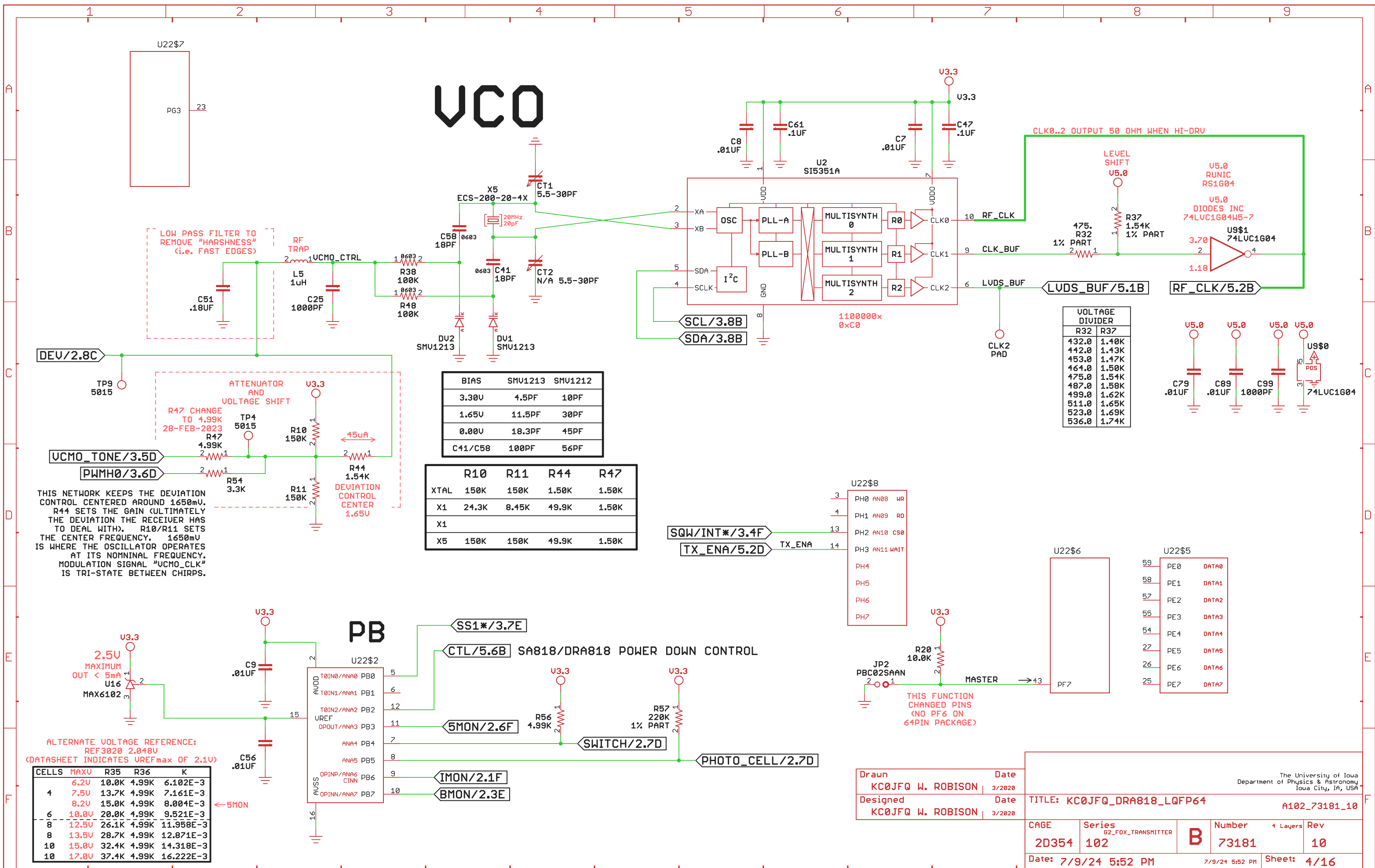
 THIS BOARD CONTAINS STATIC SENSITIVE DEVICES. HANDLE ONLY IN STATIC SAFE ENVIRONMENT		PWB RELEASED AS 2D354 102-73181-10	
DRAWING FRAME SHOWN ON CIRCUIT BOARD		PWA RELEASED AS 2D354 102-73181-10	
Drawn KC0JFQ W. ROBISON 3/2020		G2_FOX_TRANSMITTER The University of Iowa Department of Physics & Astronomy Iowa City, IA, USA	
Designed KC0JFQ W. ROBISON 3/2020		TITLE: KC0JFQ_DRA818_LQFP64 A102_73181_10	
MARK ZERO POINT FOR PICK & PLACE FILE ON PRINTED CIRCUIT BOARD		CAGE 2D354	Series G2_FOX_TRANSMITTER 102
		Number 73181	Rev 10
		Date: 7/9/24 5:52 PM	Sheet: 1/16

zNEO POWER, RESET, AND DEBUG

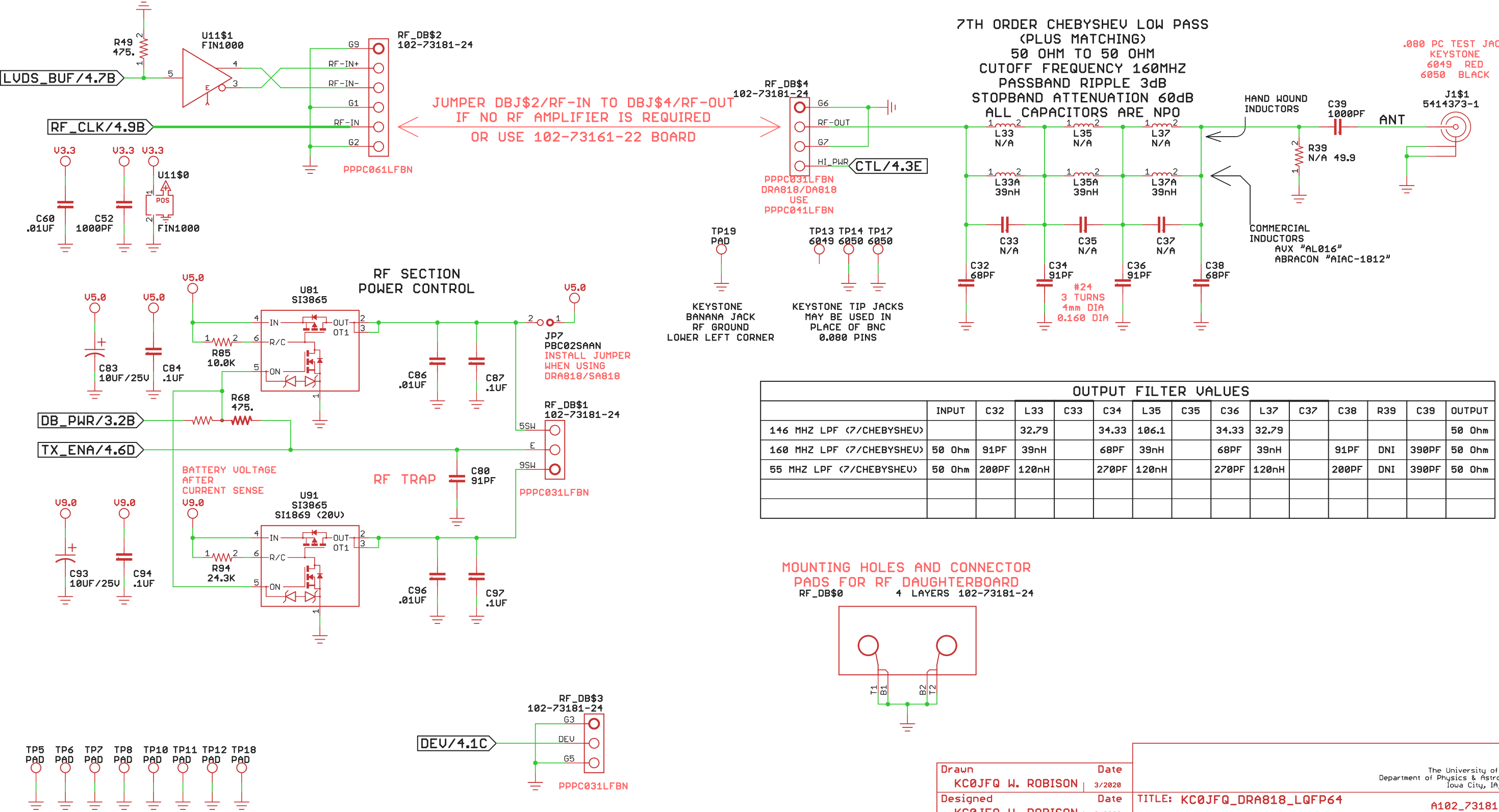


FLASH MEMORY AND COMMUNICATIONS





AMPLIFIER INTERFACE



MOUNTING HOLES AND CONNECTOR PADS FOR RF DAUGHTERBOARD
RF_DB\$0 4 LAYERS 102-73181-24

ICARC FOX TRANSMITTER

PORT BIT ASSIGNMENTS

	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0	BASE
PORT A	A<I/O> SDA	A<O> SCL	A<O> TXD0	A<I> RXD0			A<O> TIMER 0	0 TON_EN	
PORT B	A<A> BMON	A<A> IMON	A<A> CdS	A<A> SWITCH	A<A> 5MON	0 CTL		0 SS1*	
PORT C		A<O> PWMH0	A<I> MISO	A<O> MOSI	A<O> SCLK	A<O> SS*	0 ICS_STB (deprecated)	0 SER_SEL (deprecated)	
PORT D	0 DB_PWR		A<O> TXD1	A<I> RXD1	0 PTT	I TEST*			
PORT E									
PORT F	I MAS*	I (MAS*) 102-73181-5							
PORT G									
PORT H					0 TX_ENA	INT SQW/INT*			

ANALOG CHANNELS	
BMON	7 BATTERY MONITOR
IMON	6 CURRENT MONITOR
CdS	5 PHOTOCELL(J6)
SWITCH	4 SWITCH(J6)
5MON	3 5 VOLT MONITOR

SDA/SCL	I2C DEVICES
UART 0	SA818/DRA818 PORT
TIMER 0	CW TONE FREQUENCY
TONE_EN	CW TONE ENABLE
CTL	SA818/DRA818 POWER DOWN
SS1*	SPI: SECOND S08-209 FLASH
PWMH0	AUDIO DAC
MISO/MOSI/SCLK	SPI: DATA AND CLOCK
SS*	SPI: FIRST S08-209 FRAM
UART 1	CONFIGURATION PORT
PTT	HANDIE TALKIE PTT
TEST	TEST MODE
MAS	MASTER MODE
TX_ENA	DB POWER/RF ENABLE
SQW/INT*	WAKEUP FROM DS1339
DB_PWR	DAUGHTERBOARD POWER ENABLE

I	BIT INPUT
0	BIT OUTPUT
A<I>	ALTERNATE FUNCTION (INPUT)
A<O>	ALTERNATE FUNCTION (OUTPUT)
A<I/O>	ALTERNATE FUNCTION (I/O W/OPEN DRAIN)
A<A>	ALTERNATE FUNCTION (A/D)
INT	INTERRUPT/WAKEUP

SIGNALS DEPICTED IN RED
ARE LEFTOVER ALLOCATIONS
FROM PREVIOUS REVISIONS

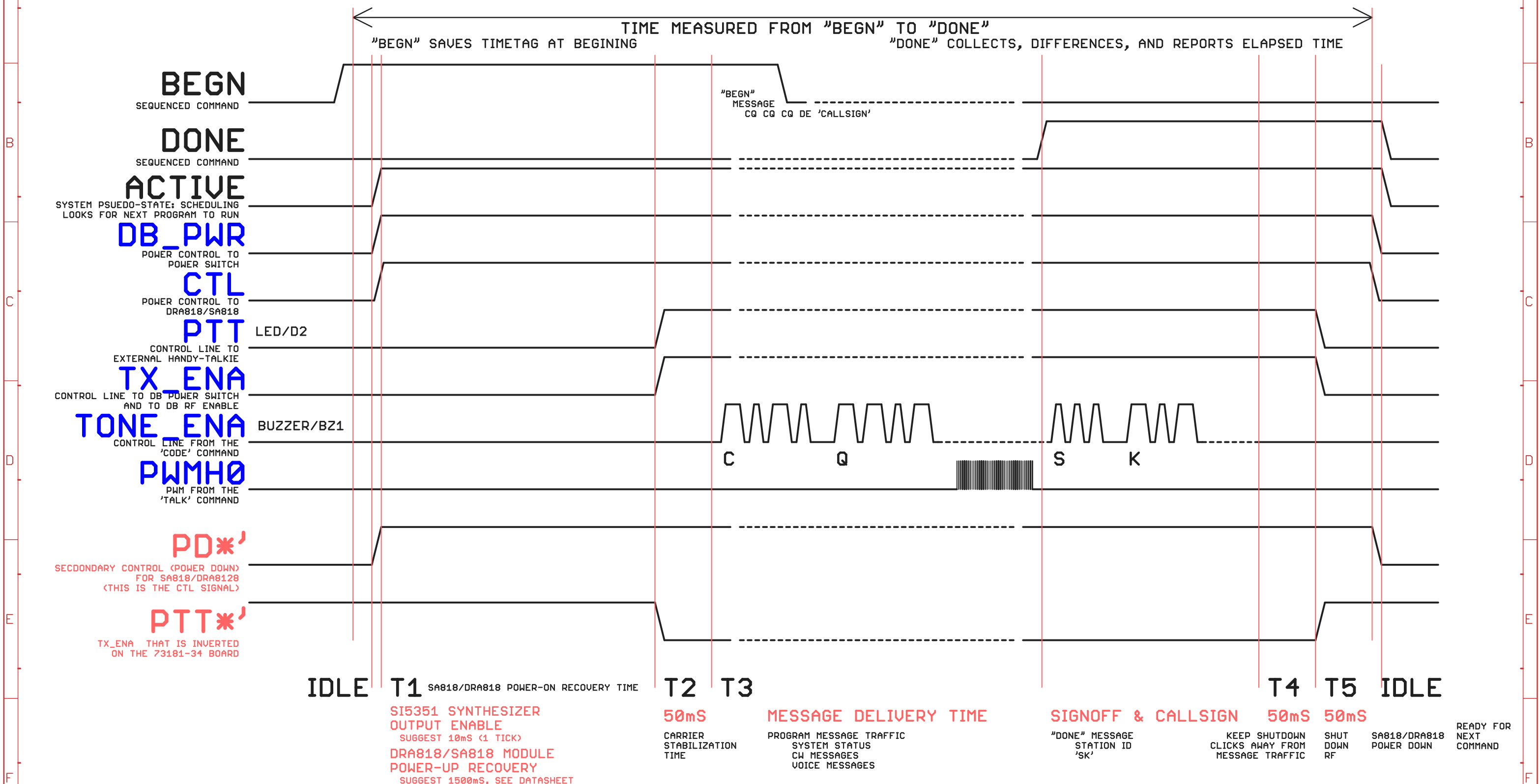
NOTE PACKAGE DRIVEN PIN CHANGE
(CONFIGURE BOTH PINS W/PULL-UP)

1		2		3		4		5		6		7		8		9	

ICARC FOX TRANSMITTER PORT DIFFERENCES

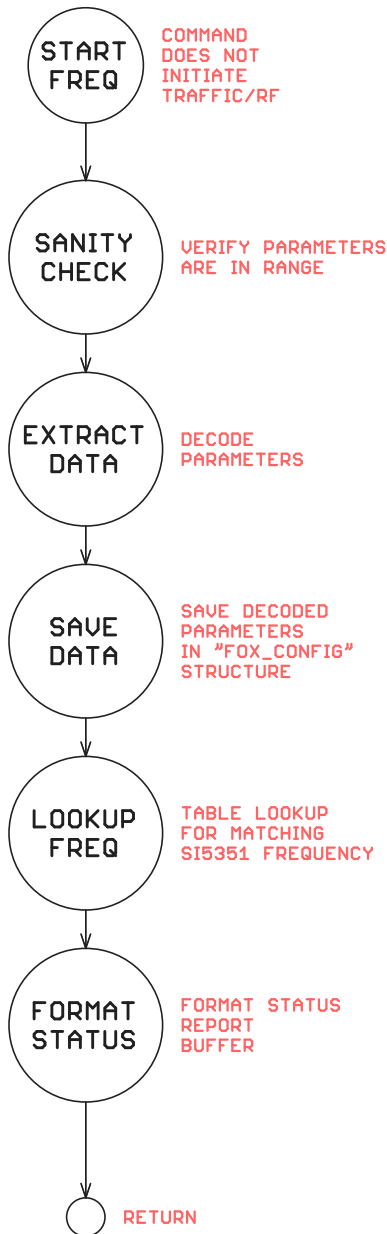
73181-10, 73181-5, 73181-0, 73161-25

TRANSMITTER ENABLE TIMING

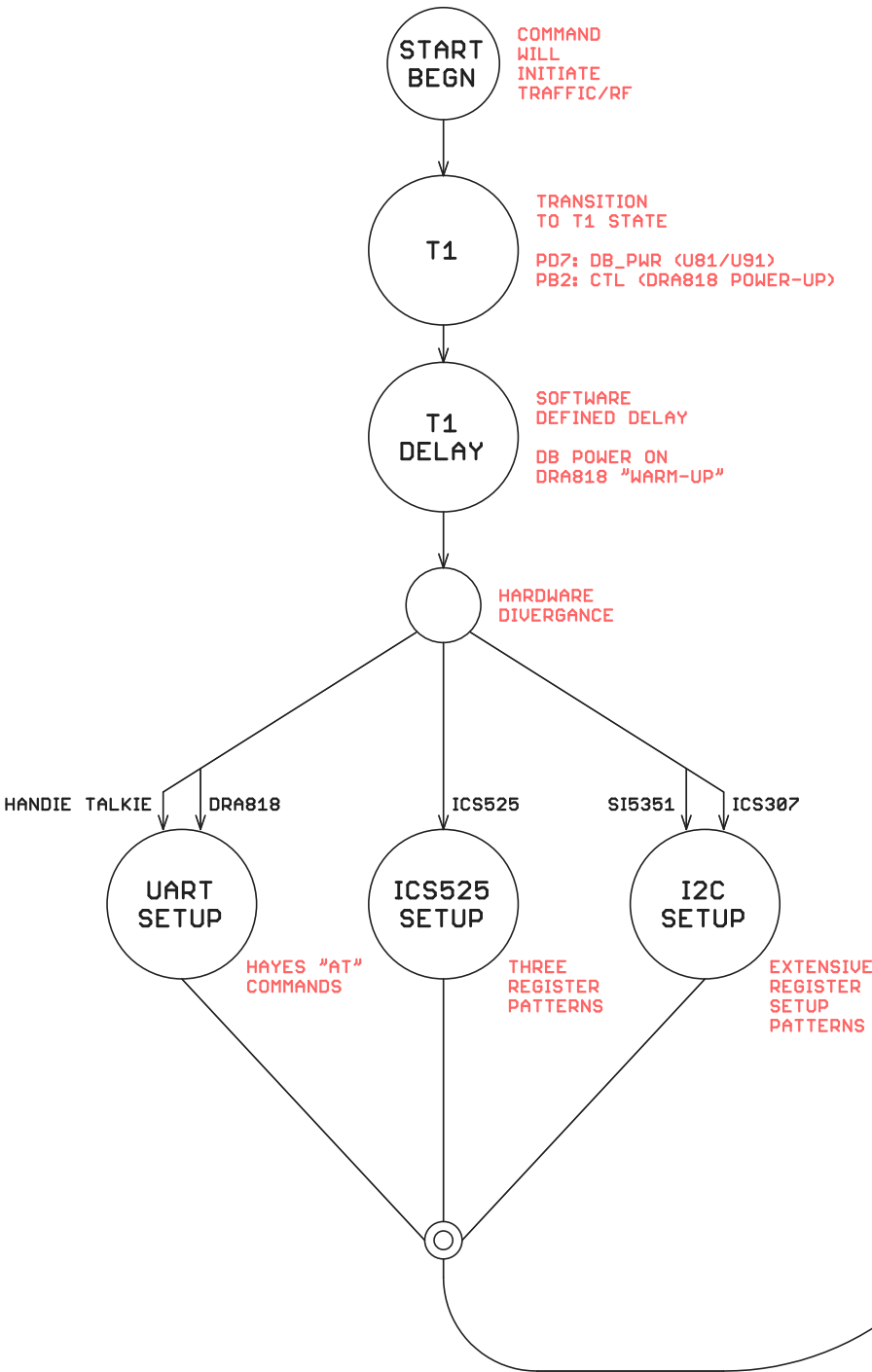


TRANSMITTER SETUP

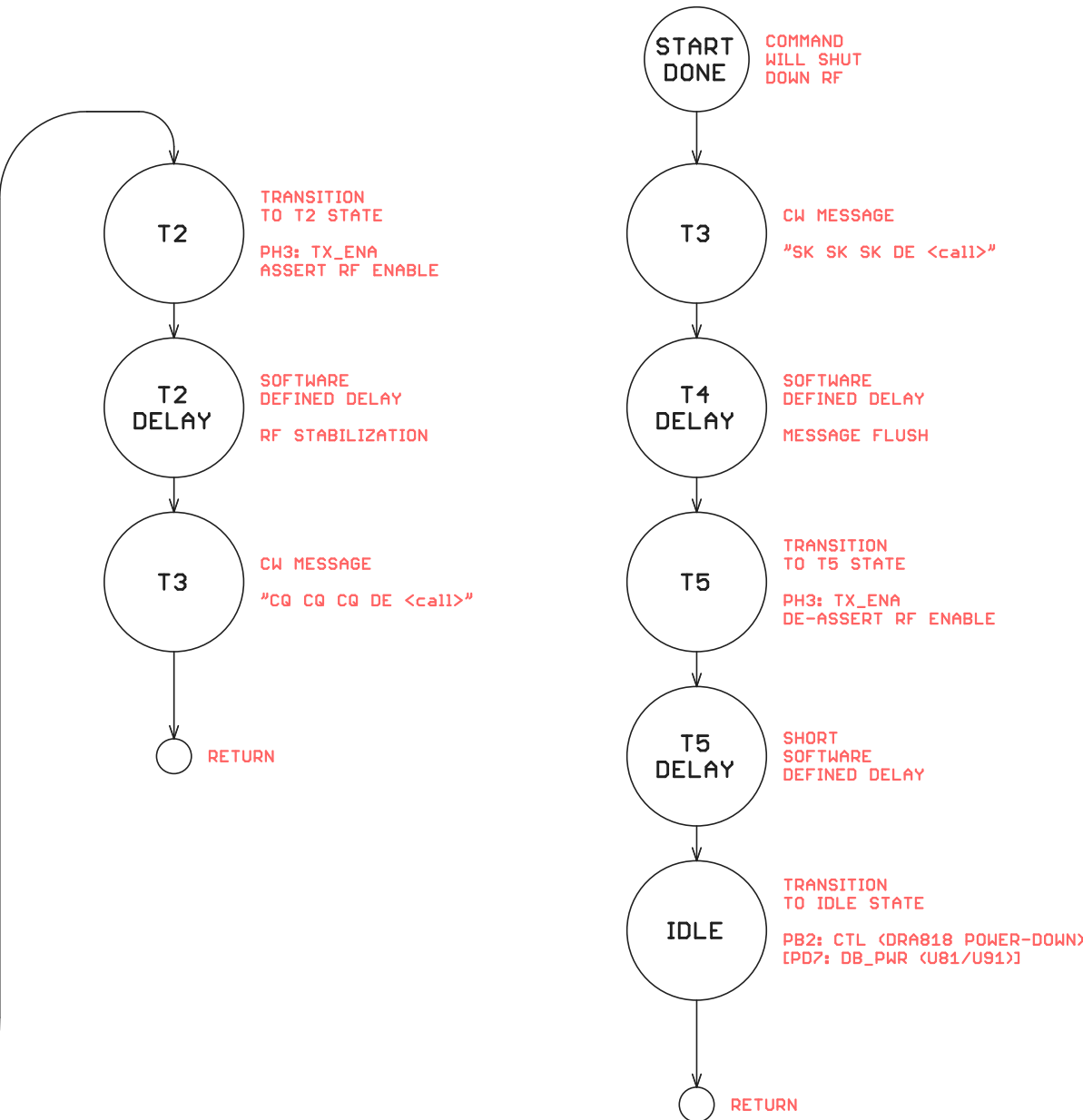
FREQ CMD_FREQUENCY



BEGN CMD_MESSAGE

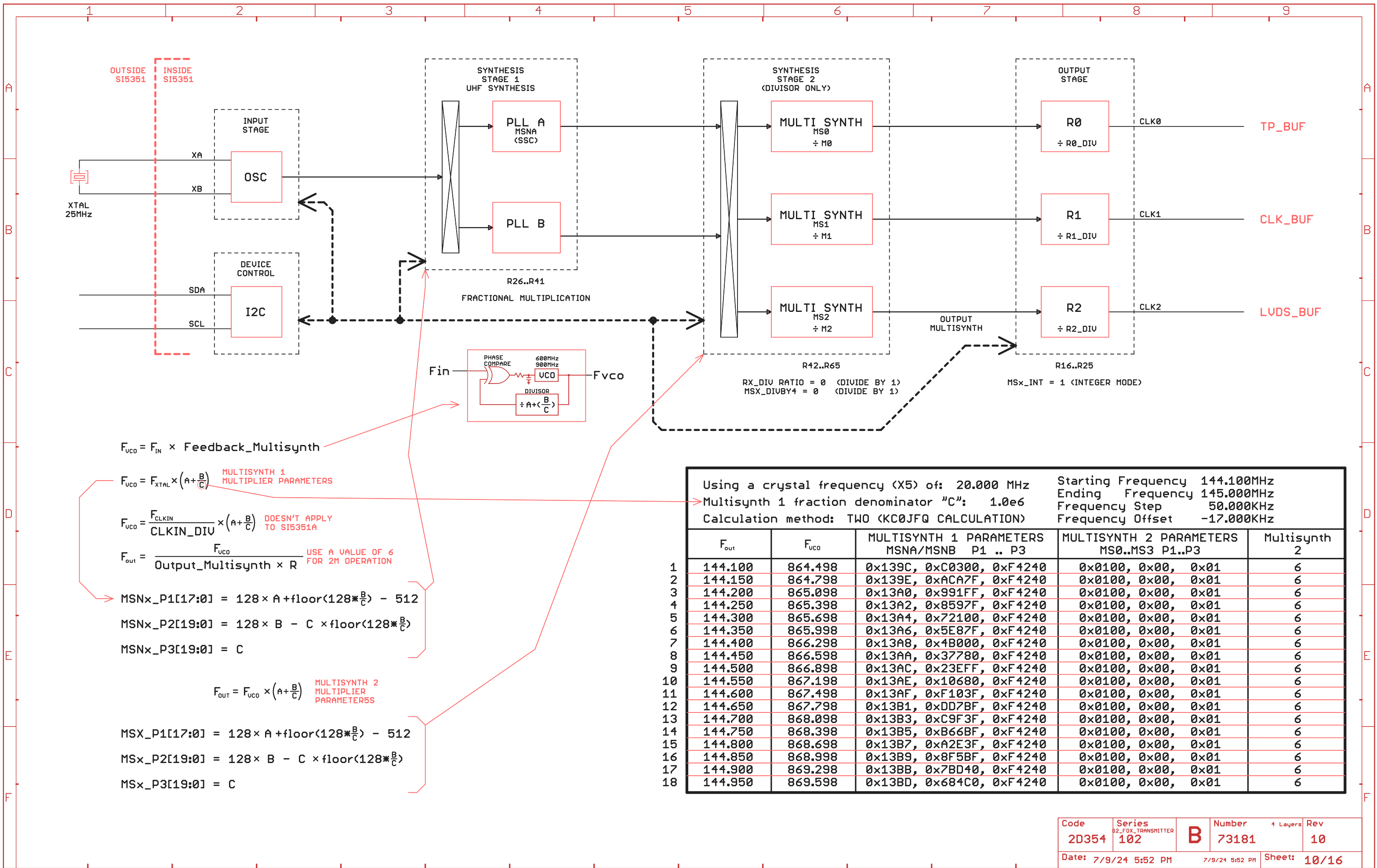


DONE CMD_MESSAGE



Drawn	Date
KC0JFQ W. ROBISON	3/2020
Designed	Date
KC0JFQ W. ROBISON	3/2020

The University of Iowa Department of Physics & Astronomy Iowa City, IA, USA				
TITLE: KC0JFQ_DRA818_LQFP64				
A102_73181_10				
CAGE	Series	B	Number	Rev
2D354	102		73181	10
Date: 7/9/24 5:52 PM		7/9/24 5:52 PM		Sheet: 9/16



$F_{VCO} = F_{IN} \times \text{Feedback_Multisynth}$

$F_{VCO} = F_{XTAL} \times \left(A + \frac{B}{C}\right)$ **MULTISYNTH 1 MULTIPLIER PARAMETERS**

$F_{VCO} = \frac{F_{CLKIN}}{CLKIN_DIV} \times \left(A + \frac{B}{C}\right)$ **DOESN'T APPLY TO SI5351A**

$F_{OUT} = \frac{F_{VCO}}{\text{Output_Multisynth} \times R}$ **USE A VALUE OF 6 FOR 2M OPERATION**

$MSNx_P1[17:0] = 128 \times A + \text{floor}(128 \times \frac{B}{C}) - 512$

$MSNx_P2[19:0] = 128 \times B - C \times \text{floor}(128 \times \frac{B}{C})$

$MSNx_P3[19:0] = C$

$F_{OUT} = F_{VCO} \times \left(A + \frac{B}{C}\right)$ **MULTISYNTH 2 MULTIPLIER PARAMETER5S**

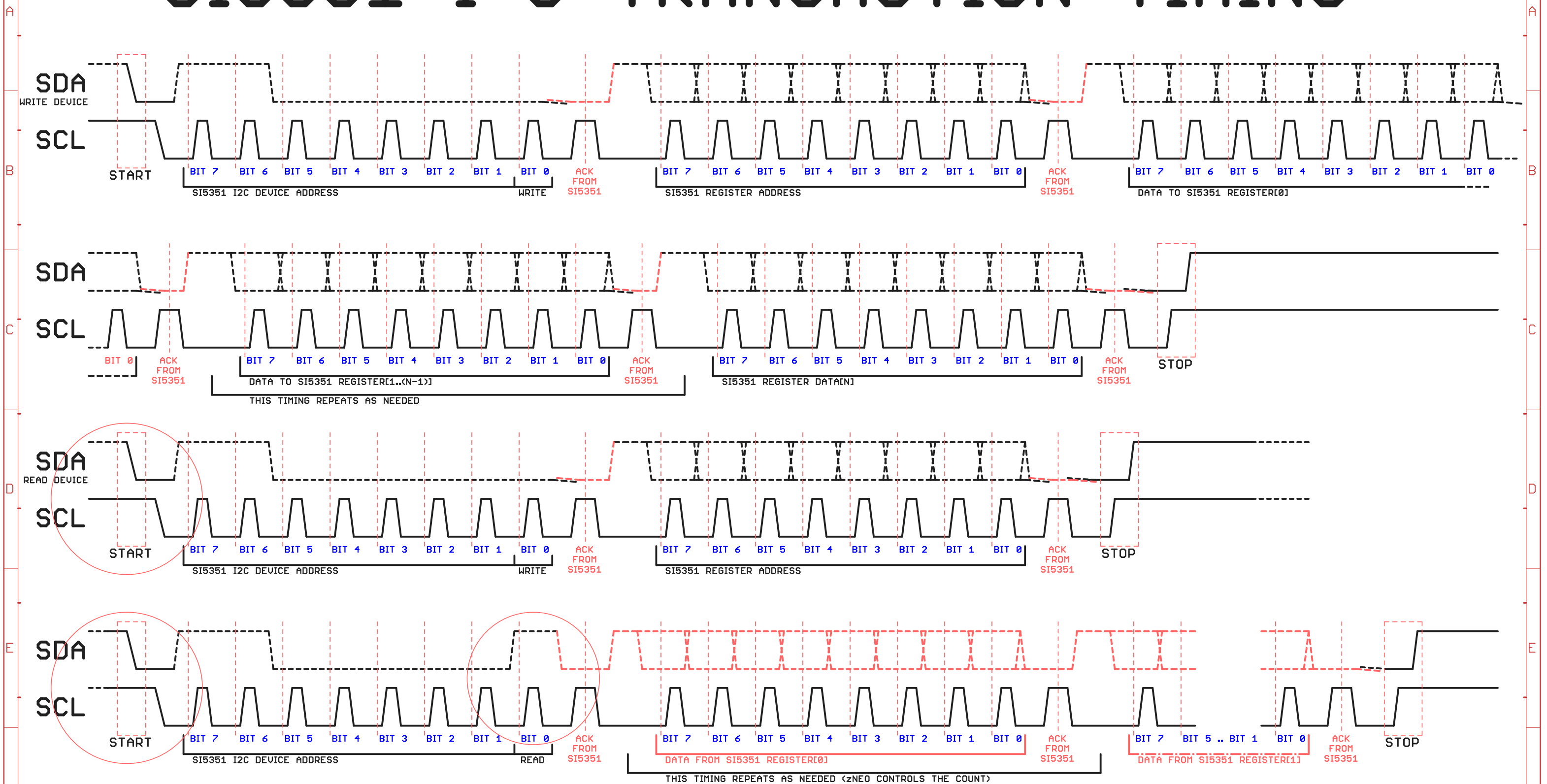
$MSX_P1[17:0] = 128 \times A + \text{floor}(128 \times \frac{B}{C}) - 512$

$MSx_P2[19:0] = 128 \times B - C \times \text{floor}(128 \times \frac{B}{C})$

$MSx_P3[19:0] = C$

Using a crystal frequency (X5) of: 20.000 MHz					Starting Frequency	144.100MHz
Multisynth 1 fraction denominator "C": 1.0e6					Ending Frequency	145.000MHz
Calculation method: TWO (K0JFQ CALCULATION)					Frequency Step	50.000KHz
					Frequency Offset	-17.000KHz
	F _{out}	F _{VCO}	MULTISYNTH 1 PARAMETERS MSNA/MSNB P1 .. P3	MULTISYNTH 2 PARAMETERS MS0..MS3 P1..P3	Multisynth 2	
1	144.100	864.498	0x139C, 0xC0300, 0xF4240	0x0100, 0x00, 0x01	6	
2	144.150	864.798	0x139E, 0xACA7F, 0xF4240	0x0100, 0x00, 0x01	6	
3	144.200	865.098	0x13A0, 0x991FF, 0xF4240	0x0100, 0x00, 0x01	6	
4	144.250	865.398	0x13A2, 0x8597F, 0xF4240	0x0100, 0x00, 0x01	6	
5	144.300	865.698	0x13A4, 0x72100, 0xF4240	0x0100, 0x00, 0x01	6	
6	144.350	865.998	0x13A6, 0x5E87F, 0xF4240	0x0100, 0x00, 0x01	6	
7	144.400	866.298	0x13A8, 0x4B000, 0xF4240	0x0100, 0x00, 0x01	6	
8	144.450	866.598	0x13AA, 0x37780, 0xF4240	0x0100, 0x00, 0x01	6	
9	144.500	866.898	0x13AC, 0x23EFF, 0xF4240	0x0100, 0x00, 0x01	6	
10	144.550	867.198	0x13AE, 0x10680, 0xF4240	0x0100, 0x00, 0x01	6	
11	144.600	867.498	0x13AF, 0xF103F, 0xF4240	0x0100, 0x00, 0x01	6	
12	144.650	867.798	0x13B1, 0xDD7BF, 0xF4240	0x0100, 0x00, 0x01	6	
13	144.700	868.098	0x13B3, 0xC9F3F, 0xF4240	0x0100, 0x00, 0x01	6	
14	144.750	868.398	0x13B5, 0xB66BF, 0xF4240	0x0100, 0x00, 0x01	6	
15	144.800	868.698	0x13B7, 0xA2E3F, 0xF4240	0x0100, 0x00, 0x01	6	
16	144.850	868.998	0x13B9, 0x8F5BF, 0xF4240	0x0100, 0x00, 0x01	6	
17	144.900	869.298	0x13BB, 0x7BD40, 0xF4240	0x0100, 0x00, 0x01	6	
18	144.950	869.598	0x13BD, 0x684C0, 0xF4240	0x0100, 0x00, 0x01	6	

SI5351 I²C TRANSACTION TIMING



WRITE TRANSACTIONS ALWAYS SET REGISTER ADDRESS
MANY REGISTER LOADS MAY OCCUR IN A TRANSACTION
READ TRANSACTIONS REQUIRE WRITE OF REGISTER ADDRESS
AND THEN A BURST OF READ TRANSACTIONS

FOX TRANSMITTER PREPARATION CHECKLIST												
UNIT	CONFIG FREQ 144.150	ANT ATTACHED	SCH LOADED	STATION		BATTERY VOLTAGE		SYSTEM TIME SET	OPERATING SCRIPTS PRESENT	WAV FILES PRESENT	STARTUP SCRIPT LINKED	COMMENTS AND NOTES
				FREQUENCY	DAUGHTERBOARD RF POWER	IDLE	TRANS					
FOX2												
FOX3												
FOX4												
FOX5												
FOX6												
FOX7												
FOX8												
FOX9												
FOX10												
FOX11												
FOX12												
FOX13												
FOX18												
FOX19												
FOX20												
FOX21												
FOX22												
FOX23												
FOX24												
FOX25												
FOX26												
FOX27												
FOX28												
FOX29												

COMMON
ALIVENESS
CHECK
FREQUENCY

144.150

Code
20354

Series
62_FOX_TRANSMITTER
102

Number
73181

Date: 7/9/24 5:52 PM

B

4 Layers

Rev
10

7/9/24 5:52 PM

Sheet: 12/16

FOX TRANSMITTER PREPARATION CHECKLIST														
UNIT	CONFIG FREQ 144.150	ANT ATTACHED	SCH LOADED	STATION		BATTERY VOLTAGE		BATTERY CURRENT		SYSTEM TIME SET	OPERATING SCRIPTS PRESENT	WAV FILES PRESENT	STARTUP SCRIPT LINKED	COMMENTS AND NOTES
				FREQUENCY	DAUGHTERBOARD RF POWER	IDLE	TRANS	IDLE	TRANS					
FOX2														
FOX3														
FOX4														
FOX5														
FOX6														
FOX7														
FOX8														
FOX20														
FOX21														
FOX22														
FOX23														
FOX24														
FOX25														
FOX26														

COMMON
ALIVENESS
CHECK
FREQUENCY

144.150

Code
2D354

Series
62_FOX_TRANSMITTER
102

B

Number
73181

4 Layers

Rev
10

Date: 7/9/24 5:52 PM

7/9/24 5:52 PM

Sheet: 13/16

[illegible]

[illegible]

B

[illegible]

15 MINUTE CYCLE (900S.)

S0																	
S1																	
S2																	
S3																	
S4																	
S5																	
S6																	
S7																	

B