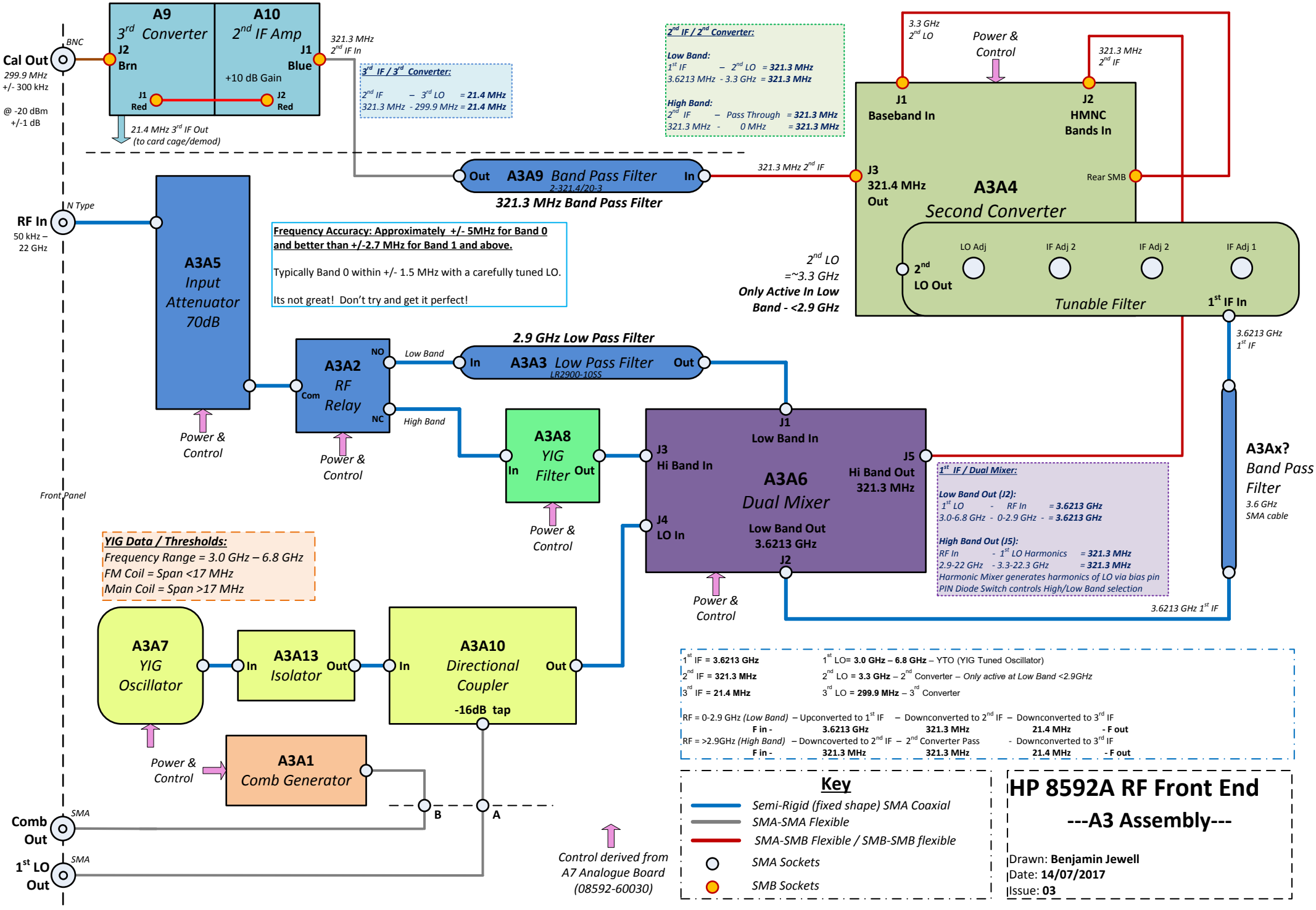

A9
3rd Converter
J2
Brn
J1
Red
A10
2nd IF Amp
+10 dB Gain
J1
Blue
J2
Red
BNC
Cal Out
299.9 MHz
+/- 300 kHz
@ -20 dBm
+/-1 dB
321.3 MHz
2nd IF In
21.4 MHz 3rd IF Out
(to card cage/demod)
3rd IF / 3rd Converter:
2nd IF – 3rd LO = 21.4 MHz
321.3 MHz - 299.9 MHz = 21.4 MHz
2nd IF / 2nd Converter:
Low Band:
1st IF – 2nd LO = 321.3 MHz
3.6213 MHz - 3.3 GHz = 321.3 MHz
High Band:
2nd IF – Pass Through = 321.3 MHz
321.3 MHz - 0 MHz = 321.3 MHz
3.3 GHz
2nd LO
Power & Control
321.3 MHz
2nd IF
J1
Baseband In
J2
HMNC
Bands In
Out
A3A9 Band Pass Filter
2-321.4/20-3
In
321.3 MHz Band Pass Filter
321.3 MHz 2nd IF
J3
321.4 MHz
Out
A3A4
Second Converter
Rear SMB
LO Adj
IF Adj 2
IF Adj 2
IF Adj 1
2nd
LO Out
Tunable Filter
1st IF In
2nd LO
=~3.3 GHz
Only Active In Low
Band - <2.9 GHz
N Type
RF In
50 kHz –
22 GHz
A3A5
Input
Attenuator
70dB
Frequency Accuracy: Approximately +/- 5MHz for Band 0
and better than +/-2.7 MHz for Band 1 and above.
Typically Band 0 within +/- 1.5 MHz with a carefully tuned LO.
Its not great! Don't try and get it perfect!
2.9 GHz Low Pass Filter
A3A2
RF
Relay
NO
Com
NC
Low Band
High Band
In
A3A3 Low Pass Filter
LR2900-10SS
Out
3.6213 GHz
1st IF
Power &
Control
A3A8
YIG
Filter
In
Out
J1
Low Band In
J3
Hi Band In
J4
LO In
A3A6
Dual Mixer
Low Band Out
3.6213 GHz
J2
J5
Hi Band Out
321.3 MHz
1st IF / Dual Mixer:
Low Band Out (J2):
1st LO - RF In = 3.6213 GHz
3.0-6.8 GHz - 0-2.9 GHz - = 3.6213 GHz
High Band Out (J5):
RF In - 1st LO Harmonics = 321.3 MHz
2.9-22 GHz - 3.3-22.3 GHz = 321.3 MHz
Harmonic Mixer generates harmonics of LO via bias pin
PIN Diode Switch controls High/Low Band selection
A3Ax?
Band Pass
Filter
3.6 GHz
SMA cable
3.6213 GHz 1st IF
Front Panel
YIG Data / Thresholds:
Frequency Range = 3.0 GHz – 6.8 GHz
FM Coil = Span <17 MHz
Main Coil = Span >17 MHz
A3A7
YIG
Oscillator
A3A13
Isolator
A3A10
Directional
Coupler
-16dB tap
A3A1
Comb Generator
B
A
SMA
Comb
Out
1st LO
Out
Control derived from
A7 Analogue Board
(08592-60030)
1st IF = 3.6213 GHz
1st LO= 3.0 GHz – 6.8 GHz – YTO (YIG Tuned Oscillator)
2nd IF = 321.3 MHz
2nd LO = 3.3 GHz – 2nd Converter – Only active at Low Band <2.9GHz
3rd IF = 21.4 MHz
3rd LO = 299.9 MHz – 3rd Converter
RF = 0-2.9 GHz (Low Band) – Upconverted to 1st IF – Downconverted to 2nd IF – Downconverted to 3rd IF
F in - 3.6213 GHz 321.3 MHz 21.4 MHz - F out
RF = >2.9GHz (High Band) – Downcoverted to 2nd IF – 2nd Converter Pass - Downconverted to 3rd IF
F in - 321.3 MHz 321.3 MHz 21.4 MHz - F out
Key
Semi-Rigid (fixed shape) SMA Coaxial
SMA-SMA Flexible
SMA-SMB Flexible / SMB-SMB flexible
SMA Sockets
SMB Sockets
HP 8592A RF Front End
---A3 Assembly---
Drawn: Benjamin Jewell
Date: 14/07/2017
Issue: 03

Low Band In : <2.9 GHz - Triple Conversion :

1st LO - RF In = Low Mixer Out (J2) = 1st IF
3.0-6.8 GHz - 0-2.9 GHz = 3.6213 GHz

1st IF into [2nd Converter] - 2nd LO = 2nd IF.
3.6213 GHz - 3.3 GHz = 321.3 MHz

2nd IF into [3rd Converter] - 3rd LO = 3rd IF
321.3 MHz - 299.9 MHz = 21.4 MHz

RF In + 1st LO = (1st IF) - 2nd LO = (2nd IF) - 3rd LO = (3rd IF)
3.6123 GHz 321.3 MHz 21.4 MHz

Test Results:
F in = 1 GHz Centre F
Zero Hz Span
YTO = 4.6213 GHz
= 3.6213 GHz 1st IF Out

50kHz - 2.9GHz

2.9 GHZ LPF

A3A3

A3A5 70 dB Input Attenuator

A3A2 µWave Relay

RF In
50kHz–22 GHz

A3A8 YIG Filter

2.9 GHz – 22 GHz

DUAL MIXER A3A6:

Low Band – Low Band is mixed with 1st LO to form 1st IF @ 3.6213 GHz

High Band – High Band is mixed with 1st LO Harmonics (selected by the bias pin) to form 2nd IF @ 321.3 MHz

The Dual Mixer A3A6 is a HARMONIC MIXER. Biasing selects frequency range / harmonic used.

Bias Voltage:

Band 0 : 0 - 2.9 GHz =	0.0 VDC
Band 1 : 2.75 - 6.2 GHz =	3.815 VDC
Band 2 : 6.0 – 12.8 GHz =	0.150 VDC
Band 3 : 12.4 – 19 GHz =	3.320 VDC
Band 4 : 19.1 – 22 GHz =	1.030 VDC

PIN Diode Switch:
Band 0 = +9.6 VDC = Fundamental Oscillator Frequency Output
Band 1-4 = -9.4 VDC = Harmonic Output.

J1 Low Band In

J3 Hi Band In

A3A6 Dual Mixer

J4 LO In

3.0 – 6.8 GHz

A3A10 Coupler — 1st LO Out

A3A13 Isolator

A3A7 YIG Oscillator

3.6213 GHz

3.6 GHz LPF

A3Ax?

J2 Low Band Out 3.6123 GHz

J5 Hi Band Out 321.3 MHz

321.3 MHz

2nd CONVERTER A3A4:

Low Band:
Low Band is converted from 1st IF to 2nd IF 3.6213 GHz to 321.3 MHz using 2nd LO

2nd Converter produces 2nd LO (3.3GHz) No reference or locking required. **Only Active in Low Band - <2.9 GHz**

High Band:
High Band passes through 2nd Converter – 321.3 MHz In to Out – J2 to J3

Band Switching is done by PIN Diode

3.3 GHz

2nd LO Out

2nd LO ONLY ACTIVE IN LOW BAND <2.9 GHz

Filter

1st IF In

J2 HMNC Bands In

A3A4 Second Converter

J1 Baseband In

Rear SMB
- Active when in Low Band.
2nd LO Output

3.3 GHz

J3 321.3 MHz Out

321.3 MHz

321.3 MHz BPF

A3A9

LO's & IF's

1st LO = 3.0 GHz – 6.8 GHz* - Origin: YIG Oscillator
2nd LO = 3.3 GHz* - Origin: 2nd Converter
3rd LO = 299.9 MHz – Origin: 3rd Converter (also Cal. Ref.)
**1st & 2nd LO NOT Phase-Locked to Ref. Therefore some frequency drift occurs.*

1st IF = 3.6213 GHz
2nd IF = 321.3 MHz
3rd IF = 21.4 MHz

3rd CONVERTER A9:

2nd IF Converted to 3rd IF

321.3 MHz to 21.4 MHz

J1 Blue 321.3 MHz In

A10
2nd IF Amp (10 dB Gain)

321.3 MHz

A9
Third Converter

3rd LO 299.9 MHz

3rd LO Osc. 299.9 MHz

Cal. Out
299.9 MHz (+/-300 kHz)
@ -20 dBm (+/-1 dB)

21.4 MHz

21.4 MHz
3rd IF Out
-36 dBm to -39 dBm

Note:
3rd Converter Oscillator is a modified Colpitts Oscillator. A9Y1 Xtal is a 299.9 MHz SAW Resonator therefore due to parasitic/stray capacitances output frequency will always be lower than 299.9 MHz

Frequency Accuracy: Approximately +/- 5MHz for Band 0 and better than +/-2.7 MHz for Band 1 and above.

Typically Band 0 within +/- 1.5 MHz with a carefully tuned LO.

High Band In : 2.9 - 22 GHz - Double Conversion :

RF In – 1st LO Harmonics = Hi Mixer Out (J5) = 2nd IF
2.9-22 GHz - 3.0-6.8 GHz Harmonics = 321.3 MHz

2nd IF [into 2nd Converter] – Pass Through
321.3 MHz - 0 MHz = 321.3 MHz

2nd IF [into 3rd Converter] - 3rd LO = 3rd IF
321.3 - 299.9 MHz = 21.4 MHz

RF In - 1st LO Harmonics = (2nd IF) - 3rd LO = (3rd IF)
321.3 MHz 21.4 MHz

YIG OSCILLATOR (YTO) A3A7:

Output Frequency set by **CENTRE FREQUENCY** on analyser.

Frequency Sweep controlled by **SPAN**.

0Hz Span = No Sweep (stable LO)

Key

- *High Band Signal Route >2.9 GHz*
- *Low Band Signal Route <2.9 GHz*
- *2nd IF Signal 321.3 MHz*
- *3rd IF Signal 21.4 MHz*
- *1st LO 3.0-6.8 GHz – YIG Osc.*

HP 8592A RF Block Diagram

---A3 Assembly---

Drawn: **Benjamin Jewell**
Date: **14/07/2017**
Issue: **03**