

*Two-section 160 meter BPF plus 32 MHz LPF

*LPF 32 MHz

CA:120PF
CB:200PF
LLP:0.341UH
QQ:150
FF:32MHZ

BLK

CAP 1 0 C=CA
IND 1 2 L=LLP Q=QQ F=FF
CAP 2 0 C=CB
IND 2 3 L=LLP Q=QQ F=FF
CAP 3 0 C=CA

LPF: 2POR 13
END

*NBPF, SHUNT-COUPLED

QL:200
QC:4000
C2:1500PF
C1:560PF
CS:2700PF
LL:17.07UH
FO:1.9MHZ

BLK

CAP 1 0 C=C2 Q=QC F=F0
CAP 1 2 C=C1 Q=QC F=F0
IND 2 3 L=LL Q=QL F=F0
CAP 3 0 C=CS Q=QC F=F0
IND 3 4 L=LL Q=QL F=F0
CAP 4 5 C=C1 Q=QC F=F0
CAP 5 0 C=C2 Q=QC F=F0
LPF 5 6

FILTER2:2POR 1 6
END

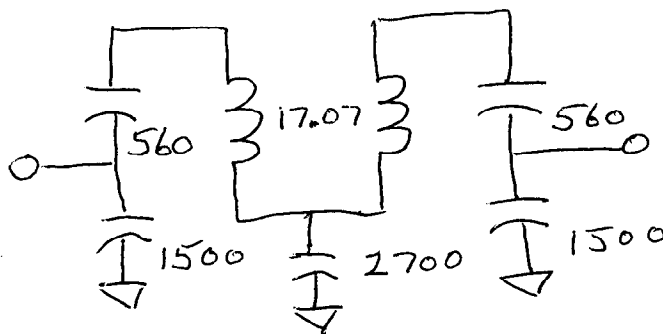
FREQ

STEP 1.6MHZ 2.3MHZ 5KHZ

ESTP 1MHZ 100MHZ 300

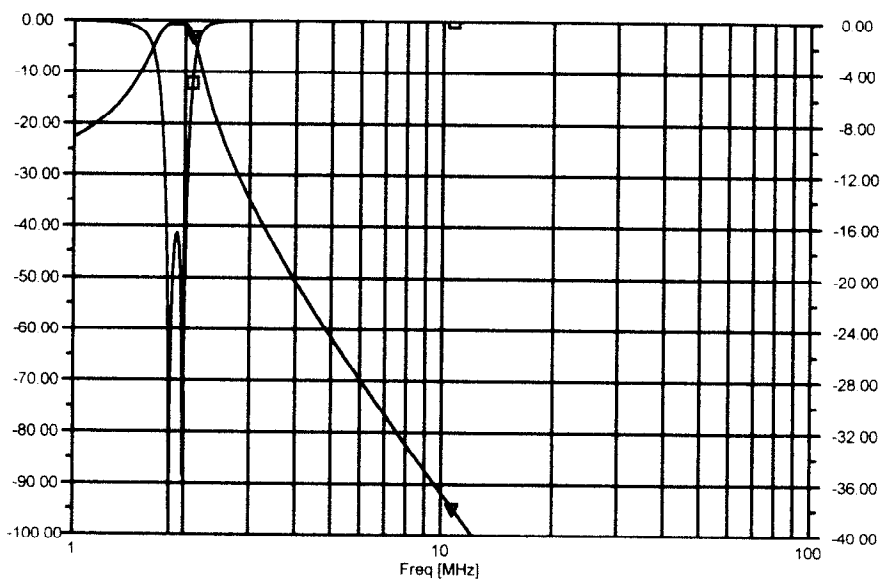
END

*COIL: 53 TURNS #28, 330 DEGREES, T80-2 CORE

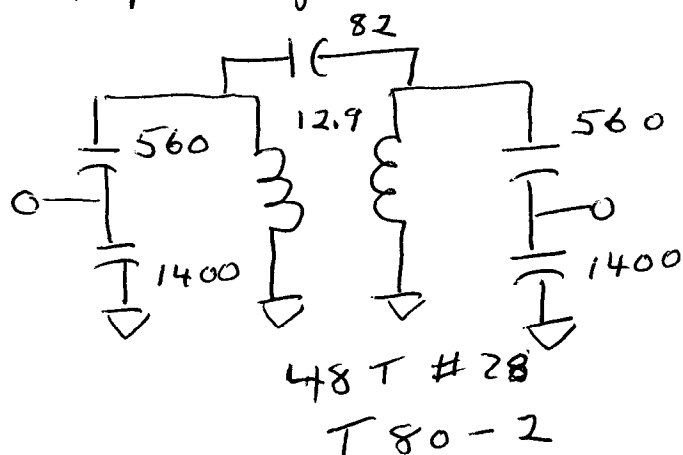


▼ MS21 [dB] FILTER2

□ MS11 [dB] FILTER2

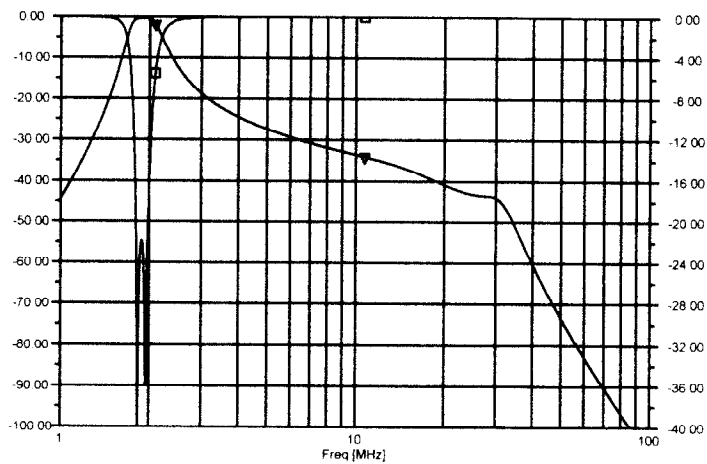


Top-Coupled



▼ MS21 [dB] FILTER2

□ MS11 [dB] FILTER2



160 M NBPF + LPF

*Two-section 80 meter BPF plus 32 MHz LPF

*LPF 32 MHz

CA:120PF
CB:200PF
LLP:0.341UH
QQ:150
FF:32MHZ

BLK
CAP 1 0 C=CA
IND 1 2 L=LLP Q=QQ F=FF
CAP 2 0 C=CB
IND 2 3 L=LLP Q=QQ F=FF
CAP 3 0 C=CA
LPF: 2POR 1 3
END

*NBPF, SHUNT-COUPLED

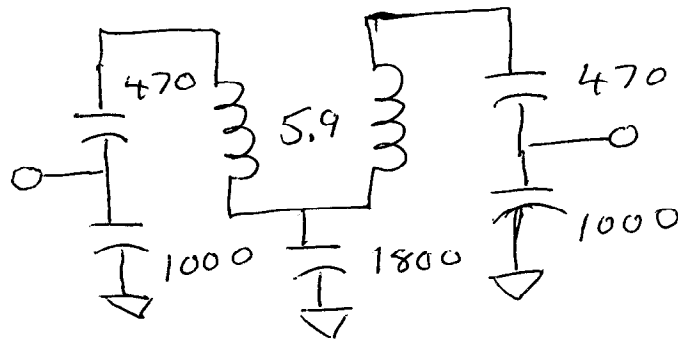
QL:180
QC:4000
C2:1000PF
C1:470PF
CS:1800PF
LL:5.9UH
F0:3.5MHZ

BLK
CAP 1 0 C=C2 Q=QC F=F0
CAP 1 2 C=C1 Q=QC F=F0
IND 2 3 L=LL Q=QL F=F0
CAP 3 0 C=CS Q=QC F=F0
IND 3 4 L=LL Q=QL F=F0
CAP 4 5 C=C1 Q=QC F=F0
CAP 5 0 C=C2 Q=QC F=F0
LPF 5 6

FILTER2:2POR 1 6
END

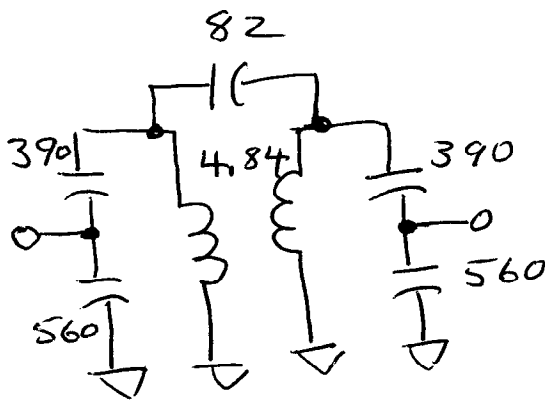
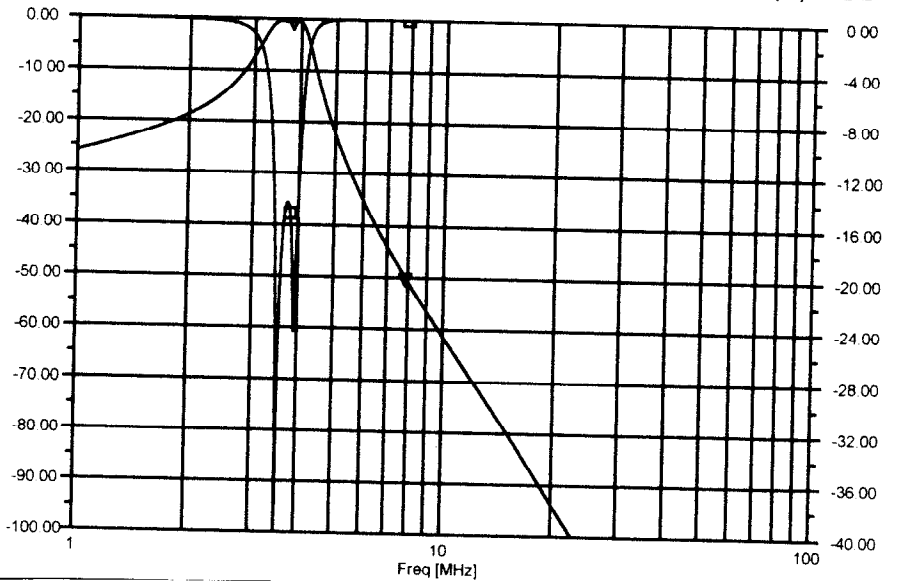
FREQ
STEP 3MHZ 5MHZ 10KHZ
ESTP 1MHZ 100MHZ 300
END

*COIL: 22 TURNS #28, 270 DEGREES, (2) T50-2 CORES



▼ MS21 [dB] FILTER2

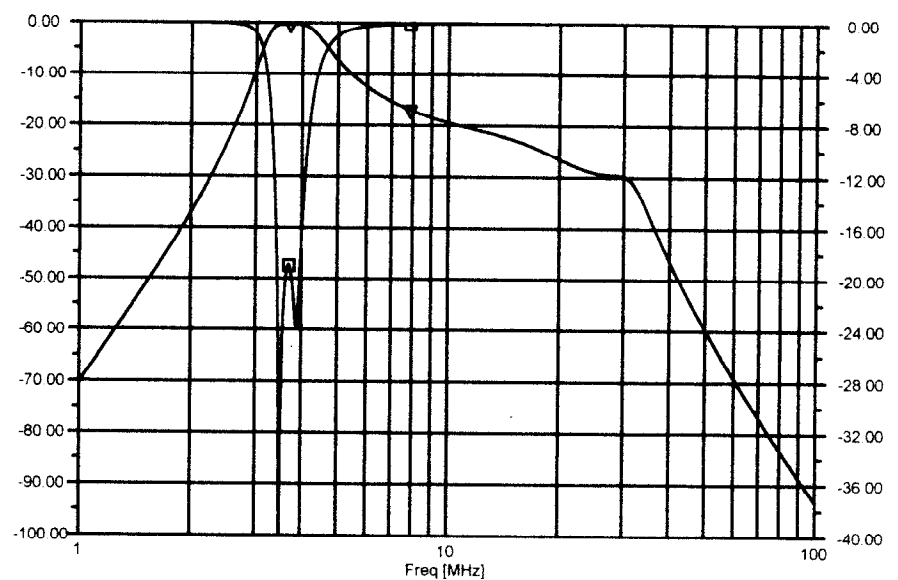
■ MS11 [dB] FILTER2



(2) T50-2
30 T #28

▼ MS21 [dB] FILTER2

■ MS11 [dB] FILTER2



80M NBPF + LPF

*Two-section 40 meter BPF plus 32 MHz LPF

*LPF 32 MHz

CA:120PF
CB:200PF
LLP:0.341UH
QQ:150
FF:32MHZ

BLK
CAP 1 0 C=CA
IND 1 2 L=LLP Q=QQ F=FF
CAP 2 0 C=CB
IND 2 3 L=LLP Q=QQ F=FF
CAP 3 0 C=CA
LPF 2POR 1 3
END

*NBPF, SHUNT-COUPLED

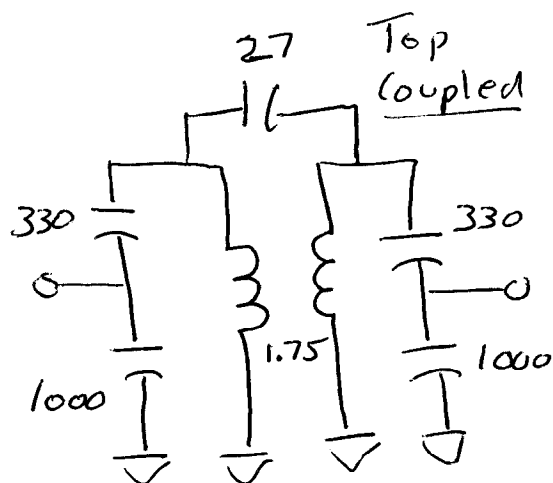
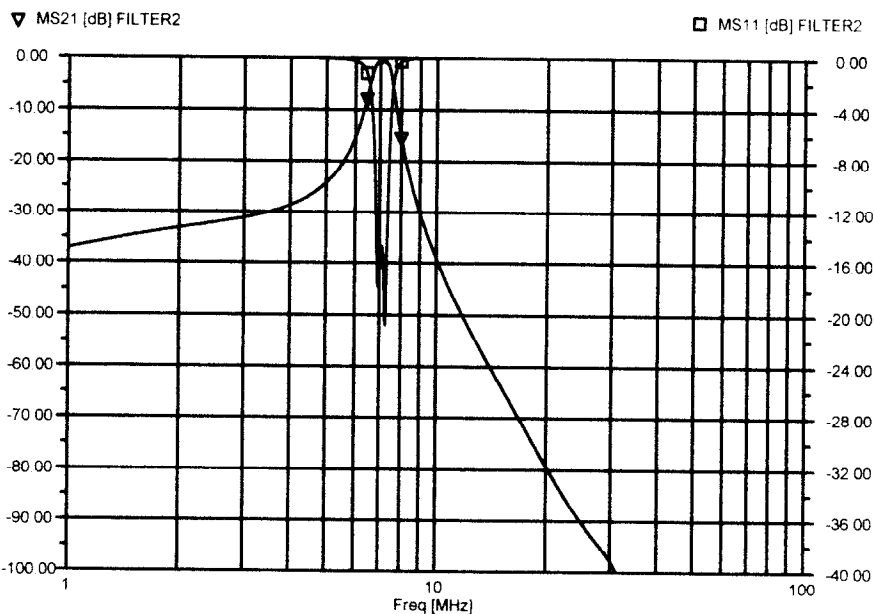
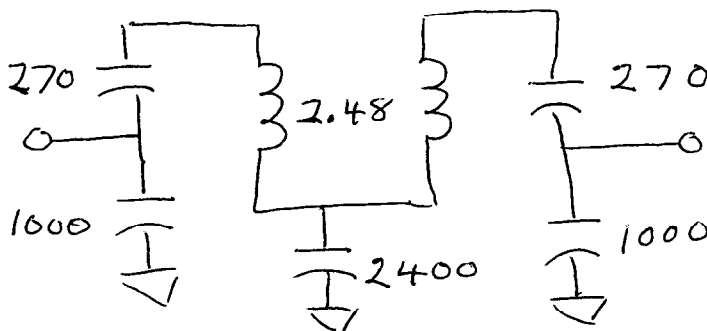
QL:180
QC:4000
C2:1000PF
C1:270PF
CS:2400PF
LL:2.46UH
F0:7MHz

BLK
CAP 1 0 C=C2 Q=QC F=F0
CAP 1 2 C=C1 Q=QC F=F0
IND 2 3 L=LL Q=QL F=F0
CAP 3 0 C=CS Q=QC F=F0
IND 3 4 L=LL Q=QL F=F0
CAP 4 5 C=C1 Q=QC F=F0
CAP 5 0 C=C2 Q=QC F=F0
LPF 5 6

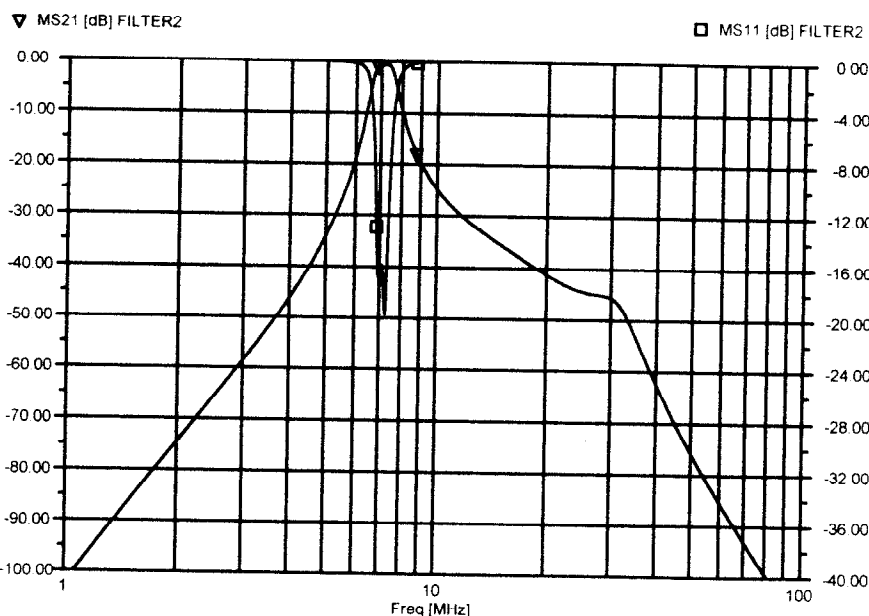
FILTER2:2POR 1 6
END

FREQ
STEP 6MHZ 8MHZ 10KHZ
ESTP 1MHZ 100MHZ 300
END

*COIL: 13 TURNS #26, 270 DEGREES, (2)T50-2 CORES



12T #28 (2) T50-2



40M NBPF + LPF

*Two-section 30 meter BPF plus 32 MHz LPF

*LPF 32 MHZ

CA:120PF
CB:200PF
LLP:0.341UH
QQ:150
FF:32MHZ

BLK

CAP 1 0 C=CA
IND 1 2 L=LLP Q=QQ F=FF
CAP 2 0 C=CB
IND 2 3 L=LLP Q=QQ F=FF
CAP 3 0 C=CA

LPF: 2POR 1 3
END

*NBPF, SHUNT-COUPLED

QL:180
QC:4000
C2:1000PF
C1:220PF
CS:3190PF
LL:1.41UH
F0:10MHz

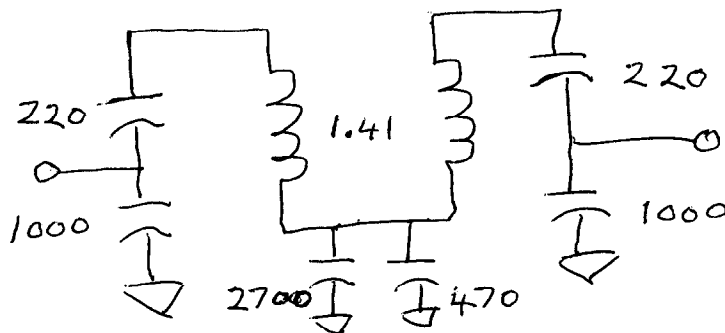
BLK

CAP 1 0 C=C2 Q=QC F=F0
CAP 1 2 C=C1 Q=QC F=F0
IND 2 3 L=LL Q=QL F=F0
CAP 3 0 C=CS Q=QC F=F0
IND 3 4 L=LL Q=QL F=F0
CAP 4 5 C=C1 Q=QC F=F0
CAP 5 0 C=C2 Q=QC F=F0
LPF 5 6

FILTER2:2POR 1 6
END

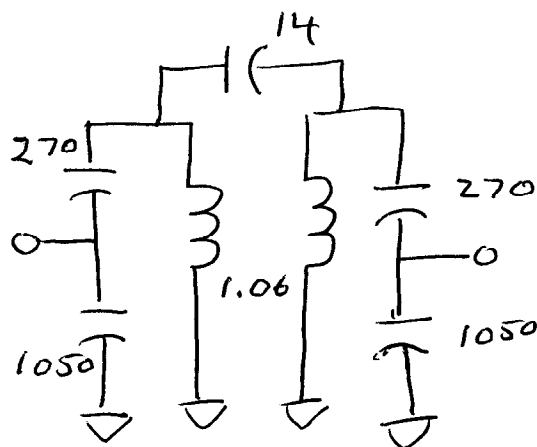
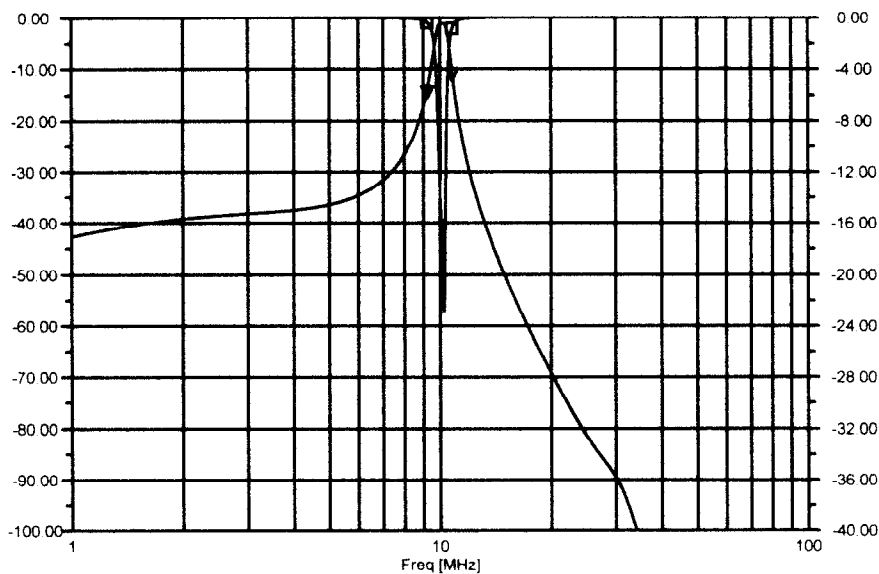
FREQ
STEP 9MHZ 11MHZ 10KHZ
ESTP 1MHZ 100MHZ 300
END

*COIL: 16 TURNS #26, 270 DEGREES, T50-2 CORE



▼ MS21 [dB] FILTER2

□ MS11 [dB] FILTER2

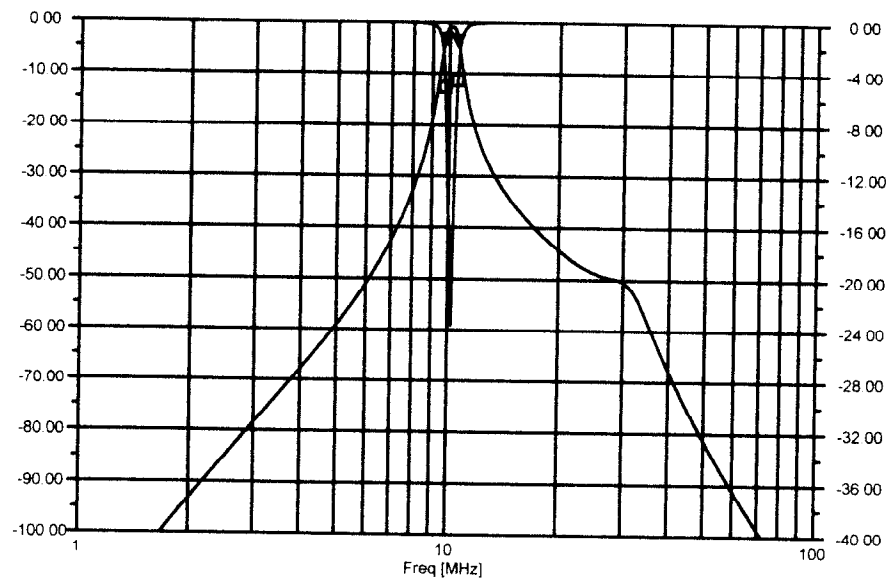


14T #28

(1) T50-2

▼ MS21 [dB] FILTER2

□ MS11 [dB] FILTER2



30 M NBPF + LPF

*Two-section 20 meter BPF plus 32 MHz LPF

*LPF 32 MHz

CA:120PF
CB:200PF
LLP:0.341UH
QQ:150
FF:32MHZ

BLK
CAP 1 0 C=CA
IND 1 2 L=LLP Q=QQ F=FF
CAP 2 0 C=CB
IND 2 3 L=LLP Q=QQ F=FF
CAP 3 0 C=CA
LPF: 2POR 1 3
END

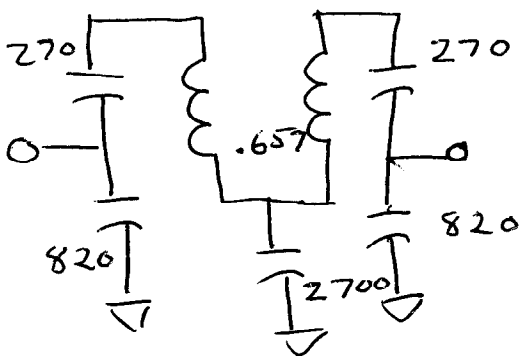
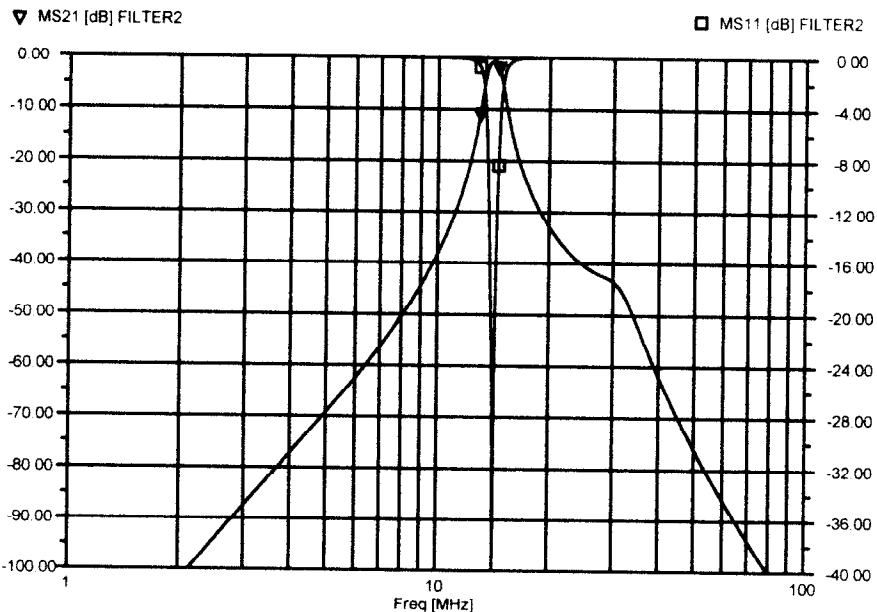
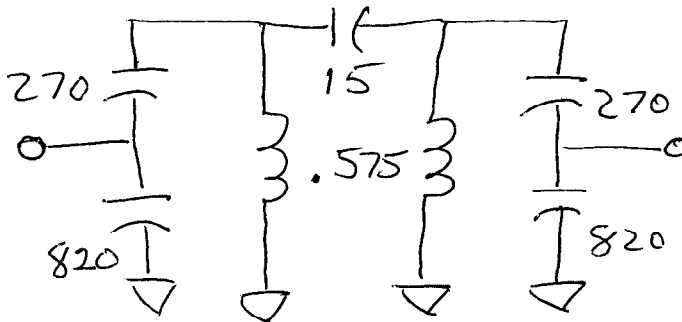
*NBPF, TOP-COUPLED

QL:180
QC:4000
C2:820PF
C1:270PF
CT:15PF
LL:0.575UH
FO:14MHz

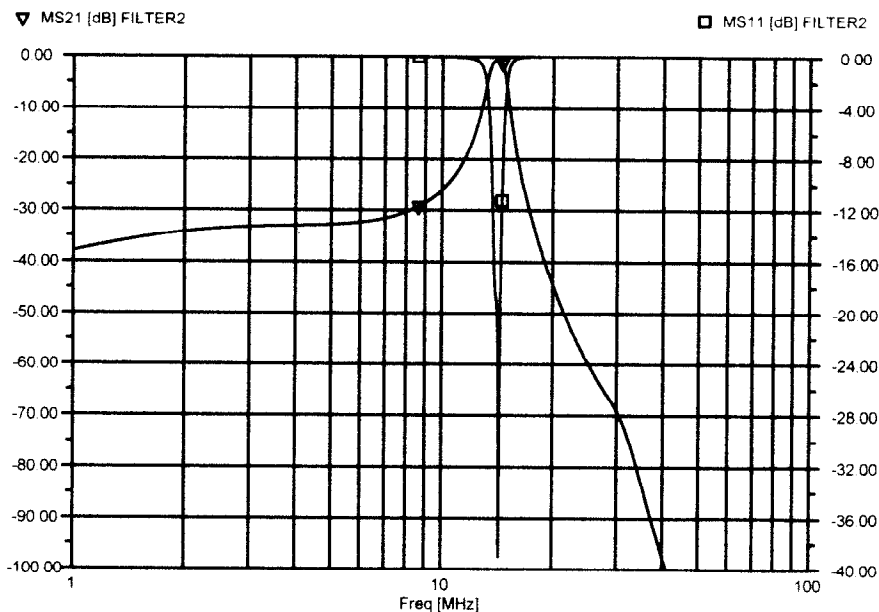
BLK
CAP 1 0 C=C2 Q=QC F=F0
CAP 1 2 C=C1 Q=QC F=F0
IND 2 0 L=LL Q=QL F=F0
IND 3 0 L=LL Q=QL F=F0
CAP 3 4 C=C1 Q=QC F=F0
CAP 4 0 C=C2 Q=QC F=F0
CAP 2 3 C=CT
LPF 4 5
FILTER2:2POR 1 5
END

FREQ
STEP 13MHZ 15MHZ 10KHZ
ESTP 1MHZ 100MHZ 300
END

*COIL: 10 TURNS #26, 240 DEGREES, T50-6 CORE



12 T #28
(1) T50-6



20M NBPF + LPF

*Two-section 17 meter BPF plus 32 MHz LPF

*LPF 32 MHZ

CA:120PF
CB:200PF
LLP:0.341UH
QQ:150
FF:32MHZ

BLK
CAP 1 0 C=CA
IND 1 2 L=LLP Q=QQ F=FF
CAP 2 0 C=CB
IND 2 3 L=LLP Q=QQ F=FF
CAP 3 0 C=CA
LPF: 2POR 1 3
END

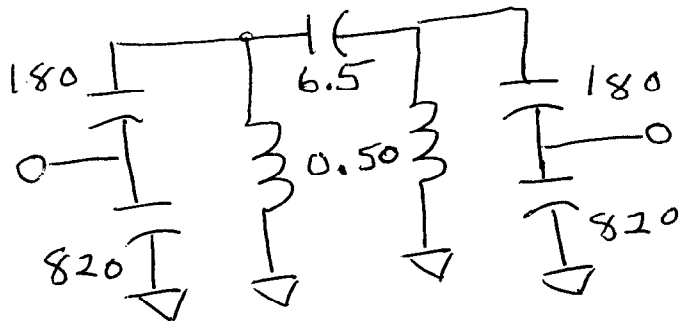
*NBPF, TOP-COUPLED

QL:180
QC:4000
C2:820PF
C1:180PF
CT:6.5PF
LL:0.50UH
F0:18MHZ

BLK
CAP 1 0 C=C2 Q=QC F=F0
CAP 1 2 C=C1 Q=QC F=F0
IND 2 0 L=LL Q=QL F=F0
IND 3 0 L=LL Q=QL F=F0
CAP 3 4 C=C1 Q=QC F=F0
CAP 4 0 C=C2 Q=QC F=F0
CAP 2 3 C=CT
LPF 4 5
FILTER2:2POR 1 5
END

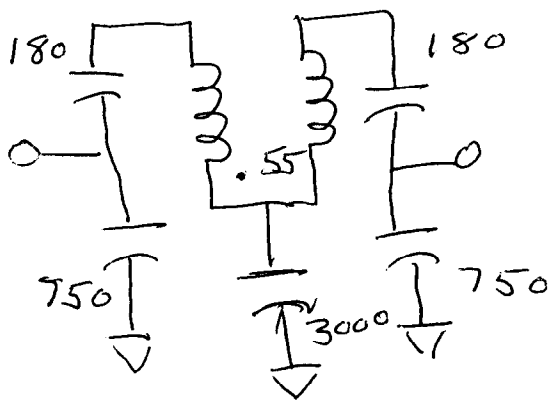
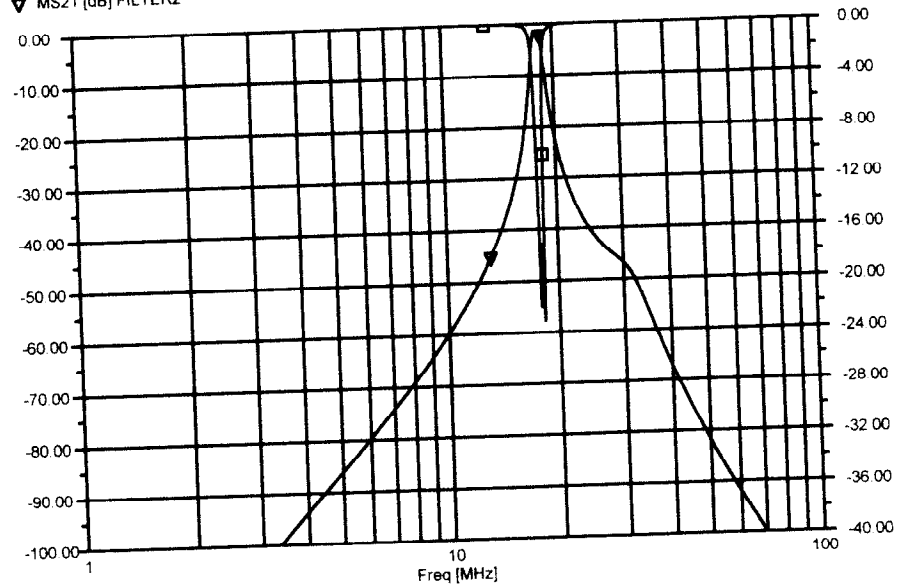
FREQ
STEP 17MHZ 19MHZ 10KHZ
ESTP 1MHZ 100MHZ 300
END

*COIL: 10 TURNS #26, 270 DEGREES, T50-6 CORE



▼ MS21 [dB] FILTER2

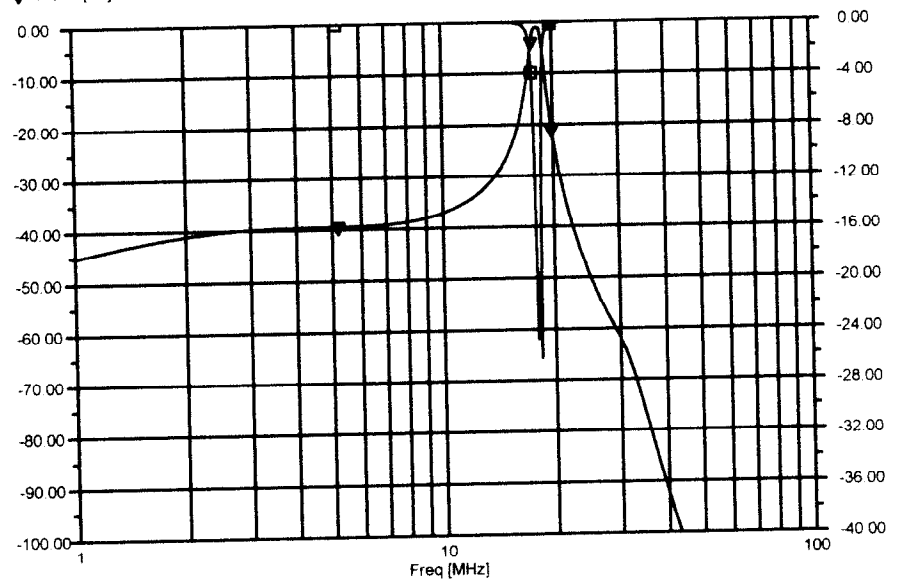
□ MS11 [dB] FILTER2



11 T #26 (1) T50-6

▼ MS21 [dB] FILTER2

□ MS11 [dB] FILTER2



17 M NBPF + LPF

*Two-section 15 meter BPF plus 32 MHz LPF

*LPF 32 MHz

CA:120PF
CB:200PF
LLP:0.341UH
QQ:150
FF:32MHZ

BLK

CAP 1 0 C=CA
IND 1 2 L=LLP Q=QQ F=FF
CAP 2 0 C=CB
IND 2 3 L=LLP Q=QQ F=FF
CAP 3 0 C=CA

LPF: 2POR 1 3
END

*NBPF, TOP-COUPLED

QL:180
QC:4000
C2:470PF
C1:150PF
CT:8.0PF
LL:0.455UH
F0:21.2MHZ

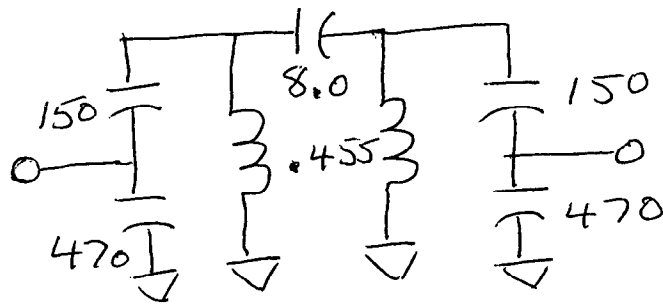
BLK

CAP 1 0 C=C2 Q=QC F=F0
CAP 1 2 C=C1 Q=QC F=F0
IND 2 0 L=LL Q=QL F=F0
IND 3 0 L=LL Q=QL F=F0
CAP 3 4 C=C1 Q=QC F=F0
CAP 4 0 C=C2 Q=QC F=F0
CAP 2 3 C=CT
LPF 4 5

FILTER2:2POR 1 5
END

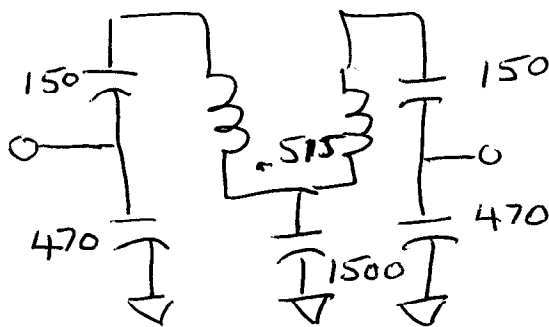
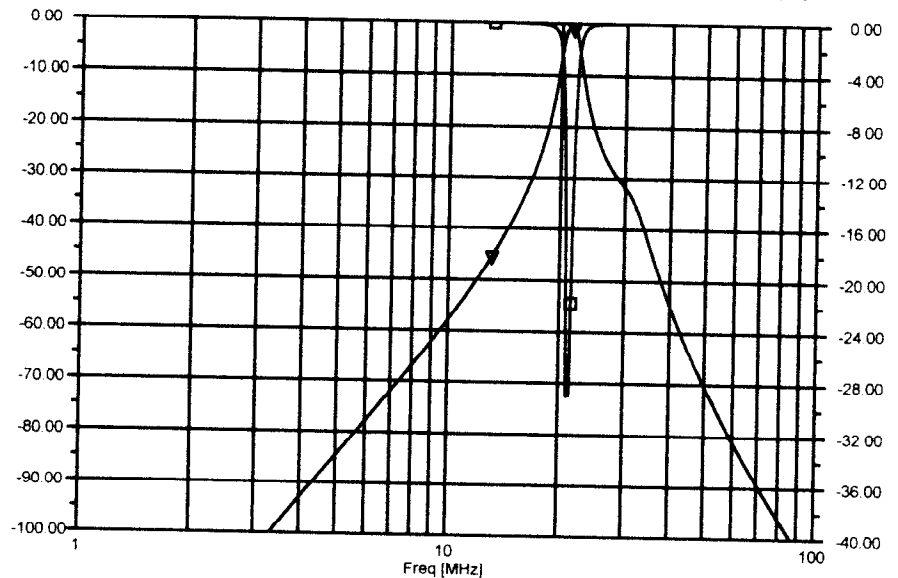
FREQ
STEP 20.2MHZ 22.2MHZ 10KHZ
ESTP 1MHZ 100MHZ 300
END

*COIL: 9 TURNS #22, 270 DEGREES, T50-6 CORE



▼ MS21 [dB] FILTER2

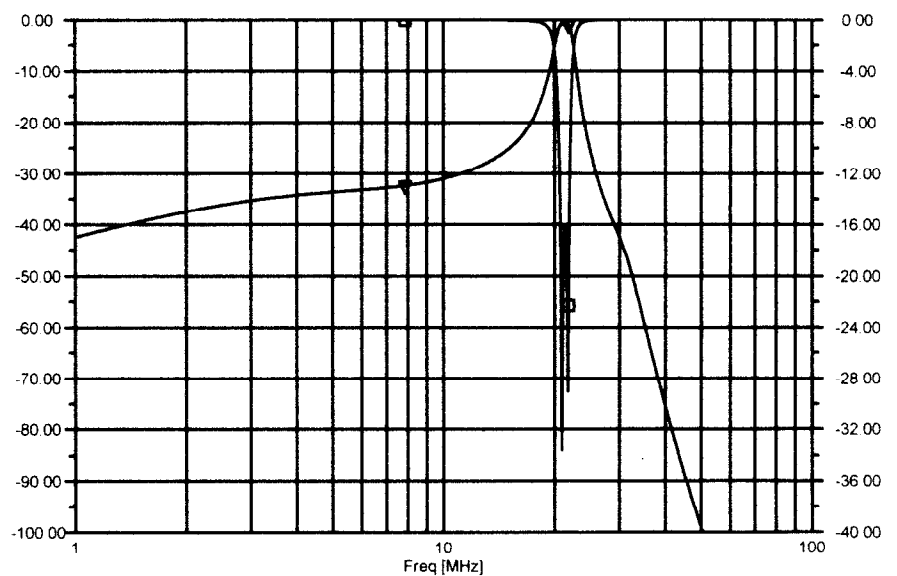
□ MS11 [dB] FILTER2



11 T #28
(1) T50-6

▼ MS21 [dB] FILTER2

□ MS11 [dB] FILTER2



15 M NBPF + LPF

*Two-section 12 meter BPF plus 32 MHz LPF

*LPF 32 MHZ

CA:120PF
CB:200PF
LLP:0.341UH
QQ:150
FF:32MHZ

BLK

CAP 1 0 C=CA
IND 1 2 L=LLP Q=QQ F=FF
CAP 2 0 C=CB
IND 2 3 L=LLP Q=QQ F=FF
CAP 3 0 C=CA
LPF: 2POR 1 3
END

*NBPF, TOP-COUPLED

QL:180
QC:4000
C2:470PF
C1:130PF
CT:5.4PF
LL:0.373UH
F0:24.0MHz

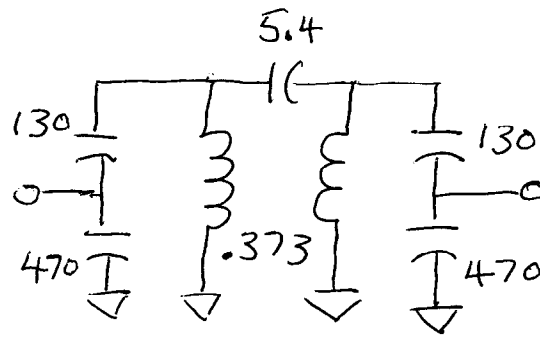
BLK

CAP 1 0 C=C2 Q=QC F=F0
CAP 1 2 C=C1 Q=QC F=F0
IND 2 0 L=LL Q=QL F=F0
IND 3 0 L=LL Q=QL F=F0
CAP 3 4 C=C1 Q=QC F=F0
CAP 4 0 C=C2 Q=QC F=F0
CAP 2 3 C=CT
LPF 4 5
FILTER2:2POR 1 5
END

FREQ

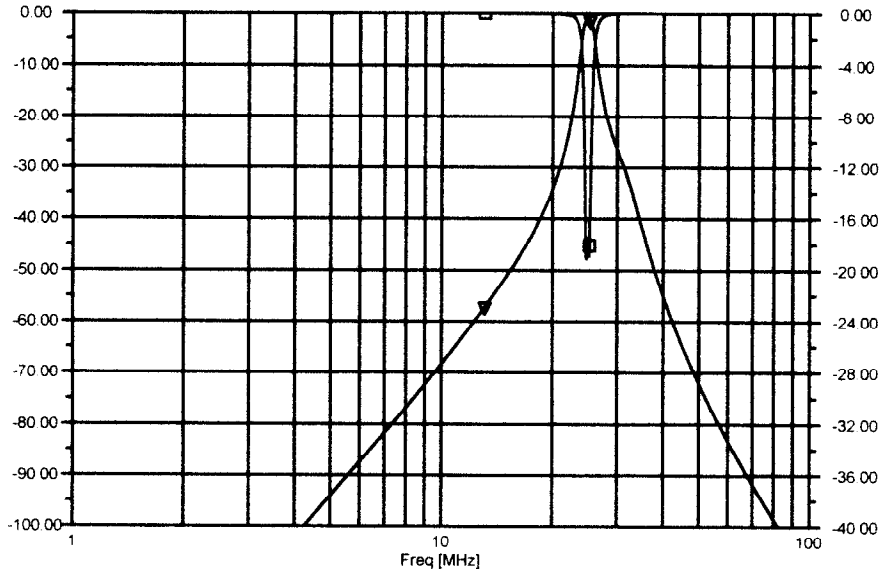
STEP 24MHZ 26MHZ 10KHZ
ESTP 1MHZ 100MHZ 300
END

*COIL: 8 TURNS #22, 270 DEGREES, T50-6 CORE



▽ MS21 [dB] FILTER2

□ MS11 [dB] FILTER2



Shunt Filter not recommended
for this band. The LPF
provides attenuation above 30 MHz

12M NBPF + LPF

*Two-section 10 meter BPF plus 32 MHz LPF

*LPF 32 MHz

CA:120PF
CB:200PF
LLP 0.341UH
QQ 150
FF:32MHZ

BLK
CAP 1 0 C=CA
IND 1 2 L=LLP Q=QQ F=FF
CAP 2 0 C=CB
IND 2 3 L=LLP Q=QQ F=FF
CAP 3 0 C=CA
LPF 2POR 1 3
END

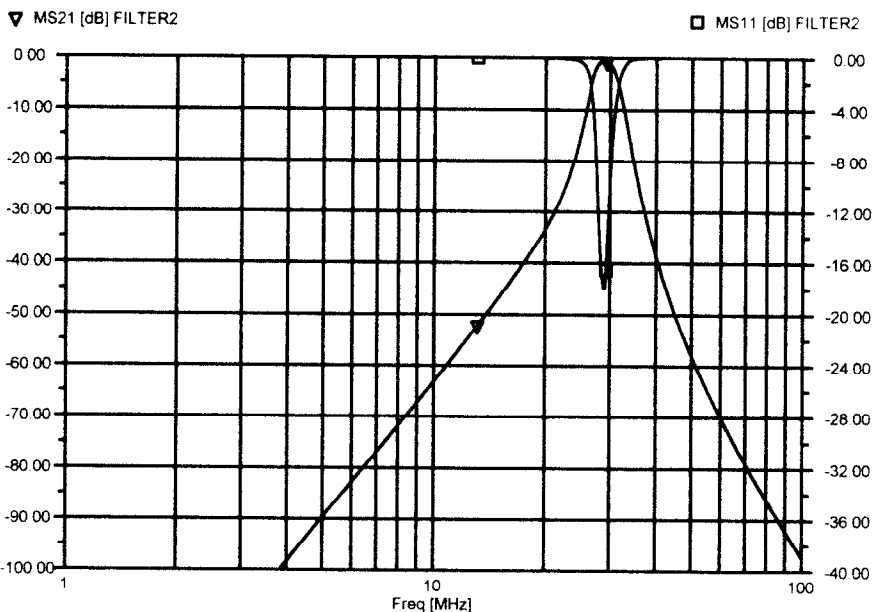
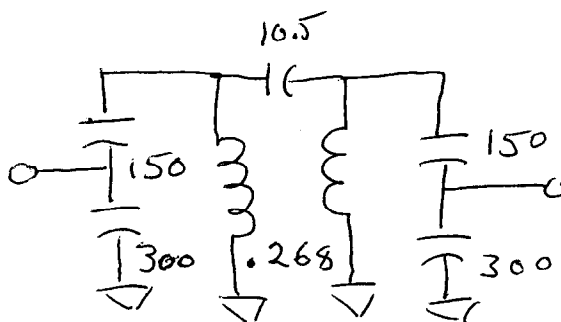
*NBPF, TOP-COUPLED

QL 180
QC:4000
C2:300PF
C1:150PF
CT:10.5PF
LL 0.268UH
F0:28.5MHz

BLK
CAP 1 0 C=C2 Q=QC F=F0
CAP 1 2 C=C1 Q=QC F=F0
IND 2 0 L=LL Q=QL F=F0
IND 3 0 L=LL Q=QL F=F0
CAP 3 4 C=C1 Q=QC F=F0
CAP 4 0 C=C2 Q=QC F=F0
CAP 2 3 C=CT
LPF 4 5
FILTER2:2POR 1 5
END

FREQ
STEP 27MHZ 31MHZ 20KHZ
ESTP 1MHZ 100MHZ 300
END

*COIL: 5 TURNS #22 CLOSE SPACED, T50-6 CORE



Shunt Filter not recommended
for this band. The LPF
Provides attenuation
above 30 MHz

10 M NBPF + LPF

Compact Software - ARRL Radio Designer 1.5 05-DEC-99
 File: c:\ard\sabin\lpf32.ckt

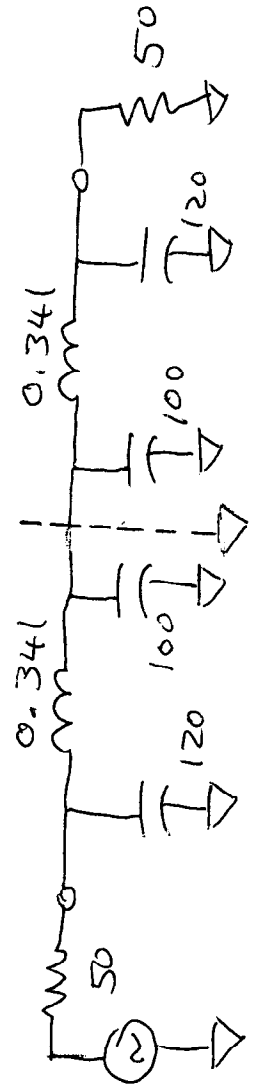
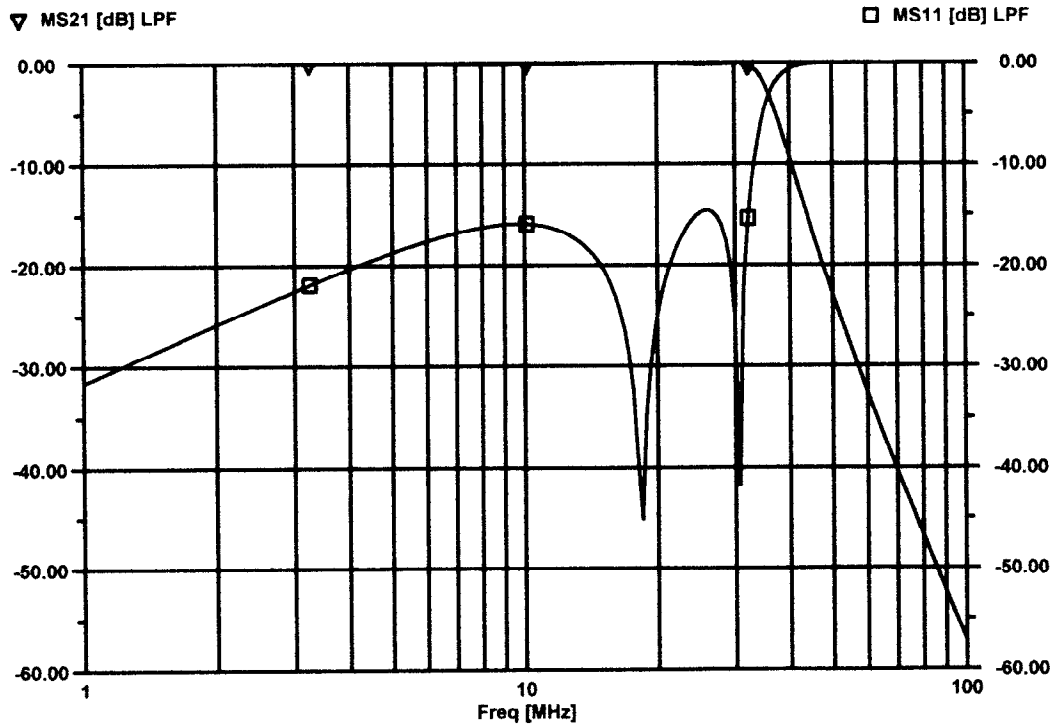
*LPF 30 MHz

CA:120PF
 CB:200PF
 LL:0.341UH
 QQ:150
 FF:32MHZ

BLK
 CAP 1 0 C=CA
 IND 1 2 L=LL Q=QQ F=FF
 CAP 2 0 C=CB
 IND 2 3 L=LL
 CAP 3 0 C=CA
 LPF: 2POR 1 3
 END

FREQ
 ESTP 1MHZ 100MHZ 200
 END

* Inductor 0.341 uH 8 Turns #26 on T50-6 core
 * Use two 100 pF caps separated as shown in photo



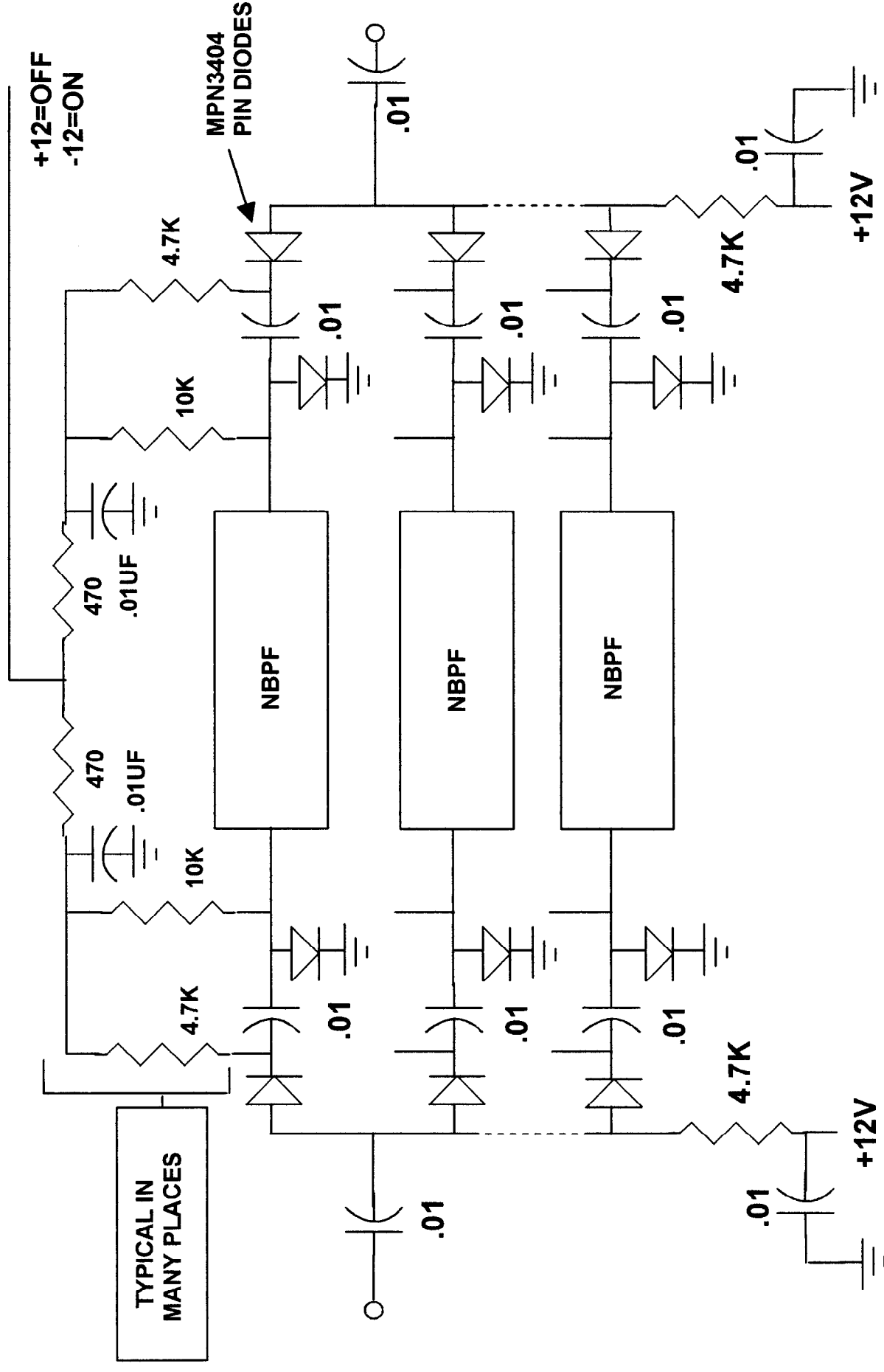
32 MHz LPF

Two-resonator NBPF top-coupled filter design

Bandpass frequencies	$FLO := 27 \cdot 10^6$	$FHI := 31 \cdot 10^6$	$\omega 0 := 2 \cdot \pi \cdot \sqrt{FHI \cdot FLO}$
	$FHI - FLO = 4 \cdot 10^6$	$f0 := \frac{\omega 0}{2 \cdot \pi}$	$f0 = 2.893 \cdot 10^7$
Filter selectivity -----	$QB := \frac{\sqrt{FHI \cdot FLO}}{FHI - FLO}$		$QB = 7.233$
0.1 dB Cheby parameters -----	$q := 1.414$		$k := 0.707$
Filter QN -----	$QN := q \cdot QB$		$QN = 10.227$
Filter coupling Kc -----	$Kc := \frac{k}{QB}$		$Kc = 0.098$
Choose a value of C -----	$C := 120 \cdot 10^{-12}$		
Find value of L -----	$L := \frac{1}{(\omega 0)^2 \cdot C}$		$L = 2.522 \cdot 10^{-7}$
Find value of R -----	$R := \frac{QN}{\omega 0 \cdot C}$		$R = 468.844$
Find modified value of R = Rs -----	$QL := 180$	$Rs := \frac{1}{\frac{1}{R} - \frac{1}{\omega 0 \cdot L \cdot QL}}$	$Rs = 497.087$
Values for top-coupling -----	$Cnew := C \cdot (1 - Kc)$ $CT := C \cdot Kc$		$Cnew = 1.083 \cdot 10^{-10}$ $CT = 1.173 \cdot 10^{-11}$
Choose RL -----	$RL := 50$		
Value of C2 -----	$C2 := \sqrt{\frac{RL}{Rs} \cdot \left[1 + (\omega 0 \cdot Cnew \cdot Rs)^2 \right] - 1}$		$C2 = 3.2504 \cdot 10^{-10}$
Value of C1 -----	$C1 := \frac{1 + (\omega 0 \cdot C2 \cdot RL)^2}{\omega 0^2 \cdot RL \cdot (Cnew \cdot Rs - C2 \cdot RL)}$		$C1 = 1.567 \cdot 10^{-10}$

Two-resonator NBPf shunt-C coupled filter design

Bandpass frequencies	$FLO := 9.7 \cdot 10^6$	$FHI := 10.5 \cdot 10^6$	$\omega 0 := 2 \cdot \pi \cdot \sqrt{FHI \cdot FLO}$
	$FHI - FLO = 8 \cdot 10^5$	$f0 := \frac{\omega 0}{2 \cdot \pi}$	$f0 = 1.009 \cdot 10^7$
Filter selectivity -----	$QB := \frac{\sqrt{FHI \cdot FLO}}{FHI - FLO}$		$QB = 12.615$
0.1 dB Cheby parameters -----	$q := 1.4142$		$k := 0.7071$
Filter QN -----	$QN := q \cdot QB$		$QN = 17.84$
Filter coupling Kc -----	$Kc := \frac{k}{QB}$		$Kc = 0.056$
Choose a value of C -----	$C := 180 \cdot 10^{-12}$		
Find value of L -----	$L := \frac{1}{(\omega 0)^2 \cdot C}$		$L = 1.382 \cdot 10^{-6}$
Find value of R -----	$R := \frac{QN}{\omega 0 \cdot C}$		$R = 1.563 \cdot 10^3$
Find modified value of R = Rs -----	$QL := 170$	$Rs := \frac{1}{\frac{1}{R} - \frac{1}{\omega 0 \cdot L \cdot QL}}$	$Rs = 1.746 \cdot 10^3$
Values for shunt-coupling -----	$CS := \frac{1}{Kc \cdot L \cdot (\omega 0)^2}$		$CS = 3.2113 \cdot 10^{-9}$
	$Lnew := L \cdot (1 + Kc)$		$Lnew = 1.4591 \cdot 10^{-6}$
Choose RL -----	$RL := 50$		
Value of C2 -----	$C2 := \frac{\sqrt{\frac{RL}{Rs} \cdot [1 + (\omega 0 \cdot C \cdot Rs)^2]} - 1}{\omega 0 \cdot RL}$		$C2 = 1.0173 \cdot 10^{-9}$
Value of C1 -----	$C1 := \frac{1 + (\omega 0 \cdot C2 \cdot RL)^2}{\omega 0^2 \cdot RL \cdot (C \cdot Rs - C2 \cdot RL)}$		$C1 = 2.153 \cdot 10^{-10}$



PIN Diode NBPf Switching Circuit