TMC SPECIFICATION			NO. S 10188
REV:			
COMPILED: K HOLT	CHECKED: J.G. PARKIN	APPD:	SHEET 1 OF 12
TITLE:	TEST PROCEDURE FX10018		

TEST EQUIPMENT REQUIRED (TOTAL)

	1	Model 80 Signal Generator
	1	Vector Voltmeter H/P 8405A
	1	JG 10006 Filter Jig
	1	Prime Sample Filter (FX 10018)
	1	High Frequency Counter (100 Mhz.)
	1	50 Ω to 2 x 75 Ω Splitter
	2	6" Coaxial Jumper Terminated BNC, RG 59/U Cable (these cables must be exactly the same length)
	2	75 Ω BNC Type Dummy Loads
	3	BNC "Tee" Connectors
	2	Right-Angle BNC Connectors
	1	50/75 Ω Pad
	1	RG/58 Coaxial Jumper BNC Terminated, 8" Long
V.S.W.R. ONLY	1	Sweep Generator
V.S.W.R. ONLY	1	"Rho" Tector with 50 Ω and 75 Ω Loads
V.S.W.R. ONLY	1	Tetronix Scope or equivilant
	1	Tetronix Scope Probe 1:1
	1	Small Trimming Tool, Insulated

APPLICABLE DRAWINGS

CL 10042)
CL 10043) Coils
CK 10679 Filter Schematic

GENERAL

The FX10018 (A 10741-5) filter is a 7 pole, 2-32 Mhz. bandpass filter having an in-band V.S.W.R. of better than 1.4:1 an insertion loss of .2 dB and ripple of ± .2 dB (see attached graphs.) Out-of-band attenuation is -30 dB @ 1.4 and 46 Mhz. In addition to these exacting specifications is the requirement that all filters must track in phase, across the entire pass-band 2-32 Mhz. (achieved by reference to a master standard.) Due to this phase tracking requirement, an unusual degree of accuracy is required at all stages of manufacture and test. Briefly this entails:

(1) Measurement of all coils on an "RX" meter (not a "Q" meter).
(2) Testing of coils before final laquer and "fine trimming" same.
(3) Testing of coils after baking and cooling.
(4) Matching certain coils with selected capacitors (necessary because no trimmer is provided in the filter for these coils).
NOTE: Coil drawings CL 10042, and CL 10043 include all data for above tests.
(5) Grading of certain capacitors (C5, or C12) in increments above and below their nominal for use in (4) above.
(6) Testing of filters prior to installation of certain parts.
(7) Use of frequency counter on all test equipment to negate dial errors and provide better read out.

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There is no adjustment possible on a finished filter to correct a phase error at 2 Mhz. and since the specification calls for a maximum error of ± 2° only by close adherence to all tests can phase correlated units be produced. (Slight adjustment is possible at 32 Mhz. as outlined later in this test procedure).

Testing of the filter proper is done in four distinct and separate steps which should be done on a batch basis to reduce set-up time and wear and tear of the extremely delicate probes of the Vector Voltmeter. The first test (8 Mhz. Tune) is done on filters having the following parts missing; L3, L6, C5, C6, C12, after this test the above mentioned parts (which are matched pairs) are installed and the filter assembled into its casting before the remaining tests.

TESTS TO BE PERFORMED

(1) 8 Mhz. Tune. (C1, C7, C13 Trim).

(2) Final Tune. (C3, and C10 Trim only).

(3) Phase Check. (Trim C10 only here).

(4) V.S.W.R. Check. (No adjustment here please).

NOTE: The trimmers are intended only to take out the Tolerances of the fixed capacitors NOT intended to allow bad coils to be brought to resonance. Hopefully the coils are exact if their tests were done correctly. The reason for this is that for correct phase and impedance to be achieved, the tuned circuits must have the correct L/C ratios not just be resonant at the appropriate frequency, (which could be achieved with all sorts of L/C ratios). In view of the foregoing, tested filters should all end up with their trimmers in the same position within very narrow limits and any observable deviations viewed with suspicion.

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FX10018 (A 10741-5) 8 MHZ. TUNE

EQUIPMENT

1 H./P. Vector Voltmeter 8405A
1 Model 80 Signal Generator
1 Counter with 8 Mhz. capability
1 Tektronix scope probe 1:1 (used for Signal Generator, don't use anything else.)
1 Test Jig JG 10006. NOTE: The ground clips have been identified, see Figure 1 on Sheet 7 of this Spec.

Set generator to 8 Mhz. using counter. Connect probe "A" of Vector Voltmeter and the Tektronix 1:1 scope probe, by means of a "Tee" connector, to the output of the signal generator, and adjust Generator to give zero dB indication on Vector Voltmeter channel "A" then switch to channel "B". Proceed as follows:-

(1) Place filter on locating pins of Test Jig.

(2) Connect ground clip #4 to filter P.C. ground pattern; leave for remainder of tests.

(3) Plug Probe "B" of Vector Voltmeter to B.N.C. Jack on Test Jig.

(4) Connect ground clip #2 to Filter Pin 2.

(5) Connect ground clip "C10" to filter trimmer C10 leads.

(6) Connect Scope Probe to Filter Pin 1, and tune C1 for a dip indication on Vector Voltmeter Channel "B".

(7) Rearrange grounding clips and Scope Probe as follows:
(a) Clip 1 to Pin 1.
(b) Clip 2 to Pin 2.
(c) Scope Probe to Trimmer C10.
Tune C9 for a dip as in Step 6.

(8) Rearrange ground clip and Scope Probe as follows:
(a) Clip 1 to Pin 1.
(b) Clip C10 to C10.
(c) Scope Probe to Pin 2.
Tune C13 for a dip as in Step 6. This completes the 8 Mhz. tuning and filter should be marked so, and returned to production for installation of C6, C5, C12, L3, L6.

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FX10018 (A 10741-5) FINAL TUNE

(1) Set up test equipment as shown in Figure 2 on Sheet 7 of this Spec.

(2) Tune signal generator to 87.00 Mhz. and adjust output to read ODBM on Vector Voltmeter probe "A".

(3) Switch to probe "B" and adjust "DB" range switch until an on-scale deflection is obtained.

(4) Adjusted trimmer "C3" to minimize the deflection obtained in Step (3); i.e. tune for a dip.

(5) Repeat Step (2) and (3) using 46 Mhz.

(6) Adjust trimmer "C10" for a dip.

(7) Repeat Steps (2) through (6), this completes the test and filter is ready for phase check and V.S.W.R. test.

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PHASE TEST

(1) Set up equipment per Figure 3 on Sheet 8 of this Spec.

(2) Set generator to 32 Mhz. and adjust output level to give ODBM on Probe "A".

(3) Set "meter offset" switch to 0 position.

(4) Set meter range (phase) to ± 6° position.

(5) Connect Probe "B" to Probe "A" and "zero" phase meter.

(6) Connect Probe "B" to Filter under test.

(7) Read phase difference and if less than ± 5°, adjust to zero by means of C10 only. This should occur within 2 turns of the trimmer.

(8) Repeat Steps (2) through (6) at 2 Mhz.

(9) Error at 2 Mhz. should be within ± 2° if not, DON'T try to adjust, but have filter coils rechecked.

(10) Mark filter with a plus or minus sign as appropriate for 2 Mhz. with reference to the master standard.

NOTES:

(1) The phase meter must be zeroed at both frequencies; i.e. 2 and 32 Mhz.

(2) Extreme care in handling the Vector Voltmeter probes is required since they are in an integral part of the meter and are very delicate.

(3) Suspect filters can be further checked by set-up in Figure 2 and checking frequencies:-

2,137 Khz. ± 2 Khz.
29,800 Khz. ± 50 Khz.

for a dip and phase reversal.

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FX10018 (A 10741-5)

V.S.W.R. TEST

See Figure (4) for test set-up.

(1) Adjust sweep generator and scope controls to give swept range of frequencies from 0 to 35 Mhz.

(2) Calibrate by correcting a 50 Ω calibrating load to "Z_2" and adjust vertical deflection of trace to give 2 full divisions (2 cm) this establishes a 1.5:1 reference.

(3) Replace the 50 Ω calibrating resistor with the filter (be sure filter is terminated in 75 Ω at its output. Read worst frequency/V.S.W.R. points from the trace (those points which come closest to the 1.5:1 reference set in Step (2)), identify by means of sweep generator crystal marker, typically the worst spots are 4, 15, and 32 Mhz.

(4) Re-adjust sweep generator to give expanded view of worst areas, re-calibrate per Step (2) and read V.S.W.R. Compare with master standard filter on Figures 5, 6, and 7 of this Spec. DON'T try to fiddle the V.S.W.R. into Spec. by means of trimmer.

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JOB

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FIGURE 1

8MHz TUNE

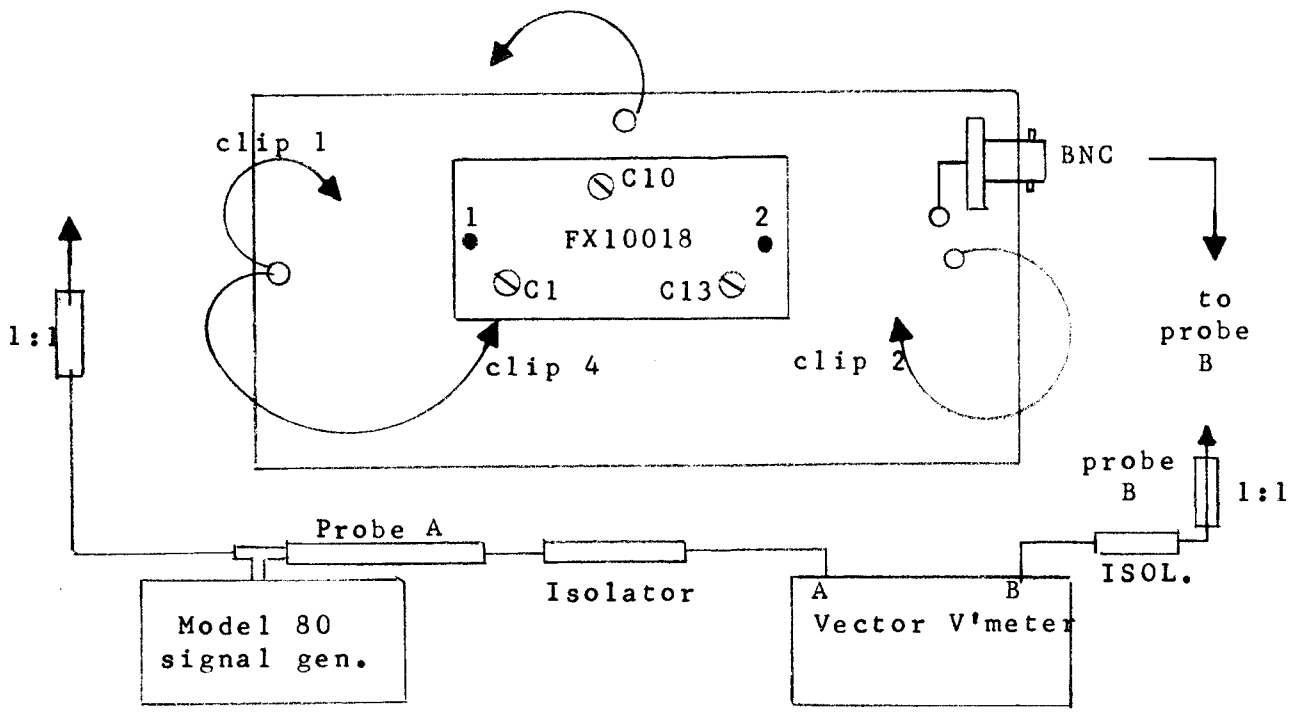
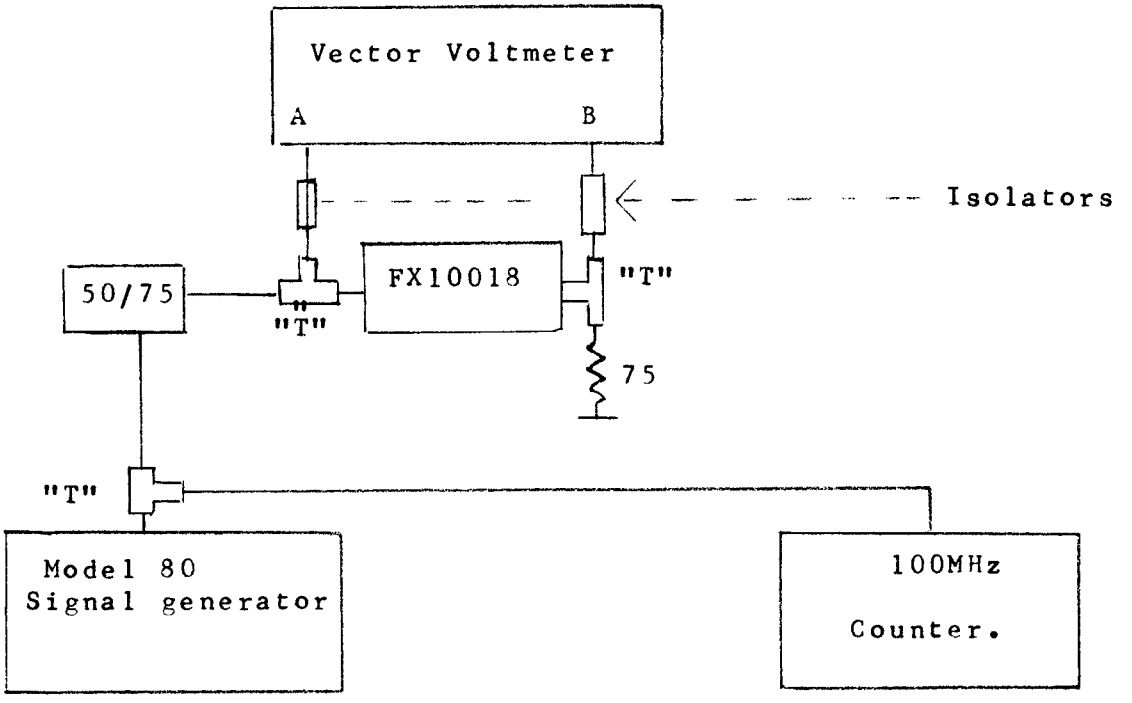


FIGURE 2

FINAL TUNE



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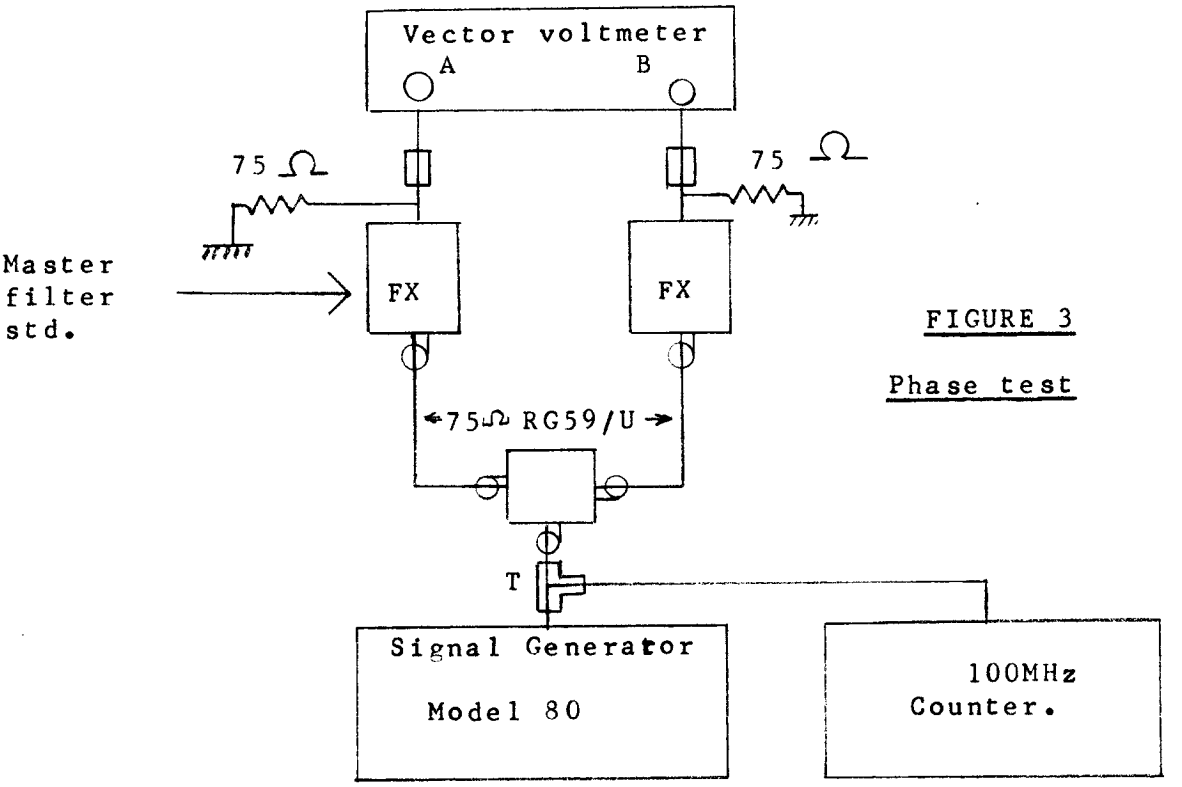
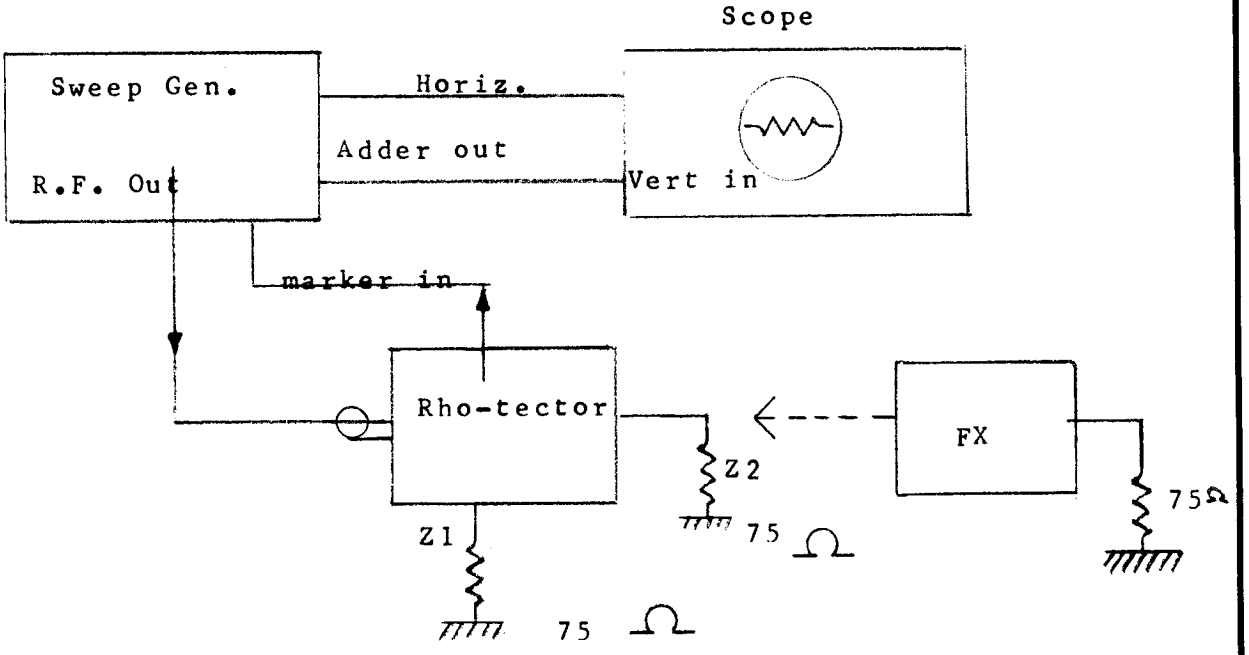


FIGURE 3

Phase test

FIGURE 4 V.S.W.R.



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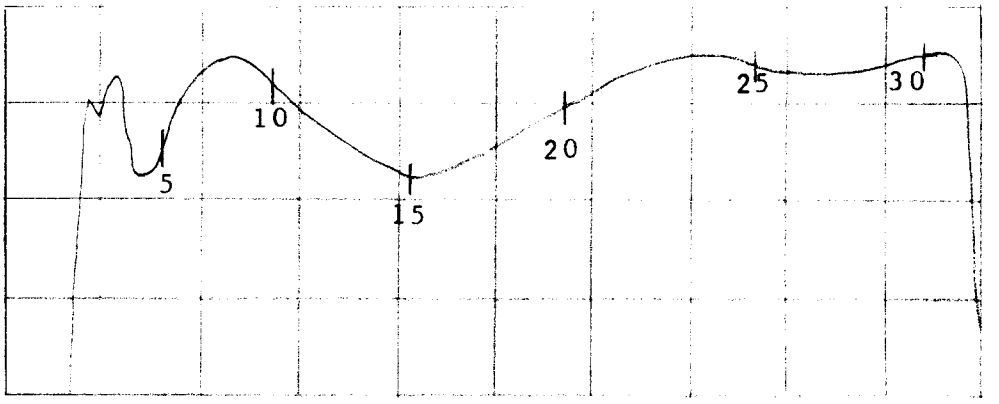
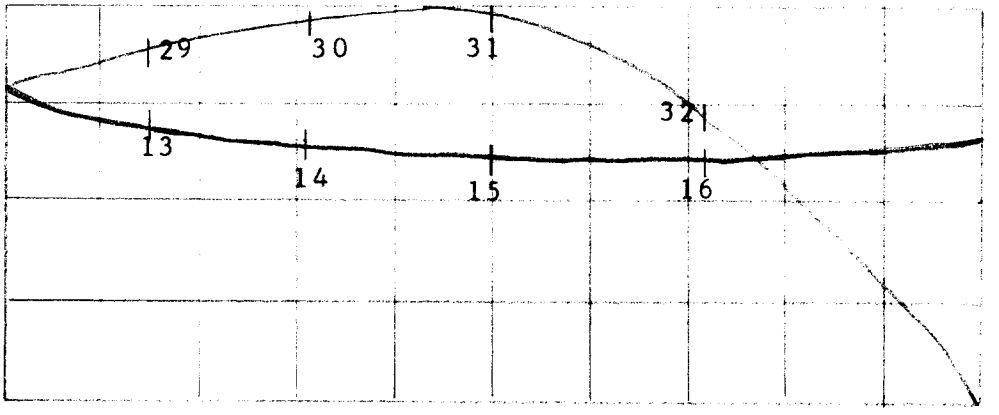


2 divisions = 1.5:1

Figure 5

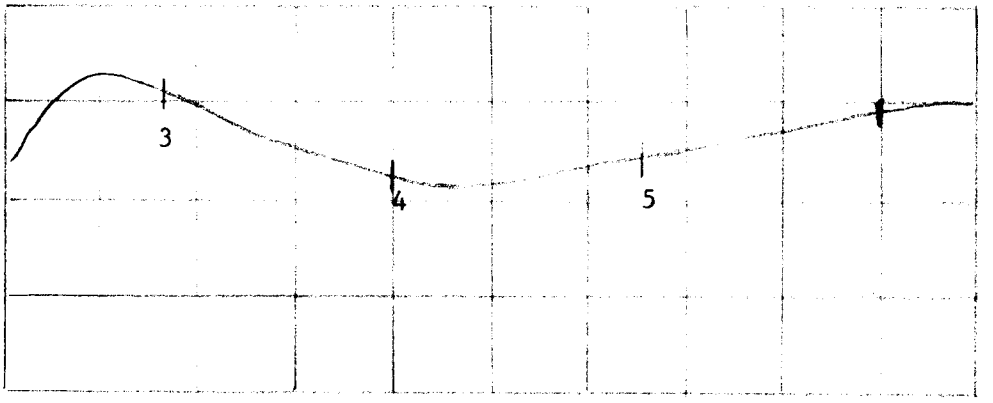
Std Filter
2-32MHz
VSWR curve.



2 divisions = 1.5:1

Figure 6

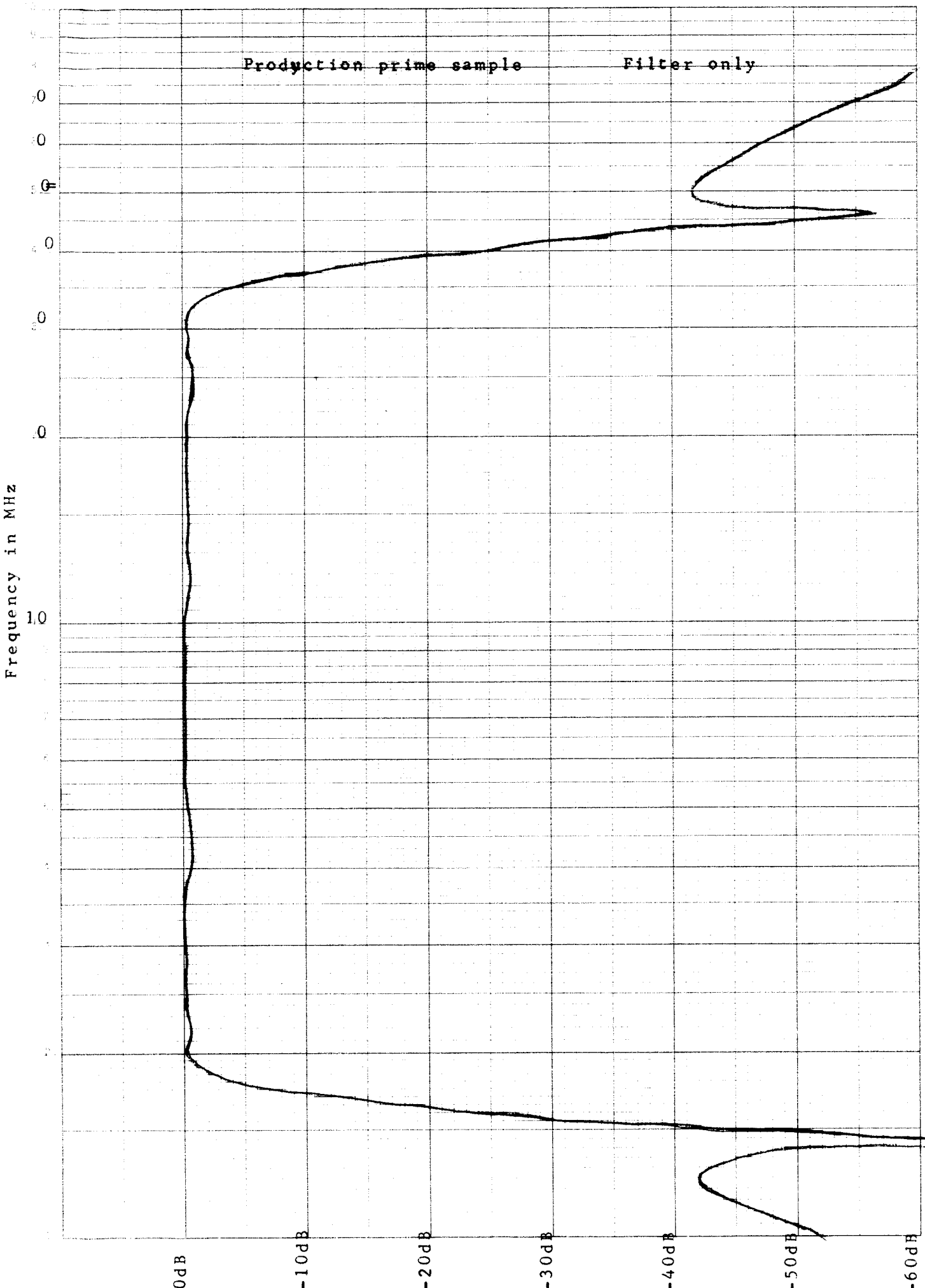
Std Filter
12 to 17MHz
& 28 to 33MHz
expanded VSWR

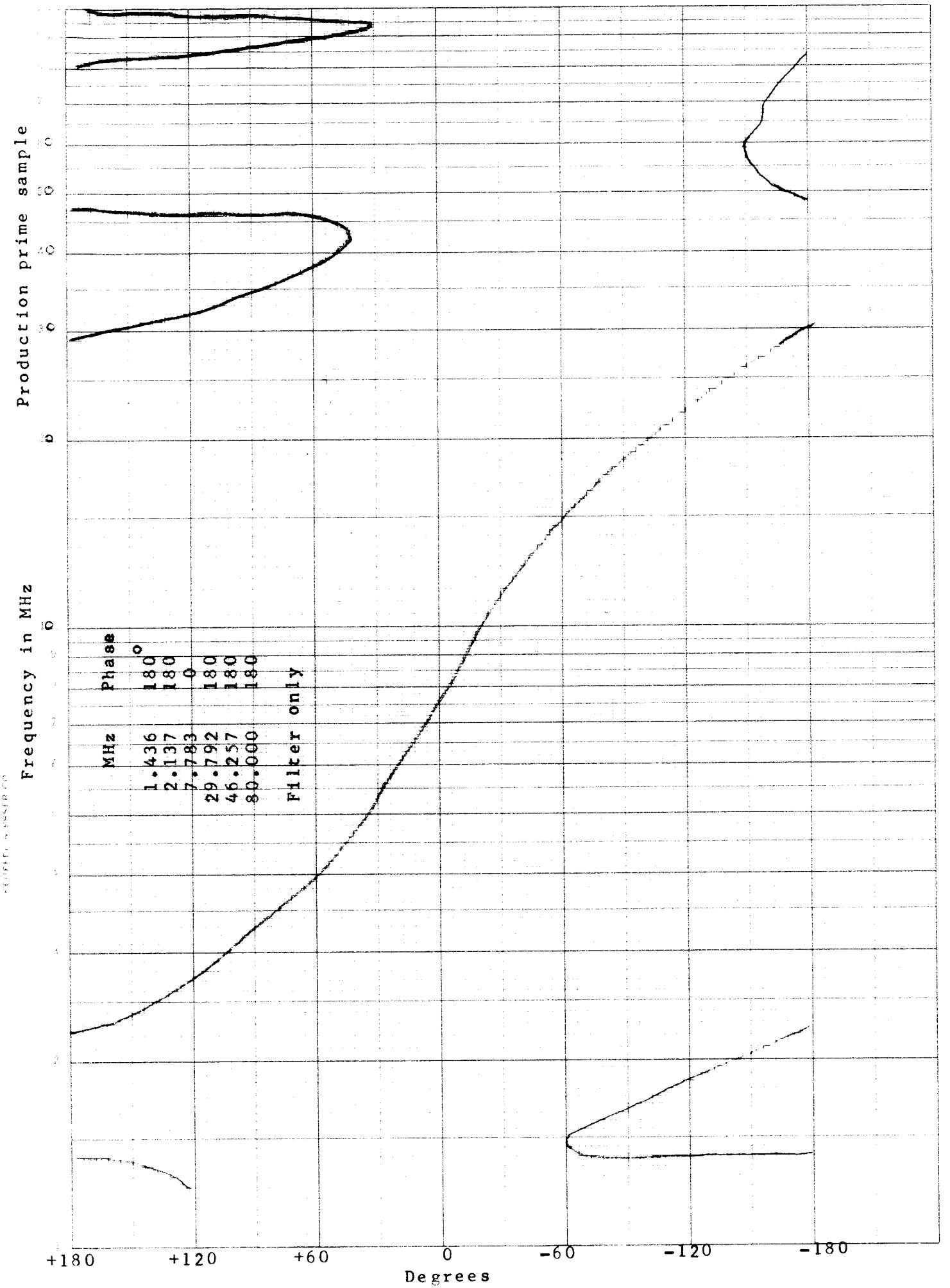


2 divisions = 1.5:1

Figure 7

Std Filter
2-6 MHZ
expanded VSWR





REVISION SHEET

TMC (Canada) LTD.
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S10188

MODEL ____________ PROJECT NO. ____________

DATE	REV.	PAGE	ITEM	DESCRIPTION	REMARKS	CHK.	APP.

FX 10018 SPECIFICATIONS

FILTER CONSTRUCTION:
Aluminum cast frame
BNC Connectors
Stamped cover plate
Irridite finish
All components P.C. Board Mounted.

ELECTRICAL TYPE:
Standard 7 - Pole Chebishev
5 Poles individually adjustable
Built-in neon front end protection

ELECTRICAL CHARACTERISTICS:

BAND PASS 2 - 32 MHZ

IN - BAND ATTENUATION 0.2dB Nominal

IN - BAND RIPPLE < ± 0.25dB

OUT OF BAND ATTENUATION Not less than 30dB (DC to 1.4 MHZ, 46 to 1000 MHZ)

TYP 65dB @ 1.4 MHZ and 46 MHZ

INPUT/OUTPUT IMPEDANCE 75 ohms nominal

PHASE TRACKING (To filter of same type manufactured under same contract both filters @ 25° C)
± 1°, 2 -32 MHZ
± ½° to special order

TEMPERATURE/PHASE TRACKING: The phase shift of the filter at any freq within the pass band, will not vary by more than ± 1° from the phase shift measured at 25° C, over the temperature range 0 to +50° C

VSWR: Less than 1.5:1 when terminated with 75 ± j0 ohms

VSWR TRACKING: Not specified, but can be supplied on Request.

LOAD VARIATIONS: Above performance (except phase) is not affected substantially by loading filter with complex 75 ohm impedance with VSWR of 1.5:1