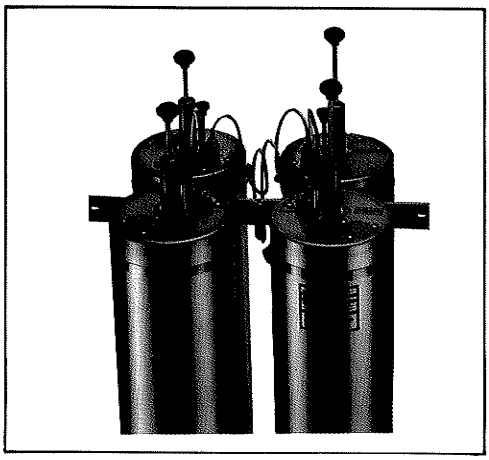
DUPLEXERS

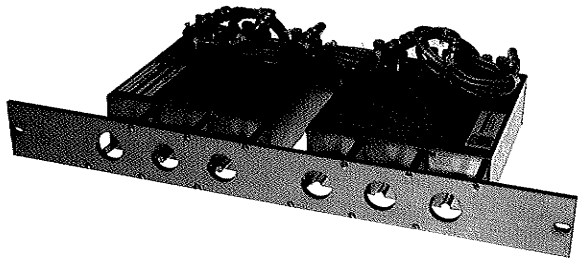
30-88 MHz

IN RANGES OF:
30 - 40 MHz
38 - 50 MHz
66 - 88 MHz

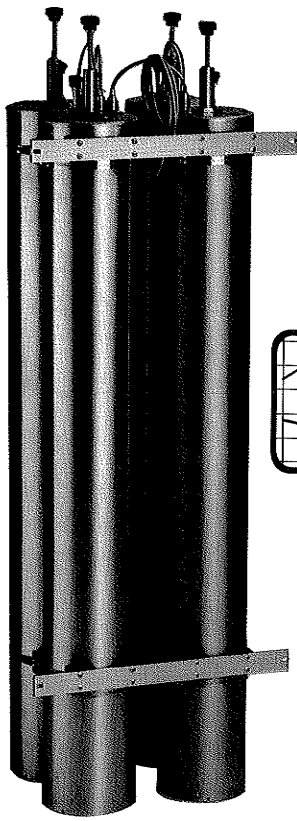
T-PASS®
(PATENTED)



SHOWING CENTERED 19" RACK MOUNT BAR
FOR MODELS. . .
28-28-02A 74-28-02A

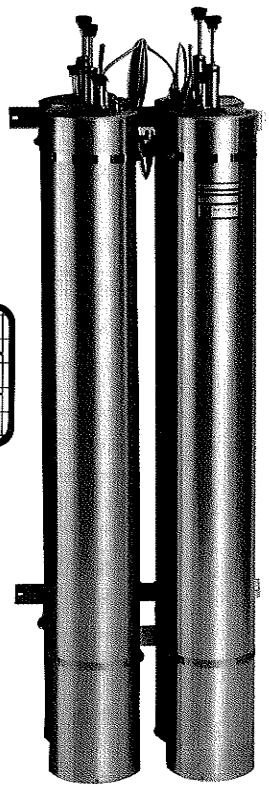


19" RACK MOUNTS
FRONT VIEW
MODELS 27-26-01A, 27-26-02A, 27-27-01A, and 27-27-02A

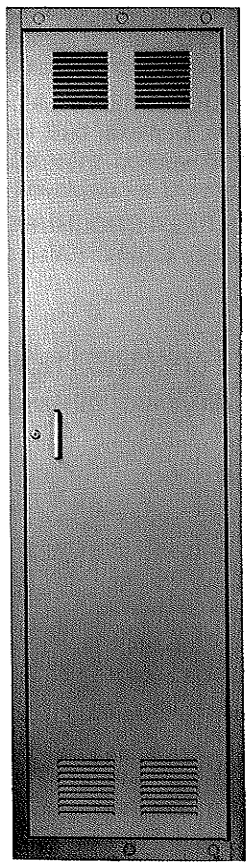


MODEL 28-13-01F, MODEL 28-14-01F
REAR VIEW
SHOWING WALL MOUNT BAR

VARI-NOTCH®
SYSTEMS, INC.
(PATENTED)



MODEL 28-13-01F, MODEL 28-14-01F
FRONT VIEW



ALTERNATE CABINET MOUNT
FOR MODELS. . .
28-28-02G 74-28-02G

DUPLEXERS • CAVITY FILTERS • MULTICOUPLER SYSTEMS • SIGNAL BOOSTER SYSTEMS • RF SYSTEM PRODUCTS

TX RX SYSTEMS INC. 8625 INDUSTRIAL PARKWAY, ANGOLA, NY 14006-9696
TELEPHONE 716-549-4700 FAX 716-549-4772 (24 HRS.)
A MEMBER OF BIRD TECHNOLOGIES GROUP

C1014G91

DUPLEXER NOMENCLATURE

FIRST PAIR OF NUMBERS
CIRCUIT STYLE
26 - : BAND PASS CIRCUIT
27 - : NOTCH CIRCUIT
28 - : VARI-NOTCH CIRCUIT (PSEUDO BAND PASS)
30 - : PSEUDO-BANDPASS/NOTCH (NON - VARI - NOTCH)
33 - : SERIES NOTCH CIRCUIT (TUNABLE PASS BANDS)
38 - : PSEUDO BANDPASS (NON - VARI-NOTCH)
74 - : BAND PASS CIRCUIT (2 - CHANNEL T-PASS)

SECOND PAIR OF NUMBERS	
FREQUENCY RANGE (MHz)	
- 13 - : 30 - 40	- 52- : 215 - 250
- 14 - : 38 - 50	- 65 - : 406 - 430
- 26 - : 66 - 77	- 66 - : 442 - 450
- 27 - : 77 - 88	- 69 - : 470 - 512
- 28 - : 66 - 88	- 70 - : 450 - 470
- 29 - : 88 - 108	- 71 - : 470 - 490
- 35 - : 108 - 136	- 72 - : 490 - 512
- 36 - : 132 - 150	- 88 - : 890 - 960
- 37 - : 144 - 174	- 89 - : 806 - 866
- 38 - : 132 - 174	- 97 - : 1215 -1300
- 41 - : 148 - 174	

THIRD PAIR OF NUMBERS PLUS LETTER	
TWO DIGIT NUMBER	MOUNTING STYLE
ELECTRICAL SPECIFICATION IDENTIFIER	A : 19" RACK MOUNT B : 19" REVERSE FLUSH RACK MOUNT C : 19" CROSS RACK MOUNT D : DUST COVERED SIDE-OF-CABINET OR WALL MOUNT E : 24" RACK MOUNT F : WALL MOUNT G : CABINET MOUNTED H : MOBILE PLATE MOUNTED

EXAMPLE: A Model 27-26-01C is a NOTCH circuit, 66 - 77 MHz range, Cross Mount Duplexer.

VARI-NOTCH®, the trademark for **TX RX SYSTEMS'** pseudo bandpass circuit design, offers the best **cost-to-performance** ratio in its class and is unsurpassed for close-spaced duplexing, combining the low loss and close frequency spacing advantages of notch filters with the broad isolation and selective pass characteristics of bandpass filters. The small geometry and efficiency of this circuit design has also resulted in a variety of space efficient mountings.

CONSTRUCTION: Our 6.625" diameter Duplexer cavities are constructed of hardened aluminum which does not easily dent, as some copper types do, causing detuning. Cavity surfaces are passivated inside and out with a chromate conversion coating (Alodine). A 1/4" thick end cap heliarced to the top of the cavity at the critical current point eliminates the problem of noise generated by poor metal to metal contact inherent in constructions using pop rivets. Silver plating the movable brass tuning probes and hardened copper contact fingers avoids erratic tuning, high loss, and degraded selectivity which result in extra time and costs. Our 6.625" diameter Duplexer cavities have both coarse and fine tuning controls as well as calibrated, easily adjustable loops to speed tuning time.Our 2" square cavities are high Q helical resonators of extruded aluminum.

SHOULD REQUIREMENTS AT A SITE CHANGE, the circuit style (Pseudo Bandpass, Bandpass, or Series Notch) of any TX R SYSTEMS INC. Duplexer built from 6.625" diameter cavities can be easily changed in the field by ordering and installing the appropriate replacement conversion assemblies (loops), thus avoiding obsolescence. Conversion assemblies, along with adaptors, hookup cables, and other hardware are displayed on page 3 of the Duplexer/Filter Price List.

OTHER DUPLEXER BROCHURES are available for bands **132-250 MHz** (Lit. No. C1024), **406-512 MHz** (Lit No. C1034), and **806 MHz to 1.3 GHz** (Lit. No. C1044). Also write for Tech-Aid No. 76007 (Lit. No. C3004), "Duplexer Problems and Remedies".

BASE STATION MODELS

GENERAL SPECIFICATIONS, ELECTRICAL: TEMPERATURE RANGE: -40° C TO +80° C IMPEDANCE: 50 Ohms VSWR: 1.3:1

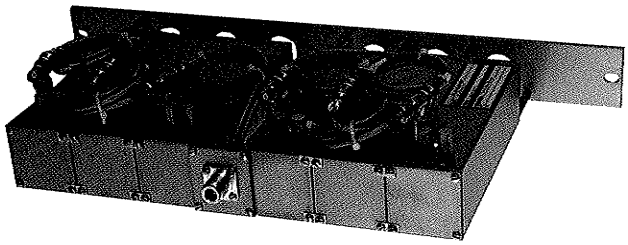
NOTE : THE TEMPERATURE RANGE FOR MODELS 27-26-01A, 27-26-02A, 27-27-01A, AND 27-27-02A IS -40° C TO + 60° C.

FREQUENCY RANGE MHz (SUB-RANGE)	MODEL NO.	ELECTRICAL					MECHANICAL									
		MIN. FREQ. SEP. MHz	POWER RATING WATTS	ISOLATION dB PER CHAN.	ISOLATION dB BET. CHAN.	INSERTION LOSS dB	CAVITIES NO.	CAVITIES SIZE	DIMENSIONS STYLE	DIMENSIONS ALT. MODEL NO.	DIMENSIONS H"	DIMENSIONS W"	DIMENSIONS D"	TX AND RX PORTS	ANTENNA PORT STD	ANTENNA PORT OPT
30-50 (30-40)	**28-13-01F**	**0.3**	**400**	**90**	**50**	**1.5**	**4**	**6.625" DIA.**	**F**	.....	**132**	**19**	**15**	**N**	**N**	.....
(38-50)	**28-14-01F**	**0.3**	**400**	**90**	**50**	**1.5**	**4**	**6.625" DIA.**	**F**	.....	**101**	**19**	**15**	**N**	**N**	.....
(66-77)	**27-26-01A**	3.0	125	100	N/A	1.0	6	2" SQ.	A C	..... 27-26-01C	3.6 7.0	19	10.3 6.0	BNC	N	.....
(66-77)	**27-26-02A**	2.5	125	100	N/A	1.0	6	2" SQ.	A C	..... 27-26-02C	3.6 7.0	19	10.3 6.0	BNC	N	.....
(75-88)	**27-27-01A**	3.0	125	100	N/A	1.0	6	2" SQ.	A C	..... 27-27-01C	3.6 7.0	19	10.3 6.0	BNC	N	.....
66-88 (75-88)	**27-27-02A**	2.5	125	100	N/A	1.0	6	2" SQ.	A C	..... 27-27-02C	3.6 7.0	19	10.3 6.0	BNC	N	...
	74-28-02A	2.0	400	57	80	1.35	4	6.625" DIA.	A G	..... 74-28-02G	66 77	19 22	±7.5 18	N	N	.....
	28-28-02A	0.350	400	85	50	1.5	4	6.625" DIA.	A G	..... 28-28-02G	66 77	19 22	**±7.5** **18**	N	N	.....

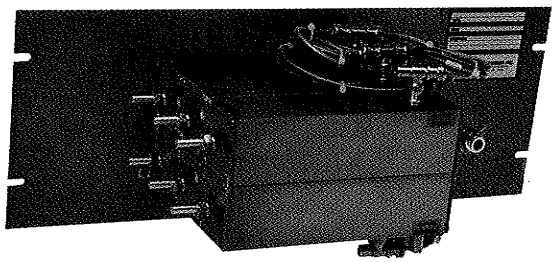
DUPLEXERS

66-88 MHz

IN RANGES OF:
66 - 77 MHz
75 - 88 MHz



19″ RACK MOUNTS
MODEL NOS.
27-26-01A 27-27-01A
27-26-02A 27-27-02A



(CROSS MOUNT CAVITIES ARE ALL ON ONE SIDE OF 19″ PANEL)
CROSS MOUNT
MODEL NOS.
27-26-01C 27-27-01C
27-26-02C 27-27-02C

GENERAL DESCRIPTION

Models 27-26-01, 27-26-02, 27-27-01 and 27-27-02 are compact, high-performance base station notch duplexers for the 66-77 and 75-88 MHz frequency ranges. They are rated for continuous-duty operation with transmitters of 125 watts or less output power, in ambient temperatures from -40° to +60° C.

These models fulfill the demand for small-sized midband duplexers for specialized commercial applications in the U.S. and general communications applications in other countries.

SMALL SIZE, LIGHT WEIGHT

These duplexers utilize six notch-type helical resonator filters which measure only 2" x 2" x 7.5" (5.1 x 5.1 x 19.1 cm) and yet provide excellent electrical performance and temperature stability.

The six helical resonators are mounted on a 19" (48.3 cm) wide rack panel, in two compact configurations for installations where either vertical space or depth behind the panel are critical. Both can be mounted on the front or rear mounting rails of 19" rack cabinets, in a maximum of 3.625" (9.2 cm) or 7" (17.8 cm) vertical space.

Their light shipping weight of 12 lbs. (5.45 Kg) makes them extremely economical to ship anywhere in the world.

HIGH PERFORMANCE

Models 27-26-01 and 27-27-01 provide more than 100 dB T-R isolation at frequency separations of 3 MHz or more, at a typical insertion loss of 0.6 to 0.9 dB. Models 27-26-02 and 27-27-02 provide the same performance at spacings of only 2.5 MHz.

EASY FIELD TUNING

Because of their independently tunable pass and notch frequencies, these duplexers are easy to tune in the field over a broad frequency range. They are therefore attractive as "stock" duplexers for manufacturers or installers.

APPLICATION

Models 27-26-01, 27-27-01, 27-26-02 and 27-27-02 are ideal for use with low-to-medium power repeaters which do not require the large broadband isolation provided by larger, more costly pseudo-bandpass duplexers built with quarter-wave, 6 5/8" diameter cavities. In such applications, they result in compact, economical installations, without compromising duplex isolation.

DUPLEXERS: 66-88 MHz

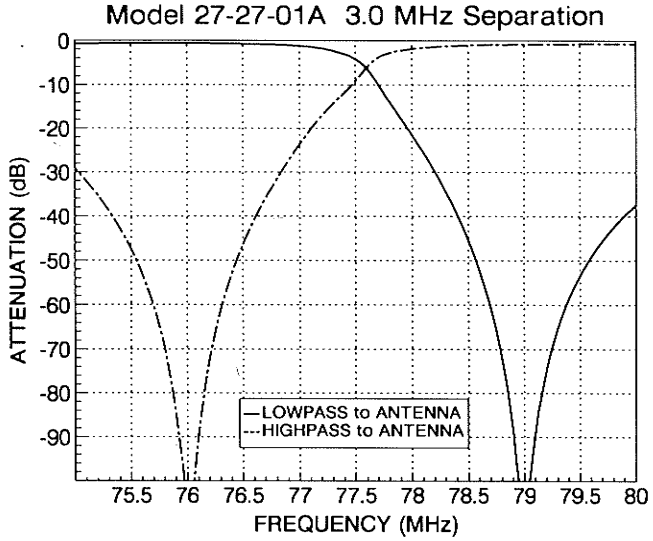
TX RX SYSTEMS INC. 8625 INDUSTRIAL PARKWAY, ANGOLA, NY 14006-9696
TELEPHONE 716-549-4700 FAX 716-549-4772 (24 HRS.)
A MEMBER OF BIRD TECHNOLOGIES GROUP

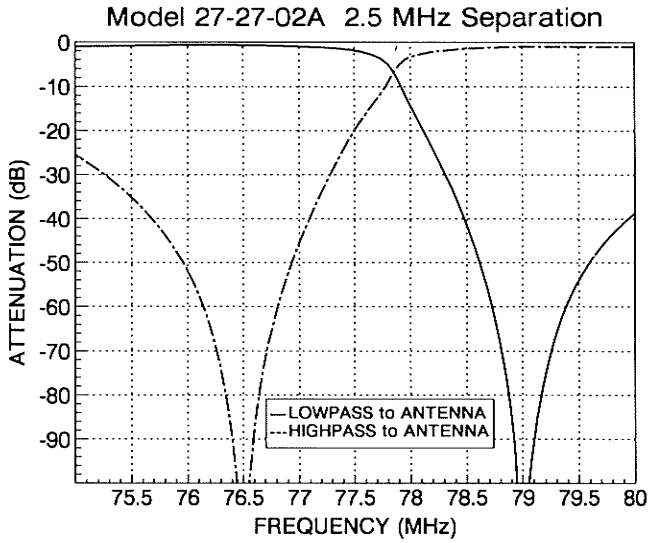
C1054G91

BASE STATION MODELS

GENERAL SPECIFICATIONS, ELECTRICAL: TEMPERATURE RANGE: -40° C TO +60° C IMPEDANCE: 50 Ohms VSWR: 1.3:1

FREQUENCY RANGE MHz (SUB-RANGE)	MODEL NO.	ELECTRICAL					MECHANICAL									
		MIN. FREQ. SEP. MHz	POWER RATING WATTS	ISOLATION dB		INSERTION LOSS dB	CAVITIES		DIMENSIONS					TX AND RX PORTS	ANTENN/ PORT	
				PER CHAN.	BET. CHAN.		NO.	SIZE	STYLE	ALT. MODEL NO.	H"	W"	D"		STD.	OPT.
66-88 (66 - 77)	27-26-01A	3.0	125	100	N/A	1.0	6	2" SQ.	A C	..... 27-26-01C	3.6 7.0	19	10.3 6.0	BNC	N	.....
	27-26-02A	2.5	125	100	N/A	1.0	6	2" SQ.	A C	..... 27-26-02C	3.6 7.0	19	10.3 6.0	BNC	N	.....
(75 - 88)	27-27-01A	3.0	125	100	N/A	1.0	6	2" SQ.	A C	..... 27-27-01C	3.6 7.0	19	10.3 6.0	BNC	N	.....
	27-27-02A	2.5	125	100	N/A	1.0	6	2" SQ.	A C	..... 27-27-02C	3.6 7.0	19	10.3 6.0	BNC	N	.....





Above curves also apply to Model 27-26-01A, 3.0 MHz separation, and 27-26-02A, 2.5 MHz separation.

DUPLEXER NOMENCLATURE

FIRST PAIR OF NUMBERS
CIRCUIT STYLE
26 - : BAND PASS CIRCUIT
27 - : NOTCH CIRCUIT
28 - : VARI-NOTCH CIRCUIT (PSEUDO BAND PASS)
30 - : PSEUDO-BANDPASS/NOTCH (NON - VARI - NOTCH)
33 - : SERIES NOTCH CIRCUIT (TUNABLE PASS BANDS)
38 - : PSEUDO BANDPASS (NON - VARI-NOTCH)
74 - : BAND PASS CIRCUIT (2 - CHANNEL T-PASS)

SECOND PAIR OF NUMBERS	
FREQUENCY RANGE (MHz)	
- 13 - : 30 - 40	- 52- : 215 - 250
- 14 - : 38 - 50	- 65 - : 406 - 430
- 26 - : 66 - 77	- 66 - : 442 - 450
- 27 - : 77 - 88	- 69 - : 470 - 512
- 28 - : 66 - 88	- 70 - : 450 - 470
- 29 - : 88 - 108	- 71 - : 470 - 490
- 35 - : 108 - 136	- 72 - : 490 - 512
- 36 - : 132 - 150	- 88 - : 890 - 960
- 37 - : 144 - 174	- 89 - : 806 - 866
- 38 - : 132 - 174	- 97 - : 1215 -1300
- 41 - : 148 - 174	

THIRD PAIR OF NUMBERS PLUS LETTER	
TWO DIGIT NUMBER	MOUNTING STYLE
ELECTRICAL SPECIFICATION IDENTIFIER	A : 19" RACK MOUNT B : 19" REVERSE FLUSH RACK MOUNT C : 19" CROSS RACK MOUNT D : DUST COVERED SIDE-OF-CABINET OR WALL MOUNT E : 24" RACK MOUNT F : WALL MOUNT G : CABINET MOUNTED H : MOBILE PLATE MOUNTED

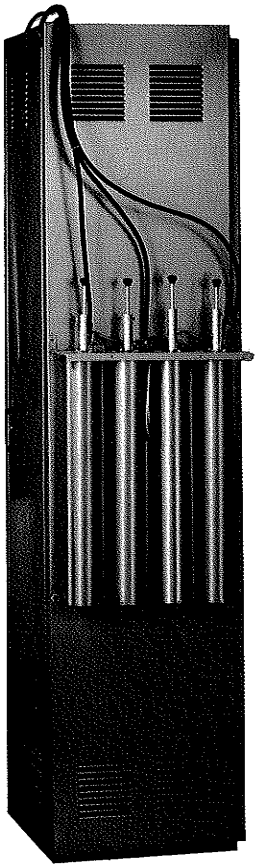
EXAMPLE: A Model **27-26-01A** is a Notch circuit, 66 - 77 MHz range, 19" rack mount Duplexer.

Adaptors, hookup cables, and other hardware are displayed on page 3 of the Duplexer/Filter Price List No. C6457.
OTHER DUPLEXER BROCHURES are available for bands **30-88 MHz** (Lit. No. C1014), **132 - 250 MHz** (Lit. NO. C1024), **406 - 512 MHz** (Lit. NO. C1034), and **806 MHz - 1.3 GHz** (Lit. NO. C1044). Also write for Tech-Aid No. 76007 (Lit. NO. C3004), "Duplexer Problems and Remedies", and Tech-Aid No. 80009 (Lit. NO. C3104), "Duplexer Response Curves".

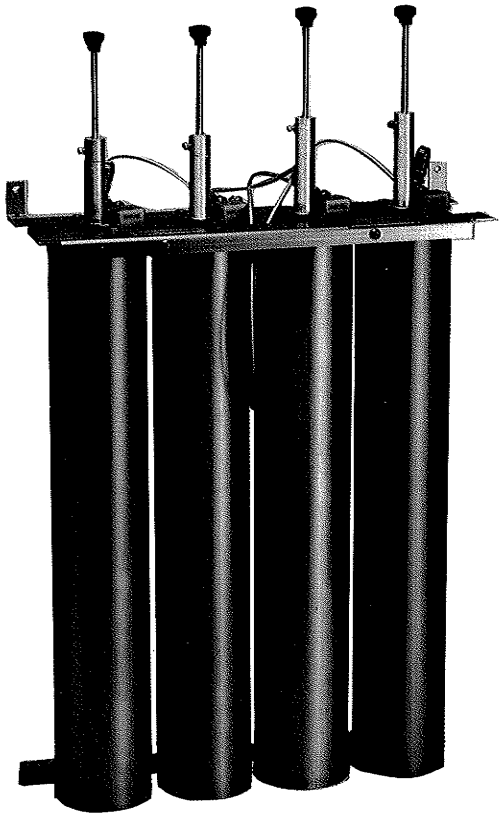
DUPLEXERS

132-250 MHz

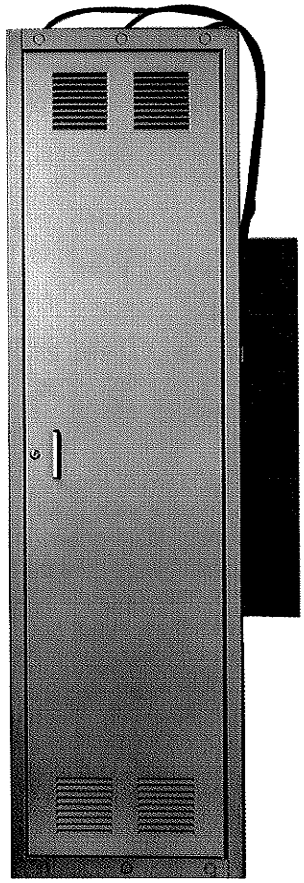
IN RANGES OF:
132 - 150 MHz
132 - 174 MHz
144 - 174 MHz
215 - 250 MHz



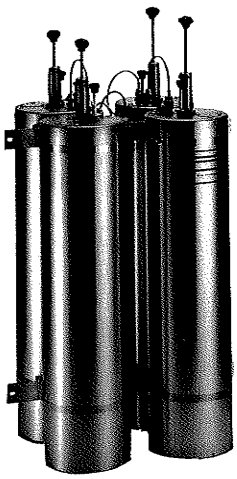
MODEL 28-38-03A SIDE-OF-CABINET MOUNT



132-174 MHz
80 dB ISOLATION AT 0.5 MHz SEPARATION
150 WATT POWER RATING
MODEL 28-38-03A
19" RACK MOUNT



MODEL 28-38-03D
DUST COVERED
VERSION



MODEL 28-37-02A
19" RACK MOUNT

VARI-NOTCH SYSTEMS, INC.

(PATENTED)

144-174 MHz
85 dB ISOLATION AT 0.5 MHz SEPARATION
400 WATT POWER RATING
MODEL 28-37-02A

MODEL 28-37-02G
CABINET MOUNT

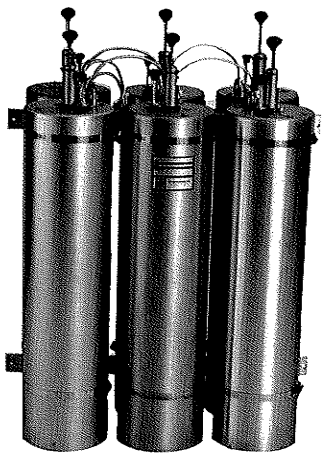
DUPLEXERS • CAVITY FILTERS • MULTICOUPLER SYSTEMS • SIGNAL BOOSTER SYSTEMS • RF SYSTEM PRODUCTS

TX RX SYSTEMS INC. 8625 INDUSTRIAL PARKWAY, ANGOLA, NY 14006
TELEPHONE 716-549-4700 TELEX 755770 FAX 716-549-4772 (24 HRS.)

C1024G91

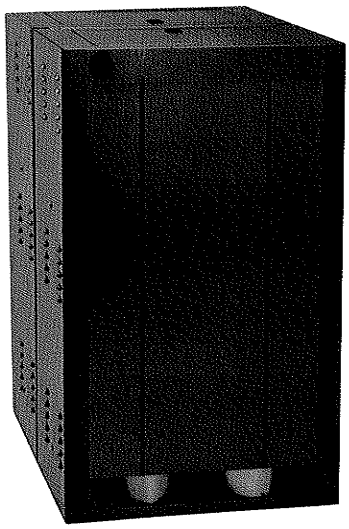
MODELS FOR VERY CLOSE SPACINGS

100 dB ISOLATION
AT 0.3 MHz SEPARATION
400 WATT POWER RATING



24″ RACK MOUNTS
(CABINET MOUNTS AVAILABLE)
MODEL NOS.
28-36-11E
28-37-11E

100 dB ISOLATION
AT 0.240 MHz SEPARATION
400 WATT POWER RATING



CABINET MOUNT
MODEL NO.
28-37-08G

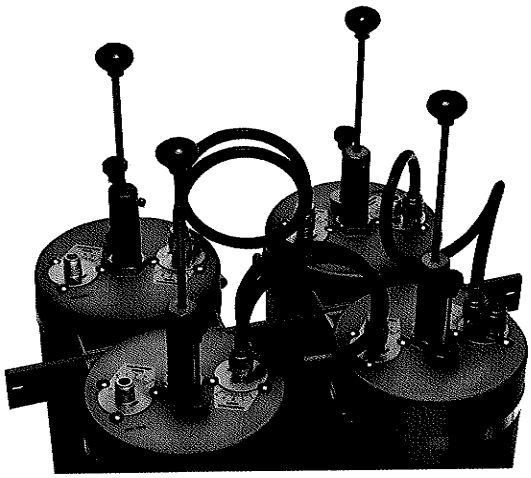
BANDPASS APPLICATIONS

DUPLEXERS FROM OUR T-PASS EXPANDABLE
MULTICOUPLER FAMILY

T-PASS®
(PATENTED)

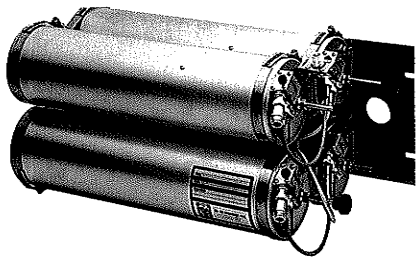
19″ RACK MOUNTS
MODEL NOS.
74-36-02A
74-37-02A

CABINET MOUNTS
MODEL NOS.
74-36-02G
74-37-02G



CLOSE SPACED MODELS FOR LIMITED SPACE OR PORTABLE REPEATER APPLICATIONS

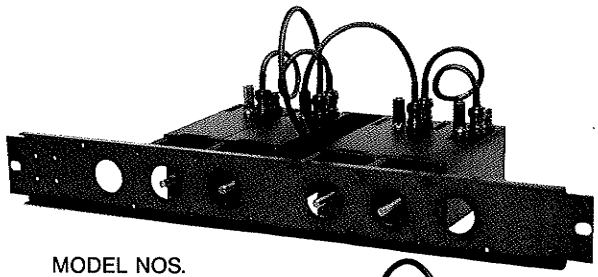
(CROSS MOUNT CAVITIES ARE ALL ON ONE SIDE OF 19″ PANEL)



CROSS MOUNTS
MODEL NOS.
28-37-04C
28-37-06C
28-37-07C

SMALL SIZED MODELS FOR WIDER SEPARATIONS

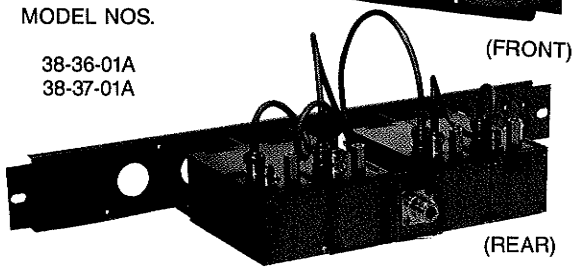
PSEUDO-BANDPASS
19″ RACK MOUNTS



MODEL NOS.

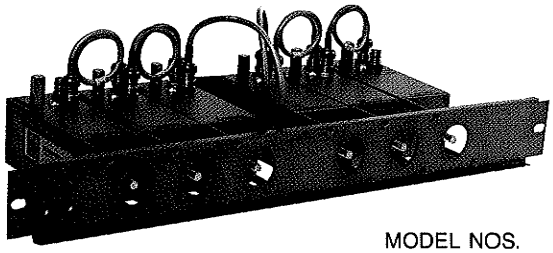
38-36-01A
38-37-01A

(FRONT)



(REAR)

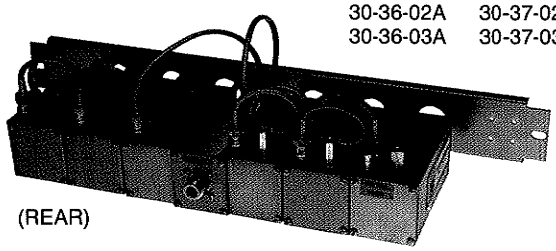
PSEUDO-BANDPASS/NOTCH
19″ RACK MOUNTS



(FRONT)

MODEL NOS.

30-36-01A	30-37-01A
30-36-02A	30-37-02A
30-36-03A	30-37-03A



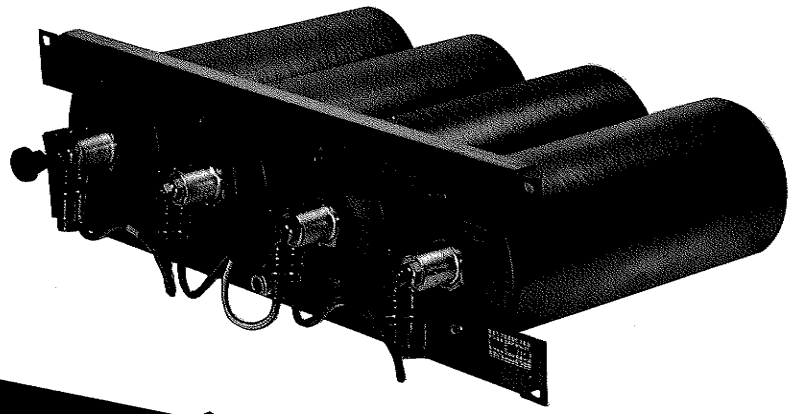
(REAR)

DUPLEXERS

406-512 MHz

IN RANGES OF:
406 - 430 MHz
442 - 450 MHz
450 - 470 MHz
470 - 512 MHz

VARI-NOTCH SYSTEMS, INC.
(PATENTED)

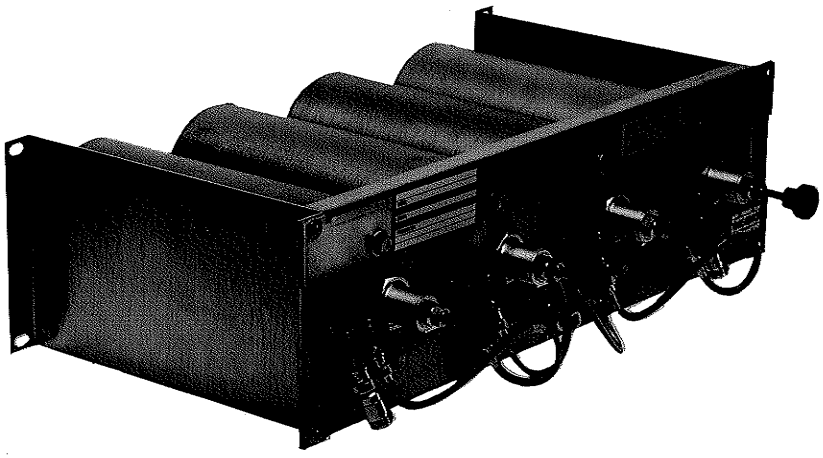


450-470 MHz
100 dB ISOLATION AT 5.0 MHz SEPARATION
350 WATT POWER RATING
MODEL 28-70-02A

19" RACK MOUNTS
MODEL NOS.

28-65-02A	28-69-02A
28-65-07A	28-69-06A
28-66-02A	28-70-02A

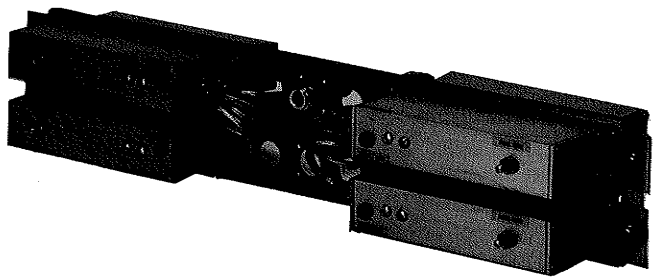
28-70-09A
(ALTERNATE MOUNT AT LEFT)



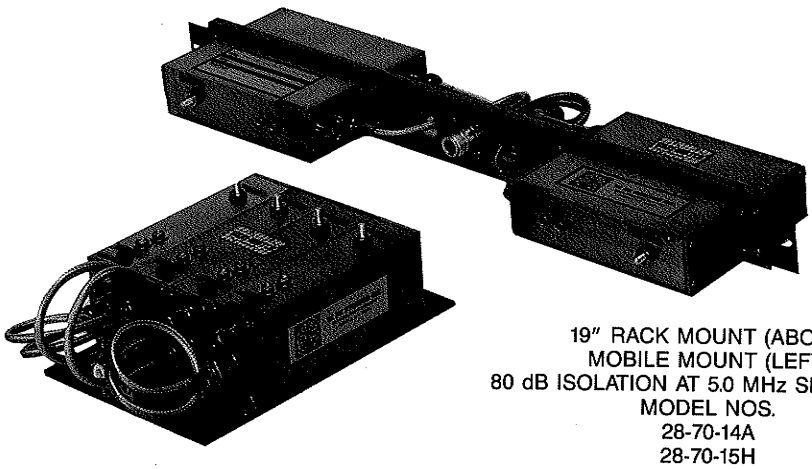
ALTERNATE MOUNT "B"
19" REVERSE FLUSH MOUNT
MODEL NOS.

28-65-02B	28-69-02B
28-65-07B	28-69-06B
28-66-02B	28-70-02B

28-70-09B



19" RACK MOUNTS
MODEL NOS
28-65-09A
28-71-01A
28-72-01A



19" RACK MOUNT (ABOVE)
MOBILE MOUNT (LEFT)
80 dB ISOLATION AT 5.0 MHz SEPARATION
MODEL NOS.
28-70-14A
28-70-15H

DUPLEXERS • CAVITY FILTERS • MULTICOUPLER SYSTEMS • SIGNAL BOOSTER SYSTEMS • RF SYSTEM PRODUCTS

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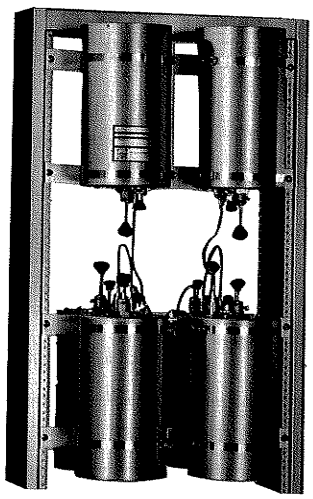
C1034G91

MODELS FOR VERY CLOSE SPACING

100 dB ISOLATION
AT 0.7 MHz SEPARATION
350 WATT POWER RATING



19″ RACK MOUNTS
MODEL NOS.
28-65-05A
28-69-04A
28-70-07A

CABINET MOUNTS
MODEL NOS.
28-65-05G
28-69-04G
28-70-07G

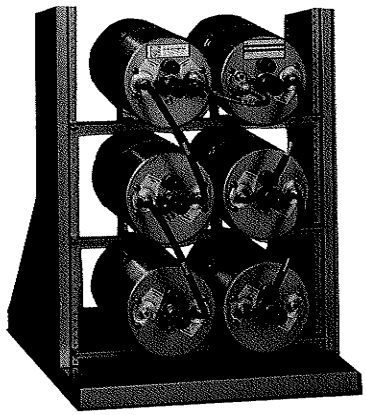
BANDPASS APPLICATIONS

DUPLEXERS FROM OUR T-PASS EXPANDABLE
MULTICOUPLER FAMILY

T-PASS®
(PATENTED)

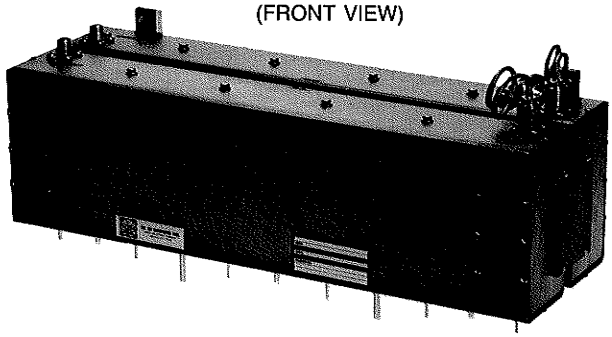
19″ RACK MOUNTS
MODEL NO.
74-70-04A

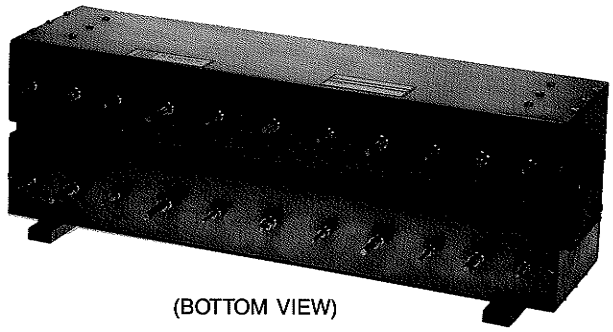
CABINET MOUNTS
MODEL NO.
74-70-04G



COMBLINE DUPLEXER FOR ATV APPLICATIONS

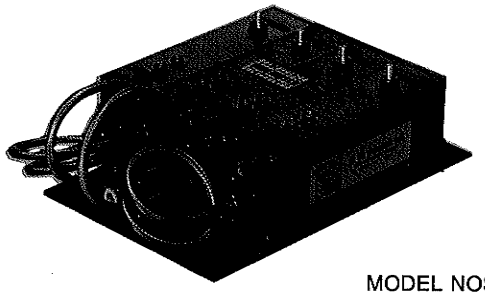
19″ RACK MOUNT
MODEL NO.
26-66-01A
(FRONT VIEW)





(BOTTOM VIEW)

MOBILE MOUNTS

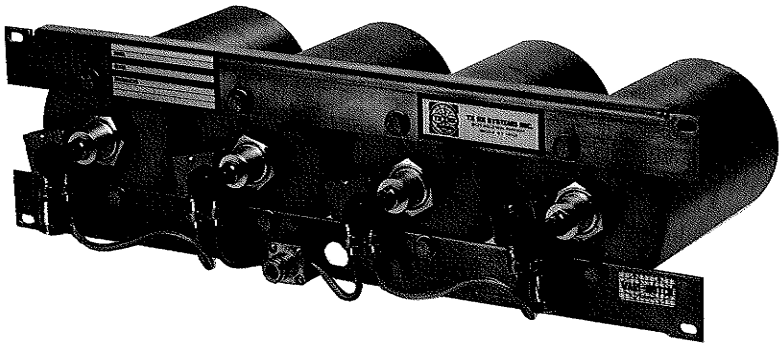


MODEL NOS.
28-65-10H
28-66-04H

DUPLEXERS

806 MHz-1.3 GHz

IN RANGES OF:
806 - 866 MHz
890 - 960 MHz
1215 - 1300 MHz



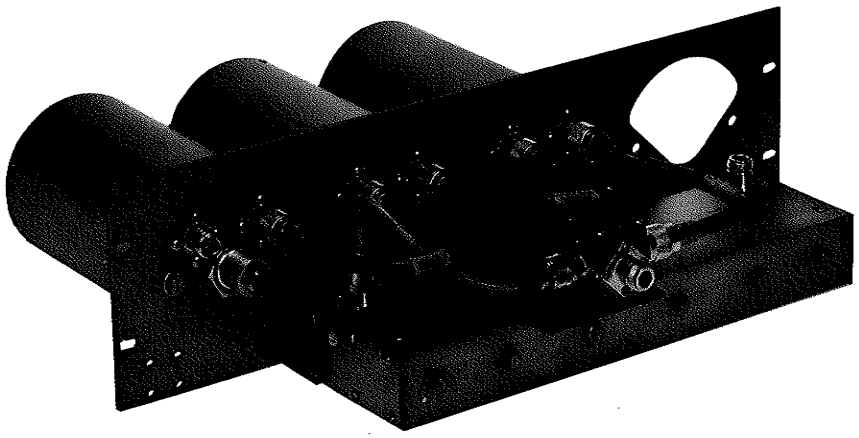
VARI-NOTCH® SYSTEMS, INC.
(PATENTED)

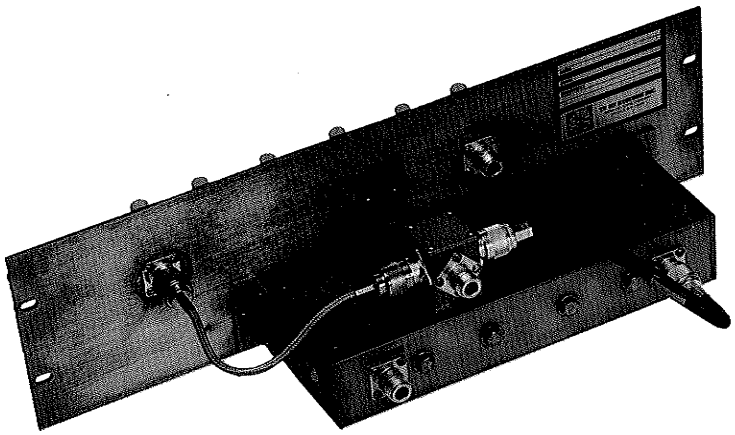
19" RACK MOUNTS
MODEL NOS.
28-88-01A
28-89-01A
28-97-01A

RECEIVER MULTICOUPLER

BANDPASS TRUNKING CAVITY/COMBLINE DUPLEXER 19" RACK MOUNT MODEL NO. 26-88-01A

TRANSMITTER MULTICOUPLER





RECEIVER MULTICOUPLER

BANDPASS TRUNKING COMBLINE DUPLEXER 19" RACK MOUNT MODEL NO. 26-89-03A

TRANSMITTER MULTICOUPLER

DUPLEXERS: 806 MHz-1.3 GHz

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C1044G91

DUPLEXER NOMENCLATURE

FIRST PAIR OF NUMBERS
CIRCUIT STYLE
26 - : BAND PASS CIRCUIT
27 - : NOTCH CIRCUIT
28 - : VARI-NOTCH CIRCUIT (PSEUDO BAND PASS)
30 - : PSEUDO-BANDPASS/NOTCH (NON - VARI - NOTCH)
33 - : SERIES NOTCH CIRCUIT (TUNABLE PASS BANDS)
38 - : PSEUDO BANDPASS (NON - VARI-NOTCH)
74 - : BAND PASS CIRCUIT (2 - CHANNEL T-PASS)

SECOND PAIR OF NUMBERS			
FREQUENCY RANGE (MHz)			
- 13 - :	30 - 40	- 52- :	215 - 250
- 14 - :	38 - 50	- 65 - :	406 - 430
- 26 - :	66 - 77	- 66 - :	442 - 450
- 27 - :	77 - 88	- 69 - :	470 - 512
- 28 - :	66 - 88	- 70 - :	450 - 470
- 29 - :	88 - 108	- 71 - :	470 - 490
- 35 - :	108 - 136	- 72 - :	490 - 512
- 36 - :	132 - 150	- 88 - :	890 - 960
- 37 - :	144 - 174	- 89 - :	806 - 866
- 38 - :	132 - 174	- 97 - :	1215 -1300
- 41 - :	148 - 174		

THIRD PAIR OF NUMBERS PLUS LETTER	
TWO DIGIT NUMBER	MOUNTING STYLE
ELECTRICAL SPECIFICATION IDENTIFIER	A : 19" RACK MOUNT B : 19" REVERSE FLUSH RACK MOUNT C : 19" CROSS RACK MOUNT D : DUST COVERED SIDE-OF-CABINET OR WALL MOUNT E : 24" RACK MOUNT F : WALL MOUNT G : CABINET MOUNTED H : MOBILE PLATE MOUNTED

EXAMPLE: A Model 26-89-03A is a BANDPASS circuit, 806 - 866 MHz range, 19" rack mount Duplexer.

VARI-NOTCH®, the trademark for **TX RX SYSTEMS'** pseudo bandpass circuit design, offers the best **cost-to-performance** ratio in its class and is unsurpassed for close-spaced duplexing, combining the low loss and close frequency spacing advantages of notch filters with the broad isolation and selective pass characteristics of bandpass filters. The small geometry and efficiency of this circuit design has also resulted in a variety of space efficient mountings.

TRUNKING DUPLEXERS combine transmitter and receiver multicouplers to a common antenna. The receive section provides the total system isolation required for carrier suppression. The transmit section usually provides supplemental noise suppression, with the cavities in the transmit multicoupler being the major contributor. The model 26-89-03A combines the 806-821 MHz receive and 851-866 MHz transmit bands to a common antenna. Model 26-88-01A combines 896-901 MHz receive and 935-940 MHz transmit similarly.

CONSTRUCTION: Our 4" diameter Duplexer cavities are constructed of hardened aluminum which does not easily dent, as some copper types do, causing detuning. Cavity surfaces are passivated inside and out with a chromate conversion coating (Alodine). A 3/16" thick end cap heliarced to the top of the cavity at the critical current point eliminates the problem of noise generated by poor metal to metal contact inherent in constructions using pop rivets. Silver plating the movable brass tuning probes and hardened copper contact fingers avoids erratic tuning, high loss, and degraded selectivity which result in extra time and costs.

Adaptors, hookup cables, and other hardware are displayed on page 3 of the Duplexer/Filter Price List No. C6457.

OTHER DUPLEXER BROCHURES are available for bands **30-88 MHz** (Lit. No. C1014), **132-250 MHz** (Lit. No. C1024), and **406-512 MHz** (Lit. No. C1034). Also write for Tech-Aid No. 76007 (Lit. No. C3004), "Duplexer Problems and Remedies", and Tech-Aid No. 80009 (Lit. No. C3104), Duplexer Response Curves.

BASE STATION MODELS

GENERAL SPECIFICATIONS, ELECTRICAL: TEMPERATURE RANGE: -40° C TO +80° C IMPEDANCE: 50 Ohms VSWR: 1.3:1

NOTE : Specifications for duplexers of unsymmetrical construction or response are listed as follows: ISOLATION - noise suppression/carrier suppression; INSERTION LOSS - TX insertion loss/ RX insertion loss.

FREQUENCY RANGE MHz (SUB-RANGE)	MODEL NO.	ELECTRICAL					MECHANICAL									
		MIN. FREQ. SEP. MHz	POWER RATING WATTS	ISOLATION dB PER CHAN.	ISOLATION dB BET. CHAN.	INSERTION LOSS dB	CAVITIES NO.	CAVITIES SIZE	DIMENSIONS STYLE	DIMENSIONS ALT. MODEL NO.	DIMENSIONS H"	DIMENSIONS W"	DIMENSIONS D"	TX AND RX PORTS	ANTENNA PORT STD.	ANTENNA PORT OPT.
(806-866)	26-89-03A	45.0	600	45/77	45	0.5/1.0	2	COMBLINES	A		5.25	19	+7-2	N	N	....
(806-866)	28-89-01A	45.0	125	90	60	0.8	4	4" DIA.	A B	..... 28-89-01B	5.25 5.25	19 19	+3-6.5 10	N	N	....
806-960 (890-960)	28-88-04A	39.0	125	90	50	0.8	4	4" DIA.	A B	..... 28-88-04B	5.25 5.25	19 19	+3-6.5 10	N	N	....
(890-960)	26-88-01A	39.0	600	55/100	50	0.6/1.2	1 3	COMBLINE & 4" DIA.	A		5.25	19	+7-6.5	N	N	....
(890-960)	28-88-01A	3.6	125	90	40	1.25	4	4" DIA.	A B	..... 28-88-01B	5.25 5.25	19 19	+3-6.5 10	N	N	....
1215-1300	28-97-01A	12.0	125	100	50	1.0	4	4" DIA.	A B	..... 28-97-01B	5.25 5.25	19 19	+3-6.5 10	N	N	....

DUPLEXER PROBLEMS AND REMEDIES

TECH-AID NO. 76007

FOR

BROCHURES :	30-88 MHz	66-88 MHz	132-150 MHz	406-512 MHz	806 MHz - 1.3 GHz
LIT. ORDER NO. :	C1014	C1054	C1024	C1034	C1044

INTRODUCTION:

As an aid to those in the field concerned with servicing Duplexers, TX RX SYSTEMS INC. offers this field service guide along with our thanks for their contributions to its contents. Advice from our customers is always most welcome and is a prime source for designs and applications.

Duplexers are passive devices requiring little or no service once installed in a system. The proper design and application of a given Duplexer will give years of trouble free service. When problems do occur in a duplex system it is necessary to identify as many abnormal conditions as possible to zero in on the specific cause of the problem.

Unfortunately, there are only a few measurable or observable performance indicators at the disposal of the field serviceman, and any number of conditions may exist, even simultaneously, which are responsible for the observed phenomena.

Most Duplexer installation problems fall into three categories. Each of these three conditions will be treated separately, using the typical cause and remedy approach:

A. HIGH INPUT VSWR B. EXCESSIVE LOSS C. DESENSITIZATION OF THE RECEIVER WHEN TRANSMITTER IS KEYED

PROBLEM			POTENTIAL CAUSE THE NUMBER AT RIGHT CORRESPONDS TO THE APPROPRIATE NUMBERED REMEDY PARAGRAPH ON THE REVERSE	
A	B	C		
●	●		Reverse labeling of Tx and Rx terminals.	1
●	●		Unit tuned to wrong frequencies.	2
●			Bad antenna or interconnect cables.	3
●	●		Use of between series adaptors, especially UHF types.	4
●	●	●	Duplexer detuned in shipment.	5
●	●		Water has entered the Duplexer antenna connector from the antenna feed line.	6
●	●		Spurious Tx output is being reflected by the selective Duplexer input terminal and observed on the wattmeter, the wattmeter being unable to discriminate between on-frequency and off-frequency energy.	7
		●	Bad joint in a cable or antenna system beyond the antenna terminal of the Duplexer. All lines may show zero reflected power, but noise can still be produced when a corroded or indefinite metal-to-metal contact is exposed to RF energy. When this occurs beyond the Duplexer, it cannot be filtered out, and the noise backs up into the receiver.	8
		●	Adverse cable length between Duplexer and transmitter using varactor or broadband hybrid combining type transmitter outputs. Even though the Duplexer VSWR is flat on frequency, the reflected impedance of the Duplexer off resonance, transformed by changing cable lengths, can cause parasitics to be generated.	9
		●	Duplexer transmitter mixing with another outside transmitter, producing intermodulation on or near the receiver frequency.	10
		●	Transmitter cable leading to Duplexer in close proximity to Duplexer antenna or receiver cable. This is usually only a problem on close separation Duplexers, (1.0 MHz or less) where the 85 to 100 dB isolation is decreased by adverse coupling, created by running these cables too close together for too great a distance.	11
		●	Inadequate shielding of transmitter and receiver modules in the repeater.	12
		●	Insufficient duplex isolation for the application.	13
		●	A spurious transmitter response outside of the normal Duplexer isolation band or inadequacy of notch filter type Duplexers to suppress a wide enough band of Tx noise to protect the receiver.	14
		●	Impedance change in antenna due to icing. VSWR increase may be sufficient to reflect back through the Duplexer and upset transmitter tuning, causing parasitics, which are not suppressed sufficiently by the Duplexer.	15
		●	The addition of a broadband power amplifier to a low power transmitter. The noise floor of the low power radio is raised by an amount equal to the gain of the power amplifier, and in addition, the power amplifier will contribute its own noise. Power amplifiers are just as prone to the generation of parasitics as transmitters, and may be triggered by an adverse cable length between power amplifier and Duplexer, a problem covered above.	16
		●	Excessive loss with changing temperature and apparent Duplexer detuning.	17

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FIELD SERVICE REMEDIES FOR PAGE ONE PROBLEMS

1. Tune a signal generator to the receive frequency and inject it into the antenna terminal, sampling for the signal at each equipment terminal. Reverse the labels if necessary. It may be that the unit was ordered to the reverse frequencies. If so, the label will indicate this. If the duplexer is symmetrical in design (usually indicated by the same number of Tx and Rx filter sections) just reverse the equipment labels and operate. Generally, no damage will be done to the duplexer when operated in reverse for a short time period. If other adverse symptoms appear, contact the factory.

2. Check the unit label. If needed, the duplexer may be field tuned. Consult the instructions and/or the factory if the duplexer is still under warranty or beyond field tuning capability.

3. Check cable, by substitution, using a termaline wattmeter, or a thruline wattmeter into a good load. Check the antenna line input for reflected power.

4. To eliminate high input VSWR reduce the number of between series adaptors by making up proper interconnect cables. UHF connectors are non-constant impedance, and certain combinations can transform a 1.1:1 VSWR into a 2.0:1, or vice versa.

5. Consult the instruction manual for field tuning procedures, or the factory, if unit is still under warranty or beyond field tuning capability. (We trust that our products will not be prone to this problem).

6. Consult the factory. The affected antenna cables may be field replaceable, or a "baking out" process may be possible.

7. To prove this condition, place a bandpass filter between the Tx and duplexer to clean up the spurious, and put the wattmeter between the bandpass filter and the duplexer to measure reflected power from the duplexer. The bandpass filter selectivity should be equal to or better than that of the duplexer at about the 3.0 dB points.

8. Operate the duplex system into a dummy load. If no desensitization occurs, check out all lines, antennas, and look for potential bad joints close to the radiating antenna where re-radiation of noise may be possible back into the antenna system receiver. Loose metal-to-metal contacts on tower guying systems have also been known to create system noise. Note the effect of vibrating tower guys on system noise.

9. Change the length of cable between the transmitter and duplexer, traversing through a half wave in increments of 1 to 2 inches until desensitization ceases or is minimal. A ferrite isolator will also cure this condition when installed between the transmitter and duplexer. However, this is a much more expensive remedy.

10. If the IM is in the duplex transmitter, a ferrite isolator in the duplex transmitter line (NOT antenna line) will show this by reducing or eliminating it. More isolation can be obtained by cascading isolators if needed. However, IM of this magnitude indicates the system should be studied for possible revision to reduce the production of this IM.

11. Cables such as RG-8a/u and RG-213/u should be at least 3-4" apart over 5'-10' runs. Use of double shielded cable will reduce the susceptability to this problem.

12. Consult the radio manufacturer. This condition can be verified by operating the transmitter into a dummy load while injecting a minimum quieting signal into the receiver. Some radios require special modifications before they are suitable for repeater operation.

13. If this problem is suspected, contact the radio manufacturer for recommended duplex isolation for Tx noise suppression and carrier suppression. Duplexer isolation should be measured first per instruction manual to verify rated specifications are present. If more duplex isolation is required, contact TX RX SYSTEMS for recommended filtering.

14. Consult the factory. Bandpass filter tests can be made to confirm this. In extreme cases, adjustments to the transmitter may be required.

15. Either de-ice the antenna, or use an antenna less sensitive to ice. A ferrite isolator can also be put at the transmitter output to improve the impedance match. Ferrite isolators cannot be put in antenna lines, as they will attenuate Rx signals.

16. A mismatch may possibly be reduced by lengthening the cable between the power amplifier output and the duplexer input until the receiver desensitization disappears, as follows:
30 MHz to 512 MHz RANGE; BNC or N type adaptors may be inserted in the original cable, one at a time and not to exceed a total of 1/2 wavelength, until desensitization disappears.
800 MHz to 1.3 GHz RANGE; Prepare a cable length 3/4" longer than original cable and insert. If desensitization does not disappear, repeat with cables each 3/4" longer than the previous length, not to exceed 1/2 wavelength.

17. We find this cause most commonly relates to shifting impedance of the transmitter or power amplifier with temperature. The duplexer "appears" detuned, since a "conjugate match" (cancelling reactance, and matching resistance component) is approached by shifting the duplexer passband above or below the 50 ohm point, as determined by an increase in output power on the wattmeter. In this case, temperature control of the room is the only answer, other than upgrading the transmitter.