L MULTIPLEX TERMINALS
COMMON EQUIPMENT
DFSG BANK
DESCRIPTION

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1. INTRODUCTION

A. General

1.01 This section describes the direct formed supergroup (DFSG) bank (Fig. 1) and the associated carrier supplies. The bays and frames in which the DFSG bank is mounted are described in Section 356-016-107.

> ***Note:*** The A6B bank is covered in Sections 356-016-104 and 356-016-105.

1.02 Whenever this section is reissued, the reasons for reissue will be listed in this paragraph.

1.03 The DFSG bank is an arrangement of frequency-division multiplex equipment that translates 60 voice-frequency (VF) message channels into a corresponding supergroup (SG) without the use of intervening groups (12 frequency-multiplexed message channels in the 60- to 108-kHz range).

1.04 The DFSG bank translates 60 outgoing 200- to 3400-Hz VF channels into one 312- to 552-kHz basic SG in its transmitting section and it translates the corresponding incoming basic SG into 60 VF channels in its receiving section. Thus, the DFSG bank functions as an interface between 60 VF circuits and one SG circuit. Its function in the L-multiplex terminal is shown in Fig. 2, and the principal characteristics of the DFSG bank are listed in Table A.

1.05 A carrier failure alarm (CFA) system is used (optionally) in the DFSG bank to monitor the condition of the associated carrier system. In the event of carrier failure, associated trunk conditioning equipment is activated and lamp indications are provided. The CFA system consists of (a) one J68954BJ CFA unit mounted on each of the five transmission shelves in each DFSG bank (Fig. 1) and (b) an associated CFA carrier supply (Fig. 6, 7, and 8).

> ***Note:*** The transmission characteristics of the associated DFSG banks are unaffected by addition of the CFA system, other than the addition of five CFA pilots to the SG spectrum and a resultant slight (but acceptable) increase in VF-channel-3 noise in 2-way systems.

2. EQUIPMENT DESCRIPTION

A. Physical Design

2.01 The DFSG bank utilizes monolithic crystal-type bandpass filters and integrated circuits in the channel modems and integrated circuits in the DFSG modulator/demodulator and the carrier/pilot supplies.

2.02 The various units comprising the DFSG bank and associated DFSG-bank carrier/pilot supply are plug-in mounted in specified slots on stamped steel shelf assemblies. Each shelf has connectors at the rear of each slot. Mating connectors on the plug-in units provide for all external wiring. A plastic faceplate is used on each plug-in unit, and quick-release spring catches at the lower end of the faceplates hold the units in place but permit easy removal. The shelf height is 4 inches, the depth is 12 inches, and the width is suitable for mounting on a 23-inch bay.

> ***Note 1:*** When the DFSG bank is used in J68954( ) bays, the transmission shelves (J68954T) will be arranged as shown in Fig. 1, and will be designated J68954C. When used in the J98629( ) UTE frames, the J68954T shelves will be arranged for a maximum of 8 DFSG banks per standard frame grouping. The DFSG-bank carrier/pilot supply is arranged as shown in Fig. 6, 7, and 8.

> ***Note 2:*** Some A6 channel bank plug-in units are equivalent to corresponding DFSG-bank units shown in Fig. 1. Equivalent units are (a) J68929AR and J68954BG channel modems and (b) J68929BC and J68954BJ CFA units.

2.03 All channel modems used in the DFSG bank are identical in function; however, they are ***not*** interchangeable since each of the 12 VF channels requires a different channel filter in both transmit and receive directions. DFSG plug-in units having the same function ***are*** interchangeable since they do not contain band filters.

2.04 Individual gain controls are provided for alignment of the 60 VF channels in the receiving section of the DFSG bank. One such channel gain (GAIN ADJ) control is located on the faceplate of each J68954BG channel modem as shown in Fig. 1.

2.05 A control (ADJ) is provided on the faceplate of the J68954BA DFSG combining unit for building out the transmitting line length between the DFSG bank and the supergroup distributing frame (SGDF). Similarly, a control (ADJ) is provided on the J68954BB DFSG splitting unit for building out the corresponding receiving line length.

2.06 Access for VF and signaling tests and restoration patching is provided via multiple access connectors on the DFSG bank shelves in J68954( ) bays and on the maintenance connectors in J98629( ) frames. Access for high-frequency tests and restoration patching is provided via jacks on the faceplate of applicable plug-in units as described in Part 3B.

B. Transmission Circuits

2.07 ***General:*** The DFSG bank consists of 60 channel modulators and demodulators (modems), five DFSG modulators and demodulators, associated combining and splitting circuits, and required carrier supplies. The 60 VF channels are processed in five groups of 12 channels.

> ***Note:*** If the CFA system is used, five CFA units will also be used in the DFSG bank.

2.08 The transmitting section (Fig. 3) of each of the 60 channel modems used in the DFSG bank amplitude modulates one of 60 corresponding carrier frequencies with the speech information from one of 60 VF channels. The 60 carriers consist of five groups of 12 frequencies located at 4-kHz intervals in the range of 8.140 to 8.184

J68954T SHELF 5 (COMMON)	* MULTIPLE ACCESS CONNECTORS	CHAN BK -12V REG J68954- BF -12V GRD	MODEM CHAN 1 J68954- BG GAIN ADJ	MODEM CHAN 2 J68954- BG GAIN ADJ	MODEM CHAN 3 J68954- BG GAIN ADJ	MODEM CHAN 4 J68954- BG GAIN ADJ	MODEM CHAN 5 J68954- BG GAIN ADJ	MODEM CHAN 6 J68954- BG GAIN ADJ	MODEM CHAN 7 J68954- BG GAIN ADJ	MODEM CHAN 8 J68954- BG GAIN ADJ	MODEM CHAN 9 J68954- BG GAIN ADJ	MODEM CHAN 10 J68954- BG GAIN ADJ	MODEM CHAN 11 J68954- BG GAIN ADJ	MODEM CHAN 12 J68954- BG GAIN ADJ	DFSG TRMT J68954- BD	DFSG RCVG J68954- BE PIL ALM	CFA UNIT J68954- BJ TRMT FAIL RCV FAIL	
J68954T SHELF 4 (COMBINE)	* MULTIPLE ACCESS CONNECTORS	CHAN BK -12V REG J68954- BF -12V GRD	MODEM CHAN 1 J68954- BG GAIN ADJ	MODEM CHAN 2 J68954- BG GAIN ADJ	MODEM CHAN 3 J68954- BG GAIN ADJ	MODEM CHAN 4 J68954- BG GAIN ADJ	MODEM CHAN 5 J68954- BG GAIN ADJ	MODEM CHAN 6 J68954- BG GAIN ADJ	MODEM CHAN 7 J68954- BG GAIN ADJ	MODEM CHAN 8 J68954- BG GAIN ADJ	MODEM CHAN 9 J68954- BG GAIN ADJ	MODEM CHAN 10 J68954- BG GAIN ADJ	MODEM CHAN 11 J68954- BG GAIN ADJ	MODEM CHAN 12 J68954- BG GAIN ADJ	DFSG TRMT J68954- BD	DFSG RCVG J68954- BE PIL ALM	CFA UNIT J68954- BJ TRMT FAIL RCV FAIL	DFSG COMBG J68954- BA TST ADJ
J68954T SHELF 3 (PILOT)	* MULTIPLE ACCESS CONNECTORS	CHAN BK -12V REG J68954- BF -12V GRD	MODEM CHAN 1 J68954- BG GAIN ADJ	MODEM CHAN 2 J68954- BG GAIN ADJ	MODEM CHAN 3 J68954- BG GAIN ADJ	MODEM CHAN 4 J68954- BG GAIN ADJ	MODEM CHAN 5 J68954- BG GAIN ADJ	MODEM CHAN 6 J68954- BG GAIN ADJ	MODEM CHAN 7 J68954- BG GAIN ADJ	MODEM CHAN 8 J68954- BG GAIN ADJ	MODEM CHAN 9 J68954- BG GAIN ADJ	MODEM CHAN 10 J68954- BG GAIN ADJ	MODEM CHAN 11 J68954- BG GAIN ADJ	MODEM CHAN 12 J68954- BG GAIN ADJ	DFSG TRMT J68954- BD	DFSG RCVG J68954- BE PIL ALM	CFA UNIT J68954- BJ TRMT FAIL RCV FAIL	DFSG † PIL SEC DIST J68954- BC TST ADJ
J68954T SHELF 2 (SPLIT)	* MULTIPLE ACCESS CONNECTORS	CHAN BK -12V REG J68954- BF -12V GRD	MODEM CHAN 1 J68954- BG GAIN ADJ	MODEM CHAN 2 J68954- BG GAIN ADJ	MODEM CHAN 3 J68954- BG GAIN ADJ	MODEM CHAN 4 J68954- BG GAIN ADJ	MODEM CHAN 5 J68954- BG GAIN ADJ	MODEM CHAN 6 J68954- BG GAIN ADJ	MODEM CHAN 7 J68954- BG GAIN ADJ	MODEM CHAN 8 J68954- BG GAIN ADJ	MODEM CHAN 9 J68954- BG GAIN ADJ	MODEM CHAN 10 J68954- BG GAIN ADJ	MODEM CHAN 11 J68954- BG GAIN ADJ	MODEM CHAN 12 J68954- BG GAIN ADJ	DFSG TRMT J68954- BD	DFSG RCVG J68954- BE PIL ALM	CFA UNIT J68954- BJ TRMT FAIL RCV FAIL	DFSG SPLIT J68954- BB TST ADJ
J68954T SHELF 1 (COMMON)	* MULTIPLE ACCESS CONNECTORS	CHAN BK -12V REG J68954- BF -12V GRD	MODEM CHAN 1 J68954- BG GAIN ADJ	MODEM CHAN 2 J68954- BG GAIN ADJ	MODEM CHAN 3 J68954- BG GAIN ADJ	MODEM CHAN 4 J68954- BG GAIN ADJ	MODEM CHAN 5 J68954- BG GAIN ADJ	MODEM CHAN 6 J68954- BG GAIN ADJ	MODEM CHAN 7 J68954- BG GAIN ADJ	MODEM CHAN 8 J68954- BG GAIN ADJ	MODEM CHAN 9 J68954- BG GAIN ADJ	MODEM CHAN 10 J68954- BG GAIN ADJ	MODEM CHAN 11 J68954- BG GAIN ADJ	MODEM CHAN 12 J68954- BG GAIN ADJ	DFSG TRMT J68954- BD	DFSG RCVG J68954- BE PIL ALM	CFA UNIT J68954- BJ TRMT FAIL RCV FAIL	

* NOT EQUIPPED IN J98629( ) UTE FRAMES.
† J68954BC OR J68954CT DFSG QUATERNARY DISTRIBUTION UNIT IN UTE FRAMES.
NOTE 1: THE FIVE J68954T SHELVES MAY NOT BE CONTIGUOUS NOR IN THE SAME ORDER IN UTE FRAMES.
NOTE 2: EQUIVALENT PLUG-IN UNITS (J68929AR ~ J68954BG AND J68929BC ~ J68954BJ) MAY BE USED IN THESE SHELVES.

Fig. 1—The DFSG Bank—Front View

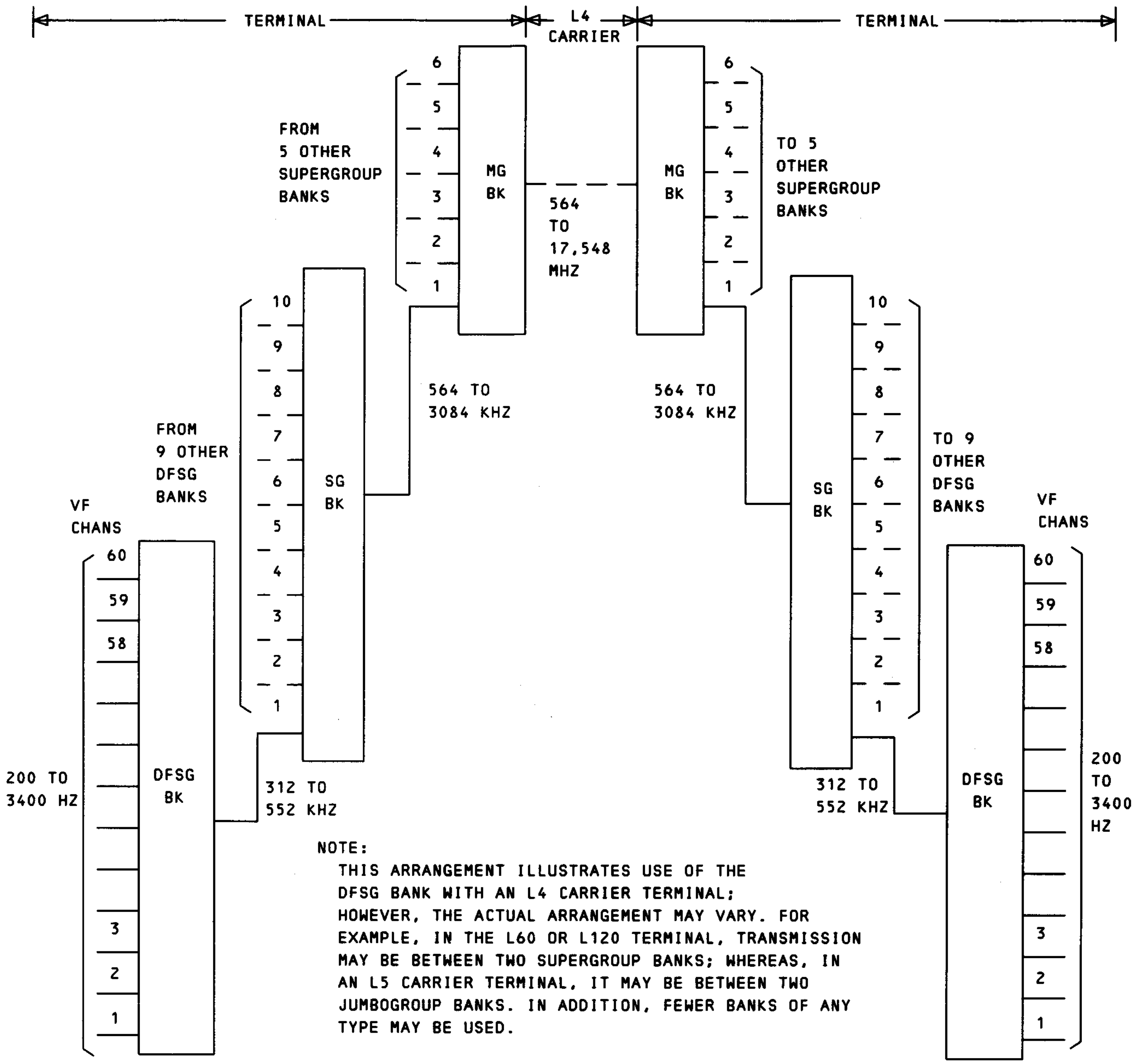


Fig. 2—Typical Function of the DFSG Bank in the L-Type Terminal

MHz. After modulation is accomplished, the carriers and lower sidebands are suppressed. The upper sidebands are then combined to form five bands of 12 contiguous single-sideband channels, each 4-kHz wide, over the range of 8.140 to 8.188 MHz. These five composite 48-kHz-wide bands of upper sidebands are translated into five contiguous 48-kHz-wide bands (312 to 360, 360 to 408, 408 to 456, 456 to 504, and 504 to 552 kHz). These five bands are combined to form one 240-kHz-wide band of lower sidebands in the range of 312 to 552 kHz. Five carrier frequencies located at 48-kHz intervals in the range of 7.636 to 7.828 MHz are used to obtain the required translation of the five 8.140- to 8.188-MHz bands. This second composite band of frequencies (a basic SG) is applied to one of the ten input circuits on the equipment side of the associated SG bank (usually via the SGDF).

2.09 In the receiving section of the DFSG bank, the incoming SG (312 to 552 kHz) is divided into five paths and applied to five DFSG demodulators. These five 312- to 552-kHz bands are translated into five overlapping 240-kHz-wide (60-channel) bands in the range of 7.948 to 8.380 MHz (Fig. 3), each of which contains the 12-channel range of 8.140 to 8.188 MHz, but is displaced 48 kHz (12-channels) from the bands produced by adjacent DFSG demodulators. Thus, each of the five groups of 12-channel modems demodulates a different

TABLE A

CHARACTERISTICS OF THE DFSG BANK

Normal field of use	Long-haul carrier
Typical associated terminal:	
Carrier telephone	K, L, etc.
Microwave radio	TD, TH, TJ, TL, TM, etc.
Number of channels:	
Without program service	60 VF
With 5-kHz program service	50 VF
With 8-kHz program service	45 VF
Type of multiplexing	Frequency division
Type of modulation	SSB — SC — AM (two steps)
Type of signaling	SF or CCIS
Drop side of bank:	
Voice channel bandwidth	200 to 3400 Hz
Transmit level	—16 dB
Receive level	+7 dB
Impedance	600Ω (4-wire)
Line side of bank:	
Frequency band	312 to 552 kHz (basic supergroup)
Transmit level	—21.1 dB
Receive level	—28.6 dB
Impedance	75Ω (unbalanced)
Required carrier supply:	
Primary frequency	64 kHz (synchronous)
Carrier frequencies:	
Channel (12)	8.140, 8.144, 8.148. . . 8.184 MHz
DFSG (5)	7.636, 7.684, 7.732, 7.780, 7.828 MHz
Pilot frequencies:	
CFA	8.147920 MHz
DFSG	8.143920 MHz
Required dc supply	—24 volts
End-to-End Compatibility:	
DFSG with A1 channel banks	Unsatisfactory
DFSG with A2 channel banks	Satisfactory
DFSG with A3 channel banks	Unsatisfactory
DFSG with A4 channel banks	Satisfactory
DFSG with A5 channel banks	2nd choice
DFSG with A6, A6B, or DFSG	1st choice

Note: AM = amplitude modulation
CCIS = common channel interoffice signaling
CFA = carrier failure alarm
DFSG = direct-formed supergroup
SC = suppressed carrier
SF = single frequency
SSB = single sideband

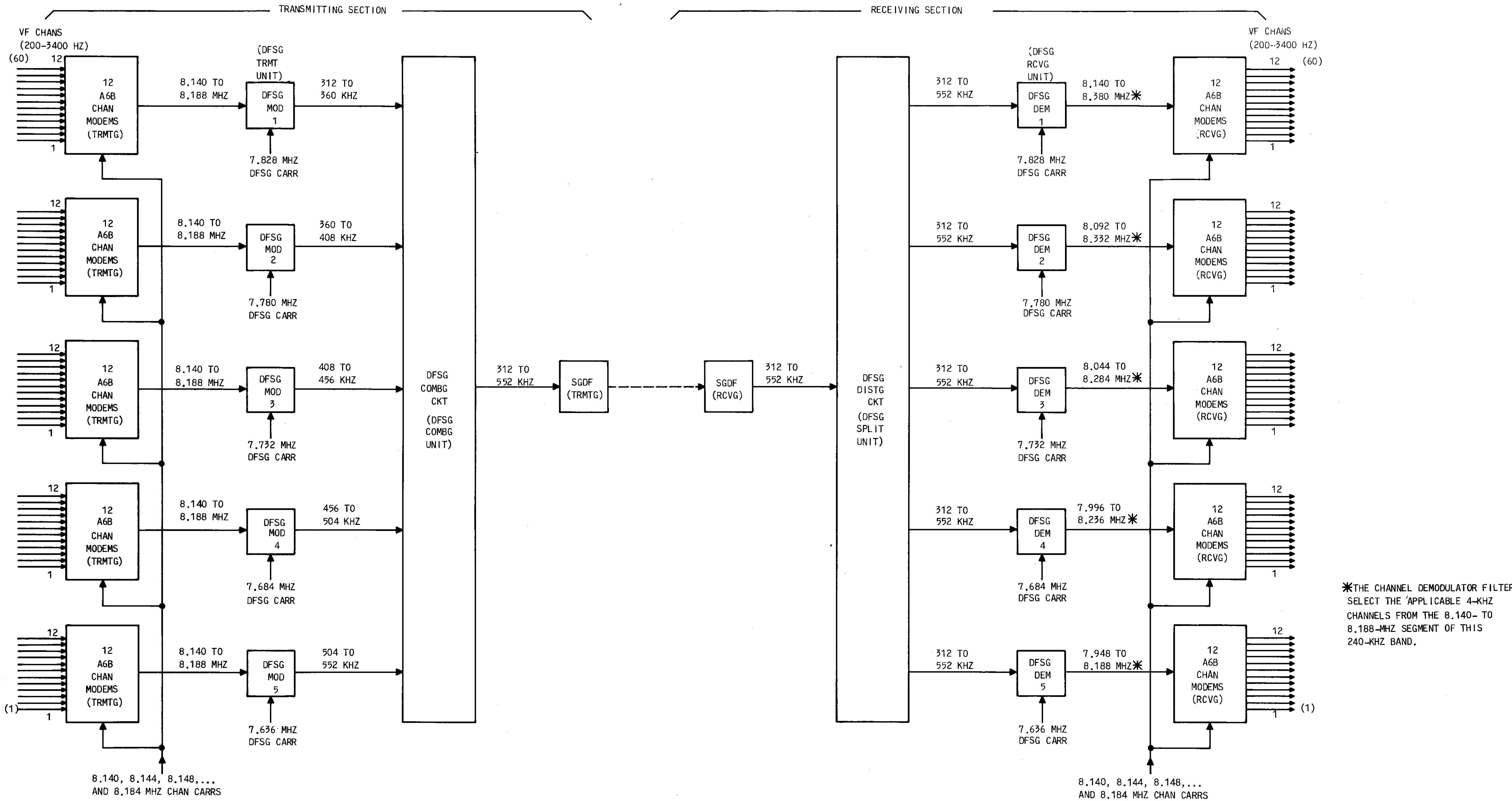


Fig. 3—Frequency Translations Used in DFSG Bank—Block Diagram

12-channel (48-kHz) segment of its applied 60-channel (240-kHz) band. This results in an output of 60 discrete VF channels that correspond with the 60 VF channels applied to the input of the transmitting section of the DFSG bank at the distant end.

2.10 ***Channel Modems—Transmitting:*** In the transmitting section of the channel modems (Fig. 4), the 200- to 3400-Hz voice information in each of 12 VF (4-kHz-wide) channels is applied (via an isolation transformer) to a corresponding channel modulator where it is combined with a channel carrier of 8.140, 8.144, 8.148, . . . or 8.184 MHz and is thus translated to the range of 8.136 to 8.144, 8,140, to 8.148, 8.144 to 8.152, . . . or 8.180 to 8.188 MHz. These resultant twelve 8-kHz-wide bands are amplified and applied to corresponding bandpass filters where they are divested of all except the upper sidebands (8.140 to 8.144, 8.144 to 8.148, 8.148 to 8.152, . . . or 8.184 to 8.188 MHz). These twelve contiguous 4-kHz-wide sidebands are applied to a channel combining multiple to form one composite 48-kHz-wide band ranging from 8.140 to 8.188 MHz.

> ***Note:*** When the DFSG bank is equipped for CFA, the CFA 2-way pilot frequency (8.147920 MHz) is also injected in the channel combining multiple.

2.11 ***DFSG Transmitting Units:*** Each of the 8.140- to 8.188-MHz bands of frequencies from the five groups of 12 channel modems is combined with the DFSG pilot (8.143920 MHz), amplified, and applied to a corresponding DFSG modulator. The DFSG modulators use a carrier frequency of 7.828, 7.780, 7.732, 7.684, or 7.636 MHz for translating the five 8.140- to 8.188-MHz bands to 312 to 360, 360 to 408, 408 to 456, 456 to 504, and 504 to 552 kHz, respectively. In addition, the CFA pilot (8.147920 MHz) is translated to form CFA pilots at 319.92, 367.92, 415.92, 463.92, and 511.92 kHz; and the DFSG pilot (8.143920 MHz) is translated to form the conventional SG pilot at 315.92 plus the translated pilots for groups 2, 3, 4, and 5 at 363.92, 411.92, 459.92, and 507.92 kHz, respectively.

2.12 ***DFSG Combining Unit:*** The five 48-kHz-wide bands formed in the five DFSG transmitting units are applied to a DFSG combining multiple (a hybrid tree) to form one composite 240-kHz-wide band ranging from 312 to 552 kHz (a basic SG). This composite signal is passed through a filter to remove any frequencies above the SG range and is then sent to the associated SGDF, via a matching transformer and a line build-out adjust control. This variable control is used to build out the line length between the transmitting section of the DFSG bank and the SGDF to the equivalent of 600 feet.

> ***Note 1:*** The transmit adjust control is used ***only*** during initial lineup, subsequent reassignment, or trouble location. It is ***not*** used for routine maintenance.

> ***Note 2:*** A jack, designated TST, is located on the front panel of the DFSG combining unit to enable measurement of the outgoing SG signal before it is applied to the transmit adjust control.

2.13 The frequencies at key points in the transmitting section of the DFSG bank are listed in Table B.

2.14 ***DFSG Splitting Unit:*** In the receiving section of the DFSG bank, the incoming SG (312 to 552 kHz) is applied to a DFSG distributing multiple, via a line build-out adjust control which is used to build out the line length between the SGDF and the DFSG bank to the equivalent of 600 feet. The distributing multiple (a hybrid tree) divides the SG into five equal paths for application to five DFSG demodulator circuits in the five DFSG receiving circuits.

> ***Note 1:*** The receive adjust control is used ***only*** during initial lineup, subsequent reassignment, or trouble location. It is ***not*** used for routine maintenance.

> ***Note 2:*** A jack, designated TST, is located on the front panel of the DFSG splitting unit to enable measurement of the incoming SG signal before it is applied to the DFSG demodulator circuits.

2.15 ***DFSG Receiving Units:*** Each of the five outputs from the DFSG splitting unit is applied to a corresponding DFSG demodulator, via a regulating amplifier. The amplifier is used to maintain a constant-level input to the demodulator. The DFSG demodulators use carriers of 7.828, 7.780, 7.732, 7.684, and 7.636 MHz to form five 240-kHz-wide bands (8.140 to 8.380, 8.092 to 8.332, 8.044 to 8.284, 7.996 to 8.236, and 7.948 to 8.188

MHz) from the composite 240-kHz-wide SG. Each DFSG demodulator output is filtered to remove any modulation products above 8.2 MHz. Each of these bands of frequencies is amplified for driving the associated channel demodulators.

> ***Note:*** The regulating amplifier is controlled by translating the received DFSG pilot (8.143920 MHz) to 77 Hz [by combining it with the locally-generated 1-way CFA pilot (8.143843 MHz)], filtering it, and converting it to dc. The dc voltage so developed is compared with a precise dc reference voltage, and the difference is used as an automatic gain control (AGC) voltage that varies in accordance with the received DFSG pilot. Office alarms are initiated if the DFSG pilot is interrupted.

2.16 ***Channel Modems—Receiving:*** Each of the five 240-kHz-wide bands produced by the DFSG demodulators are divided into 12 equal-level signals, filtered to remove all except the applicable upper sidebands (8.140 to 8.144, 8.144 to 8.148, 8.148 to 8.152, . . . or 8.184 to 8.188 MHz), and applied to the appropriate channel demodulators. Channel carriers of 8.140, 8.144, 8.148, . . . and 8.184 MHz are used to translate these twelve 4-kHz-wide bands to the VF range (200 to 3400 Hz). The resultant VF is amplified and applied to the appropriate VF circuits in the office. Since there are five such 12-channel groups, a total of 60 VF channels are produced by the DFSG bank.

> ***Note:*** Each of the 60 VF amplifiers in the DFSG bank has a gain control (GAIN ADJ) for setting the VF output to the standard transmission level (+7 dBTL). These controls are used ***only*** during initial lineup, subsequent reassignment, or trouble location. They are ***not*** used for routine maintenance.

2.17 The frequencies at key points in the receiving section of the DFSG bank are listed in Table C.

2.18 ***Transmission Frequency Characteristics:*** The nominal transmission frequency characteristics for a typical VF channel in the DFSG bank are as follows:

(a) Nominal passband: 200 to 3400 Hz

(b) Frequencies at which attenuation is 10-dB greater than at 1000 Hz: 110 and 3500 Hz.

> ***Note:*** When one type of bank is used at one terminal and another type is used at the other terminal, the transmission characteristics may be slightly degraded at the edges of the band (200 and 3400 Hz). It is therefore desirable, where practicable, to assign DFSG banks so that they operate with either DFSG banks; A5, A6, or A6B channel banks; or, when required, A2 or A4 banks. Complete compatibility information is listed in Table A.

2.19 ***J68954BJ CFA Unit:*** The J68954BJ CFA unit (Fig. 5) consists of a 10-Hz gating circuit; noise, pilot, and 10-Hz detectors; alarm and delay timing logic circuits; and transmit and receive failure indicating lamps.

2.20 Five CFA units are used as an interface between the CFA carrier supply and each associated DFSG bank for monitoring transmission between system ends and providing for automatic trunk conditioning and restoral. These units accomplish the following.

(a) Apply an 8.147920-MHz signal (from the CFA pilot distributing circuit) to the transmitted DFSG bank spectrum to produce five CFA pilots (2-way) at 319.92, 367.92, 415.92, 463.92, and 511.92 kHz when combined with the DFSG carriers (7.828, 7.780, 7.732, 7.684, and 7.636 MHz) in the DFSG modulators.

(b) Monitor the state of the five 48-kHz-wide bands of the received DFSG bank spectrum for the following:

  (1) Loss of CFA pilot

  (2) Excessive line noise

  (3) 10-Hz modulation of the corresponding incoming CFA pilot.

(c) Modulate the corresponding transmitted CFA pilot at a 10-Hz rate in the event of excessive noise or loss of a CFA pilot in the received DFSG bank spectrum.

(d) Provide CFA lamp indications in the event of CFA pilot failure or excessive noise. The lamp indications are as follows.

  (1) The RCV FAIL lamp lights if the noise is excessive or the corresponding CFA

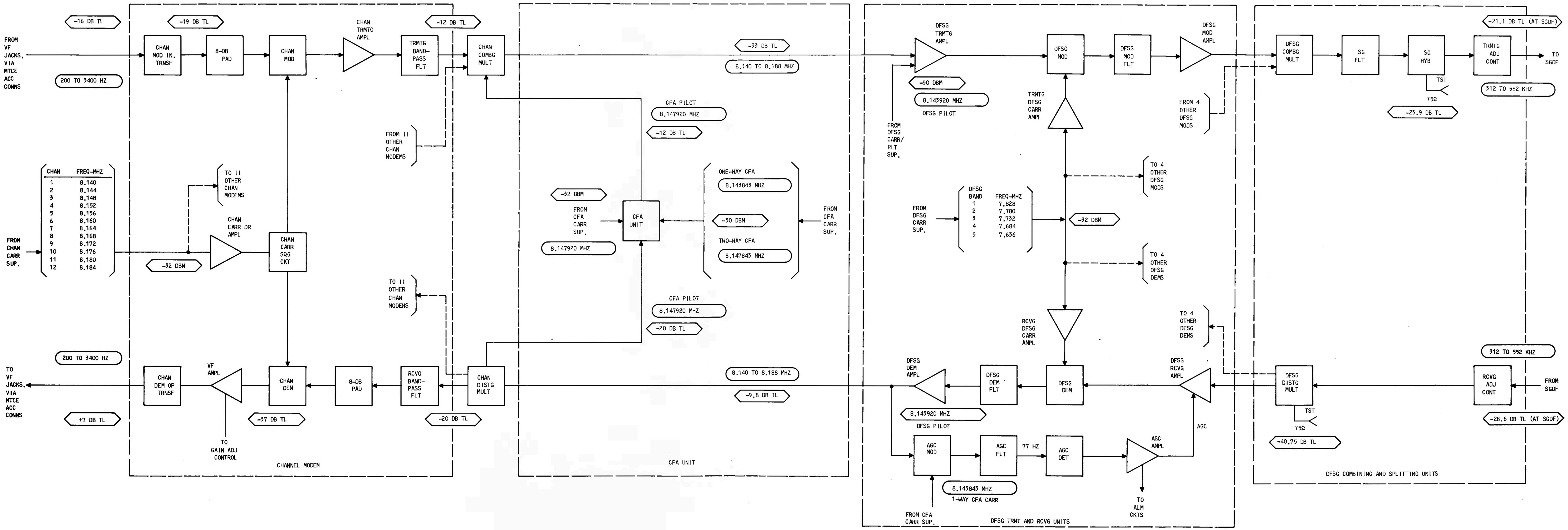


Fig. 4—DFSG Bank—Block Diagram

TABLE B

FREQUENCIES AT KEY POINTS IN TRANSMITTING SECTION OF DFSG BANK

VF CHAN NO.	CHAN MOD IN. (HZ)	CHAN CARR FREQ (MHZ)	CHAN MOD OP (MHZ)	DFSG MOD IN. (MHZ)*	DFSG CARR FREQ	DFSG MOD OP FREQ
1, 13, 25, 37, 49	200-3400	8.140	8.136-8.144	8.140-8.144	†	‡
2, 14, 26, 38, 50	200-3400	8.144	8.140-8.148	8.144-8.148	†	‡
3, 15, 27, 39, 51	200-3400	8.148	8.144-8.152	8.148-8.152	†	‡
4, 16, 28, 40, 52	200-3400	8.152	8.148-8.156	8.152-8.156	†	‡
5, 17, 29, 41, 53	200-3400	8.156	8.152-8.160	8.156-8.160	†	‡
6, 18, 30, 42, 54	200-3400	8.160	8.156-8.164	8.160-8.164	†	‡
7, 19, 31, 43, 55	200-3400	8.164	8.160-8.168	8.164-8.168	†	‡
8, 20, 32, 44, 56	200-3400	8.168	8.164-8.172	8.168-8.172	†	‡
9, 21, 33, 45, 57	200-3400	8.172	8.168-8.176	8.172-8.176	†	‡
10, 22, 34, 46, 58	200-3400	8.176	8.172-8.180	8.176-8.180	†	‡
11, 23, 35, 47, 59	200-3400	8.180	8.176-8.184	8.180-8.184	†	‡
12, 24, 36, 48, 60	200-3400	8.184	8.180-8.188	8.184-8.188	†	‡

* A single 12-channel band from 8.140 to 8.188 MHz

† 7.828, 7.780, 7.732, 7.684, or 7.636 MHz, depending on which group (1, 2, 3, 4, or 5) of 12 VF channels is involved

‡ A single 12-channel band from 312 to 360, 360 to 408, 408 to 456, 456 to 504, or 504 to 552 kHz, depending on which group (1, 2, 3, 4, or 5) of 12 VF channels is involved.

pilot is lost in the received DFSG bank spectrum.

(2) The TRMT FAIL lamp lights if the corresponding incoming CFA pilot is modulated at a 10-Hz rate, due to (c) above at the distant end.

(e) Provides transfer relay contacts that may be used to initiate trunk conditioning.

2.21 In the 1-way CFA system, the five incoming pilots at supergroup frequencies (315.92, 363.92, 411.92, 459.92, and 507.92 kHz) are translated to 8.143920 MHz in the DFSG demodulators and this signal, when combined with the local 8.143843-MHz 1-way CFA carrier in the CFA demodulator, is translated to 77 Hz. Presence of this 77-Hz translated pilot is interpreted (by the pilot detector) as a normal condition; its absence as a trouble condition. The noise detector responds to excessive noise in a range of approximately 4 to 26 Hz on either side of this 77-Hz translated pilot. Either of these faulty conditions, loss of pilot or excessive carrier noise, causes the RCV FAIL lamp to light and the alarms to operate.

2.22 Two-way CFA operation is similar to that for 1-way CFA, except for the following.

TABLE C

FREQUENCIES AT KEY POINTS IN RECEIVING SECTION OF DFSG BANK

VF CHAN NO.	DFSG DEM IN. FREQ	DFSG CARR FREQ	DFSG DEM OP (MHZ)‡	CHAN DEM IN. (MHZ)	CHAN CARR FREQ (MHZ)	CHAN DEM OP (HZ)
1, 13, 25, 37, 49	*	†	8.140-8.144	8.140-8.144	8.140	200-3400
2, 14, 26, 38, 50	*	†	8.144-8.148	8.144-8.148	8.144	200-3400
3, 15, 27, 39, 51	*	†	8.148-8.152	8.148-8.152	8.148	200-3400
4, 16, 28, 40, 52	*	†	8.152-8.156	8.152-8.156	8.152	200-3400
5, 17, 29, 41, 53	*	†	8.156-8.160	8.156-8.160	8.156	200-3400
6, 18, 30, 42, 54	*	†	8.160-8.164	8.160-8.164	8.160	200-3400
7, 19, 31, 43, 55	*	†	8.164-8.168	8.164-8.168	8.164	200-3400
8, 20, 32, 44, 56	*	†	8.168-8.172	8.168-8.172	8.168	200-3400
9, 21, 33, 45, 57	*	†	8.172-8.176	8.172-8.176	8.172	200-3400
10, 22, 34, 46, 58	*	†	8.176-8.180	8.176-8.180	8.176	200-3400
11, 23, 35, 47, 59	*	†	8.180-8.184	8.180-8.184	8.180	200-3400
12, 24, 36, 48, 60	*	†	8.184-8.188	8.184-8.188	8.184	200-3400

* A single 12-channel band from 312 to 360, 360 to 408, 408 to 456, 456 to 504, or 504 to 552 kHz, depending on which group (1, 2, 3, 4, or 5) of 12 VF channels is involved.

† 7.828, 7.780, 7.732, 7.684, or 7.636 MHz, depending on which group (1, 2, 3, 4, or 5) of 12 VF channels is involved.

‡ A single 12-channel band from 8.140 to 8.188 MHz.

(a) An 8.147920-MHz CFA pilot is translated (in the five DFSG modulators) to five outgoing CFA pilots (319.92, 367.92, 415.92, 463.92, and 511.92 kHz) at both ends of the system.

(b) Each of the five incoming CFA pilots are translated (in their respective DFSG demodulators) to 8.147920 MHz and combined (in the J68954BJ CFA unit) with a local 8.147843-MHz CFA carrier to form a 77-Hz translated pilot at both ends.

(c) Loss of an incoming CFA pilot or excessive noise causes 10-Hz modulation of the corresponding outgoing 8.147920-MHz pilot, and thus the translated (319.92, 367.92, 415.92, 463.92, or 511.92 kHz) CFA pilot. At the distant end, this condition is interpreted by the 10-Hz detector circuit as an outgoing pilot failure and, thus, the TRMT FAIL lamp at that end lights.

2.23 A 4-section switch inside the J68954BJ CFA unit permits the applicable 1- or 2-way CFA option to be selected. When set to the required option, the switch rocker arms will be ***down*** at the applicable numerical designations (1 and 2 for 1-way CFA; 3 and 4 for 2-way CFA).

2.24 ***Multiple Access Connectors:*** In the J68954( ) bays, VF access to the DFSG bank

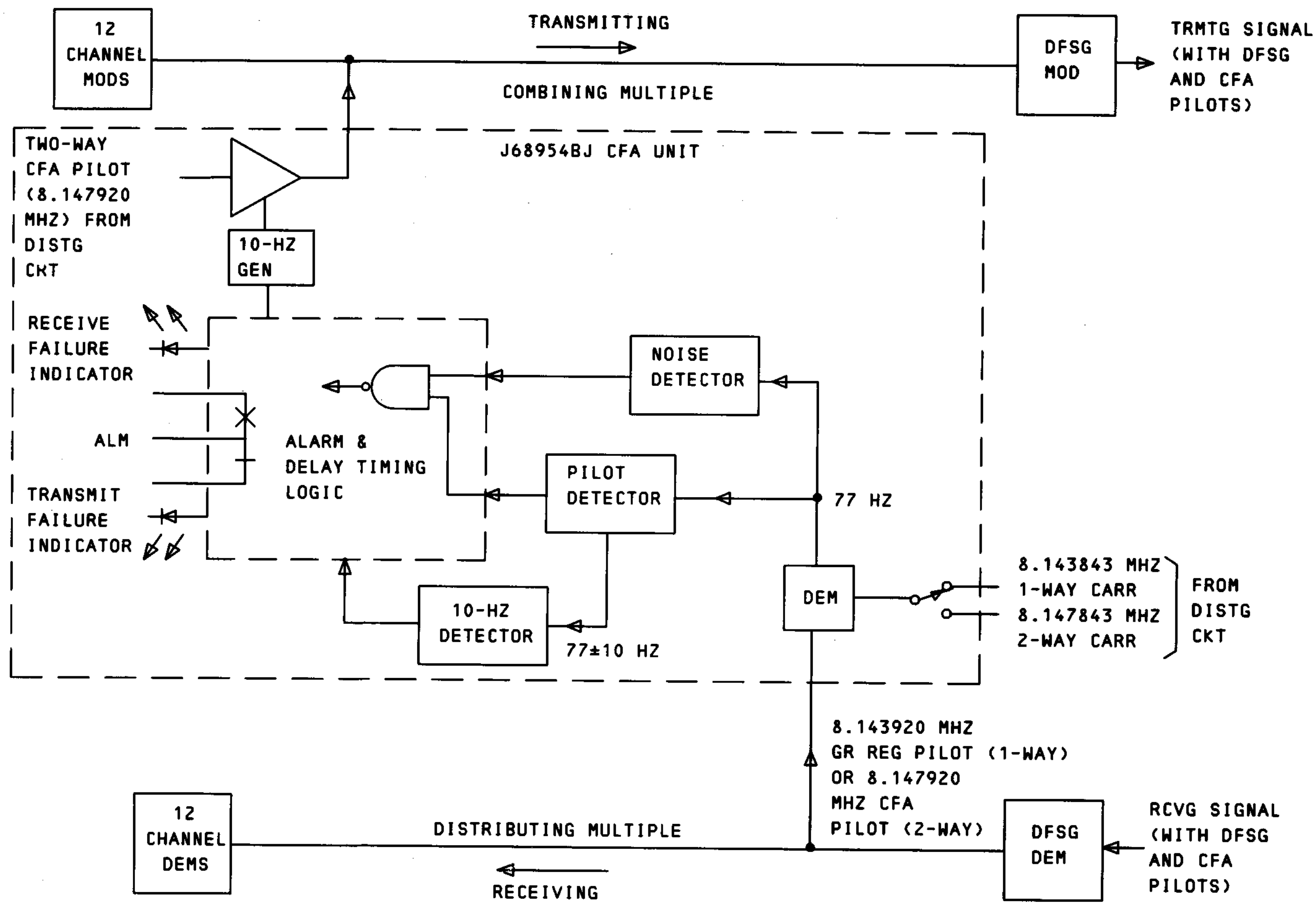


Fig. 5—CFA Unit—Block Diagram

is provided via three multiple access connectors at the left end of the J68954T transmission shelves. Each connector is used to patch (simultaneously) four channels to (a) another such connector for VF channel restoration or (b) one of three VF patch panels for VF channel testing. The VF patch panels are mounted on the J68954( ) bays and are described in Section 356-016-107.

> ***Note:*** The multiple access conectors are not used in the J98629( ) frames. Instead, VF access is obtained via the manual access panel and maintenance connectors on those frames.

C. DFSG-Bank Carrier/Pilot Supply

2.25 ***General:*** The DFSG-bank carrier/pilot supply provides all carrier and pilot frequencies required for proper operation of the DFSG bank. It consists of a channel carrier supply, a DFSG carrier/pilot supply, and a CFA carrier/pilot supply.

2.26 The DFSG-bank carrier/pilot supply consists of plug-in units for generating and distributing the required frequencies, for automatic protective switching of all critical generators, and for initiating carrier supply and transmission alarms. The DFSG-bank carrier/pilot supply can be equipped for either of two applications—one for the J68954( ) bays (Fig. 6 and 7) and one for the J98629( ) frames (Fig. 8). The difference between these two arrangements is in the type and location of the distribution units.

Note: Distribution units, in addition to those shown in Fig. 6, 7, and 8, are used in the J68954( ) bays and J98629( ) frames. They are the J68954BC, CB, CC, CE, CF, CL, CM, CN, CP, CS, and CT units. All of these, except the J68954BC and CT units, are mounted in two shelves—the ED-7C075 UTE secondary distribution shelf and the ED-7C076 UTE tertiary distributing shelf. The J68954BC DFSG pilot secondary distribution unit is mounted in the No. 3 J68954T shelf in the DFSG bank (Fig. 1) for J68954( ) bays, and the J68954BC unit and the J68954CT DFSG pilot quaternary distribution unit are mounted in the pilot shelf for J98629( ) frames.

2.27 The DFSG-bank carrier/pilot supply can provide for a maximum of 12 DFSG banks (720 VF channels). Carrier supply protection is provided by use of two identical generators (A and B) in all circuits that supply frequencies involving complete DFSG banks. (These circuits are, as can be seen in Fig. 9, the 4-kHz-sync, DFSG-pilot, 392-kHz, 1-way-CFA-carrier, 2-way-CFA-carrier, and CFA-pilot circuits). Except for the 392-kHz generator, the output from each such pair of generators is applied to its load (the associated distributing circuits) via an automatic switch unit, designated J68954AE. A manual switch mounted on the J68954AE switch unit permits the load to be shifted to either generator, provided that the selected generator is operating. In the event the selected generator fails, the switch unit will automatically shift the load to the other generator. The generator (A or B) in use is indicated by a corresponding lighted lamp (A or B) on the switch unit. An alarm (ALM) lamp on each generator unit, when lighted, indicates a defective generator, and an ALM lamp on the switch unit indicates that the required signal is either not reaching or not actuating the switch unit alarm circuit. Thus, these three associated ALM lamps, in conjunction with the A and B lamps, indicate that (a) both generators, (b) the switch unit, or (c) one generator plus the switch unit are defective.

Note: Protective switching for the 392-kHz generators (A and B) is provided via the DFSG pilot switch, the 1-way CFA carrier switch, the 2-way CFA carrier switch, and the CFA pilot switch since failure of the 392-kHz A or B generator causes failure of the corresponding (A or B) DFSG and CFA generators and, thus, switching of the operating generators (B or A) to the output circuit.

2.28 An in-service test jack, designated ALT OUT, is provided on each generator unit in the DFSG-bank carrier supply. During normal operation, this jack terminates one output winding of the generator output hybrid in 95 ohms. When a test-set-connecting plug is inserted in the ALT OUT jack, the termination is disconnected and the test set is connected to the alternate output winding of the hybrid.

2.29 ***4-kHz Sync Generator:*** All channel, DFSG, and CFA generators used in the DFSG bank carrier/pilot supply are synchronized to the office 64-kHz primary frequency source via the 4-kHz sync generator. The 4-kHz sync generator (Fig. 10) consists of a 64-kHz bandpass filter, a frequency divider, and an alarm detector and lamp circuit. The filter ensures that only the accurate 64-kHz signal reaches the divider, and the divider reduces the 64 kHz to 4 kHz. The resultant accurate 4-kHz sync frequency from either of a mutually protected pair (A or B) of 4-kHz generators is applied to the various other generators used in the DFSG-bank carrier supply, via an automatic switch unit as described in 2.27. The alarm circuit detects loss of the 4-kHz signal in the event of loss of input signal or generator failure, lights a front panel ALM lamp, and sends an alarm indication to the alarm unit.

2.30 ***Channel Carrier Generators and Distribution Circuits:*** Twelve channel carrier generators are used to produce the 12 channel carrier frequencies (8.140, 8.144, 8.148 · · · and 8.184 MHz) for use in the 12 channel modems of the DFSG bank.

2.31 The 12 channel carrier generators are identical except for the frequencies produced. As shown in Fig. 11, the basic generator circuit consists of an amplifier, a 4-kHz pulse generator, a comparison circuit, an oscillator, a low-pass filter, and a hybrid transformer. In addition, an alarm detector and lamp circuit are provided in each generator unit.

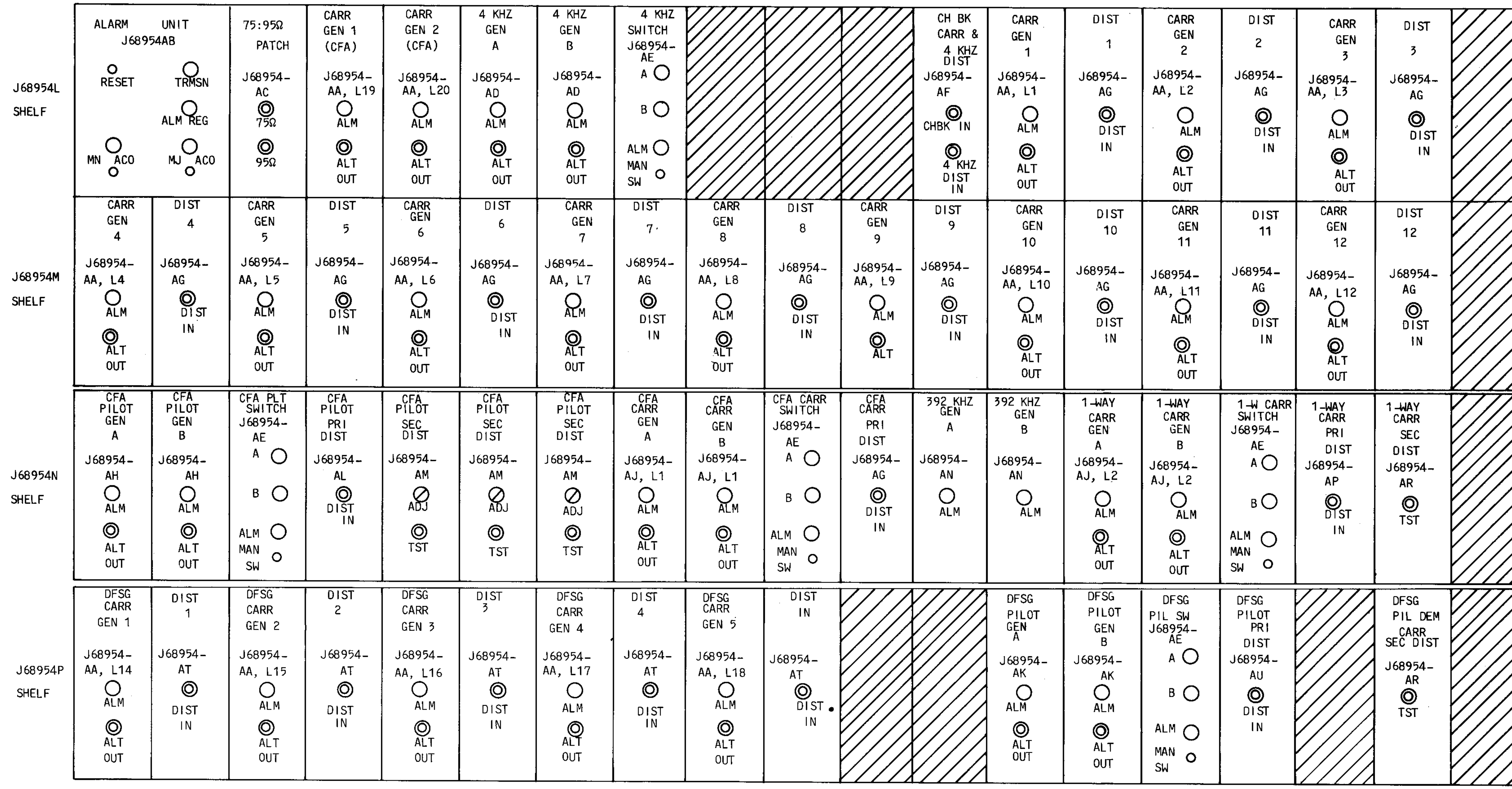


Fig. 6—DFSG-Bank Carrier/Pilot Supply as Equipped for J68954( ) Bays—Bay No. 1 and J98629H Frames

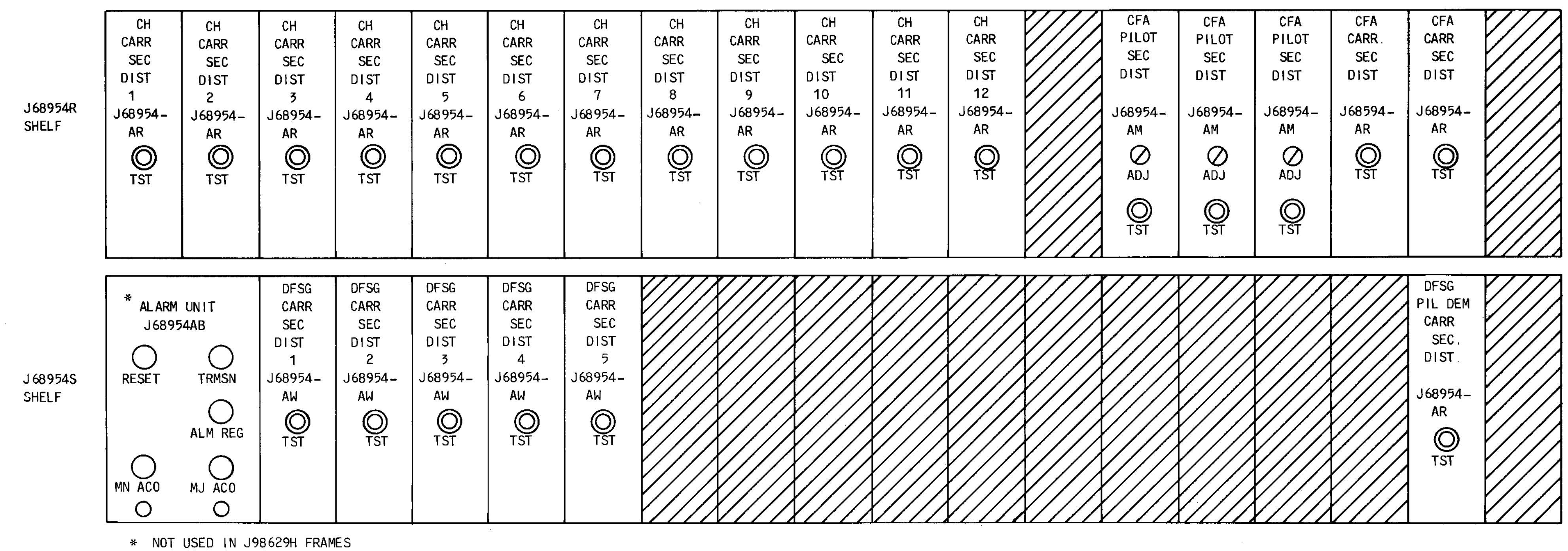


Fig. 7—DFSG-Bank Carrier/Pilot Supply as Equipped for J68954( ) Bays—Bay No. 2 and J98629H Frames

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
J68954L SHELF	ALARM UNIT J68954AB RESET TRMSN ALM REG MN ACO MJ ACO		75:95Ω PATCH J68954-AC 75Ω 95Ω	CARR GEN 1 (CFA) J68954-AA, L19 ALM ALT OUT	CARR GEN 2 (CFA) J68954-AA, L20 ALM ALT OUT	4 KHZ GEN A J68954-AD ALM ALT OUT	4 KHZ GEN B J68954-AD ALM ALT OUT	4 KHZ SWITCH J68954-AE A B ALM MAN SW				CH BK CARR & 4 KHZ DIST J68954-CG CHBK IN 4 KHZ DIST IN	CARR GEN 1 J68954-AA, L1 ALM ALT OUT	DIST 1 J68954-AG DIST IN	CARR GEN 2 J68954-AA, L2 ALM ALT OUT	DIST 2 J68954-AG DIST IN	CARR GEN 3 J68954-AA, L3 ALM ALT OUT	DIST 3 J68954-AG DIST IN	
J68954M SHELF	CARR GEN 4 J68954-AA, L4 ALM ALT OUT	DIST 4 J68954-AG DIST IN	CARR GEN 5 J68954-AA, L5 ALM ALT OUT	DIST 5 J68954-AG DIST IN	CARR GEN 6 J68954-AA, L6 ALM ALT OUT	DIST 6 J68954-AG DIST IN	CARR GEN 7 J68954-AA, L7 ALM ALT OUT	DIST 7 J68954-AG DIST IN	CARR GEN 8 J68954-AA, L8 ALM ALT OUT	DIST 8 J68954-AG DIST IN	CARR GEN 9 J68954-AA, L9 ALM ALT	DIST 9 J68954-AG DIST IN	CARR GEN 10 J68954-AA, L10 ALM ALT OUT	DIST 10 J68954-AG DIST IN	CARR GEN 11 J68954-AA, L11 ALM ALT OUT	DIST 11 J68954-AG DIST IN	CARR GEN 12 J68954-AA, L12 ALM ALT OUT	DIST 12 J68954-AG DIST IN	
J68954N SHELF	CFA PILOT GEN A J68954-AH ALM ALT OUT	CFA PILOT GEN J68954-AH ALM ALT OUT	CFA PLT SWITCH J68954-AE A B ALM MAN SW	CFA PILOT PRI DIST J68954-CA DIST IN				CFA CARR GEN A J68954-AJ, L1 ALM ALT OUT	CFA CARR GEN B J68954-AJ, L1 ALM ALT OUT	CFA CARR SWITCH J68954-AE A ALM MAN SW	CFA CARR PRI DIST J68954-CH DIST IN	392 KHZ GEN A J68954-AN ALM	392 KHZ GEN B J68954-AH ALM	1-WAY CARR GEN A J68954-AJ, L2 ALM ALT OUT	1-WAY CARR GEN B J68954-AJ, L2 ALM ALT OUT	1-W CARR SWITCH J68954-AE A B ALM MAN SW	1-WAY CARR PRI DIST J68954-CK DIST IN	1-WAY CARR DIST J68954-CR TST	
J68954P SHELF	DFSG CARR GEN 1 J68954-AA, L14 ALM ALT OUT	DIST 1 J68954-CD DIST IN	DFSG CARR GEN 2 J68954-AA, L15 ALM ALT OUT	DIST 2 J68954-CD DIST IN	DFSG CARR GEN 3 J68954-AA, L16 ALM ALT OUT	DIST 3 J68954-CD DIST IN	DFSG CARR GEN 4 J68954-AA, L17 ALM ALT OUT	DIST 4 J68954-CD DIST IN	DFSG CARR GEN 5 J68954-AA, L18 ALM ALT OUT	DIST J68954-CD DIST IN			DFSG PILOT GEN A J68954-AK ALM ALT OUT	DFSG PILOT GEN B J68954-AK ALM ALT OUT	DFSG PIL SW J68954-AE A B ALM MAN SW	DFSG PILOT PRI DIST J68954-CJ DIST IN		DFSG PIL DEM CARR J68954-CR TST	

NOTE:
SECONDARY, TERTIARY, AND QUATERNARY DISTRIBUTION UNITS ARE MOUNTED ON OTHER SHELVES IN THE J98629() FRAMES

Fig. 8—DFSG-Bank Carrier/Pilot Supply as Equipped for J98629J, N, R, U, W, and Y Frames

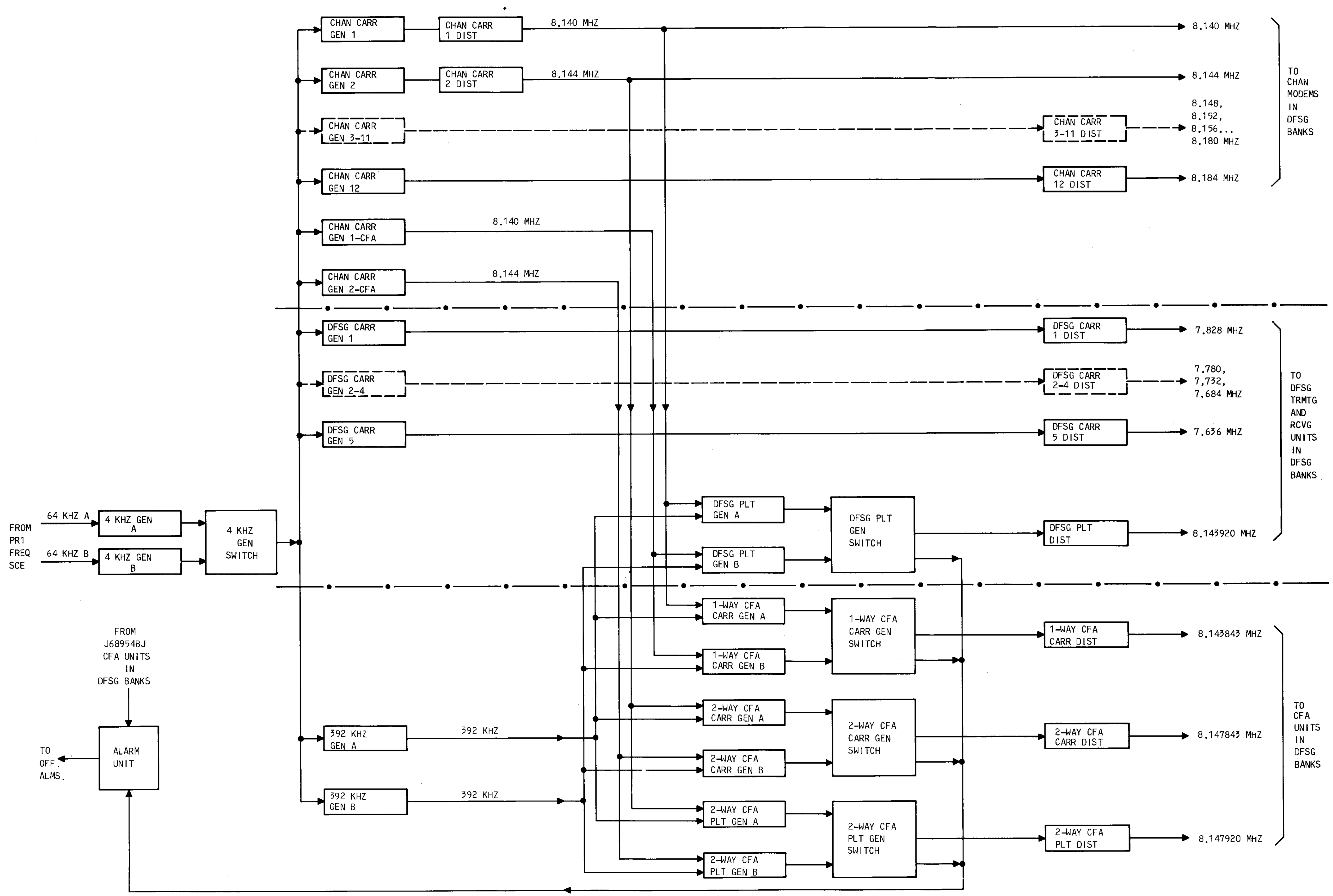


Fig. 9—DFSG-Bank Carrier Supply—Block Diagram

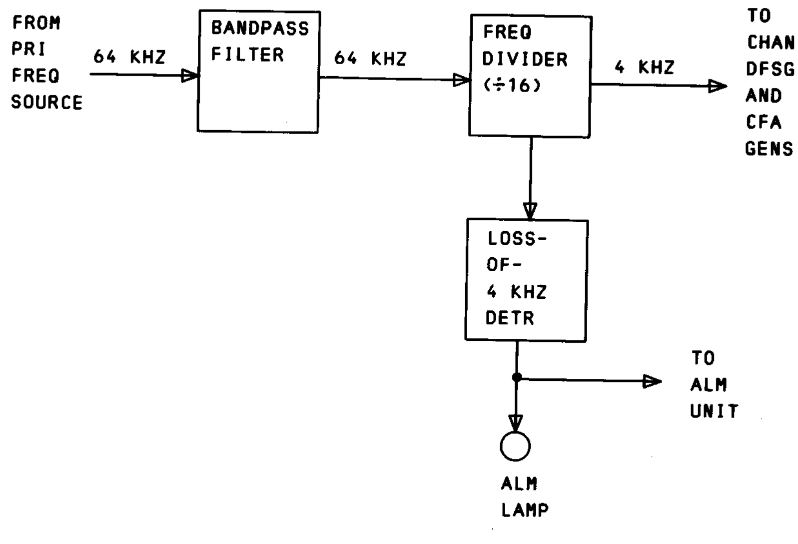


Fig. 10—4-kHz Sync Generator—Block Diagram

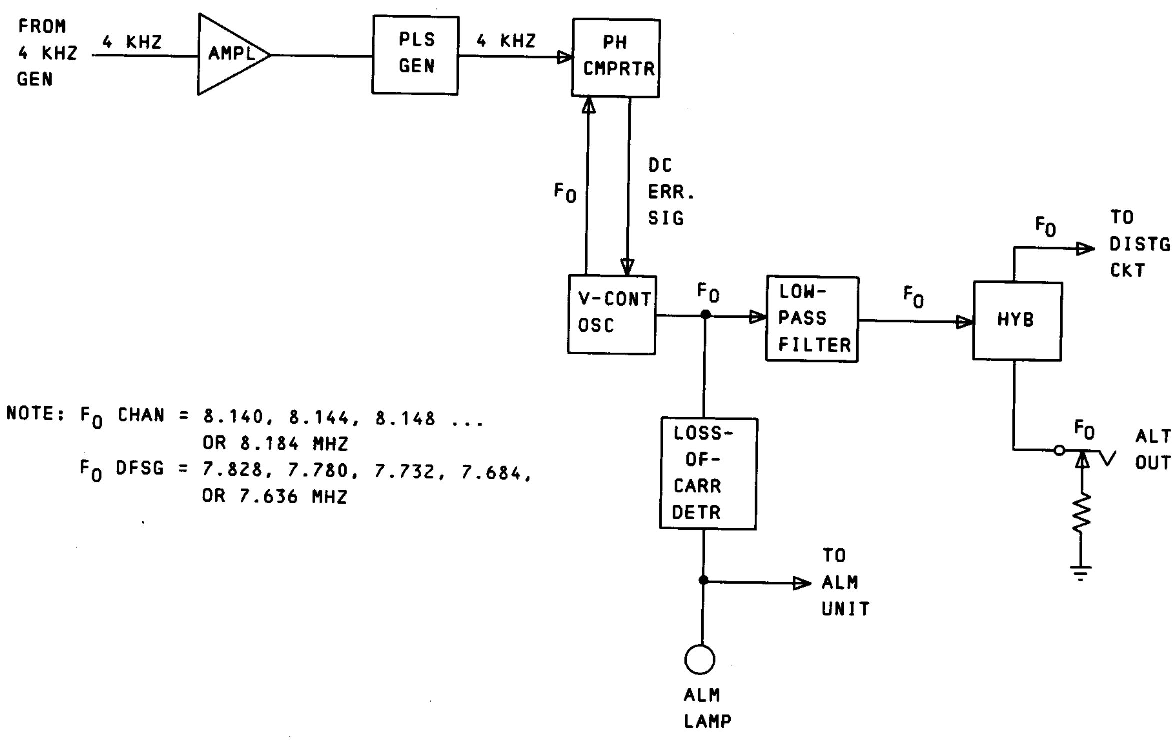


Fig. 11—Channel Carrier Generator or DFSG Carrier Generator—Block Diagram

2.32 The 4-kHz pulse generator produces a stream of accurate, narrow pulses for actuating the comparison circuit (in the channel carrier generator) at a 4-kHz rate. This causes the comparison circuit to sample the oscillator frequency every 250 microseconds and, if there is any deviation in phase between samples, develop a corresponding error voltage which corrects the oscillator frequency. The resultant highly accurate oscillator frequency is fed to the output hybrid via a low-pass filter in which any harmonics of the channel carrier frequency are removed. The alarm circuit detects loss of the carrier signal in the event of loss of input signal or generator failure, lights a front panel ALM lamp, and sends an alarm indication to the alarm unit.

2.33 Each of the 12 channel carrier frequencies (8.140, 8.144, 8.148 . . . or 8.184 MHz) is applied to a separate distribution circuit (Fig. 12), via a jack (designated DIST IN) that permits restoration of a failed channel carrier supply. Each distribution circuit applies its input frequency to all channel modems using that frequency. A test (TST) jack is located on (a) all J68954AR secondary distribution units in J68954( ) bays (on the J68954R shelf in bay No. 2) and (b) all J68954CL secondary and J68954CP tertiary distribution units in J98629( ) frames. Channel carrier distribution level controls are not provided. The distribution circuits consist entirely of hybrids, pads, and test jacks.

2.34 ***DFSG Carrier Generators and Distribution Circuits:*** Five DFSG carrier generators are used to produce the five DFSG carrier frequencies (7.828, 7.780, 7.732, 7.684, and 7.636 MHz) for use in the five DFSG modulators and demodulators of the DFSG bank.

2.35 The five DFSG carrier generators are identical to the channel carrier generators as described in 2.30 through 2.32, except for the frequencies and levels produced.

2.36 The five DFSG carrier distributing circuits for the J68954( ) bays are similar to the channel carrier distributing circuits (2.33), except that (a) the frequencies and levels are different, (b) a 3-hybrid branching circuit followed by a resistive branching circuit is used, and (c) the TST jack is located on the J68954AW DFSG carrier secondary distribution units (on the J68954S shelf in bay No. 2). For the J98629( ) frames, the DFSG carrier distributing circuits are similar to the channel carrier distributing circuits, except that (a) the frequencies and levels are different, (b) equivalent units have different J codes, and (c) a different mounting arrangement is used for secondary distribution units.

2.37 ***392-kHz Generators:*** A mutually protected pair of 392-kHz generators (Fig. 9) is used in conjunction with the channel 1 and 2 carriers (8.140 and 8.144 MHz) to produce the DFSG pilot, the CFA carriers, and the CFA pilot, as applicable. Both 392-kHz generators (A and B) are identical and are used with corresponding A and B DFSG and CFA generators to provide mutually protected pairs in those circuits. In addition, an alarm detector and lamp circuit are provided in each generator unit.

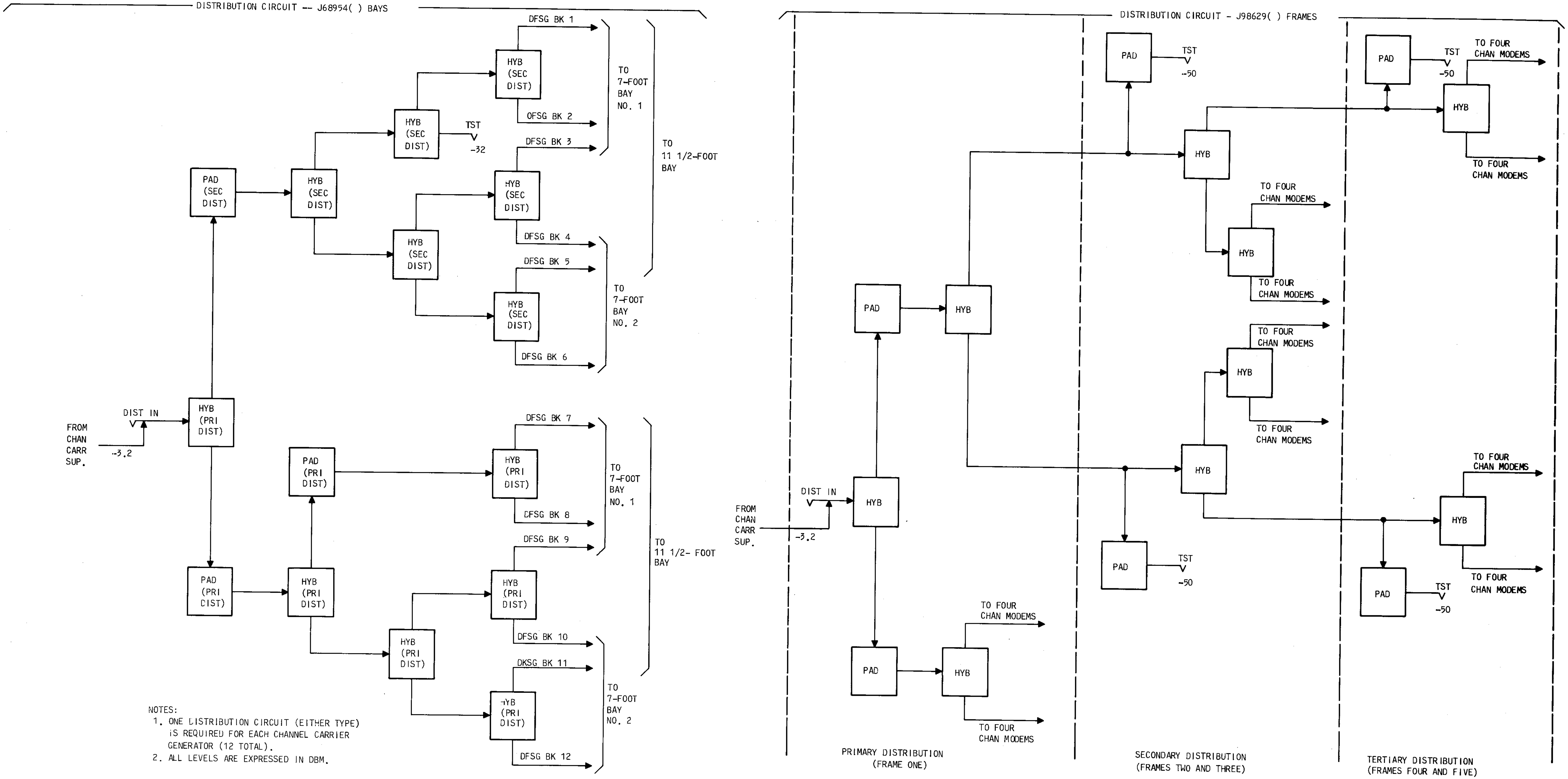
2.38 The 392-kHz generators use a 392-kHz oscillator synchronized to a 4-kHz pulse stream which is derived from the office 64-kHz primary frequency source by the 4-kHz sync generator (2.29). The basic frequency-generating circuit is shown in Fig. 13.

2.39 Part of the output from the 392-kHz oscillator is divided down to 4 kHz and compared, in a phase-detecting circuit, with the incoming 4-kHz signal. If the phase of the derived 4-kHz signal is incorrect, the phase detector develops a dc voltage, the amplitude of which is proportional to the phase difference between the incoming 4-kHz signal and the derived 4-kHz signal. The dc error voltage is applied to the 392-kHz oscillator where it is used to correct the oscillator output frequency.

2.40 The output from the 392-kHz generator is applied to the DFSG pilot generator, the 1-way CFA carrier generator, and/or the 2-way CFA carrier and pilot generators, as applicable. In addition, the alarm circuit monitors the 392-kHz output and detects loss of this signal (due to loss of input signal or generator failure), lights a front panel ALM lamp, and sends an alarm indication to the alarm unit.

2.41 ***DFSG Pilot Generators and Distribution Circuits:*** A mutually protected pair of DFSG pilot generators is used (singly, via an automatic switch unit as described in 2.27) to produce the DFSG pilot frequency (8.143920 MHz).

2.42 The two DFSG pilot generators are identical, except that one is labeled A and the other



NOTES:
1. ONE DISTRIBUTION CIRCUIT (EITHER TYPE) IS REQUIRED FOR EACH CHANNEL CARRIER GENERATOR (12 TOTAL).
2. ALL LEVELS ARE EXPRESSED IN DBM.

Fig. 12—Channel Carrier Distributing Circuits for J68954( ) Bays and J98629( ) Frames—Block Diagram

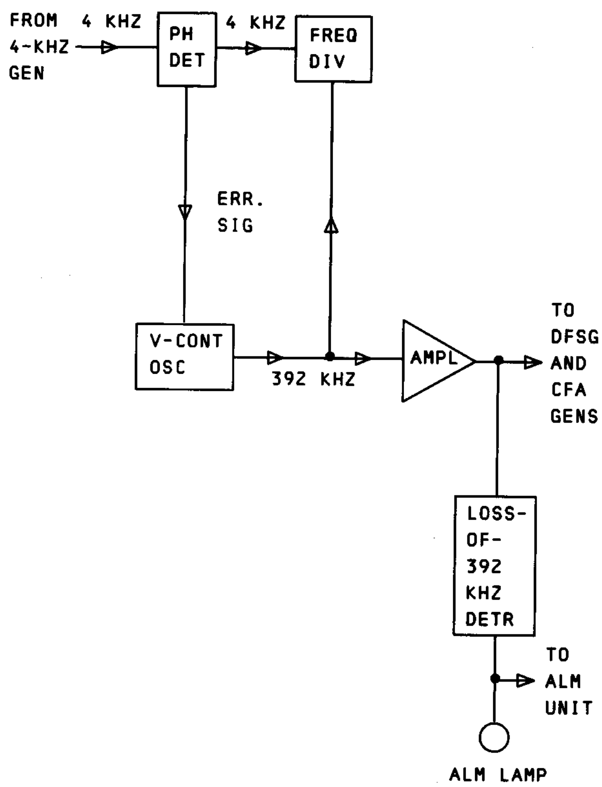


Fig. 13—392-kHz Generator—Block Diagram

B. As shown in Fig. 14, the basic generator circuit consists of a 392-kHz frequency divider, an 8.140-MHz amplifier, a modulator, a bandpass filter, a regulating amplifier, and a hybrid transformer. In addition, an alarm detector and lamp circuit are provided in each generator unit.

2.43 The 392-kHz input to the DFSG pilot generator is divided by 100 to produce 3.92 kHz. This signal is combined with the 8.140-MHz signal from the channel 1 carrier generator to produce sidebands at 8.140 $\pm N \times 0.00392$ MHz. A bandpass filter removes all sidebands produced except 8.143920 MHz, which is applied to the DFSG pilot distributing circuit via a regulating amplifier and a hybrid transformer. The hybrid also provides an alternate output for testing the DFSG pilot level. The alarm circuit detects loss of pilot in the event of loss of input signal or generator failure, lights a front panel ALM lamp, and sends an alarm indication to the alarm unit.

2.44 The DFSG pilot distributing circuit is similar to the DFSG carrier distribution circuits described in 2.36; however, (a) one J68954BC DFSG pilot secondary distribution unit in J68954( ) bays and J98629G and H frames or (b) one J68954CT DFSG pilot quaternary distribution unit in J98629( ) frames is mounted on transmission shelf (J68954T) No. 3 (pilot) of each DFSG bank. This unit injects the DFSG pilot (8.143920 MHz) into the DFSG transmitting amplifier (Fig. 4). A level adjust (ADJ) control and a TST jack (for determining presence of signal only) are provided on this unit. Similarly, (a) one J68954AR DFSG pilot demodulator carrier secondary distribution unit in J68954( ) bays and J98629H frames or (b) one J68954CR DFSG pilot demodulator carrier tertiary distribution unit in J98629( ) frames is mounted on the J68954P DFSG carrier/pilot supply shelf. This unit injects the 1-way CFA carrier frequency (8.143843 MHz) into the AGC modulator portion of the DFSG demodulator circuit (Fig. 4). A TST jack (for level measurements) is provided on this unit; a level adjustment is not provided.

2.45 ***CFA Carrier Generators and Distribution Circuits:*** A mutually protected pair of CFA carrier generators is used (singly, via an automatic switch unit as described in 2.27) to produce the 1-way CFA carrier frequency (8.143843 MHz), and another such pair is used to produce the 2-way CFA carrier frequency (8.147843 MHz).

2.46 Except for the frequencies and levels involved, the CFA carrier generator and distribution circuit are similar to the DFSG pilot generator and distribution circuit described in 2.41 through 2.44. The 1-way CFA carrier frequency is derived by combining 3.843 kHz (392 kHz $\div$ 102) with 8.140 MHz (channel 1 carrier) to obtain 8.143843 MHz—after filtering. The 2-way CFA carrier is derived by adding 3.843 kHz to 8.144 MHz (channel 2 carrier) to obtain 8.147843 MHz—after filtering.

> ***Note:*** The 1-way CFA carrier is required by the DFSG receiving unit (2.15) and must be provided even if the 1-way CFA option (2.21) is not selected.

2.47 ***CFA Pilot Generators and Distribution Circuits:*** A mutually protected pair of CFA pilot generators is used (singly, via an automatic switch as described in 2.27) to produce the CFA pilot frequency (8.147920 MHz).

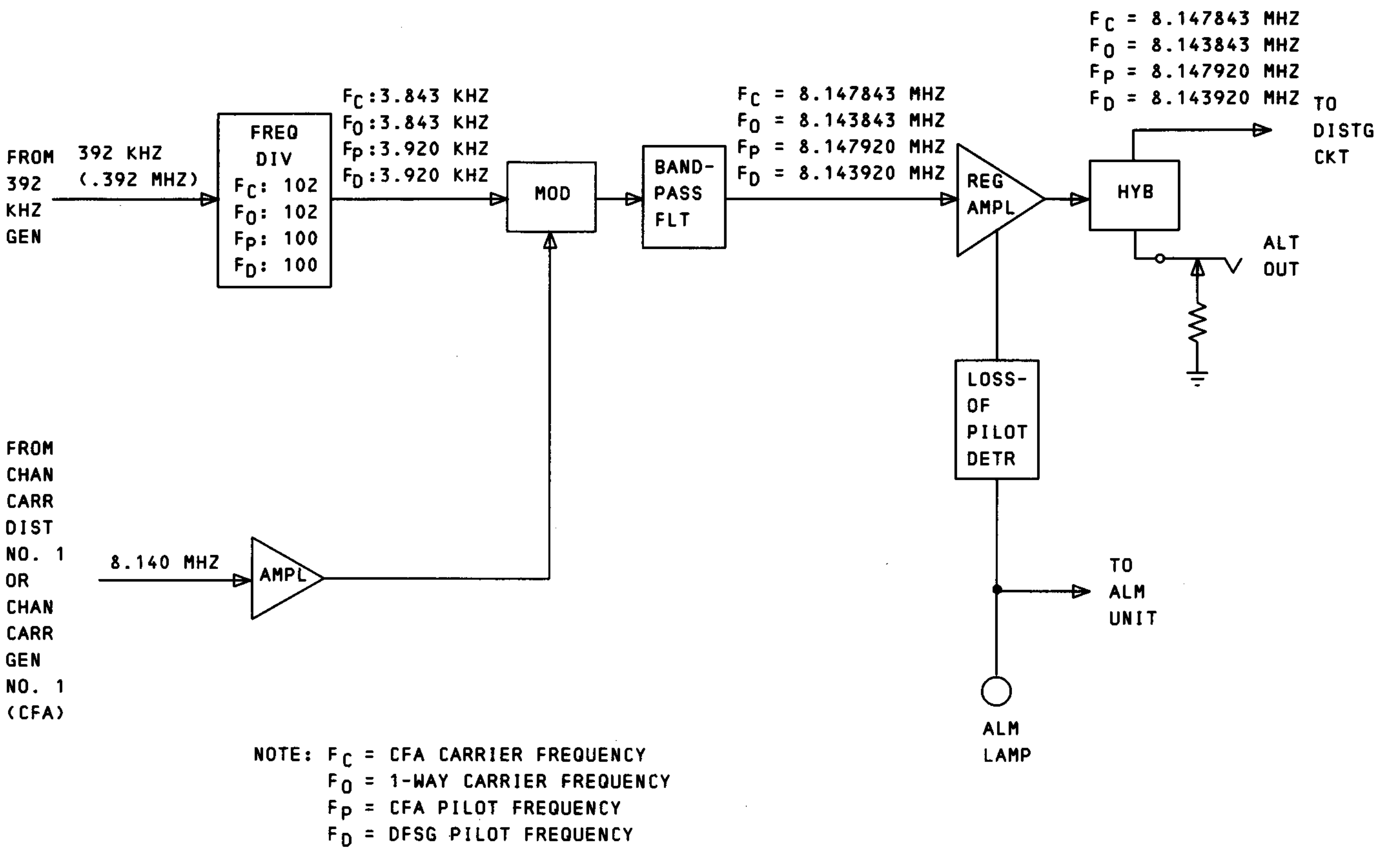


Fig. 14—CFA Carrier, One-Way Carrier, CFA Pilot, or DFSG Pilot Generator—Block Diagram

2.48 The CFA pilot generator and distribution circuit are similar to the DFSG pilot generator and distribution circuit described in 2.41 through 2.44. The CFA pilot frequency is derived by combining 3.920 kHz (392 kHz ÷ 100) with 8.144 MHz (channel 2 carrier) to obtain 8.147920 MHz—after filtering.

D. DC Power

2.49 The DFSG-bank transmission and carrier/pilot supply circuits obtain dc power from the office -24 volt source, via a fuse and alarm panel mounted at the top of the bay (Section 356-016-107). This voltage is regulated and reduced to the required value(s) by a regulator on (a) each of the five J68954T transmission shelves of the DFSG banks, and (b) each of the generator, switch, and alarm units in the DFSG-bank carrier/pilot supply. Relay circuits in the switch and alarm units use unregulated -24 volts.

2.50 The five shelf-mounted regulators (J68954BF) are used to provide -12 Vdc power for operation of the five 12-channel-group transmission circuits of the DFSG bank. These five regulators are identical and consist of a voltage regulating circuit and an overload/overvoltage protection circuit.

2.51 The J68954BF regulator provides an output of -12 volts ±2.5 percent over the normal variation in the -24 volt source. The circuitry for achieving output-voltage regulation and combined overload and overvoltage protection (monitoring, triggering, and clamping) is located within the regulator module. The disconnect portion (a fuse) of the overload and overvoltage protection circuit is provided in the fuse and alarm panel.

2.52 All carrier supply regulators provide -5 volts and all except those on the switch and alarm units provide -10 volts, both voltages being maintained within ±3 percent over the normal variation in the -24 volt source. Each such regulator is located on the circuit board which it supplies.

3. ALARMS AND MAINTENANCE

A. Alarms

3.01 Various alarms are provided for the DFSG bank and DFSG-bank carrier/pilot supply. These alarms indicate loss of transmission, loss of DFSG pilot, loss of CFA pilot, excessive channel noise, and defective carrier and pilot generators and switches. Major and minor alarm indications are transmitted to the bay fuse and alarm panel and the office alarm circuits. Also, relay contact closures provide for sending alarm indications to a status indicating system.

> *Note:* Fuse alarms are described in Section 356-016-107.

3.02 The basic alarm circuit for the DFSG-bank carrier/pilot supply is illustrated in Fig. 15. Failure of any one of the 31 generators causes an alarm (ALM) lamp on the failed unit to light, an ALM REG lamp on the alarm unit to light, and a minor alarm indication to be sent (via relay contacts or an optical transfer unit) to the bay and office alarm circuits. An alarm cutoff (MN ACO) switch on the alarm unit can be operated to silence the office audible alarms and light a MN ACO lamp on the alarm unit. In the event ***both*** generators of a mutually protected pair of generators fail (except the 392-kHz generators), an ALM lamp on the associated switch unit lights, the ALM REG lamp on the alarm unit lights, and the switch unit sends a major alarm indication (via an optical transfer unit) to the bay and office alarm circuits. A MJ ACO key and lamp are provided on the alarm unit.

> *Note:* Simultaneous failure of both 392-kHz generators causes all associated generators (DFSG pilot, 1- and 2-way CFA carriers, and CFA pilot, as applicable) to fail. This will cause the ALM lamps on all of these generators, the ALM lamps on the associated switch units, and the ALM REG lamp on the alarm unit to light and, as a result, a major alarm indication will be sent to the bay and office alarm circuits.

3.03 In addition to the above, simultaneous failure of all 12 channel carrier generators or all five DFSG carrier generators produces a major alarm indication. Also, loss of the DFSG pilot in any of the five J68954BE DFSG RCVG units will cause the PIL ALM lamp on that unit to light, the TRMSN lamp on the alarm unit to light, and a minor alarm indication to be sent to the bay and office alarm circuits.

> *Note:* In the J68954( ) bays, a second alarm unit is used in the DFSG-bank carrier/pilot supply. This unit is mounted in the J68954S DFSG carrier/pilot secondary distribution shelf (bay No. 2). It responds only to loss of received DFSG pilot in bay No. 2, which results in a lighted TRMSN lamp on that alarm unit.

3.04 Two CFA alarm lamps (TRMT FAIL and RCV FAIL) are provided on the J68954BJ CFA units in the J68954T DFSG bank shelves. If noise in the received DFSG bank spectrum is excessive or the corresponding CFA pilot is lost, the RCV FAIL lamp lights. If the CFA pilot being transmitted to the distant end is lost or the noise is excessive, the TRMT FAIL lamp at the transmitting end will light.

B. Patching and Test Access

3.05 Various jacks are provided on the plug-in units for patching and testing the DFSG bank and the DFSG-bank carrier/pilot supply.

3.06 ***DFSG Bank:*** In the J68954( ) bays, three multiple access connectors are provided on each J68954T transmission shelf for VF patching and testing of the 12 VF channels on that shelf. For testing, an ED-52616 patch cord is used to connect the four VF channels associated with each such connector to one of three VF jack panels (Section 356-016-107) in the bay. The tests are made at the VF jack panel. For restoration patching, ED-52615 cords are used to connect groups of four VF channels between corresponding multiple access connectors on two DFSG shelves. In the J98629( ) frames, VF test and restoration connections are made via the maintenance connectors and manual access panels as described in Section 356-016-107.

3.07 Test jacks, designated -12V and GRD, on the -12 volt regulators on each J68954T shelf permit the regulator output voltage to be tested. In addition, TST jacks (for level measurement) on the DFSG COMB and DFSG SPLIT units permit the DFSG-bank transmitted and received power, respectively, to be tested, and a TST jack (for determining presence of signal only) on the J68954BC DFSG pilot secondary (or J68954CT DFSG pilot quaternary) distribution unit permits the DFSG pilot to be tested and adjusted, if necessary, at the insertion point.

3.08 ***DFSG-Bank Carrier Pilot Supply:*** Jacks, designated ALT OUT, are provided on all generator units (except the 392-kHz generator) for testing the generator output power. Other jacks, designated DIST IN, are provided at the input of all primary distribution circuits (except the 392-kHz circuit) to enable restoration patching. In the event that a generator fails, and no spare is available, the ALT OUT jack on an operating generator of the same type can be patched to the DIST IN jack succeeding the defective generator. Similarly, a defective switch unit can be bypassed in the event a spare is not available.

3.09 In the J68954( ) bays, all secondary distribution units have a jack, designated TST, for testing the carrier or pilot level at appropriate points. In addition, the CFA pilot secondary distribution unit has a level adjustment control.

3.10 In the J98629( ) frames, the CFA pilot primary distribution unit, all secondary and tertiary distribution units (except the DFSG pilot), and the DFSG pilot quaternary distribution unit have a TST jack on their faceplates. In addition, all CFA pilot distribution units and the DFSG pilot quaternary distribution unit have an adjustment (ADJ) control.

3.11 A J68954AC 95- to 75-ohm patch unit is provided (on the J68954L shelf) for connecting 75-ohm test equipment to the 95-ohm jacks (ALT OUT, DIST IN, and TST) on the DFSG-bank carrier/pilot supply.

C. Adjustments and Maintenance

3.12 The DFSG bank is designed for unattended operation and minimum maintenance effort. Routine adjustments are not required; therefore, maintenance and testing should be limited to initial lineup during installation and subsequent reassignment or trouble location. Except for VF channel gain (receive), DFSG-to-SGDF line build-out (transmit and receive), and CFA and DFSG pilot levels, all plug-in units are adjusted at the factory. The channel gain, line build-out, and pilot levels are adjusted during initial lineup and when an applicable unit is replaced with a spare.

D. Test Equipment

3.13 Test equipment presently used for A6 channel bank equipment is also suitable for the DFSG bank. The only new equipment needed is test and patch cords when the DFSG bank is used in J68954( ) bays. An ED-52616 patch cord is required for connecting groups of four VF channels to the J68954K VF patch panels, via multiple access connectors, and a switchcraft TT-120 series test cord (having a miniature plug on one end) is required for connecting VF test equipment to the VF jack panel. This cord is available in standard lengths of up to 5 feet.

E. Protection

3.14 ***DFSG Bank:*** In the J68954( ) bays, defective VF channels can be restored via the corresponding multiple access connectors and an ED-52615 patch cord connected to a hot spare, via its associated multiple access connectors. In the J98629( ) frames, such connections are made, via the associated maintenance connectors and an ED-2C002 (SMAS) or an ED-2C008 (non-SMAS) patch cord.

3.15 ***DFSG-Bank Carrier/Pilot Supply:*** Automatic mutual protection is provided for all paired (A and B) generators used in the DFSG bank. All other generators and all distribution circuits are protected on a spare (shelf stock) basis or a maintenance equipment (patchable hot spare) basis.

4. ASSOCIATED BAYS AND FRAMES

4.01 The DFSG bank and its associated carrier/pilot supply are mounted in conventional [J68954( )] bays and unitized [J98629( )] frames. These arrangements are described in detail in Section 356-016-107.

5. DFSG/A6B CONVERTIBILITY

5.01 By changing appropriate transmission and carrier supply plug-in units and cabling the bays to the GDF instead of the SGDF, one DFSG bank is convertible to five A6B banks in both the J68954( ) bays and the J98629( ) frames.

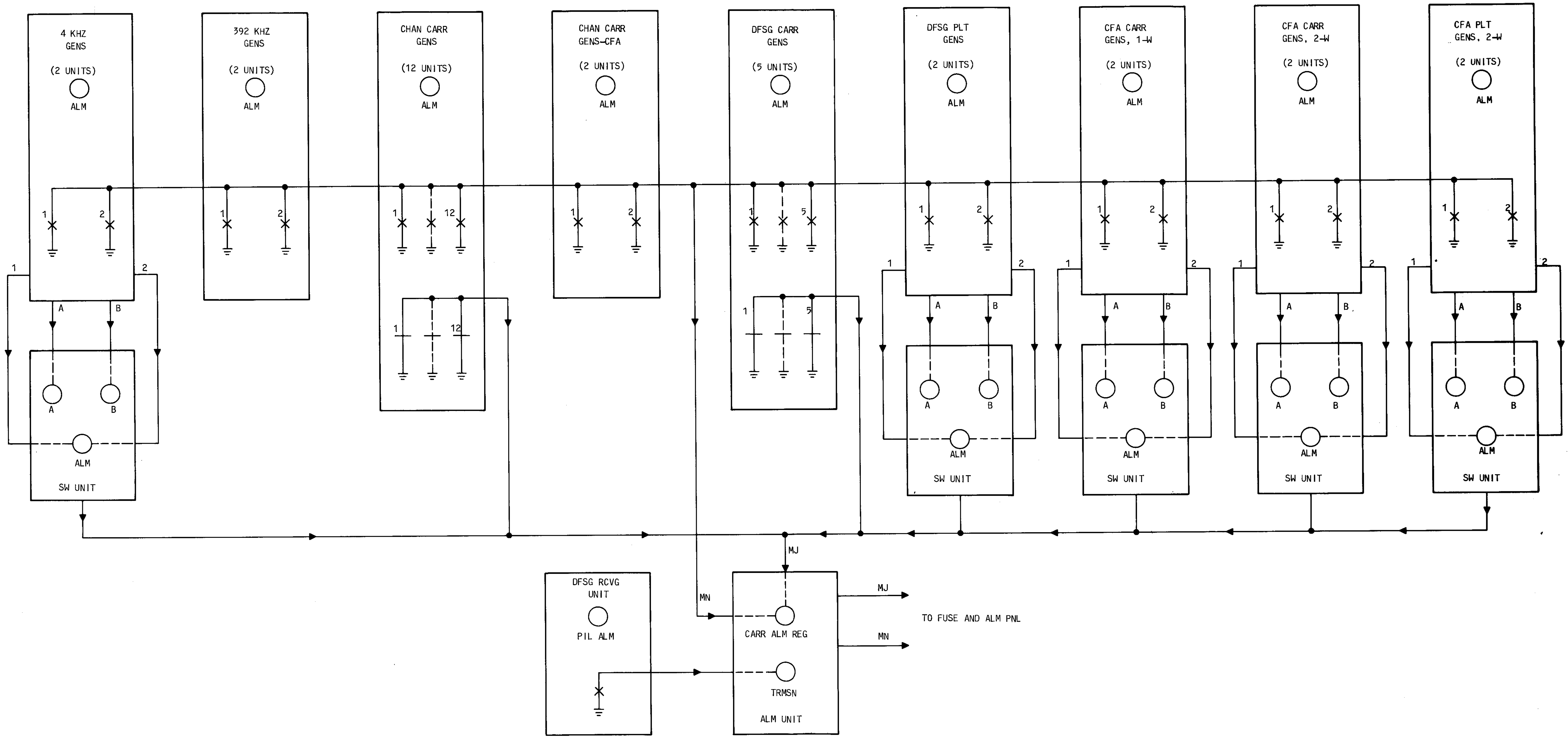


Fig. 15—DFSG Bank Carrier/Pilot Supply Alarm Circuit—Block Diagram

6. REFERENCES

6.01 The following reference material provides additional information on the DFSG bank:

DRAWING	TITLE
SD-51623-01	DFSG Bank—J68954( ) Bays—Application Schematic
SD-7C013-01	DFSG Bank—J98629K and N Frames—Application Schematic
SD-7C015-01	DFSG Bank—J98629T, U, W, and Y Frames—Application Schematic
SD-7C016-01	DFSG Bank—J98696, H, and J Frames—Application Schematic
SD-7C019-01	DFSG Bank—J98629P and R Frames—Application Schematic

SECTION	TITLE
356-016-000	A6B/DFSG—TOP
356-016-104	A6B Channel Bank—Description
356-016-105	A6B Channel Bank—J68954( ) Bays and J98629( ) Frames—Description
356-016-107	DFSG Bank—J68954( ) Bays and J98629( ) Frames—Description