

QCX
Avro
CF105
R-
0016

Classification cancelled / Changed to UNCLASS
~~SECRET~~ By authority of ANRS C105-R-0016
Date 27 Sept 96
Signature DR. ell
Unit / Rank / Appointment ANRS

FILE IN VAULT
NRC - CISTI
J. H. PARKIN
BRANCH
MAY 11 1995
ANNEXE
J. H. PARKIN
CNRC - ICIST

ANALYZED

TECHNICAL DEPARTMENT (Aircraft)

AIRCRAFT: **CF-105**

REPORT NO. **C105-R-0016**

FILE NO:

NO. OF SHEETS: **6 Figures 8**

TITLE:

GROUND INTERCOMMUNICATION SYSTEM

~~**SECRET**~~

Classification cancelled / Changed to UNCLASS
 By authority of AVRS
 Date 27 Sept 96
 Signature [Signature]
 Unit / Rank / Appointment AVRS E



PREPARED BY **K. R. Knowlton** DATE **March 1956**

CHECKED BY _____ DATE _____

SUPERVISED BY _____ DATE _____

APPROVED BY [Signature] DATE **Mar 28/56**

ISSUE NO.	REVISION NO.	REVISED BY	APPROVED BY	DATE	REMARKS

FORM 1316A

15855119

TECHNICAL DEPARTMENT (Aircraft)

REPORT No. C105-R-0016

SHEET No. 1

AIRCRAFT:

CF-105

GROUND INTERCOMMUNICATION
SYSTEM

PREPARED BY

DATE

K. R. Knowlton

March 1956

CHECKED BY

DATE

S E C R E TI N D E X

1. INTRODUCTION
2. PURPOSE OF INSTALLATION
3. AIRCRAFT INSTALLATION
4. GROUND INSTALLATION
5. WARNING SIGNALS
6. OPERATION
7. REFERENCES

F I G U R E S

1. Telescramble Wiring (Two-wire)
2. Telescramble Wiring (Four-wire)
Side tone provided by ground equipment.
3. Telescramble Wiring (Four-wire)
Side tone provided by aircraft.
4. Method of Compensating for Impedance Change.
5. Aircraft Ground Intercom. Circuits.
6. Theoretical Schematic Wiring Diagram for Warning Oscillator.
7. Schematic Wiring Diagram for CF-105 Aircraft Towing Vehicle.
8. Schematic Wiring Diagram for CF-105 Aircraft Tow Bar.



AVRO AIRCRAFT LIMITED
MALTON, ONTARIO

TECHNICAL DEPARTMENT

REPORT NO. C105-R-0016

SHEET NO. 1

AIRCRAFT	CF-105	GROUND INTERCOMMUNICATION SYSTEM	PREPARED BY	DATE
			K. R. Knowlton	March 1956
SECRET			CHECKED BY	DATE

1.0 INTRODUCTION

This report outlines the system of wired intercommunication between the aircrew and (a) the operations control centre (b) the ground crew. This supersedes Report No. C105-R-0008 "Ground Installations: 28 VDC Power Supply and Interphone" dated February 1, 1955.

2.0 PURPOSE OF INSTALLATION

2.1 Telescramble

The crew of an aircraft in operational readiness may be in two-way "press-to-talk" communication with an operations control centre by land telephone line connected with the AN/AIC-10 intercommunication system of the aircraft. This function is called "Telescramble".

2.2 Ground Intercom.

"Hot-mic" two-way communication is available between front and rear cockpit and ground personnel during the following operations:

2.2.1 Operational Readiness

Electrical isolation is provided between this function and the "Telescramble" function so that ground personnel cannot interfere with communication between the aircrew and the control centre.

2.2.2 Engine Start

This function is used in conjunction with the special engine starting vehicle.

2.2.3 Maintenance

This function allows maintenance personnel to communicate with each other.

2.2.4 Towing

This function allows communication between the cockpits and the tractor driver during aircraft towing. In addition, an audible warning signal



AVRO AIRCRAFT LIMITED
MALTON - ONTARIO

TECHNICAL DEPARTMENT

REPORT NO. C105-R-0016

SHEET NO. 2

AIRCRAFT:

CF-105

GROUND INTERCOMMUNICATION

SECRET

SYSTEM

PREPARED BY

DATE

K. R. Knowlton

March 1956

CHECKED BY

DATE

2.0 PURPOSE OF INSTALLATION

2.2.4 Continued

is provided to the tractor driver when the maximum safe angle of turn is approached, and a similar warning is provided to the aircrew and the tractor driver if the shear pin in the drawbar linkage fails.

3.0 AIRCRAFT INSTALLATION

3.1 Connections to external signal lines and, when required, 27.5 VDC power supply are made through a receptacle on the nosewheel leg assembly which also serves the engine start vehicle. No equipment other than the normal AN/AIC-10 interphone system is required in the aircraft, except as noted in 3.2.6 below.

3.2

3.2.1 The design of aircraft wiring for the telescrumble function depends upon the characteristics of the ground terminal equipment which is to be designed and procured by the RCAF. Possible arrangements are:

- (a) Two-wire system.
- (b) Four-wire system with sidetone provided by ground equipment.
- (c) Four-wire system with sidetone provided by aircraft.

3.2.2 In the two-wire system (a) one shielded line is brought from the nosewheel receptacle to interphone junction box R3 where it is connected to "Audio in #3", "Audio out #3", and "Mixing audio #5" from the two C-824/AIC-10 control panels.

3.2.3 In the four-wire systems (b) and (c) two shielded lines are brought from the receptacle. One of these is connected to "Audio in #3" and "Mixing audio #5" and the other to "Audio out #3" thus providing isolation between the in and out functions.

3.2.4 If sidetone is to be provided by the aircraft interphone system rather than the ground terminal equipment, a bridging amplifier must be used from the out line to the in line to maintain isolation



TECHNICAL DEPARTMENT

AIRCRAFT:

CF-105

GROUND INTERCOMMUNICATION

SECRET

SYSTEM

PREPARED BY

DATE

K. R. Knowlton

March 1956

CHECKED BY

DATE

3.0 AIRCRAFT INSTALLATION

3.2.4 Continued

since a direct connection would make arrangements (a) and (c) identical. Since this amplifier would not be required to provide any voltage gain, a cathode follower would be satisfactory. Schematic diagrams of the possible arrangements are shown in Figs. 1, 2 and 3.

3.2.5 In the two-wire system, the telescramble line impedance as seen by the ground terminal equipment is:

- | | | | |
|-----|--------------------------|----------|----------|
| (a) | Both PTT switches open | 150 ohms | (approx) |
| (b) | One PTT switch closed | 75 " | " |
| (c) | Both PTT switches closed | 50 " | " |

In the four-wire system, the impedance of the "in" line is 150 ohms under all conditions; the "out" line impedances are the same as (a), (b) and (c) above.

3.2.6 If it is desired to maintain constant line impedance in conditions (a) and (b) a relay may be provided to disconnect the appropriate load resistor when either PTT switch is closed. The relay coil circuit is completed by the "43 control" leads from the C-824/AIC-10 control panels. No provision need be made for maintaining constant impedance when both PTT switches are closed as this condition is not expected to occur in normal operation. Schematic diagrams are shown in Fig. 4.

3.2.7 Present wiring design of the CF-105 includes provision for the two-wire system without compensation for impedance changes pending a decision by the RCAF on the system to be used.

3.3 An additional shielded line is brought from the receptacle to the junction box R3 where it is connected to the interphone line. This line is used for all ground intercommunication functions.

3.4 Resistance networks within the AN/AIC-10 system provide theoretical isolation of about 70 db between telescramble and interphone lines. However, bench tests have shown that



AVRO AIRCRAFT LIMITED
MALTON, ONTARIO

TECHNICAL DEPARTMENT

REPORT No. C105-R-0016

SHEET No. 4

AIRCRAFT:

CF-105

GROUND INTERCOMMUNICATION

SECRET

SYSTEM

PREPARED BY

DATE

K. R. Knowlton

March 1956

CHECKED BY

DATE

3.0 AIRCRAFT INSTALLATION

3.4 Continued

capacity coupling reduces this to approximately 50 db at 400 cps. This degree of isolation is considered adequate.

3.5 During maintenance, 27.5 VDC is supplied from the aircraft to the ground intercom. installation. While the aircraft is being towed, 27.5 VDC is supplied to the aircraft AN/AIC-10 interphone system from the towing vehicle. During readiness and engine start, the ground installation and the aircraft installation are powered independently.

3.6 When the aircraft becomes airborne, all 27.5 VDC and signal leads to the nosewheel bay receptacle are opened to minimize the possibility of a power line fault and to prevent noise from being introduced into the interphone circuits as a result of rain or icing conditions.

3.7 A partial schematic diagram of this wiring is shown in Fig. 5.

4.0 GROUND INSTALLATION

4.1 Connections are made to the aircraft wiring through a lanyard release plug mating with the aircraft receptacle.

4.2 Telescramble

4.2.1 Avro will provide a shielded line from the lanyard release plug to a suitable junction box or terminal strip on the ground power supply used in the readiness hangar. The RCAF will be responsible for design and procurement of the necessary repeater amplifiers and matching devices to connect this line to a land telephone line.

4.2.2 The signal level supplied to the aircraft should be one milliwatt in 150 ohms.

4.3 Ground Intercommunication

4.3.1 A two-channel audio amplifier operated from 27.5 VDC supply is required for each headset used by the ground crew. In the starting and towing vehicles this unit will be permanently installed. For use in



AVRO AIRCRAFT LIMITED
MALTON - ONTARIO

TECHNICAL DEPARTMENT

REPORT No. G105-R-0016

SHEET No. 5

AIRCRAFT:

CF-105

GROUND INTERCOMMUNICATION
SYSTEM

PREPARED BY
K. R. Knowlton

DATE

March 1956

CHECKED BY

DATE

SECRET

4.0 GROUND INSTALLATION

4.3.1 Continued

the maintenance and readiness hangars, and on the flight line, portable amplifiers will be used by the ground crew. Portable amplifiers will be plugged into a junction box on the ground power supply.

- 4.3.2 It is expected that two-channel transistorized audio amplifiers of suitable characteristics will be available commercially. These units will weigh approximately 1 pound, and will be fitted with a shoulder harness for ground crew. For fixed use, the harness may be removed and the unit shock-mounted.

5.0 WARNING SIGNALS

- 5.1 An audio oscillator and relay unit is installed in the towing tractor. The oscillator section uses either a transistor or a vacuum tube and is capable of one milliwatt output in a load of 150 ohms. A theoretical schematic diagram is shown in Fig. 6.

5.2 Turn Warning

A mechanical device on the drawbar linkage actuates a microswitch when the maximum safe angle of turn is approached. This applies 27.5 VDC to the audio oscillator and relay unit. A relay operates to:

- (a) Open the interphone line between the towing tractor and the aircraft.
- (b) Initiate oscillator operation and connect its output to the input of the towing tractor amplifier.

5.3 Shear Pin Warning

- 5.3.1 If the drawbar shear pin fails, a second microswitch is actuated which applies 27.5 V to the audio oscillator and relay unit. A relay operates to energize the oscillator and connect its output to the interphone line.



TECHNICAL DEPARTMENT

AIRCRAFT:

CF-105

GROUND INTERCOMMUNICATION

PREPARED BY

DATE

K. R. Knowlton

March 1956

SECRET

SYSTEM

CHECKED BY

DATE

5.0 WARNING SIGNALS

- 5.3.2 This signal will not necessarily be continuous since as soon as the aircraft and the towing tractor separate a certain distance after failure of the shear pin, the cable from the drawbar will pull out disconnecting signal and 27.5 VDC power from the aircraft. To prolong the signal, about 6 feet of slack is provided in this cable.
- 5.3.3 An override switch is provided to disconnect the shear pin warning signal so that intercommunication is possible while a new shear pin is being fitted.
- 5.3.4 The wiring for the towing tractor and the drawbar is shown in Figs. 7 and 8 respectively.

6.0 OPERATION

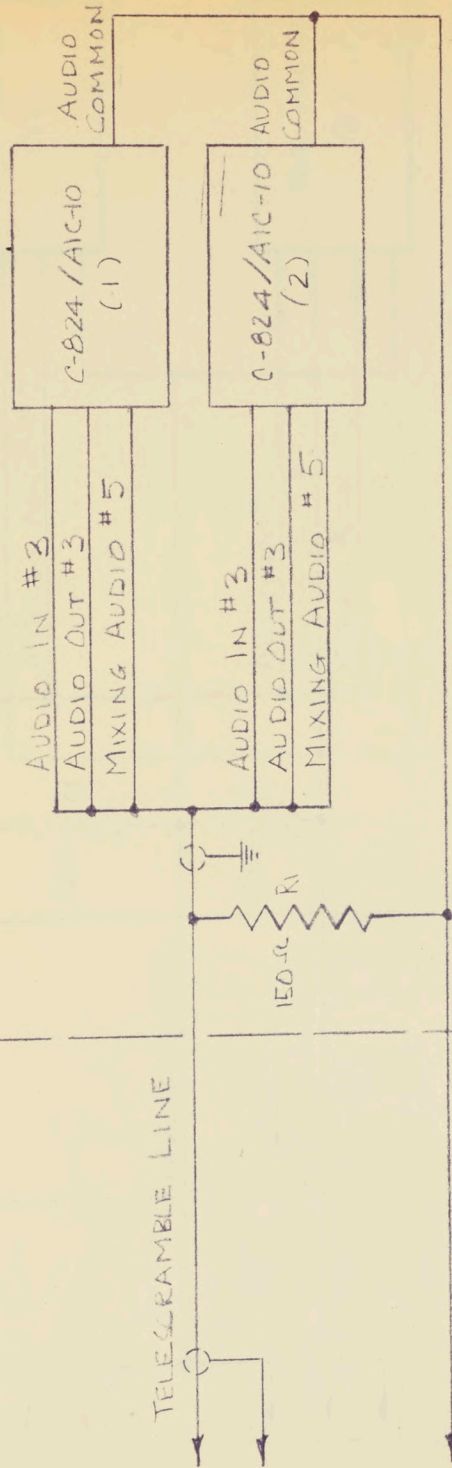
- 6.1 The aircraft AN/AIC-10 interphone installation is energized whenever the master switch of the electrical system is turned on whether the supply is rectified AC from the ground power supply, or 27.5 VDC supplied directly from a vehicle.
- 6.2 The towing tractor or starting vehicle installations are energized by operating the breaker on the instrument panel.
- 6.3 Portable amplifiers are energized by plugging them into the ground junction box.
- 6.4 For all ground intercommunication functions except Telescramble, the rotary switches on the C-824/AIC-10 control panels are set to "COMM", the "INTER" mixing toggle switch turned on and the volume control set at about 12 o'clock. When it is desired to monitor the Telescramble line, the "TEL" mixing switches are turned on.
- 6.5 For two-way Telescramble operation, the rotary switch is set to "TEL". The ground communication line is monitored as long as the "INTER" mixing switch is turned on. As soon as the lanyard released cable is disconnected at take-off, the rotary switch must be returned to the "COMM" position so that UHF communication may be available.

7.0 REFERENCES

Avro Report LOG/105/21 Towing Equipment C-105.

CONNECTIONS TO
GROUND TERMINAL EQUIP.

AIRCRAFT WIRING



SECRET

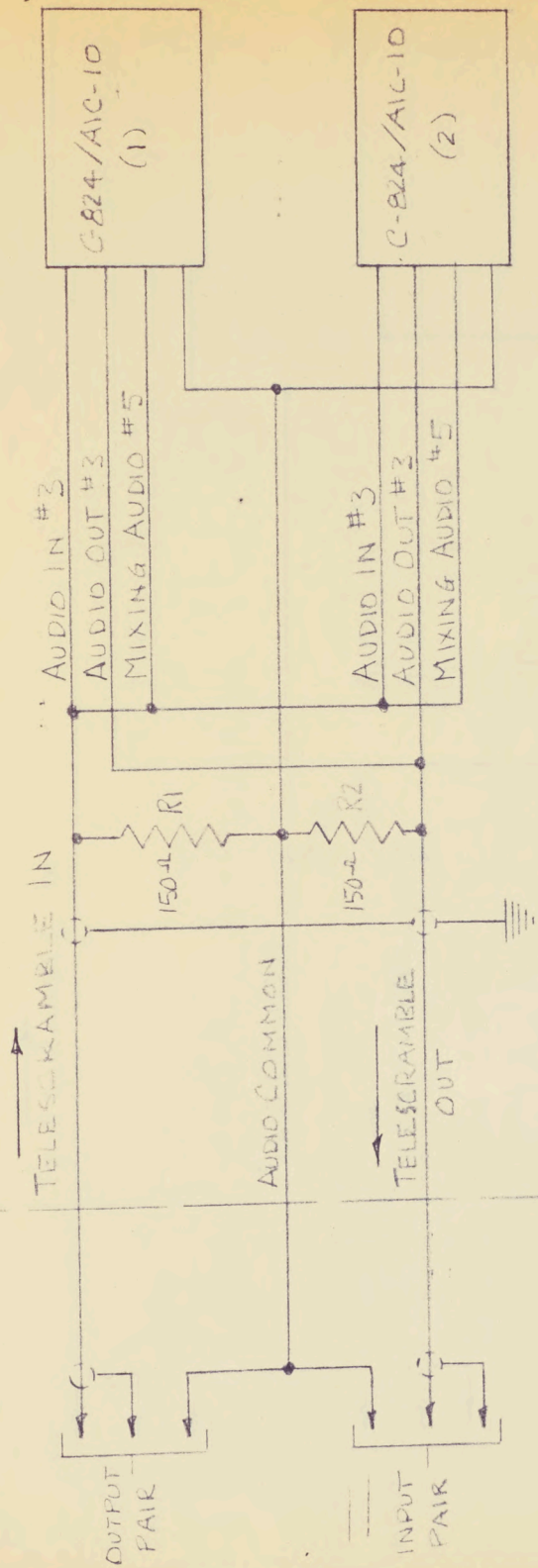
REFERENCE
REPORT C105-R-0016

TELESCRAMBLE WIRING (TWO WIRE)

FIG. 1

CONNECTIONS TO
GROUND TERMINAL
EQUIPMENT

AIRCRAFT WIRING

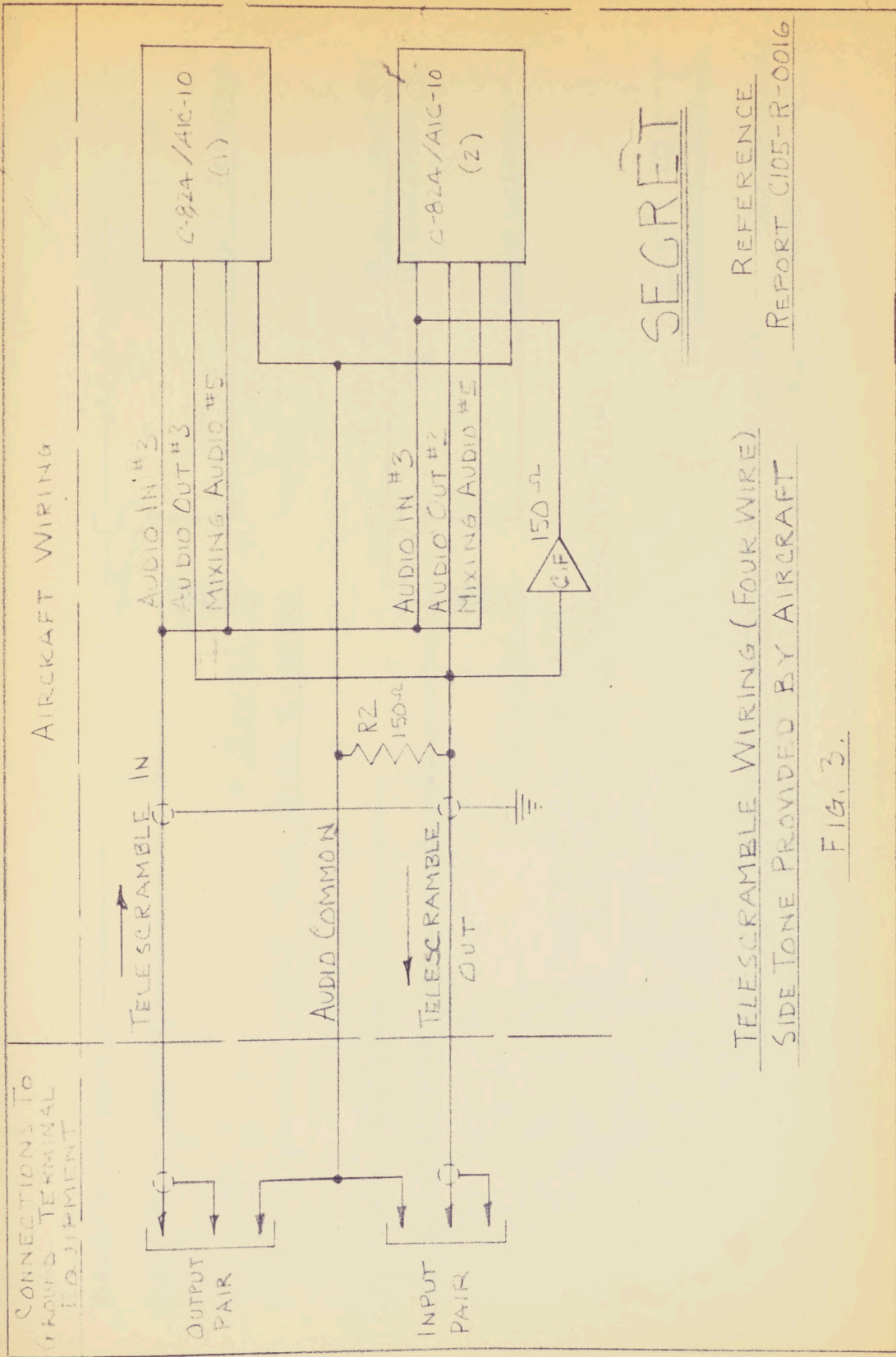


SECRET

TELESCRAMBLE WIRING (FOUR WIRE)
SIDE TONE PROVIDED BY GROUND EQUIPMENT.

REFERENCE
REPORT C105-R-0016

FIG. 2.

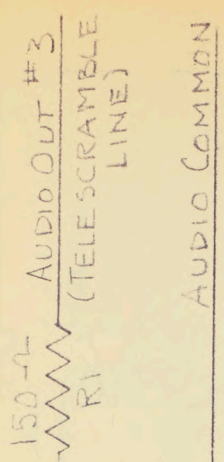


SECRET

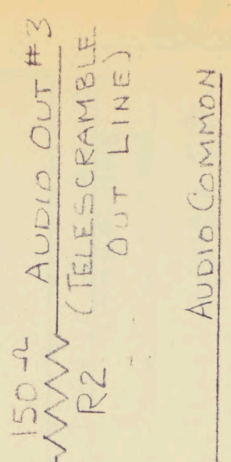
REFERENCE
REPORT C105-R-0016

TELESCRAMBLE WIRING (FOUR WIRE)
SIDE TONE PROVIDED BY AIRCRAFT

Fig. 3.



(a) TWO WIRE SYSTEM



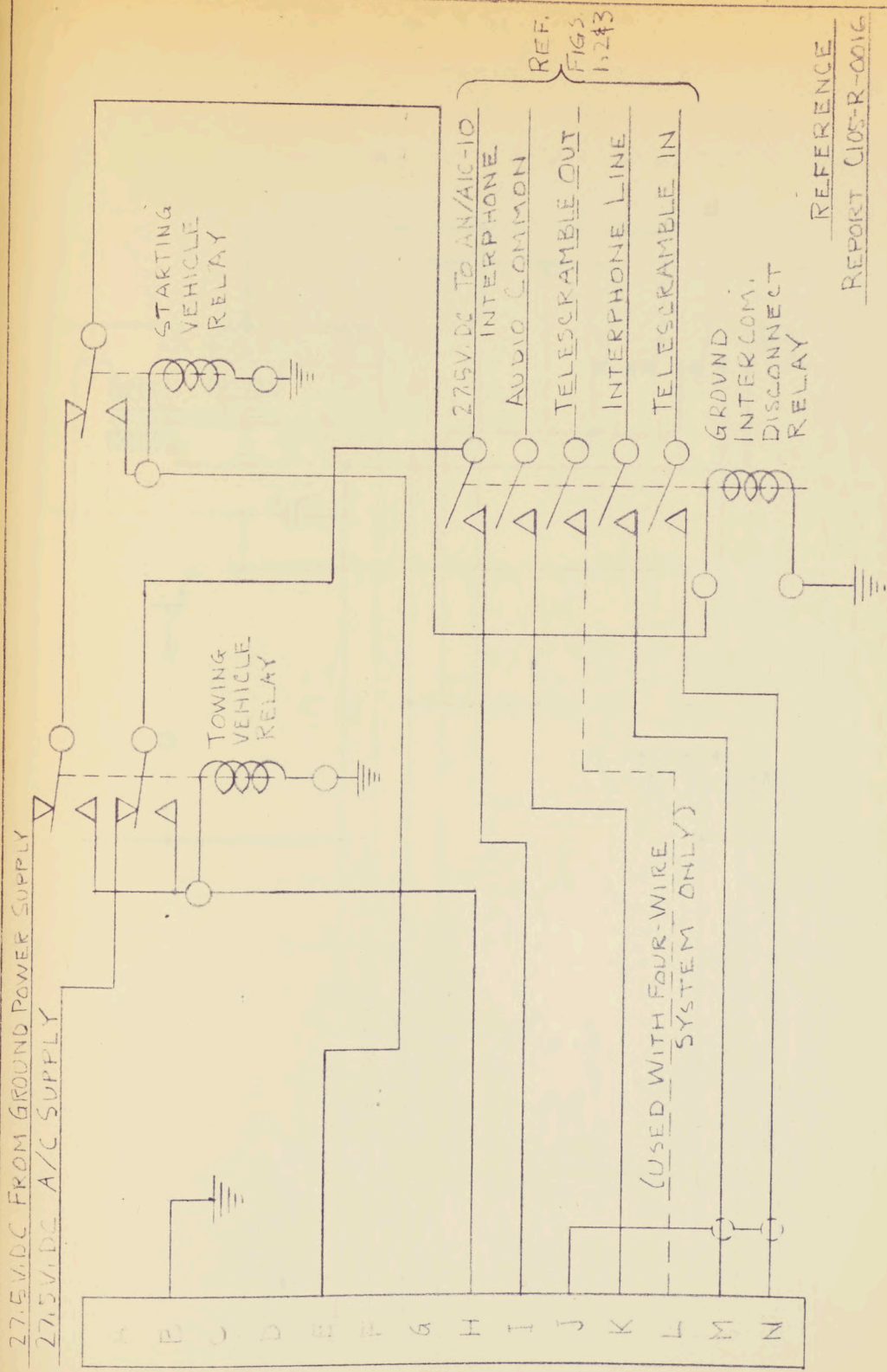
(b) FOUR WIRE SYSTEM
(EXTERNAL OR INTERNAL SIDE TONE)

SECRET

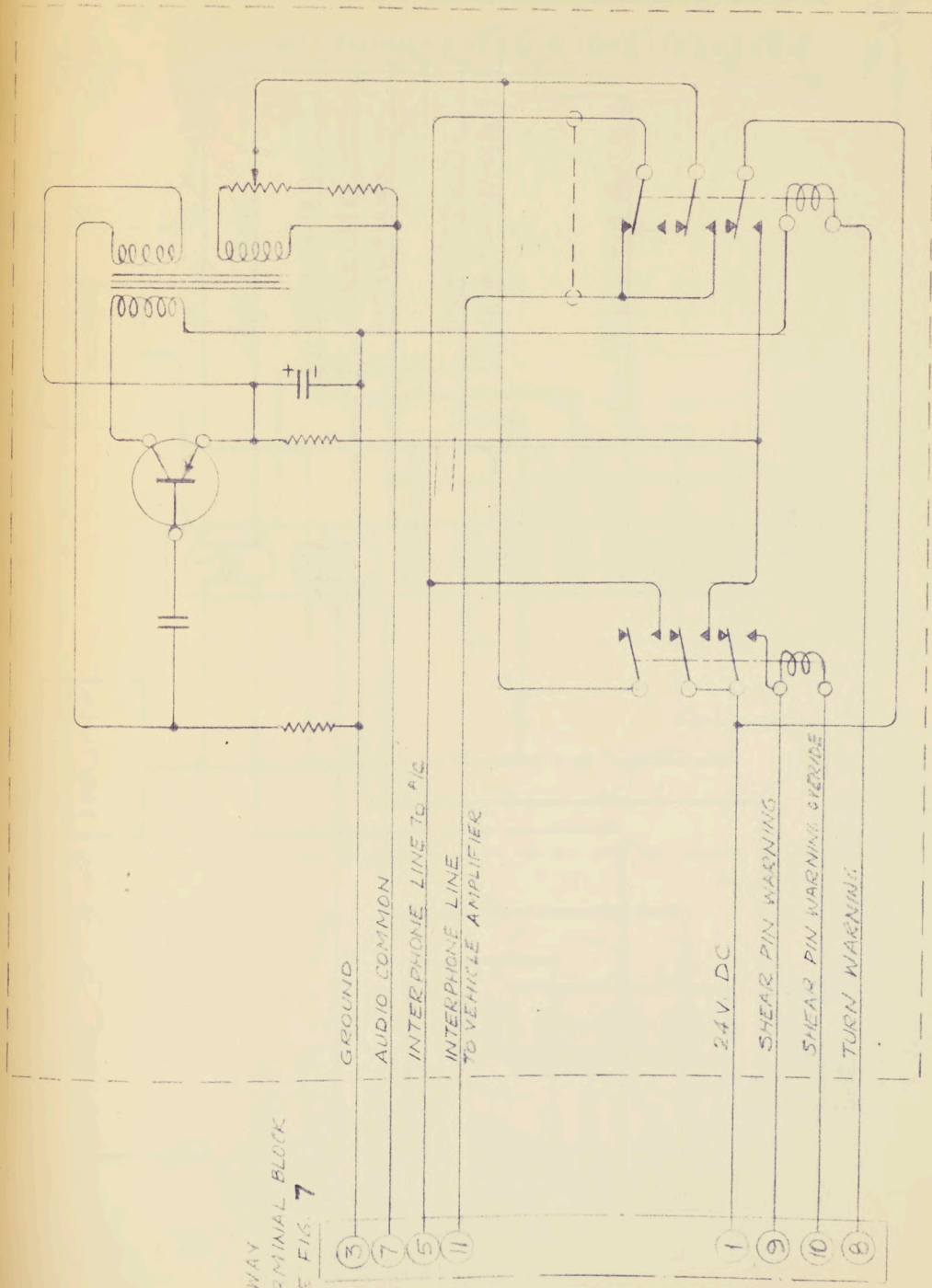
METHOD OF COMENSATING FOR IMPEDANCE
CHANGE WHEN PTT SWITCH IS CLOSED.

REFERENCE
REPORT C105-R-016

Fig. 4.



AIRCRAFT GROUND INTERCOM. CIRCUITS
 FIG. 5



12 WAY
TERMINAL BLOCK
SEE FIG. 7

GROUND

AUDIO COMMON

INTERPHONE LINE TO A/C

INTERPHONE LINE
TO VEHICLE AMPLIFIER

24 V. DC

SHEAR PIN WARNING

SHEAR PIN WARNING OVERRIDE

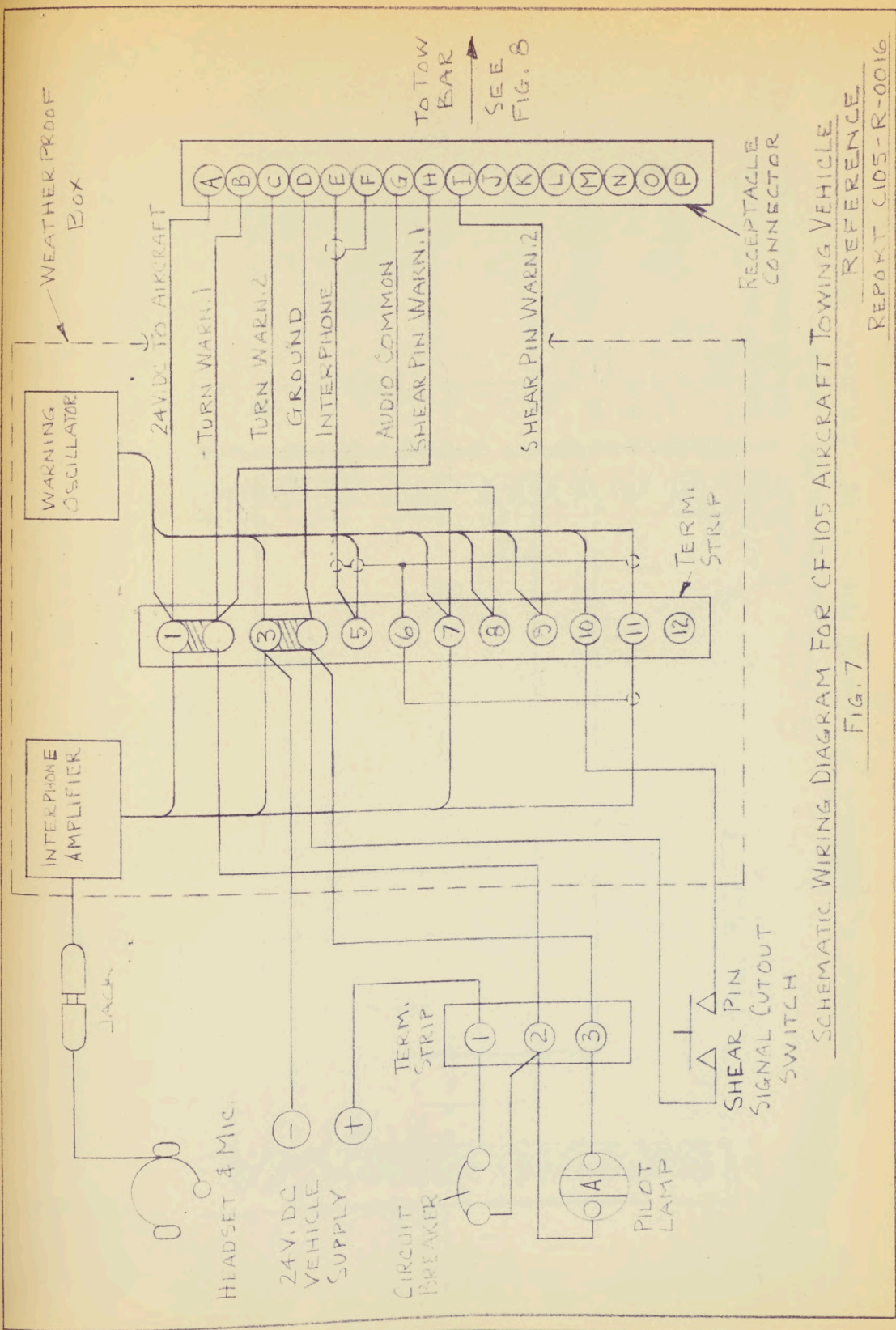
TURN WARNING

REFERENCE
REPORT C105-R-006

THEORETICAL SCHEMATIC WIRING DIAGRAM
FOR

WARNING OSCILLATOR

FIG. 6



TO TOW BAR
SEE FIG. 8

SCHEMATIC WIRING DIAGRAM FOR CF-105 AIRCRAFT TOWING VEHICLE

FIG. 7

REFERENCE
REPORT C105-R-0016

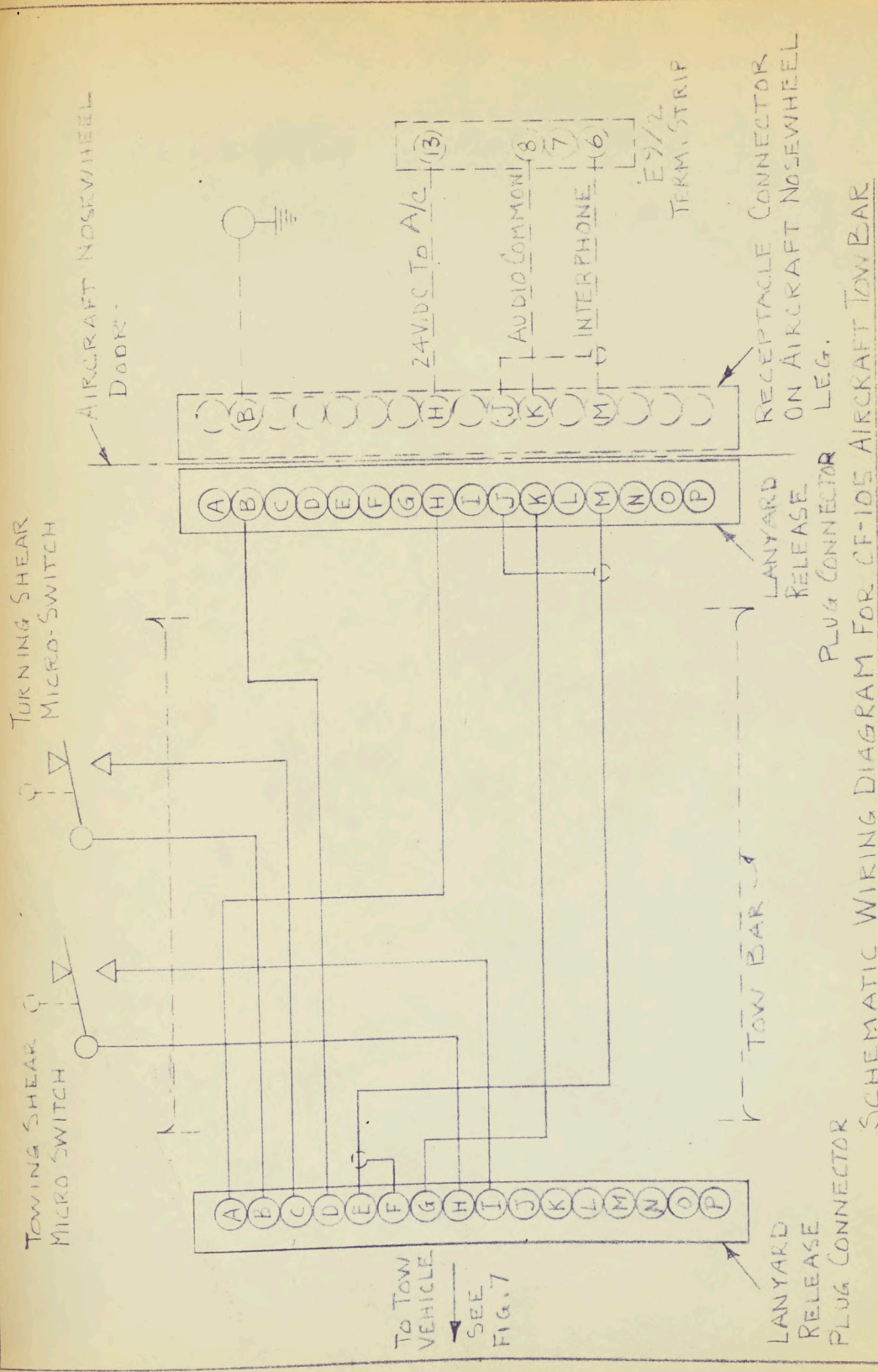


FIG. 8
 SCHEMATIC WIRING DIAGRAM FOR CF-105 AIRCRAFT TOW BAR
 REFERENCE - REPORT C105-R-0016

DUO TANG
50125
MADE IN U.S.A.