Navigation system 3300

Indicators

IN 3300 - ( )

Installation and Operation

Manual DV 28304.03
Issue 5 February 2007

Becker Flugfunkwerk GmbH ¨ Baden Airpark ¨ Building B108
D-77836 Rheinmünster ¨ Telefon +49 (0) 7229 / 305-0
E-Mail info@ becker-avionics.de or support@becker-avionics.de

FIRST ISSUE AND CHANGES

Issue	1	August 1986
Issue	2	January 1994
Issue	3	June 1995
Issue	4	August 2000
Issue	5	February 2007

LIST OF EFFECTIVE PAGES

Page No.:	Date :	Page No.:	Date :
Title	02/07		
1-I - 1-II	02/07		
1-1 - 1-6	02/07		
2-I - 2-II	02/07		
2-1 - 2-14	02/07		
3-I - 3-II	02/07		
3-1 - 3-6	02/07		

Table of contents

Blank

Section I GENERAL INFORMATION

1.1 Introduction

The following manuals described the indicators IN 3300 - ( ) for the NAV 3300 navigation system.

Section		DV 28304.03	DV 28304.04
1	General Information	X	X
2	Installation	X	X
3	Operation	X	X
4	Theory of Operation		X
5	Maintenance and Repair		X
6	Illustrated Parts List		X
7	Modification and Changes		X
8	Circuit Diagrams		X

1.2 Purpose of equipment

The indicator IN 3300 - (3) (crosspointer) with marker beacon receiver indicates VOR (VHF Omnidirectional Range) signals, LOC signals (runway course guidance) and GS (Glideslope) signals; in addition, it receives and indicates MKR signals (ILS and airway marker beacons). The indicator IN 3300 - (4) indicates VOR (VHF Omnidirectional Range) signals and LOC signals (runway course guid ance). The indicators IN 3300 - (5)/ IN 3300 - (6) and the IN 3300-(10) differs from IN 3300 - (3) because they have no the marker beacon receiver. The IN 3300-(10) has no marker lamps.

The indicator IN 3300 - (12) (crosspointer) with marker beacon receiver indicates VOR (VHF Omnidirectional Range) signals, LOC signals (runway course guidance) and GS (Glideslope) signals; in addition, it receives MKR signals (ILS and airway marker beacons).

The indicator IN 3300 - (11) (crosspointer) indicates VOR (VHF Omnidirectional Range) signals, LOC signals (runway course guidance) and GS (Glideslope) signals.

The indicators are designed for use in aircraft. The equipment has been designed to comply with the RTCA Minimum Performance Specifications. Its performance under environmental conditions meets the requirements of RTCA DO-160A. It is suitable for installation and operation in the instrument panels of virtually all types of aircraft in the certified environmental categories.

All system functions have been tested and certified for a maximum operational altitude of 50.000 ft.

1.3 Short description

Indicator IN 3300 - (4) differs from IN 3300 - (3) in the lack of the marker receiver module, the glideslope pointer and the glideslope flag. The singlepointer indicator head presents the VOR/LOC bearing information while the crosspointer indicator head presents the VOR/LOC, GS and marker information. The indicators IN 3300 - (5) / IN 3300 - (6) and IN 3300-(10) are equipped with the crosspointer indicator head. Further differences are described in the table in para. 1.4,(Survey variants) .

The indicators are designed for installation in aircraft instrument panels. All indicators and controls are arranged in a user-friendly manner. The equipment connector is located on the back side of the indicator. The antenna connector for the marker receiver incorporated in model IN 3300 - (3) also is located on the back side of the equipment.

The marker receiver is a tuned radio-frequency receiver. The marker lamps are located on the instrument flange of the IN 3300 - (3) indicator.

Upwards serial no.: 1000 the IN 3300 -(3) included a autopilot output middle Marker.

The indicator IN 3300 - (12) (crosspointer) with marker beacon receiver indicates VOR (VHF Omnidirectional Range) signals, LOC signals (runway course guidance) and GS (Glideslope) signals; in addition, it receives MKR signals (ILS and airway marker beacons), included a autopilot output middle Marker.

The indicator IN 3300 - (11) (crosspointer) indicates VOR (VHF Omnidirectional Range) signals, LOC signals (runway course guidance) and GS (Glideslope) signals.

1.4 Survey variants

The following table lists the various models of the indicators which are available. Externally, the models differ from one another by the presence or lack of an antenna jack, i.e. for installation purposes their dimensions are identical.

Type	Description	Article-No.
IN 3300 - (3) - 01	Indicator (crosspointer) with marker beacon receiver, marker switch, marker lamps and resolver (OBS) (operating volt. +27.5 V / panel illumin. +13.75 / 27.5 V)	0482.072-911
IN 3300 - (3) - 02	Indicator (crosspointer) with marker beacon receiver, marker switch, marker lamps and resolver (OBS) (operating volt. +27.5 V / panel illumin. + 5 V)	0778.087-911
IN 3300 - (4) - 01	Indicator (singlepointer) without marker beacon receiver, marker switch, marker lamps, with resolver (OBS) (none operating volt. / panel illumin. + 13.75 / 27.5 V)	0497.789-911
IN 3300 - (4) - 02	Indicator (singlepointer) without marker beacon receiver, marker switch, marker lamps, with resolver(OBS) (none operating volt. / panel illumin. + 5 V)	0778.095-911
IN 3300 - (5) - 01	Indicator (crosspointer) without marker beacon receiver, with marker switch, marker lamps and resolver (OBS) (operating volt. +27.5 V / panel illumin. + 13.75 / 27.5 V)	0804.452-911
IN 3300 - (5) - 02	Indicator (crosspointer) without marker beacon receiver, with marker switch, marker lamps and resolver (OBS) (operating volt. +27.5 V / panel illumin. + 5 V)	0804. 460-911
IN 3300 - (6) - 01	Indicator (crosspointer) without marker beacon receiver, with marker switch, marker lamps and resolver (OBS) (operating volt. +13.75 V / panel illumin. +13.75/27.5 V)	0804.479-911
IN 3300 - (6) - 02	Indicator (crosspointer) without marker beacon receiver, with marker switch, marker lamps and resolver (OBS) (operating volt. +13.75 V / panel illumin. + 5 V)	0804.487-911
IN 3300 - (8) - 01	Indicator (singlepointer) without marker beacon receiver, marker switch, marker lamps and resolver (OBS) (none operating volt. / panel illumin. +13.75 / 27.5 V)	0879.169-911
IN 3300 - (9) - 01	Indicator (crosspointer) without marker beacon receiver, marker switch, marker lamps and resolver (OBS) (none operating volt. / panel illumin. + 13.75 / 27.5 V)	0879.177-911
IN 3300 - (10) - 01	Indicator (crosspointer) without marker beacon receiver, marker switch, marker lamps, with resolver (OBS) (none operating volt. / panel illumin. + 13.75 / 27.5 V)	0891.452-911
IN 3300 - (11) - 01	Indicator (crosspointer) resolver (OBS) panel illumin. +13.75 / 27.5 V)	0597.971-911
IN 3300 - (12) - 01	Indicator (crosspointer) with marker beacon receiver, marker switch, and resolver (OBS) (operating volt. +27.5 V / panel illumin. +13.75 / 27.5 V)	0597.961-911

1.5 Technical data

1.5.1 General data

Dimensions	82.55 x 82.55 x 128 mm
Weight	
IN 3300 - (3)	850 g
IN 3300 - (4)	800 g
IN 3300 - (5)	830 g
IN 3300 - (6)	820 g
IN 3300 - (8)	800 g
IN 3300 - (9)	800 g
IN 3300 - (10)	800 g
IN 3300 - (11)	800 g
IN 3300 - (12)	800 g

1.5.2 Technical data for VOR, LOC and GS indication (IN 3300 - (3)/ - (5)/ - (6)/ - (9)/-(10)/ (11)/ - (12)/

Resolver	ARINC standard resolver Zero balance at 330°	
VOR/LOC pointer	150-0-150 mV, 1000	6%
VOR/LOC flag	0-125-250 mV, 1000	10%
TO/FROM indication	150-0-150 mV, 1000	10%
GS pointer	150-0-150 mV, 1000	6%
GS flag	0-125-250 mV, 1000	10%

1.5.3 Technical data for VOR and LOC indication (IN 3300 - (4)-(8))

Resolver	ARINC standard resolver Zero balance in compliance with RTCA DO - 62
VOR/LOC pointer	150-0-150 mV, 1000 6%
VOR/LOC flag	0-125-250 mV, 1000 10%
TO/FROM indication	150-0-150 mV, 1000 10%

1.5.4 Technical data for marker beacon receiver

Operating voltage	27.5 V DC
Current consumption	
- Standby	50 mA
- Active	180 mA
Receiver type	Tuned radio-frequency receiver (TRF)
Frequency	75 MHz
Sensitivity	200 V...10 mV EMF Adjustable via HI/LO switch positions Normal settings: HI 1 mV (receiver threshold) LO 2 mV (receiver threshold)
Bandwidth	10 kHz at 6 dB
AGC	10 dB from receiver threshold to 50 mV EMF
Audio output	100 mW into 300 Ohm at Ue = 1 mV/1000 Hz - 95% mod.
Optical display brightness control	3 indicator lamps with automatic
Autopilot output middle marker	20 mA / 50 V

1.5.5 Airworthiness specifications

Equipment complies with the following construction standards:

	RTCA DO-143 (Marker) CLASS A RTCA DO-131 A (LOC) CLASS D RTCA DO-153 A (VOR) RTCA DO-132 A (GS) CLASS D
Environmental categories	RTCA DO-160A, Env. cat D 1A/PKS/XXXXXXABABZ

1.5.6 Certifications

EASA Approval	EASA.21O.738
FTZ inspection no.	LB - 423/84
IN 3300-(11)-01	EASA.21O.738
IN 3300-(12)-01	EASA.21O.738

1.5.7 Accessories

Cable plug, completed	Article No. 0710.679-954
Coaxial plug	Article No. 0725.919-277
Marker Control Kit MCK 3300-1	Article No. 0598.232-278
consist of	
3 Lamps (white, amber blue) 1 Switch	
Marker Control Kit MCK 3300-2	Article No. 0598.224-278
consist of	
3 Lamps (white, amber blue)	

Table of contents

Blank

Section 2 INSTALLATION

2.1 General remarks

Installation of the indicators varies according to aircraft and equipment design. It is therefore only possible to provide general guidelines in this section.

2.2 Pre-installation check

2.2.1 General remarks

Prior to installing the indicators in aircraft, they should be checked for damage caused during transport.

2.2.2 Visual inspection

Before placing the equipment in operation, a sight check should be carried out to determine whether any of the following defects are present:

1. Soiling, dents, scratches, rust, broken fasteners on housing.
2. Soiled or scratched type plate or lettering.
3. Soiled, bent or cracked pins, cracked plug or jack inserts.

2.2.3 Mounting

The indicators have been constructed with standard instrument dimensions so that they can be mounted in any standard-size cutout of the instrument panel. The indicator must be mounted at a suitable location in the instrument panel that enables the pilot to read the course needles without parallactic shift. The indicators are designed for mounting on the instrument panel either from the front or from the back. The relevant dimensions for mounting are indicated in Figure 2-1.

2.3 Installation wiring

2.3.1 General remarks

The required installation wiring is illustrated schematically in Figures 2-2 - 2-7. AWG 20 cable should be used for the power supply line.

In addition, the following should be observed:

a) Only aircraft cable (self-extinguishing) should be used. Use AWG 20 for power supply voltage and ground and AWG 22 for all other lines.

b) Pull rubber sleeves over the soldered connections on the instrument plug.

c) Install a 1 A fuse or circuit breaker in the power supply line.

d) Before switching on power to the instrument, carefully recheck all wiring, making particularly sure that (+) and (-) poles have not been confused.

NOTE

The HF-cables and cables carrying audio signals or pulsed information should not be tied together with the wiring of the NAV 3300

2.3.2 Installation of indicators in helicopters

In helicopters with vibrational forces in the 17 Hz - 55 Hz range at the location of the ILS equipment which exceed an acceleration of 2 g, the flag alarms for the system functions VOR/LOC and glide scope can be caused to appear irregularly in brief bursts despite clear signal reception.

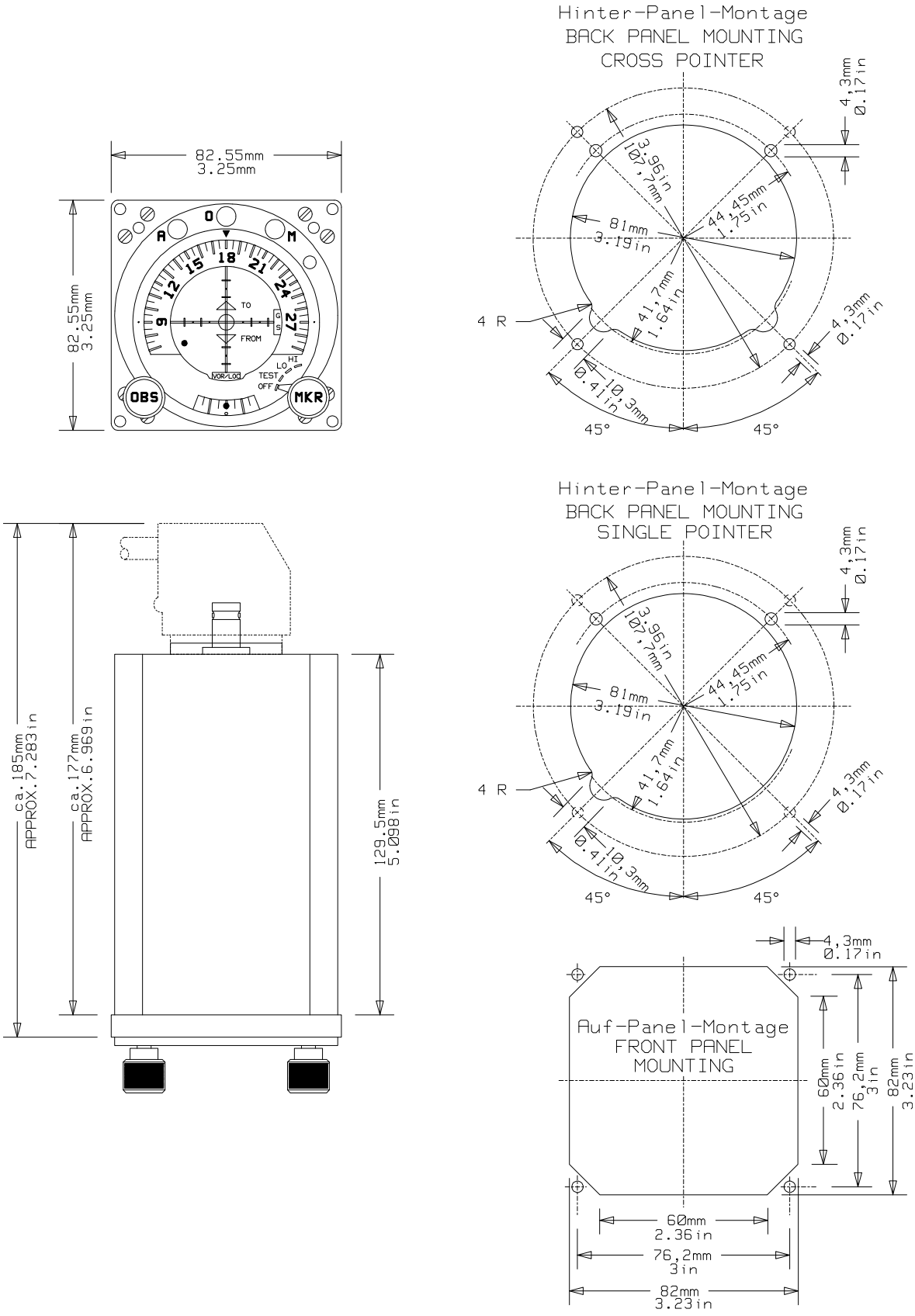

Fig. 2-1 Dimensions

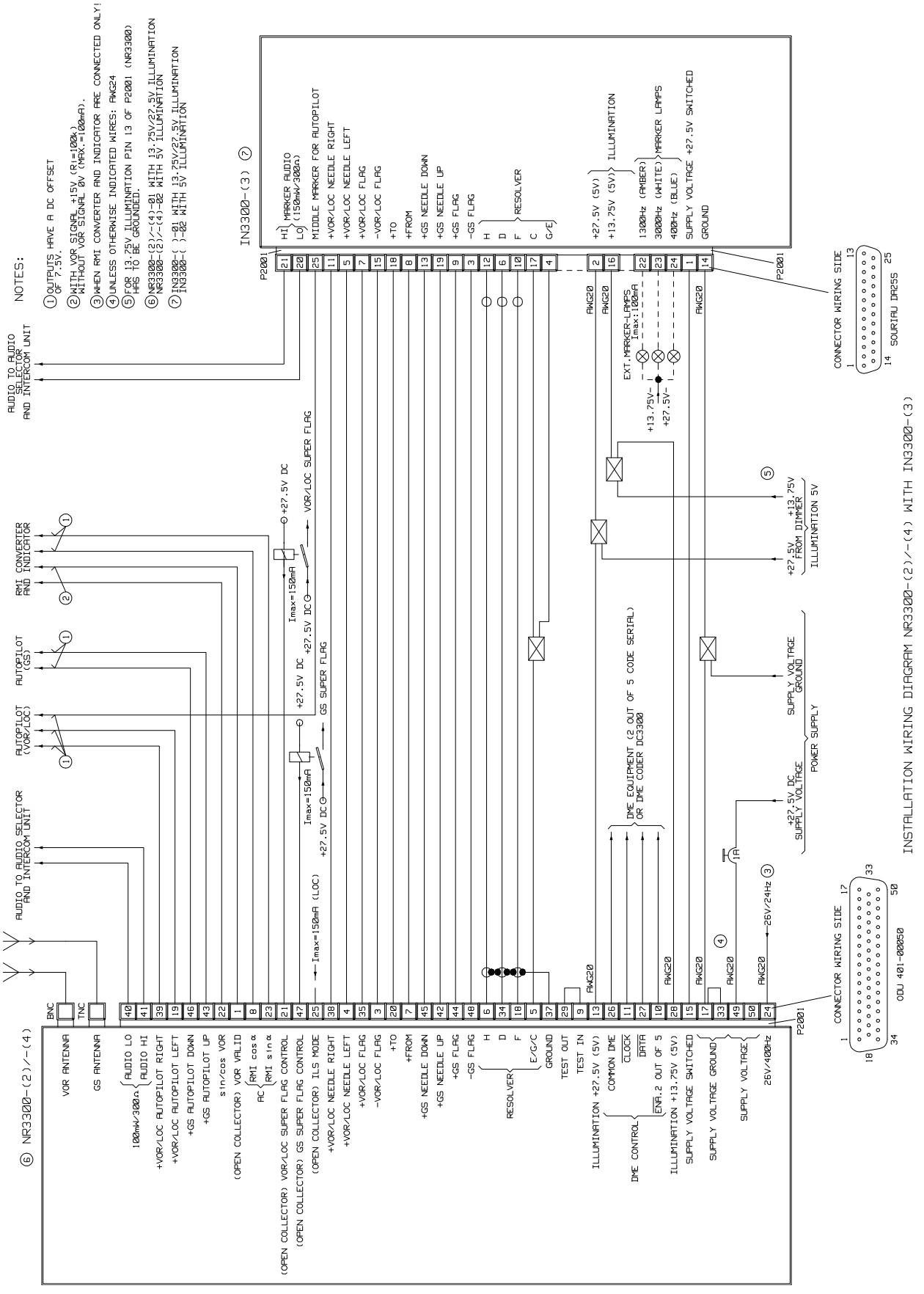

Fig. 2-2 Installation wiring diagram NR 3300-(2) / - (4) and IN 3300 - (3)

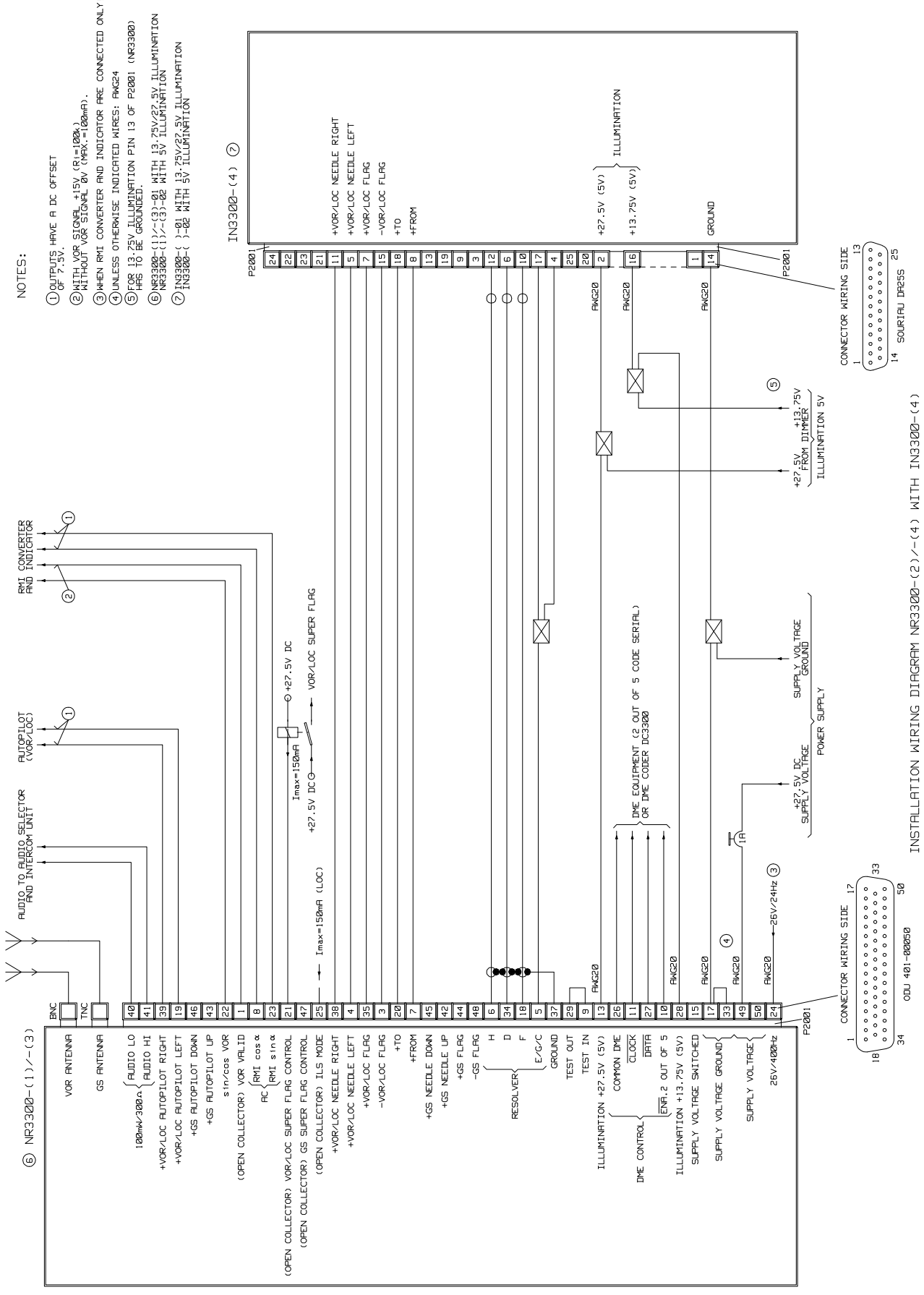

Fig. 2-3 Installation wiring diagram NR 3300-(1) / - (3) and IN 3300 - (4)

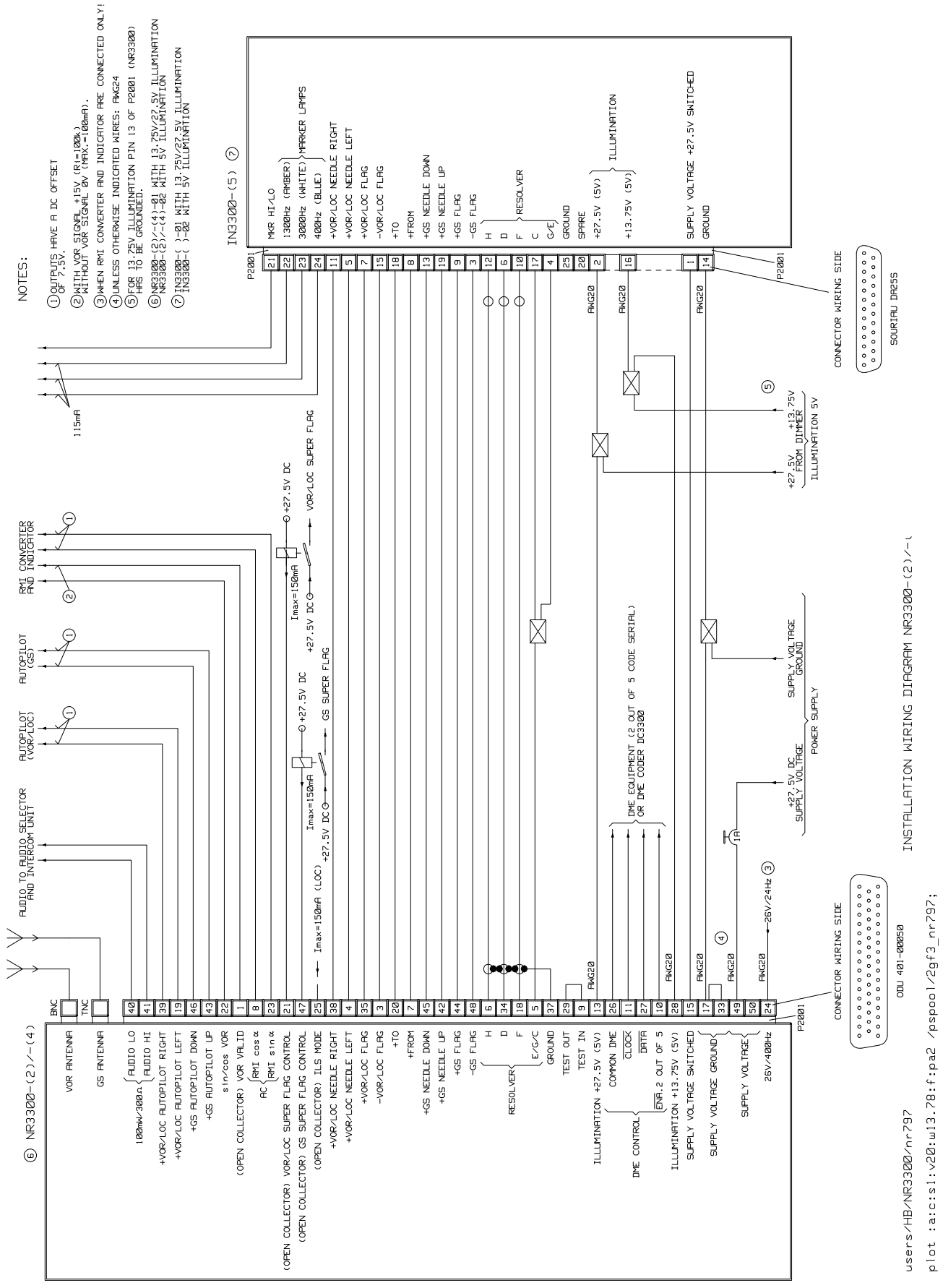

Fig. 2-4 Installation wiring diagram NR 3300-(2) / - (4) and IN 3300 - (5)

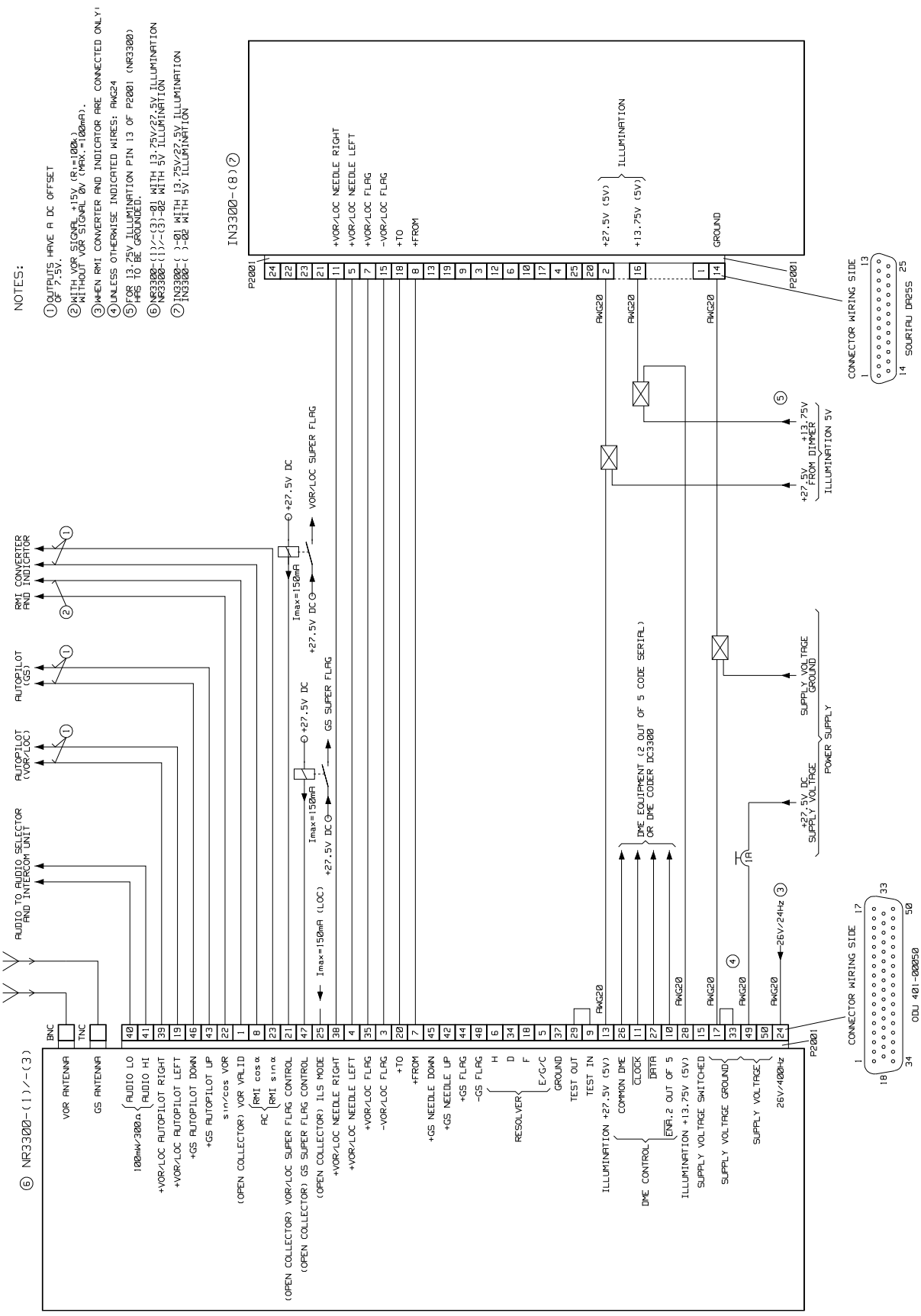

Fig. 2-5 Installation wiring diagram NR 3300 - (2) / - (4) and IN 3300 - (8)

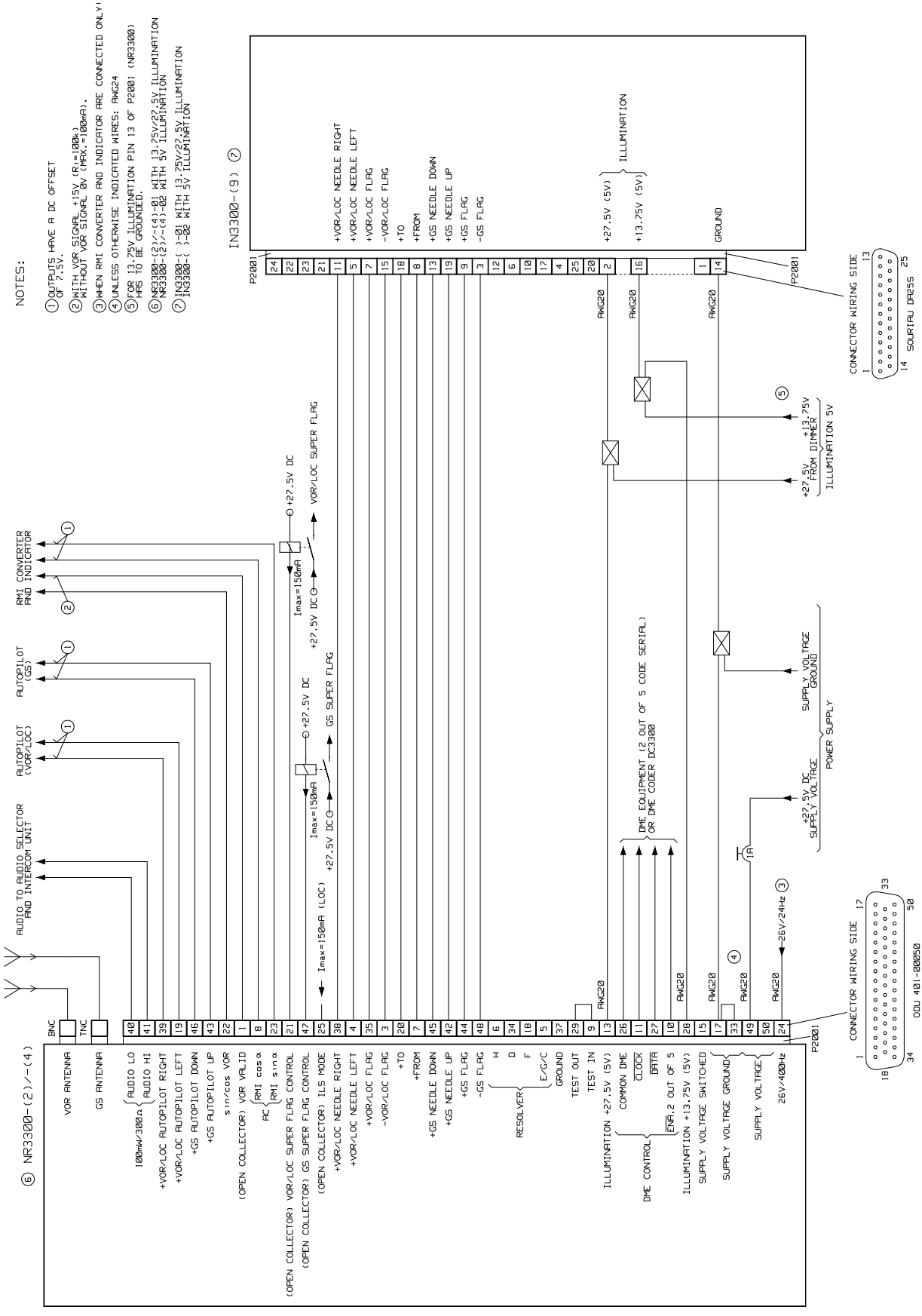

Fig. 2-6 Installation wiring diagram NR 3300 - (1) / - (3) and IN 3300 - (9)

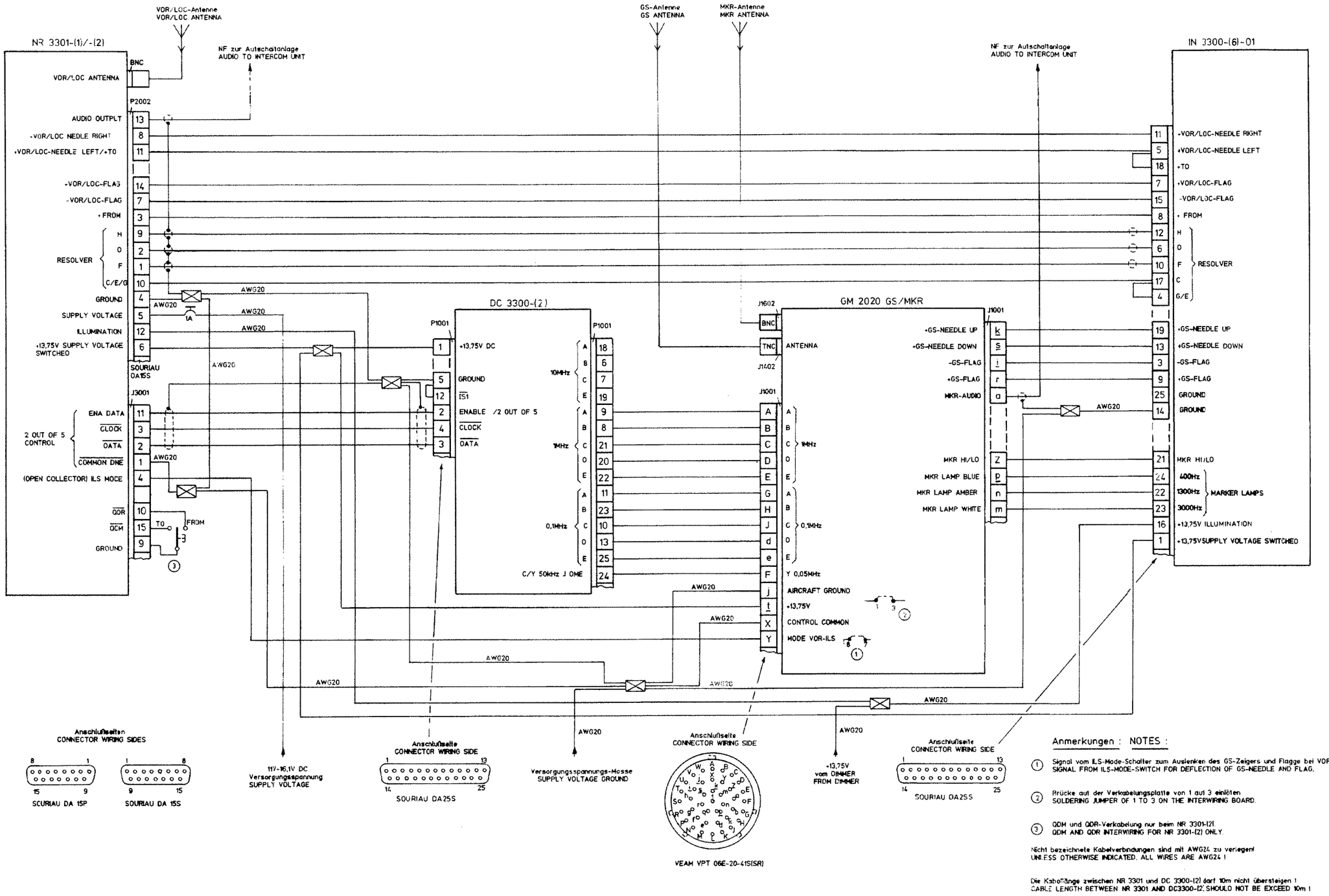

Fig. 2-6 Installation wiring for NAV receivers NR 3301 - (1) / - (2) with glideslope receiver GM 2020 and indicator IN 3300 - (6)

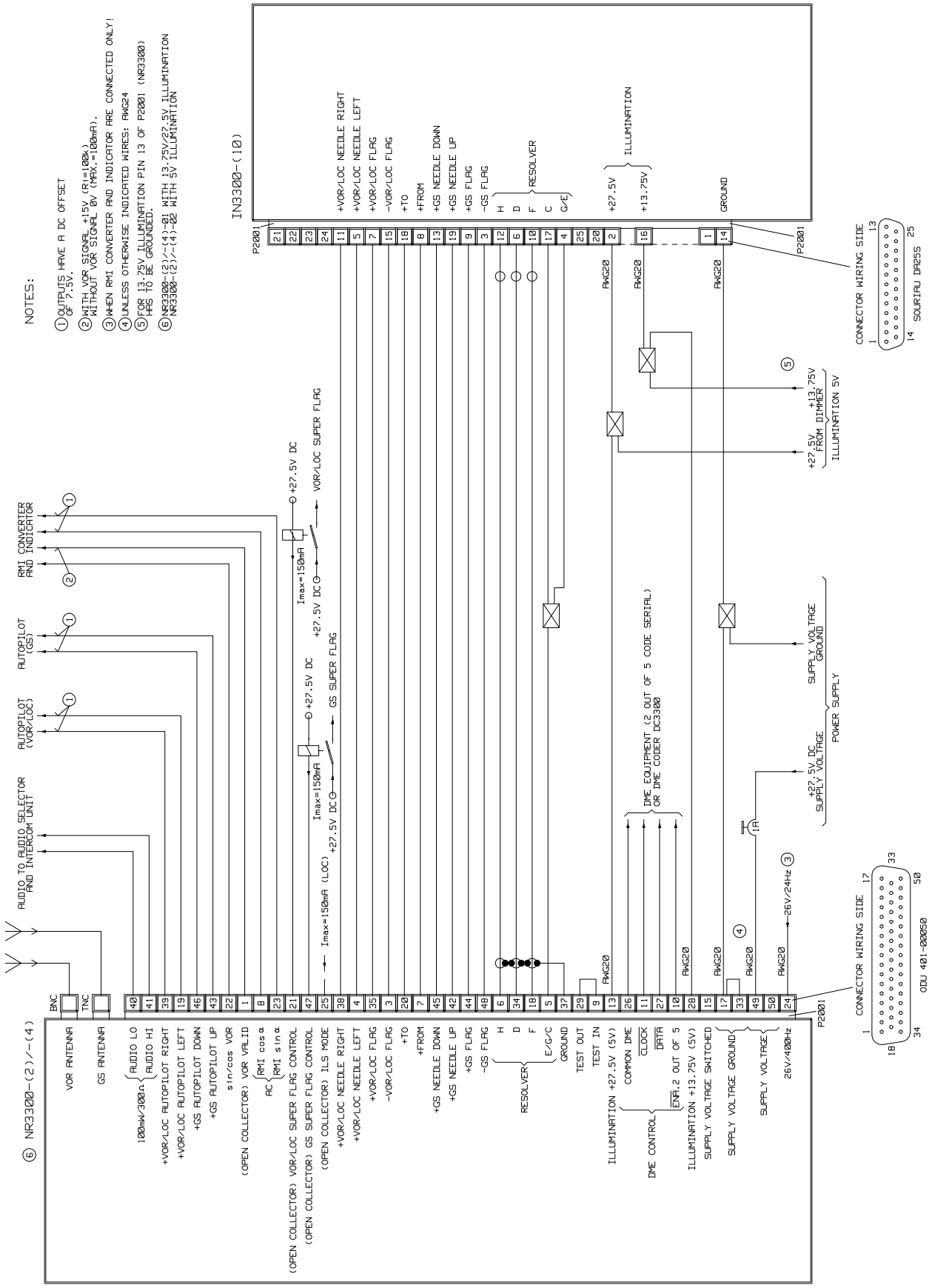

Fig. 2-8 Installation wiring diagram NR 3300-(2) / - (4) and IN 3300-(10)

BLANK

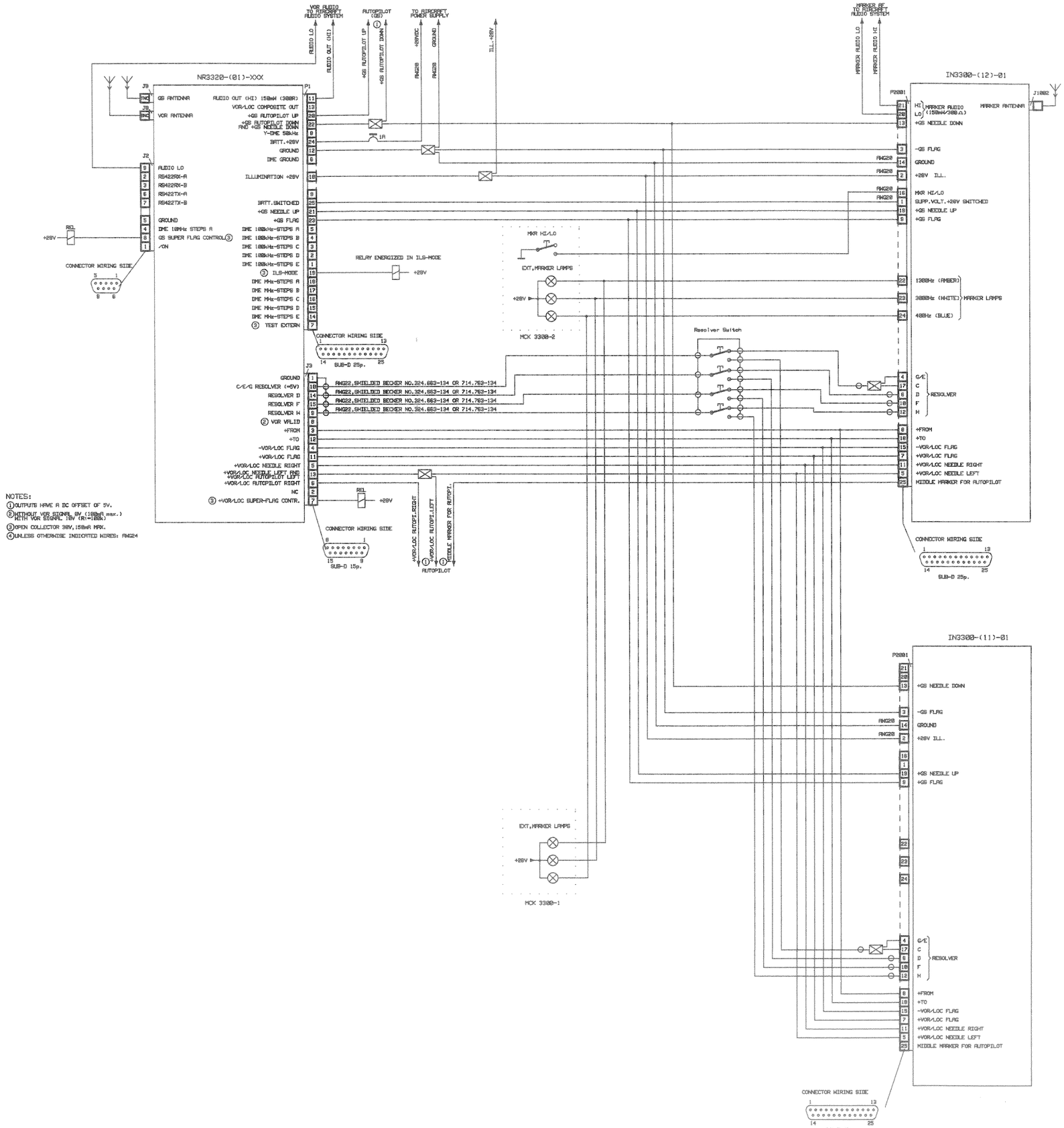

Fig. 2-9 Installation wiring diagram
NR 3320-01 / IN 3300-(11)-01 / IN 3300-(12)-01 /
MCK 3300-1 / MCK 3300-2

Table of contents

Blank

Section 3 OPERATION

3.1 Controls and indicators IN 3300 - (3) / - (5) / - (6) / - (9) / - (10) (crosspointer)

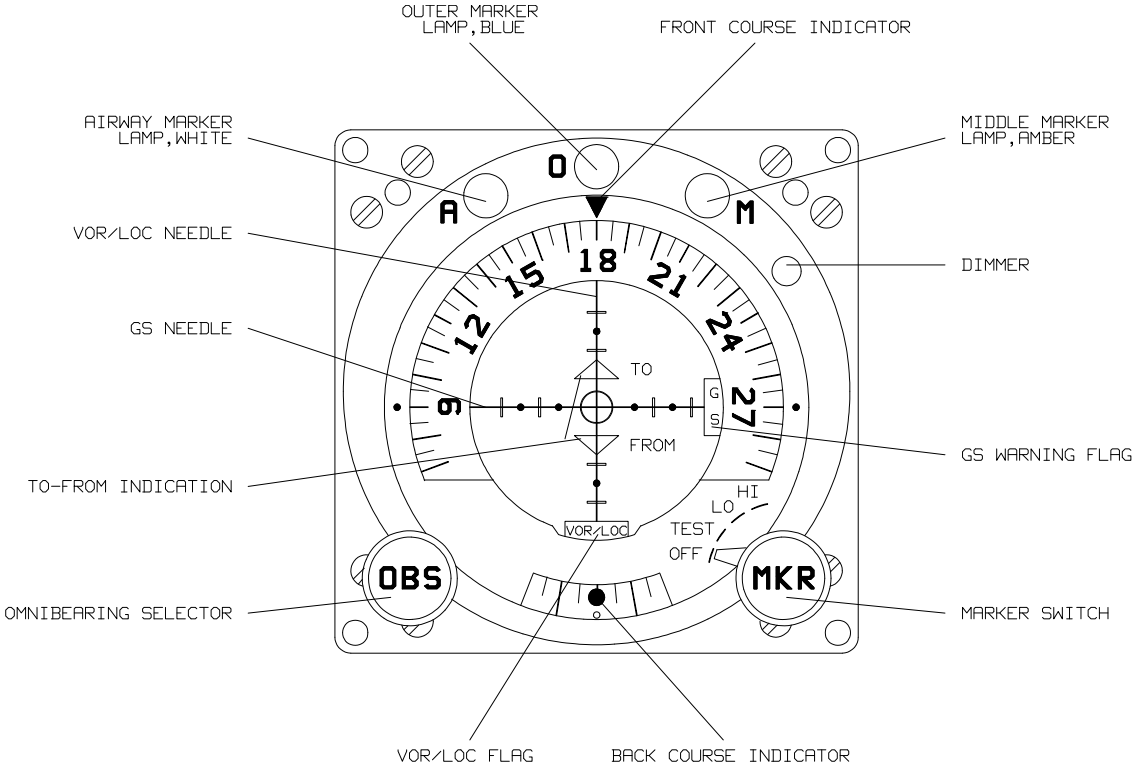

Fig.3-1 Controls and indicators IN 3300 - (3) / - (5) / - (6) / - (9) / -(10)

Controls and indicators	Description	Function
OBS	Omni bearing selector	Used to select desired VOR course
Front course indicator	White triangle	Indicates selected VOR course
Back course indicator	White dot	Indicates reciprocal of the selected VOR course
VOR/LOC needle	Vertical needle	Pointer which indicates deviation from selected VOR or LOCALIZER course
VOR/LOC flag	Red warning flag	Disappears when an assessable VOR or LOC signal is present

Controls and indicators	Description	Function
TO-FROM indication	Triangular markers	Indicates whether the OBS reading represents the magnetic course from the aircraft TO the VOR station or the magnetic course FROM the VOR station to the aircraft
GS needle	Horizontal needle	Pointer which indicates deviation from the glide path
GS warning flag	Red warning flag	Disappears when an usable glides lope signal is received
MKR	Rotary selector switch (not in IN 3300 - (9)/ - (10))	Combined ON/OFF/TEST / SENSITIVITY switch
A	White indicator lamp (not in IN 3300-(9) /- (10))	Lights up when an airway marker is flown over
O	Blue indicator lamp (not in IN 3300 - (9)/ - (10))	Lights up when an outer marker is flown over
M	Amber indicator lamp (not in IN 3300 - (9)/ - (10))	Lights up when a middle marker is flown over

3.2 Controls and indicators IN 3300 - (4) / - (8) (singlepointer)

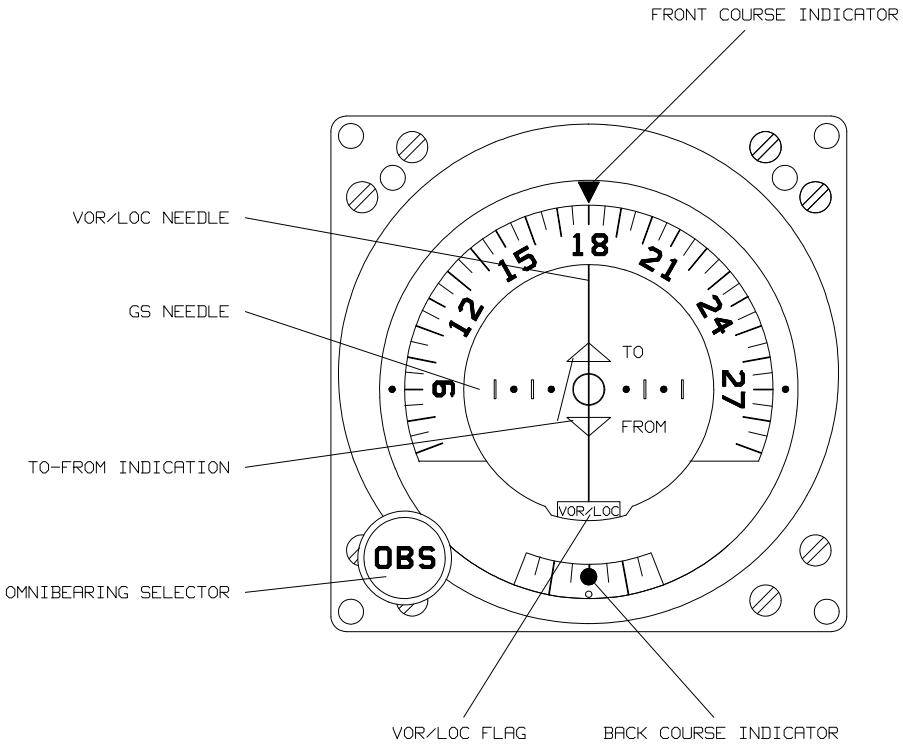

Fig. 3-2 Controls and indicators IN 3300 - (4) / - (8)

Controls and indicators	Description	Function
OBS	Omni bearing selector	Used to select desired VOR course
Front course indicator	White triangle	Indicates selected VOR course
Back course indicator	White dot	Indicates reciprocal of the selected VOR course
VOR/LOC needle	Vertical needle	Pointer which indicates deviation from selected VOR or LOCALIZER course
VOR/LOC flag	Red warning flag	Disappears when an assessable VOR or LOC signal is present
TO-FROM indication	Triangular markers	Indicates whether the OBS reading represents the magnetic course from the aircraft TO the VOR station or the magnetic course FROM the VOR station to the aircraft.

3.3 Controls and indicators IN 3300 - (11) / - (12) (crosspointer)

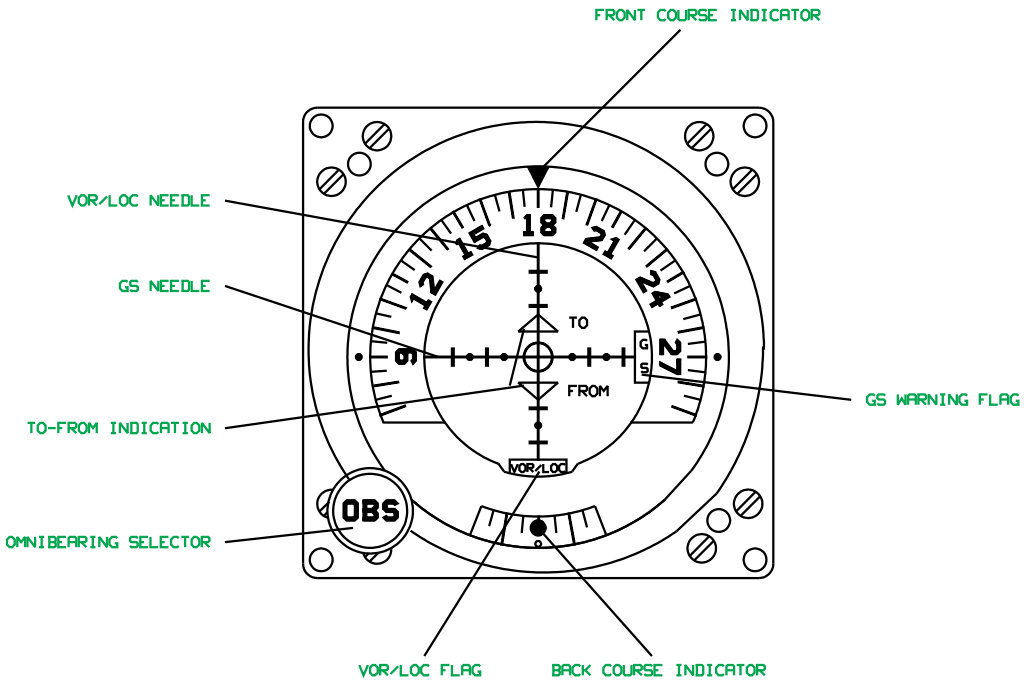

Fig. 3-3 Controls and indicators IN 3300 - (11)- (12)

Controls and indicators	Description	Function
OBS	Omni bearing selector	Used to select desired VOR course
Front course indicator	White triangle	Indicates selected VOR course
Back course indicator	White dot	Indicates reciprocal of the selected VOR course
VOR/LOC needle	Vertical needle	Pointer which indicates deviation from selected VOR or LOCALIZER course
VOR/LOC flag	Red warning flag	Disappears when an assessable VOR or LOC signal is present
TO-FROM indication	Triangular markers	Indicates whether the OBS reading represents the magnetic course from the aircraft TO the VOR station or the magnetic course FROM the VOR station to the aircraft
GS needle	Horizontal needle	Pointer which indicates deviation from the glide path
GS warning flag	Red warning flag	Disappears when an usable glides lope signal is received

3.4 Operating instructions

3.4.1 Preliminary steps

Switch on power supply (first check to see whether the protective circuit breaker for the navigation system is switched on).

CAUTION

Do not switch on the navigation system until the engines have been started and be sure to switch off before shutting down the engines in order to avoid damage caused by surge voltages.

3.4.2 VOR operation

1. Switch the operating mode selector of the NAV receiver to “ON”.
2. Press the TEST button. This causes the vertical course deviation needle of the indicator to swing out by approx. 10° and the VOR/LOC flag alarm to disappear. By turning the OBS knob check whether it is possible to center the needle.
3. Set the frequency of the desired VOR station using the MHz and kHz selectors and compare the received identification signal with the listed signal. If a readable VOR signal allows a reliable bearing to be taken, the vertical needle deflects and the VOR/LOC warning flag disappears. In model IN 3300 - (3)/ - (5)/ - (6)/ - (9)/ - (10)/ - (11)/ - (12) the glideslope needle and warning flag also disappear in order to facilitate reading of the course deviation needle.
4. To go to a VOR, dial the OBS until the TO indicator flag appears and the course deviation needle centers. The OBS reading now becomes the magnetic course TO the VOR station. Deviations from the approach course are indicated by the vertical needle on that side of the center line to which corrections must be made, e.g. if the needle deflects to the left, the course must also be corrected towards the left; the same holds for the right.

When the VOR station is flown over, the TO-FROM indicator switches from “TO” to “FROM”. If the same course is maintained, the OBS reading now becomes the magnetic course FROM the VOR station on which the aircraft is flying when the course deviation needle is centered.

3.4.3 Operation of the marker beacon receiver

1. Switch the MKR selector to TEST position. This should cause all three indicator lamps to light up.
2. Set the selector at the LO sensitivity position. Use the HI sensitivity position only when flying over an AIRWAY marker beacon. If the blue indicator lamp lights up, when flying over an outer marker. The amber indicator lamp lights up when flying over an middle marker.

Blank