EQUIPMENT INSTALLATION MANUAL

For the

GDC31 ROLL STEERING CONVERTER

P/N 1049-4000-XX-001( )

REV G

DAC International
6702 McNeil Drive
Austin, TX 78729

RECORD OF REVISIONS

REV	DESCRIPTION	DATE	APPROVED
IR	INITIAL RELEASE E266	4-5-04	LW
A	Correct P/N of mating connector E269	4/8/04	L Wootton
B	CHANGED BREAKER TO 2 AMPS E272-04	4/19/04	LW
C	Reduced 28V and 14V install kits into one universal kit and added instructions for configuration. Added wiring diagram for Bonanza A-36. E306	7/26/04	LW
D	Omit approval pending E321	9/17/04	LW
E	Add numerous wiring diagrams E327	10/22/04	LW
F	Add additional wiring diagrams, correct table 4 E389	3/30/05	LW
G	Add lighting bus circuit diagram to all wiring diagrams. Omit jumper on drawings Fig. 9 & 11. Add note to installation section, page 16. E415	5/20/05	*CC*

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INTRODUCTION:

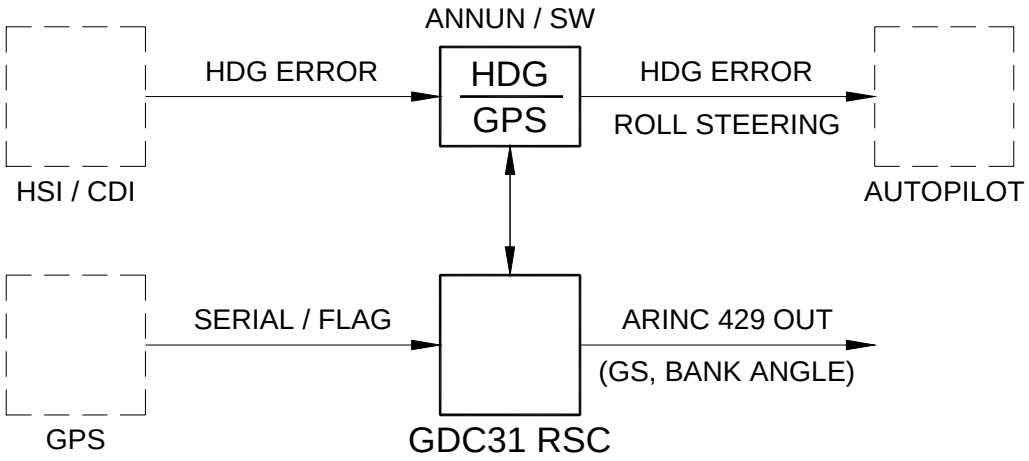
This Installation Manual contains installation data, specifications and Instructions for Continued Airworthiness for the DAC International Model GDC31 Roll Steering Converter, Part Number 1049-4000-XX-001( ).

DESCRIPTION:

The GDC31 Roll Steering Converter with software version 001( ) is designed to receive RS232 or RS422 serial data from a GPS Navigation System to produce both an analog Roll Sum Steering (RSS) signal and ARINC 429 labels bank angle command and ground speed.
The GDC31 output signal connects to the heading error input of the aircraft's existing autopilot. The GDC31 mimics the heading error signal of the aircraft's installed HSI or DG. The GDC31 does not reduce or otherwise alter any existing safety features of the autopilot, such as bank limiting, rate limiting and protection from a hard over. The GDC31 provides lateral (roll) data only (no pitch data is supplied by the GDC31). The ARINC 429 output can drive digital autopilots or converters.

The pilot simply selects between heading mode and GPS mode using the supplied switch / annunciator. In heading mode, the autopilot operates as always, tracking the heading bug of the HSI or DG. In GPS mode, the GDC31 RSS signal drives the autopilot's heading channel. The GDC31 calculates the correct course intercept angle from the data supplied by the GPS, smoothly guiding the aircraft onto the course. The GDC31 then holds the aircraft on the selected course. If the GPS is programmed with Flight Plan data, the GDC31 will calculate the new intercept angle at each waypoint change, intercepting and holding the new course without pilot intervention.

The GDC31 is designed to operate with both rate based and position based autopilots.



Block Diagram

PART NUMBERS:

The GDC31 Data Converter is available under the following part numbers:

1049-4000-01-001( ) GDC31 Roll Steering Converter, ARINC 429 Low Speed

1049-4000-02-001( ) GDC31 Roll Steering Converter, ARINC 429 High Speed

Software part number, where ( ) contains the number zero for initial release, or any letter, A – Z to denote a minor change.

REGULATORY COMPLIANCE:

Software

The Model GDC31 software was developed in accordance with RTCA/DO-178B to criticality level C.

PMA

The Model GDC31 is approved via PMA.

Environmental

The Model GDC31 meets the DO-160D environmental categories listed later in this manual.

SUPPLIED EQUIPMENT

Each Data Converter is shipped with the following items:

Part Number	Description	Qty
1049-4000-01-001( )	GDC31 Roll Steering Converter, ARINC 429 Low Speed	1
1049-4200-10	Installation Kit, GDC31 Data Converter	1

Part Number	Description	Qty
1049-4000-02-001( )	GDC31 Roll Steering Converter, ARINC 429 High Speed	1
1049-4200-10	Installation Kit, GDC31 Data Converter	1

NOTE: The Annunciator / Switch, P10280, comes pre-configured for 28V operation. For 14V operation, see the section titled INSTALLATION - Wiring Considerations.

Complete installation kits are available under kit part number 1049-4200-10. Individual pieces are available under the part numbers shown. Contact DAC International sales to place orders.

Part Number	Description	Qty
1049-4200-10	Installation Kit, GDC31 Data Converter	
M24308/2-3F	Connector, Receptacle, 25 pin D-Sub	1
M39029/63-368	Socket, Crimp Style, female	25
P10219	Slide Latch Kit, shell size 3	1
P10220	Backshell, 25-Pin D-Sub	1
P10280	Mode Annunciator / Switch with 28V lamps	1
P10301	Lamp, 14V	4
1049-2510-01	Equipment Installation Manual for the GDC31	1

OPTIONAL EQUIPMENT

Certain installations require the use of an Isolation Coupler assembly. Refer to the applicable installation drawings later in this manual for usage. This assembly is sold separately and comes with installation kit.

Part Number	**Description**
1049-4801-01	Isolation Coupler
1049-4200-50	Installation Kit, Isolation Coupler

Complete installation kits are available separately under kit part number 1049-4200-50. Individual pieces are available under the part numbers shown. Contact DAC International sales to place orders.

Part Number	**Description**	**Qty**
1049-4200-50	Installation Kit, Isolation Coupler	
M24308/2-2F	Connector, Receptacle, 15 pin D-Sub	1
M39029/63-368	Socket, Crimp Style, female	15
P10053	Slide Latch Kit	1
P10067	Backshell, 15-Pin D-Sub	1

SPECIFICATIONS:

Physical:

The GDC31 attaches to the airframe via four mounting holes. See the paragraph titled GDC31 Outline Drawing for further details.

RSC LRU

Height.....1.25”

Width.....5.22” (Includes mounting flange)

Depth.....3.54”

Weight.....0.4 lb.

The Isolation Coupler (optional) attaches to the airframe via four mounting holes. See the paragraph titled Isolation Coupler Outline Drawing for further details.

Height.....1.25 in

Width.....4.5 in (Includes mounting flange)

Depth.....2.41 in”

Weight.....0.2 lb.

Annunciator

Height.....0.753”

Width.....0.753” (Includes mounting flange)

Depth.....1.99”

Weight.....0.05 lb.

Electrical:

Input Voltage .....14 / 28 VDC (10Vdc – 32Vdc operational)

Input Current.....0.1 Amp maximum at 28 VDC

Annunciator lamp current .....0.04 Amp at 28 VDC, 0.08 Amp at 14 VDC

Serial Data Input:

Format.....RS232 or RS422 serial data in RNAV 0, RNAV 1, King 0 or King 1 format from a GPS navigation system

Baud Rate.....Selectable (2400, 4800, 9600, 19200)

Roll Sum Steering Output:

Description.....Analog bank angle command with program pin selectable scale factors to match most autopilot input levels. Program pin selection for position based or rate based output. Program pin selectable phasing.

Load 1K

ARINC 429 Output:

Labels.....Bank Angle Command, Label 121
Ground Speed, Label 312

Baud Rate.....-01 Low Speed (12.5kBaud)

-02 High Speed (100 kBaud)

Reference Inputs:

General Description .....AC or DC excitation used to excite the heading bug on the HSI or DG. The GDC31 uses the reference input to produce a steering signal with correct phase and amplitude characteristics. Two reference inputs are provided. Use only one, depending on the autopilot type. The unused input will be a no-connect. See typical interconnect diagrams later in this manual.

AP Ref 1.....Reference voltage input for use with gain settings found in Table 1.

Maximum Input Level .....42 volts peak (30Vrms)

Load: 60K

AP Ref 2.....Reference voltage input for use with gain settings found in Table 2.

Maximum Input Level .....15 volts peak (10.6Vrms)

Load: 30K

AP Offset Input:

Autopilot Offset .....For autopilots that use a signal common that is not airframe ground. Many use 5Vdc (relative to airframe) as the heading bug signal common. In these cases, connect the autopilot signal common to the GDC31 offset input pin, P1-19.

Maximum Input Level .....7 volts peak (5Vrms)

Load: 10K

Annunciator Output:

GPS Coupled.....Normally Open relay contacts configured as a SPST switch intended to control an external GPS mode annunciator. The GDC31 closes the contacts when the steering output is valid. It cycles the contacts between open and closed at a 1 Hz rate if steering data is invalid. Closed contacts connect pins P1-24 and P1-12.

Max current:.....250mA

Flag Input:

Description.....Valid input to the GDC31 at J1-25, supplied from a GPS receiver Super Flag output (14 or 28V).

Voltage:.....Greater than 6V is valid, less than 3V is invalid.

Load .....200K ohms

Certification:

PMA

DO-178B.....Level C

DO-160D.....D1/BADSXXXXXXABBBAVB/A3E3/XXX

Reliability:

MTBF.....Greater than 50,000 hours.

OPERATION:

Overview

The GDC31 Roll Steering Converter receives RS232 or RS422 serial data in RNAV 0, RNAV 1, King 0 or King 1 format from a GPS navigation system. It extracts Cross Track, Ground Speed and Track Angle Error information from the data stream to compute an appropriate bank angle command to return the aircraft to the Desired Track computed by the GPS navigation system.

Analog Output

The GDC31 produces an analog Roll Sum Steering (RSS) signal that drives the heading channel of the autopilot. Phasing and amplitude of the RSS signal is based on the reference input supplied to the GDC31 from the autopilot and the gain and phase settings established by the program pins (refer to Tables 1, 2 and 3). The GDC31 will accept either an AC or a DC reference input as well as reference inputs that contain an offset from airframe ground. The internal circuitry implements a multiplying Digital-to-Analog converter that uses the external reference input to produce the desired signal output amplitude and phase relative to the reference input. Certain installations (Century II and III, for example) will not accept a heading error signal referenced to ground, so require the Isolation Coupler in order to transformer isolate the GDC31 output signal.

Reference Inputs (Excitation)

The GDC31 contains two reference inputs to accommodate the wide range of reference voltages available. Input Ref1 will accommodate excitation voltages up to a maximum input of 42 volts peak (30Vrms). Input Ref2 will accommodate excitation voltages up to a maximum of 15 volts peak (15Vdc or 10.6Vrms). The determination of which reference to use will depend on the gain needed to match the autopilot scale factor as well as the maximum expected reference voltage. Certain installations (Century II and III, for example) produce a reference voltage that is floating relative to airframe ground. These installation require the Isolation Coupler in order to transformer isolate the GDC31 reference input signal.

ARINC 429 Output

The GDC31 produces an ARINC 429 digital output containing labels 121 and 312 intended to drive digital autopilots or digital autopilot converters.

429 Label (Octal)	Description	Output Rate
121	Bank Angle Command (BNR)	20 Hz
312	Ground Speed (BNR)	20 Hz

GPS Mode Annunciator Control

The GDC31 contains a Normally Open relay contact configured as a SPST switch to control the external GPS mode annunciator. This annunciator is further controlled by external switching and is active when the pilot selects GPS mode in place of heading mode with the external switch. Refer to the typical interconnect diagram later in this manual. If GDC31 output data is valid, the relay contacts are closed, allowing the mode annunciator to illuminate. If the data is invalid, the GDC31 will cause the mode annunciator to blink at a 1 Hz rate and command the steering output to zero degrees of bank (wings level).

The GPS mode annunciator blinks if either the super flag input is invalid or the serial data from the GPS is missing or not the correct format (see Appendix A).

Super Flag Input

The GDC31 reads the Super Flag (14 or 28Vdc) from the GPS receiver. If the flag is greater than 5Vdc, the flag shall be considered valid, if less than 2Vdc, the flag shall be considered as invalid. If the Super Flag indicates invalid, the GDC31 shall produce a steering signal of zero degrees, blink the GPS annunciator relay and invalidate the ARINC 429 label 121, bank command data, and label 312, ground speed data.

INSTALLATION

This section provides details for the installation of the GDC31 Roll Steering Converter, including configuration, wiring, mounting and checkout procedures. Follow the procedures and recommendations found in this section to assure a successful installation.

Read this entire section before beginning the installation.

Prior to installation, determine the required scale factor and phasing for use with the aircraft's autopilot. Consider the location of the mode selector / annunciator switch; it should be installed within the pilot's primary field of view and easily accessible by the pilot.

Complete an electrical load analysis in accordance with AC 43.13-1B, Chapter 11 prior to starting the aircraft modification to insure the aircraft has sufficient load capability.

Complete an aircraft weight and balance prior to aircraft modification to insure the aircraft has sufficient weight and CG margin.

Material Not Supplied

The following items are required for the installation but not supplied:

- Wire: MIL-W-22759/16 or equivalent
- Shielded Wire: MIL-C-27500 or equivalent
- Mounting screws: MS35206 6-32, 4 each
- Circuit Breaker: Klixon 7277-2-2 or equivalent
- Tie straps or lacing cord
- Ring terminals (for grounding)
- Splices

Special Tools

Use the following crimp tool to ensure reliable crimp contact connections to connector J1.

- Crimp tool M22520/2-01
- Positioner M22520/2-08

Mounting Considerations

The GDC31 Roll Steering Converter can mount in the avionics bay, shelf or other suitable structure. It can be mounted in any orientation.

The optional Isolation Coupler can mount in the avionics bay, shelf or other suitable structure. It can be mounted in any orientation.

Attach the GDC31 and Isolation Coupler to suitable structure using the following hardware.

Screw, 8-32 X 1/2”	MS35206-245
Flat Washer, #8	AN960-8L
Lock Washer, #8	MS35338-42
Nut, 8-32	MS35649-282

AN or MS self-locking nut plates may be used in place of the nut and lock washer specified above.

Mount the GPS/HDG mode annunciator / switch as near as practical to the autopilot mode controller. If there is insufficient space there, mount the mode annunciator within the pilot’s primary field of view, near the HSI or CDI.

Wiring Considerations

Wiring should be done in accordance with AC 43.13-1B, Chapter 11. Refer to the typical interconnect diagram later in this manual for specifics. Use 22 to 24 AWG wire for all connections.

Fabricate wiring harness; refer to the interconnect diagrams and pin description. Test all the wiring for continuity and for shorts. Insure aircraft power is on the correct pins of J1; refer to Table 6. Install slide latch assembly onto J1 using instructions found later in this manual.

The mode annunciator/switch, P10280, comes pre-configured for 28V operation. For 14V operation, perform the following steps:

1. Pull firmly on the edges of the lens to disengage the lamp assembly from the body. The lamp assembly will hinge out and away from the body.
2. Remove and discard the four existing lamps, and replace with the four 14V lamps, P10301, contained in the kit.
3. Push the lens firmly back into the body.

NOTE:

Perform the following setup procedures in this section if a wiring diagram for a particular autopilot is not included in this manual.

Steering Output Scale Factor Determination

The GDC31 is designed to mimic the heading error signal produced by the existing HSI or DG, so it can operate with the wide variety of autopilots in current use. These various autopilots employ a wide range of reference voltages and scale factors to interface with the array of HSI and DG control heads. Reference voltage, or excitation, is the autopilot signal used to excite the Heading Select bug in the HSI or CDI. As used in this manual, scale factor refers to the autopilot's response to the heading error input signal, expressed in volts per degree of bank. Examples are 200mv/deg and 60mv/deg. Examples of excitation voltage are 26Vac and 15Vdc. The GDC31 firsts computes the bank angle using data from the GPS. It then uses the reference voltage along with the scale factor setting (gain setting) to produce a signal that feeds into the autopilot's heading error input to produce the desired bank angle.

The GDC31 has eight (8) choices for scale factor, selected with a combination of program pins (2 each) and reference inputs (2 each). Tables 1 and 2 describe the program pin combinations for the various scale factors. To determine the appropriate setting for a given autopilot, first determine the autopilot excitation amplitude in volts (AC or DC). Next, determine the autopilot scale factor from the autopilot maintenance data. The scale factor needs to be expressed as volts/degree of bank. Divide the scale factor by the excitation (scale factor / excitation voltage). Then look in Tables 1 and 2 for the nearest Scaling value to the one just computed.

If the gain is set too high, the commanded course intercept will be overly aggressive. For 90-degree course changes, too much gain will often cause the aircraft to turn inside the new course then S-turn back to capture the track.

If the gain is set too low, the commanded course intercept will be sluggish. For a 90-degree course change, too little gain will often cause the aircraft to overshoot the desired course then S-turn back to capture the track. Some autopilots limit the maximum bank angle to less than the 30 degrees, 22 degrees for example. In these cases, the aircraft will exhibit the symptoms of too little gain because the aircraft cannot turn sharp enough to capture the track without overshooting. Examine the attitude indicator during a 90-degree course change to verify that the aircraft banks to 30 degrees, or in the case of rate based autopilots, to a standard rate turn.

Configuration Pins

The GDC31 produces one of four (4) different RSS output levels for each reference input. This scaling selection is accomplished with program pins J1-10 and J1-22. Tables 1 and 2 define the scale factors available for each of the reference inputs, Ref 1 and Ref 2

Gain Setting Using Ref 1 input J1-18

Scaling	J1-10	J1-22	
0.015138	Open	Open	(1)
0.011590	Open	Ground	(1)
0.007687	Ground	Open	(1)
0.003844	Ground	Ground	(1)

Table 1

RSS Output Scaling Selection for Ref 1 input

(1) For 14 volt aircraft, maximum AC output signal is limited to 6.3 Vrms (210mV per degree) or 8.9 Vdc (297mV per degree.

Gain Settings Using Ref 2 input J1-6

Scaling	J1-10	J1-22	
0.033444	Open	Open	(2)
0.025606	Open	Ground	(2)
0.016983	Ground	Open	(2)
0.008492	Ground	Ground	(2)

Table 2

RSS Output Scaling Selection for Ref 2 input

(2) For 14 volt aircraft, maximum AC output signal is limited to 6.3 Vrms (210mV per degree) or 8.9 Vdc (297mV per degree.)

Phase Selection

The GDC31 will accommodate steering signals that are in phase with the reference or out of phase with the reference. For DC heading error signals, in-phase means a positive error signal produces a right turn, a negative error signal produces a left turn. Determine the correct phasing from the autopilot maintenance data then wire P1-13 accordingly.

If the phasing is incorrectly wired, the autopilot will turn the opposite direction when coupled to the GDC31 Roll Steering Converter.

Phase	P1-13
IN Phase with Reference	Open
OUT of Phase with Reference	Ground

Table 3

Phase Selection

Position/Rate Selection

The GDC31 is designed to operate with both position based and rate based autopilots. Configuration is set by program pin P1-23.

Scaling	J1-23
Position Based	Open
Rate Based	Ground

Table 4

Position / Rate Selection

Position based autopilots require attitude information from the attitude indicator or vertical gyro. Rate based autopilots require turn rate information from the turn coordinator rate gyro. Determine the autopilot type, if it is rate based then connect J1-23 to program pin common, J1-11.

Baud Rate Selection

The GDC31 will accept four (4) baud rates for GPS data configured using program pins P1-9 and P1-21.

Baud Rate	P1-9	P1-21
9600	Open	Open
2400	Open	Ground
4800	Ground	Open
19200	Ground	Ground

Table 5

Serial Baud Rate Selection

Note: Use Program Pin Common, J1-11, as ground for all program pin connections

GPS Receiver Setup

Refer to the manufacturer's instructions for the GPS interfaced to the GDC31 RSC. Configure the GPS to output the Aviation Format data described in Appendix A.

REMOVAL AND REPLACEMENT

Removal, GDC31

1. Open the circuit breaker powering the GDC31.
2. Remove the connector by disengaging the slide latch then pulling the connector free.
3. Remove four (4) screws securing the unit to the airframe.

Replacement, GDC31

1. Open the circuit breaker powering the GDC31.
2. Attach the unit to the airframe with four (4) screws.
3. Seat the connector then engage the slide latch to secure.
4. Close circuit breaker.
5. Perform ground functional test found under Equipment Checkout in this manual.

Removal, Mode Annunciator

1. Open the circuit breaker powering the GDC31.
2. Pull firmly on the edges of the lens to disengage the lamp assembly from the body. The lamp assembly will hinge out and away from the body.
3. Release the two (2) pawls by unscrewing the flat-head screws located inside the body.
4. Unplug the lamp module from the sleeve.

Replacement, Mode Annunciator

1. Open the circuit breaker powering the GDC31.
2. Plug the lamp module into the sleeve.
3. Secure by engaging the two (2) pawls to the sleeve.
4. Plug the lamp module into the body - it will snap into place.
5. Close the circuit breaker.
6. Perform ground functional test found under Equipment Checkout in this manual.

EQUIPMENT CHECKOUT

The GDC31 provides conversion of Serial data from a GPS receiver into a steering signal connected to the autopilot heading channel through switching controlled by the HDG/GPS mode selector switch. There are no other operator controls associated with the GDC31 unit.

The GPS receiver and the Autopilot must both be operational in order to perform this functional checkout.

Ground Functional Test

1. Insure that all control surfaces are clear and that the control wheel is centered in roll.
2. Apply power to the GPS Receiver and Autopilot.
3. Set the HDG/GPS Mode selector to HDG.
4. On the HSI, center the heading bug.
5. Engage the autopilot in Heading Mode.
6. Operate the heading bug; observe that the control wheel turns left and right in response to the heading bug operation.
7. Center the control wheel using the heading bug.
8. Create and activate a flight plan in the GPS unit according to existing maintenance and / or flight manual instructions.
9. Place the HDG/GPS Mode selector in the GPS position. Observe GPS illuminates and is not blinking.
10. Remove power from the GPS receiver.
11. Observe that the GPS mode annunciator begins to blink within 15 seconds.
12. Verify that the control wheel centers once the GPS mode annunciator blinks.
13. Disengage the autopilot.
14. Ground test complete. Secure aircraft power.

Flight Functional Test

1. Set the HDG/GPS Mode selector to HDG.
2. On the HSI, center the heading bug.
3. Engage the autopilot in Heading Mode.
4. Operate the heading bug; observe that the control wheel turns left and right in response to the heading bug operation.
5. Center the heading bug.

6. Create and activate a flight plan in the GPS unit according to existing maintenance and / or flight manual instructions. Manually fly the aircraft until the cross track error is between 1 and 3 miles.
7. Place the HDG/GPS Mode selector in the GPS position. Observe that GPS illuminates and is not blinking.
8. Observe that the aircraft turns to intercept the course selected in Step 6. Note: The GDC31 limits the intercept angle to 45º maximum. (Intercept angle = difference between Desired Track and Track.)
9. Observe that the aircraft captures the course without overshoot or undershoot.
10. Operate the heading bug; observe that the heading bug has no effect.
11. Select HDG on the HDG/GPS Mode selector.
12. Observe that the aircraft follows the heading bug.
13. Flight test complete.

CONTINUED AIRWORTHINESS:

This section provides data intended to assist the installer with establishing Instructions for Continued Airworthiness as required by FARs 23.1529, 25.1529, 27.1529 and 29.1529.

1. Maintenance Manual information for the GDC31, which includes system description, removal instructions, installation instructions and functional testing instructions, is contained in DAC International Installation Manual, 1049-2510-01 (this document).

2. Line Replaceable Unit (LRU) part numbers and other parts contained in the installation data package should be placed in the aircraft operator's appropriate airplane illustrated Parts Catalog (IPC).

3. Wiring diagram information contained in the installation data package should be placed in the aircraft operator's appropriate airplane Wiring Diagram Manual.

4. Scheduled Maintenance Program tasks are as follows:

    a. Recommended Periodic Scheduled Servicing: ..... None required

    b. Recommended Periodic Scheduled Preventive Maintenance Tests..... None Required

    c. Recommended Periodic Inspections: ..... None Required

    d. Recommended Periodic Overhaul Period ..... None Required

    e. Special Inspection Requirements ..... None Required

5. Application of Protective Treatments ..... None Required

6. Special Tools..... None Required

7. Electrical Loads for this appliance are as specified in the DAC International Installation Manual, 1049-2510-01 (this manual).

8. There are no Airworthiness limitations associated with the installation of this appliance.

ENVIRONMENTAL:

The GDC31 meets the environmental test categories detailed below in accordance with RTCA/DO-160D, Environmental Conditions and Test Procedures for Airborne Equipment.

NOMENCLATURE: Model GDC31 Roll Steering Converter
PART NO: 1049-4000-XX-XXXX
MANUFACTURER: DAC International
ADDRESS: 6702 McNeil Drive, Austin, TX 78729

Section	Category	Remarks
4.0 Temperature and Altitude	D1	50,000 Ft Temperature controlled
5.0 Temperature Variation	B	Partially controlled temperature
6.0 Humidity	A	Standard Humidity
7.0 Operational Shock and Crash Safety	D	Fixed wing
8.0 Vibration	S	Curves L, M and C. Fixed Wing – Turbojet, Turbofan, Turboprop and reciprocating Instrument Panel or Fuselage
9.0 Explosion Proofness	X	Not Tested
10.0 Waterproofness	X	Not Tested
11.0 Fluids Susceptibility	X	Not Tested
12.0 Sand and Dust	X	Not Tested
13.0 Fungus Resistance	X	Not Tested
14.0 Salt Spray	X	Not Tested
15.0 Magnetic Effect	A	0.3 meter to 1.0 meter
16.0 Power Input	B	Alternator / Rectifiers
17.0 Voltage Spike	B	56 volts
18.0 AF Conducted Susceptibility – Power Inputs	B	Alternator / Rectifiers
19.0 Induced Signal Susceptibility	A	
20.0 Radio Frequency Susceptibility (Radiated and Conducted)	V	50 volts/meter
21.0 Emission of Radio Frequency Energy	B	
22.0 Lightning Induced Transient Susceptibility	A3E3	
23.0 Lightning Direct Effects	X	Not Tested
24.0 Icing	X	Not Tested
25.0 ESD	X	Not Tested

CONNECTOR PIN OUT:

The GDC31 contains a single 25-pin male connector, J1, per MIL-C-24308. The mating connector, P1, is described previously under the section "Equipment Supplied".

Pin	Signal	Function
1	A+	28 Vdc Primary Power
2	Serial Out	RS232 Output
3	Serial In	RS232 Input
4		Reserved (VPP)
5	AP-OUT	Autopilot Output
6	AP-REF2	Autopilot Reference, 10.6Vac max (1)
7	TX-A	ARINC 429 Transmit A
8	TX-B	ARINC 429 Transmit B
9	BAUDSEL1	Serial Baud Rate Select 1
10	GAINSEL1	Autopilot Gain Select 1
11	Prog Pin Common	Program Pin Common
12	GPS Lamp A	GPS Mode Annun Relay Armature
13	Phase Select	Phase select program pin
14	Power Common	28 Vdc Return
15	AP-COM	Autopilot Common (ground)
16	Serial Common	RS232 Common
17		Reserved (/PGM Enable)
18	AP-REF1	Autopilot Reference, 30Vac max (1)
19	AP-OFFSET	Autopilot Offset Input (A/P Common) +6Vdc max
20	429 Shield	ARINC 429 Shield Common
21	BAUDSEL0	Serial Baud Rate Select 0
22	GAINSEL0	Autopilot Gain Select 0
23	TYPESEL0	Rate Based Select
24	GPS Lamp B	GPS Mode Annun Relay N.O. Contact
25	Super Flag In	14 / 28 Vdc valid flag from GPS

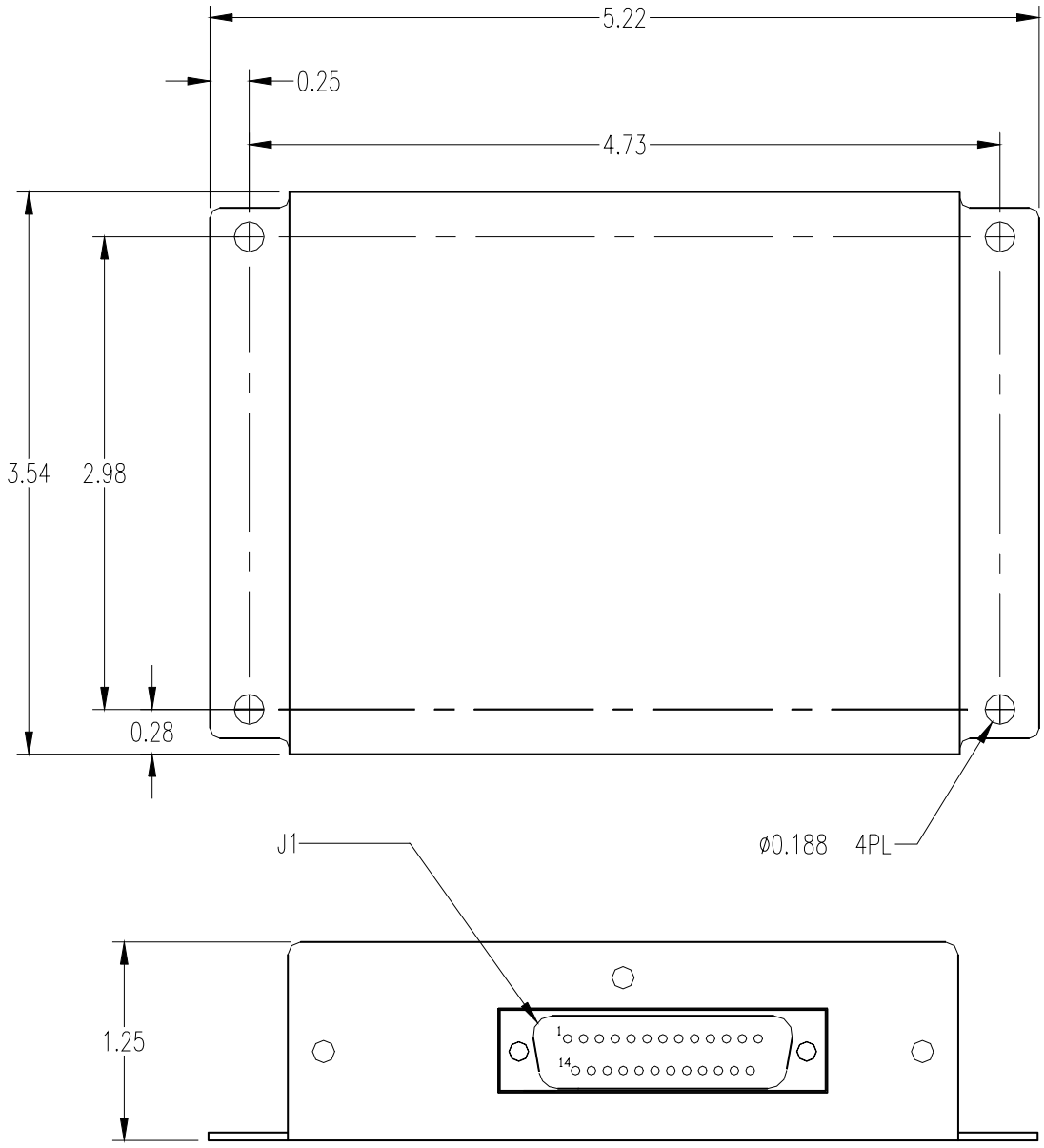
Table 6

J1 Pin Description

NOTES: Do not use pins labeled Reserved. These are for factory test and In-Circuit-Programming
(1) Connect only one reference. Refer to "Reference Inputs" section.

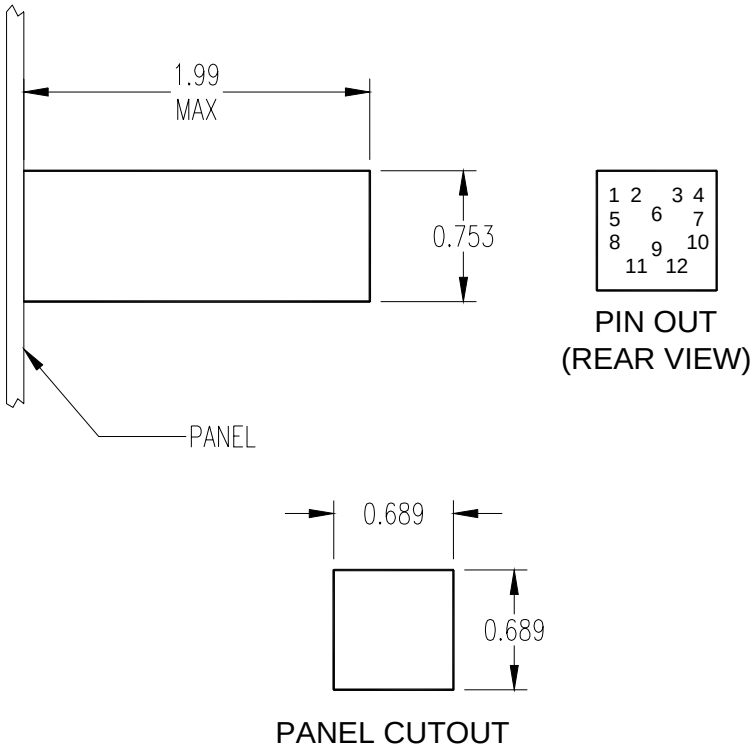
OUTLINE DRAWINGS

GDC31 Outline



Note: Dimensions are in inches.

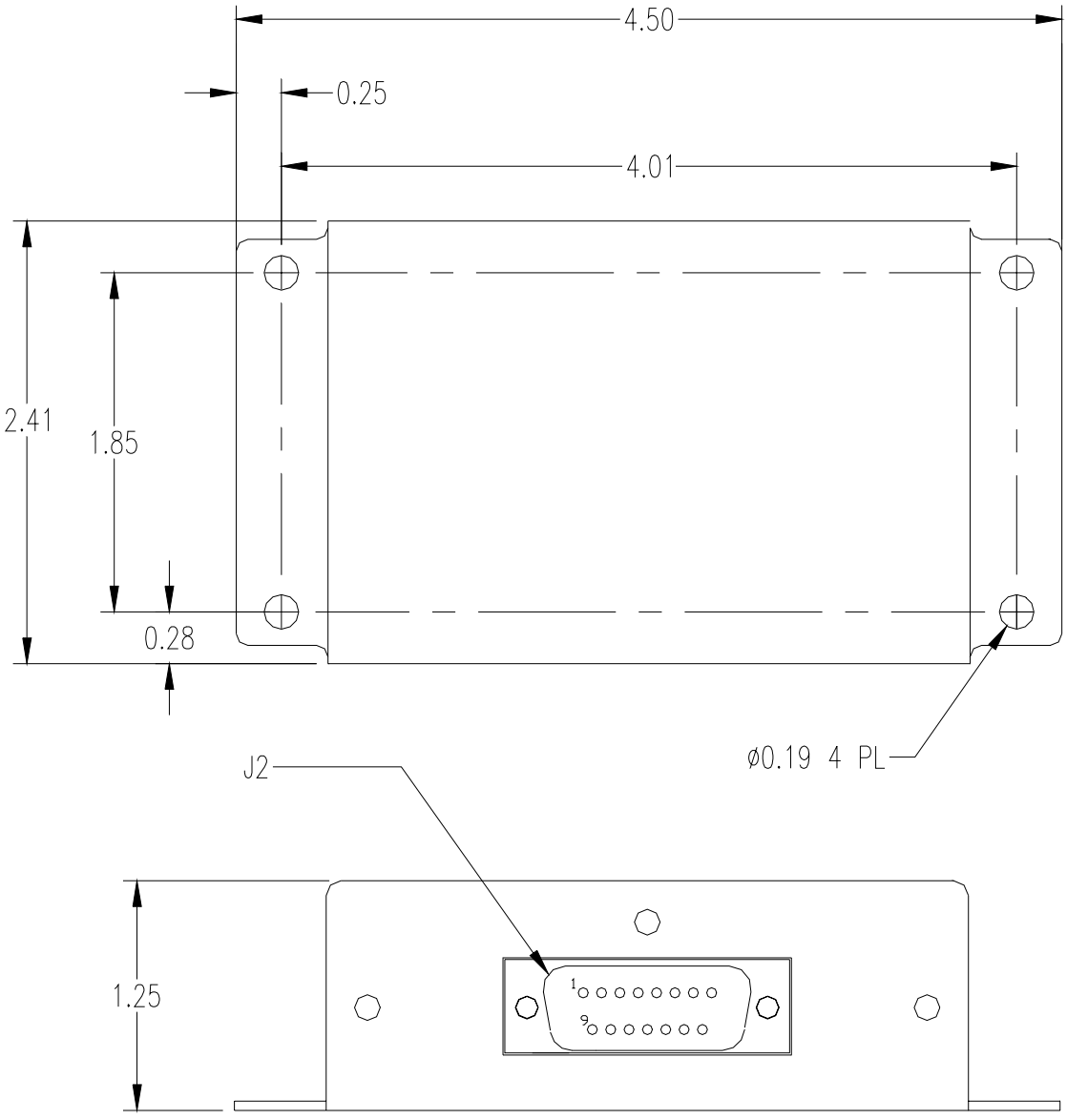
Switch / Annunciator Outline



Outline for part number P10280

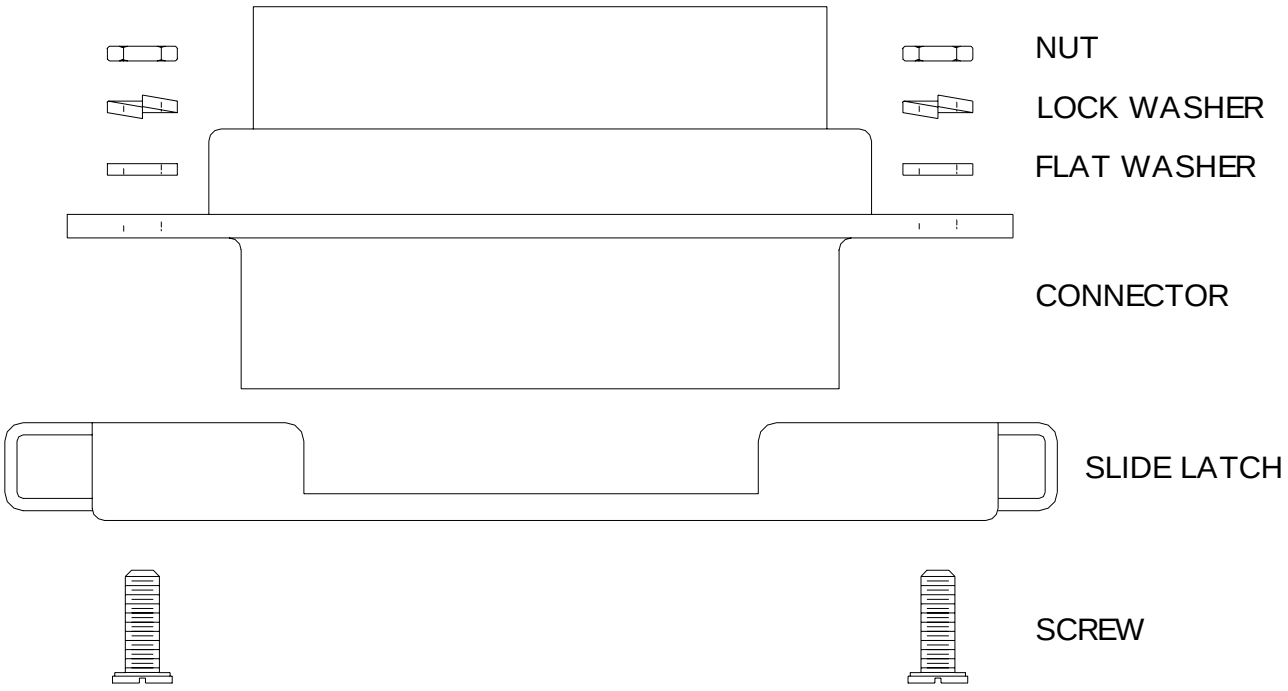
Note: Dimensions are in inches.

Isolation Coupler Outline



SLIDE LATCH ASSEMBLY

Assemble the slide latch mechanism, part number P10219 or P10053, onto the mating connector as pictured using the hardware supplied with the slide latch.



APPENDIX A – AVIATION FORMAT

The GDC31 accepts data in the RS232 Aviation Format produced by most GPS panel mount receivers. Various manufacturers refer to this data as RNAV, KING or MAPCOM. The following table contains the minimum data set required by the GDC31. The GDC31 is designed to disregard additional data records transmitted from the GPS.

The preferred baud rate is 9600 baud, however, the GDC31 will accept 2400, 4800 or 19200 baud. Insure the GDC31 is configured for the correct baud rate (refer to "Serial Baud Rate Selection" located earlier in this manual)

Aviation Data Format	**Description**
<STX>	ASCII Start of Transmission character
…	other data
C284<cr>	track; in degrees magnetic (ex: 284º)
D162<cr>	ground speed; in knots (ex: 162 kt)
GR0050<cr>	crosstrack; L (left) or R (right) in hundredths of nautical miles (ex: Right 0.5nm)
I2855<cr>	desired track; in tenths of degrees (ex: 285.5º)
…	other data
<ETX>	ASCII End of Transmission character

1. Each data field ends in a <cr> or <cr> <lf>
2. <cr> - ASCII carriage return character (0D hex)
3. <lf> - ASCII line feed character (0A hex)

APPENDIX B – 429 OUTPUT

Label 121 - Bank Angle Command

Label 121 shall be formatted as follows:

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
P	SSM		S	Roll Angle (two's compliment if negative)														PAD				SDI		Label 121								

P = odd parity
SSM = sign status matrix
00 = fail/warning
11 = normal
S = sign bit, 0=positive roll angle
SDI = source/destination identifier (always zero)
Data Range: ±180°
Resolution: 0.01°

Label 312 - Ground Speed

Label 312 shall be formatted as follows:

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
P	SSM		S	Ground Speed														PAD				SDI		Label 312								

P = odd parity
SSM = sign status matrix
00 = fail/warning
11 = normal
S = sign bit, 0=positive (always)
SDI = source/destination identifier (always zero)
Data Range: 0 to 4096 knots
Resolution: 0.125 knot

APPENDIX C - TYPICAL INTERCONNECT

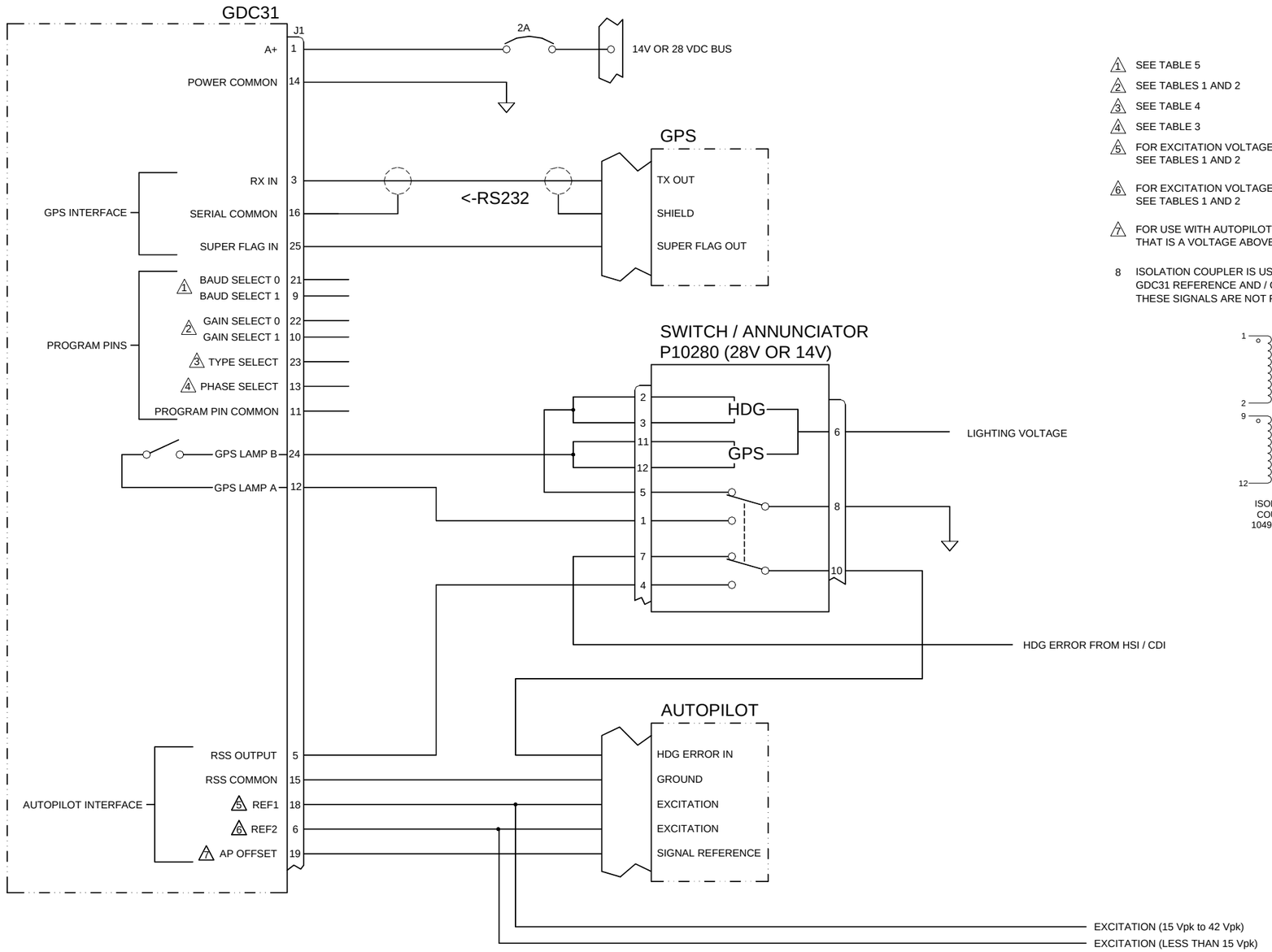
The following section contains typical interconnect diagrams to aid in wiring the GDC31.

All wiring, wire gauge and wire type shall be according to the INSTALLATION section of this manual.

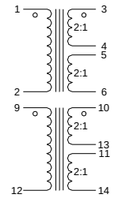
Mounting shall use the hardware called out in this manual or AN / MS equivalent fasteners.

NOTE:

Many autopilot units provide both an AC and a DC excitation signal. Verify the HSI or DG is connected to the autopilot signal and reference as shown in that diagram. Refer to the HSI or DG manufacturer's data and the autopilot manufacturer's data for additional information.



1. SEE TABLE 5
2. SEE TABLES 1 AND 2
3. SEE TABLE 4
4. SEE TABLE 3
5. FOR EXCITATION VOLTAGES GREATER THAN 15 VOLTS PEAK
   SEE TABLES 1 AND 2
6. FOR EXCITATION VOLTAGES LESS THAN 15 VOLTS PEAK
   SEE TABLES 1 AND 2
7. FOR USE WITH AUTOPILOTS THAT USE A SIGNAL REFERENCE
   THAT IS A VOLTAGE ABOVE AIRFRAME COMON, TYPICALLY 5VDC
8. ISOLATION COUPLER IS USED TO TRANSFORMER ISOLATE THE GDC31 REFERENCE AND / OR OUTPUT FOR INSTALLATIONS WHERE THESE SIGNALS ARE NOT REFERENCED TO AIRFRAME GROUND.



ISOLATION
COUPLER
1049-4801-01

Typical Interconnect

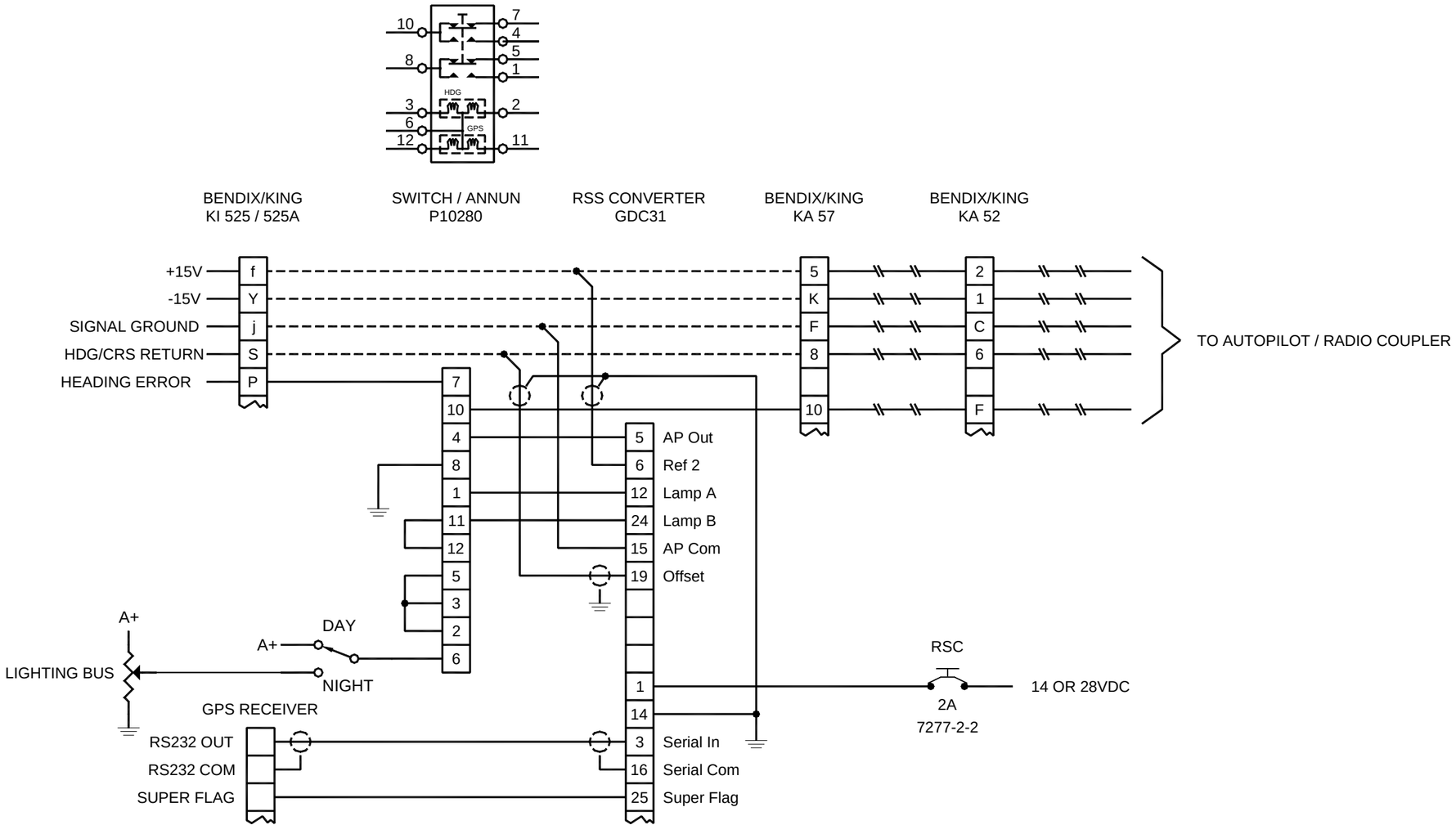
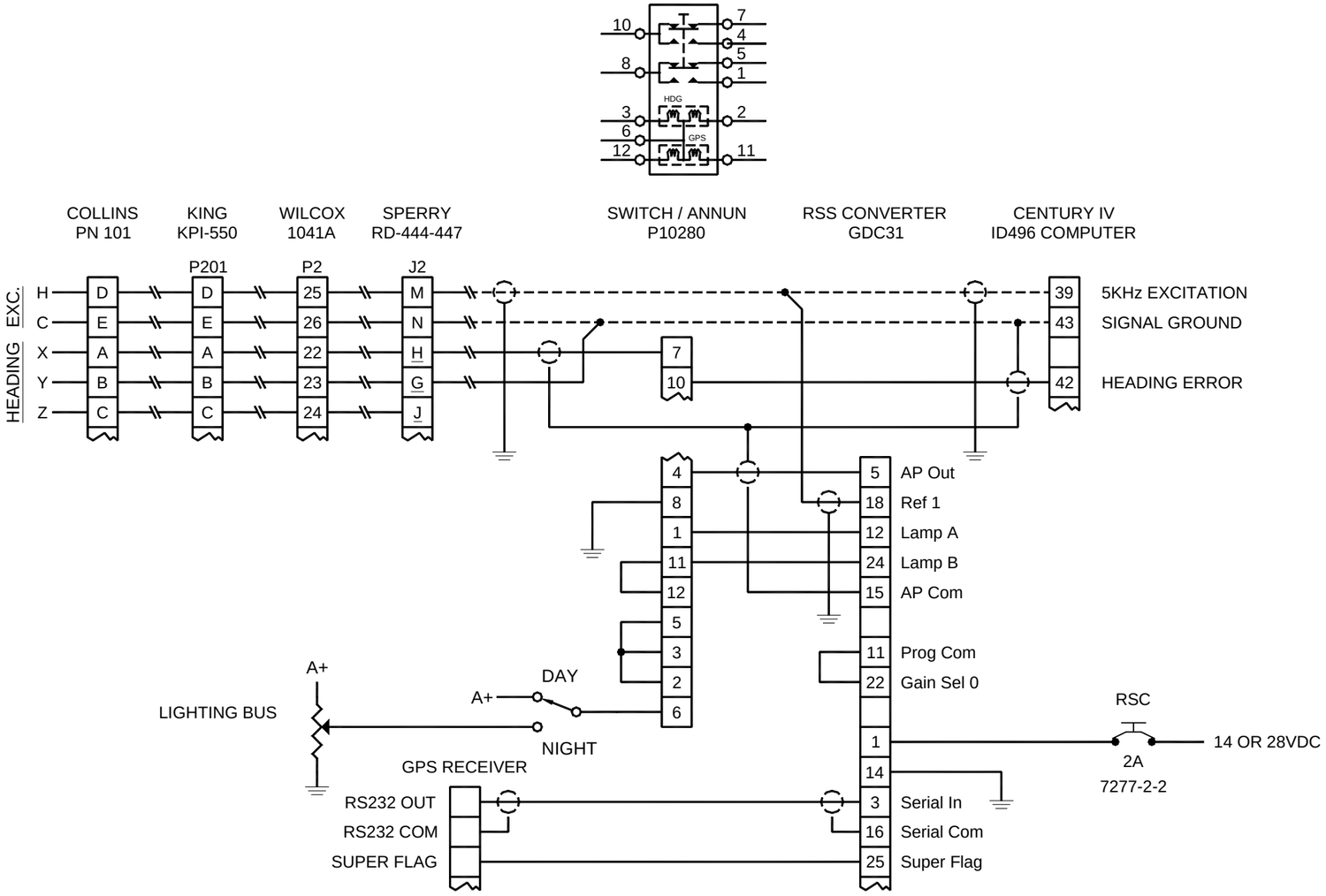


Figure 2 KI 525 / 525A with KA 52 / KA 57



NOTE: ID496 COMPUTER MUST BE ARINC TYPE ID496-X1XX2

Figure 3 ARINC HSI with Century IV

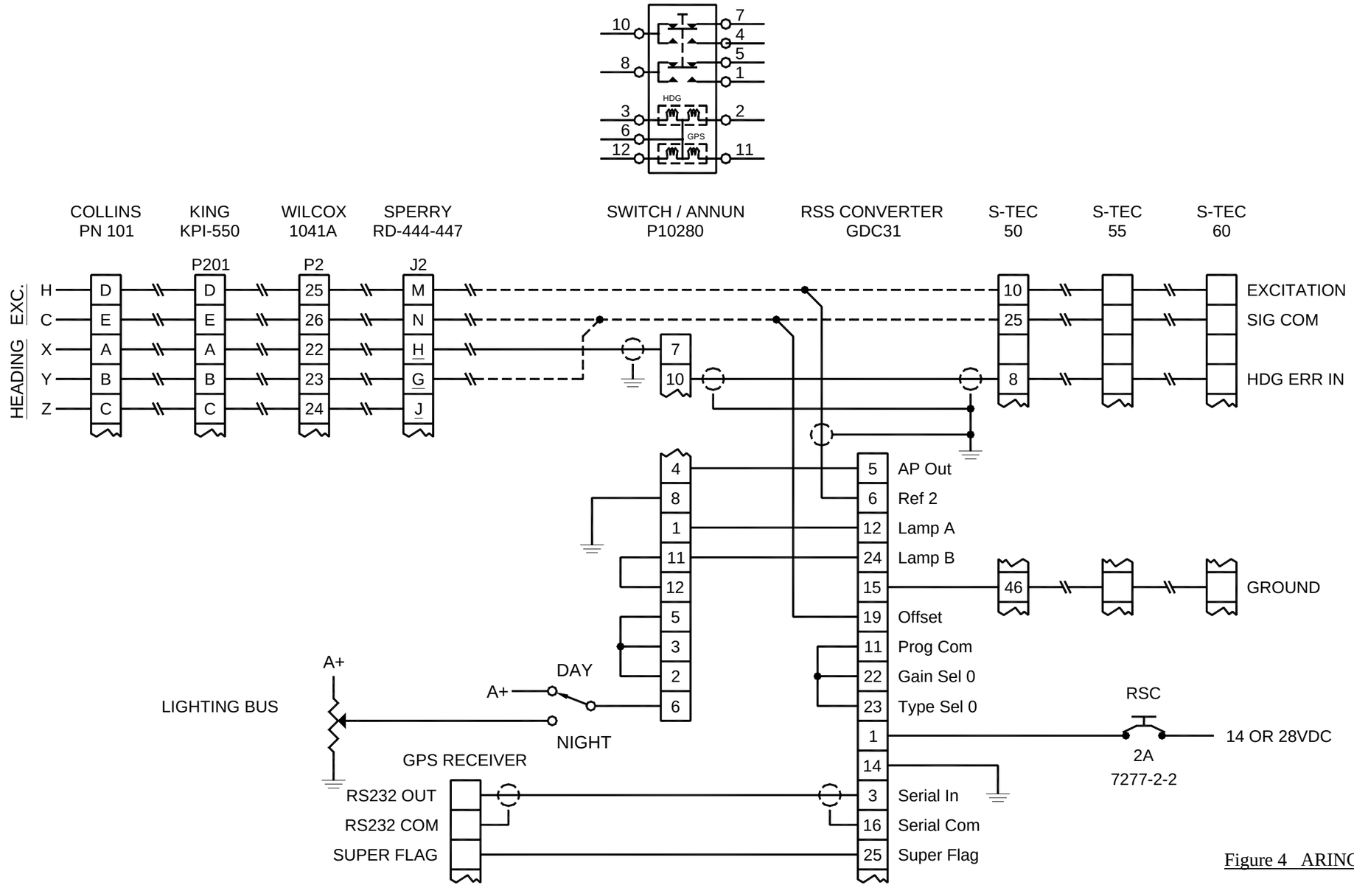


Figure 4 ARINC HSI with S-TEC 50, 55 or 60

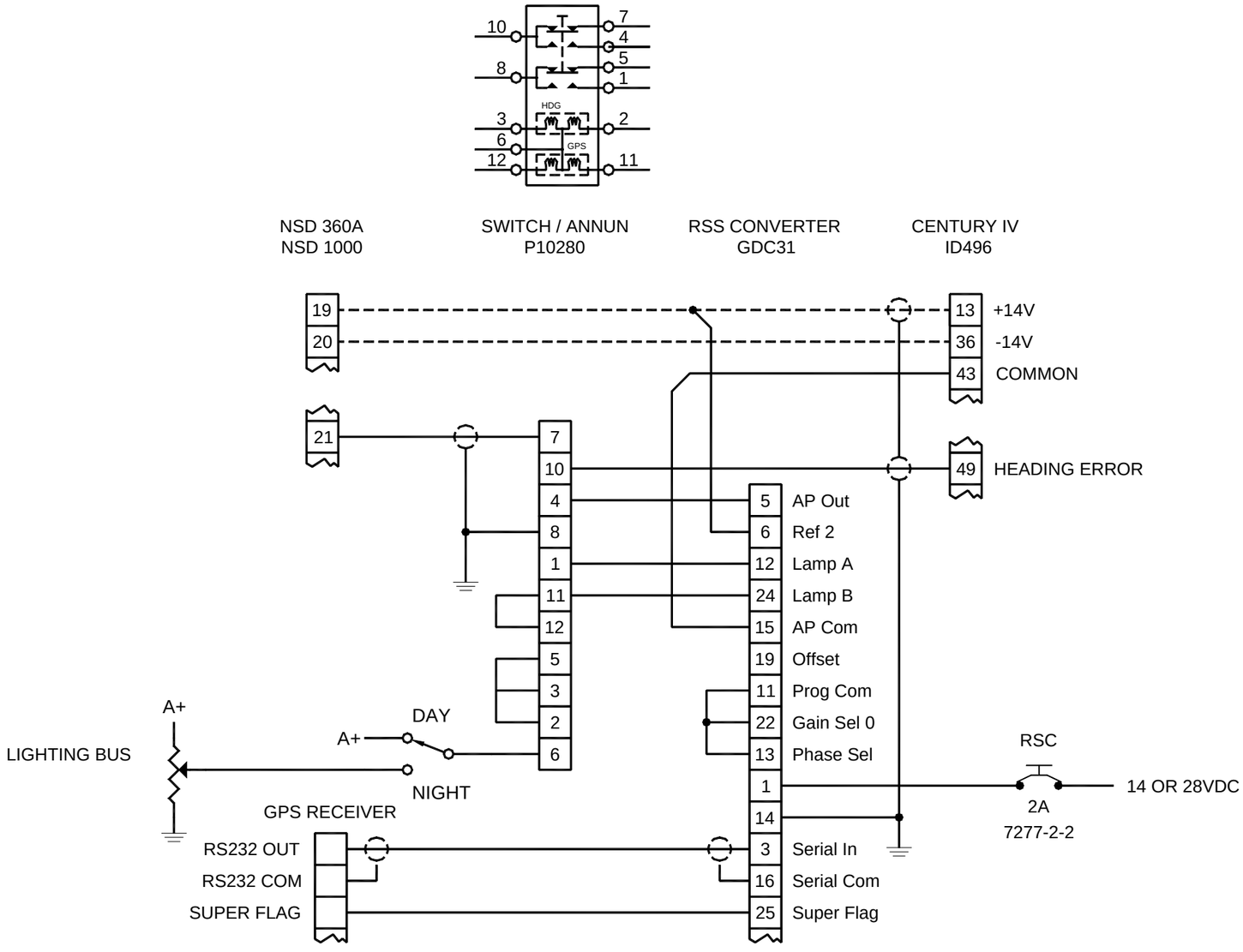


Figure 5 NSD 360A / NSD 1000 with Century IV

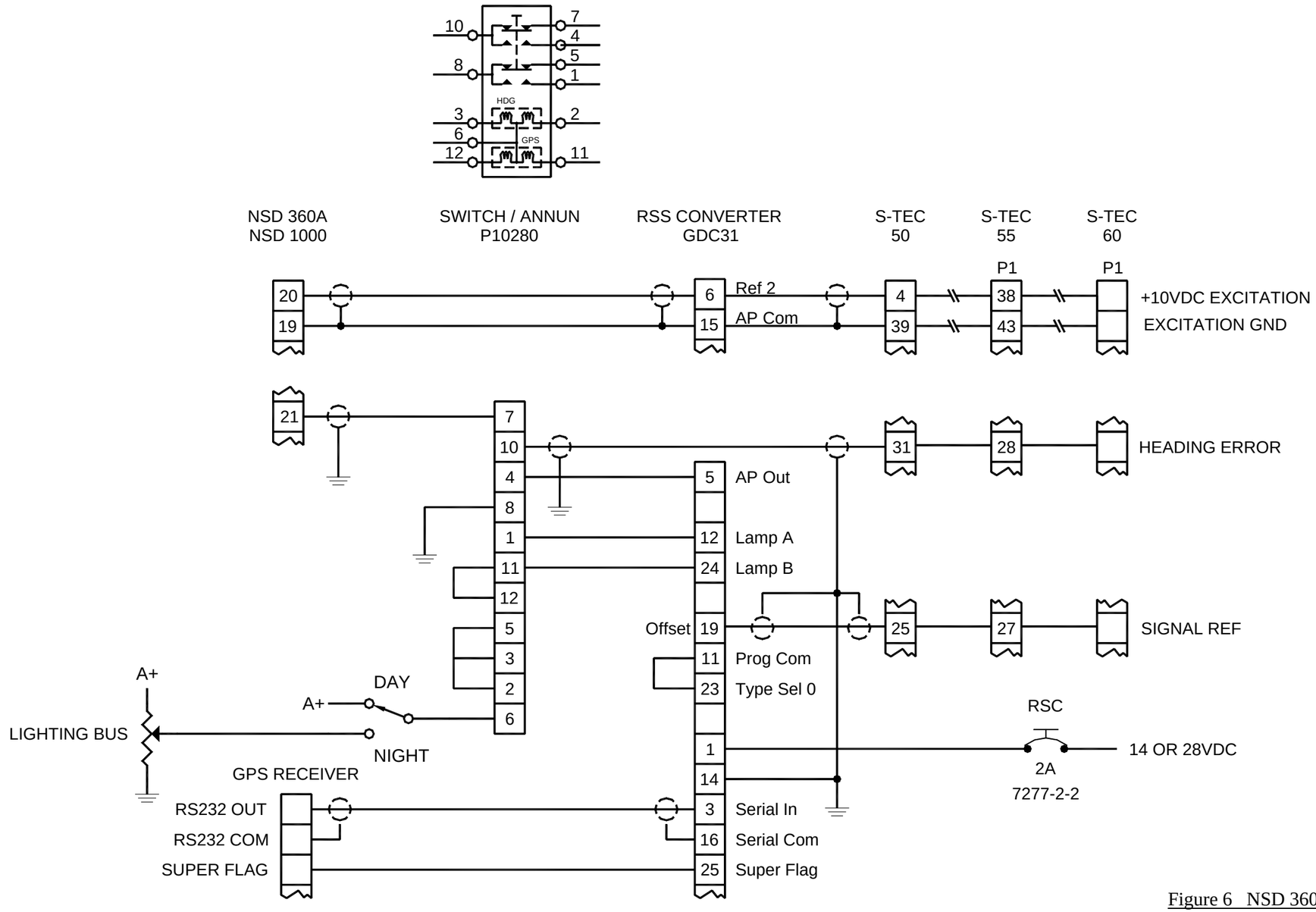


Figure 6 NSD 360A / NSD 1000 with S-TEC 50 or 55

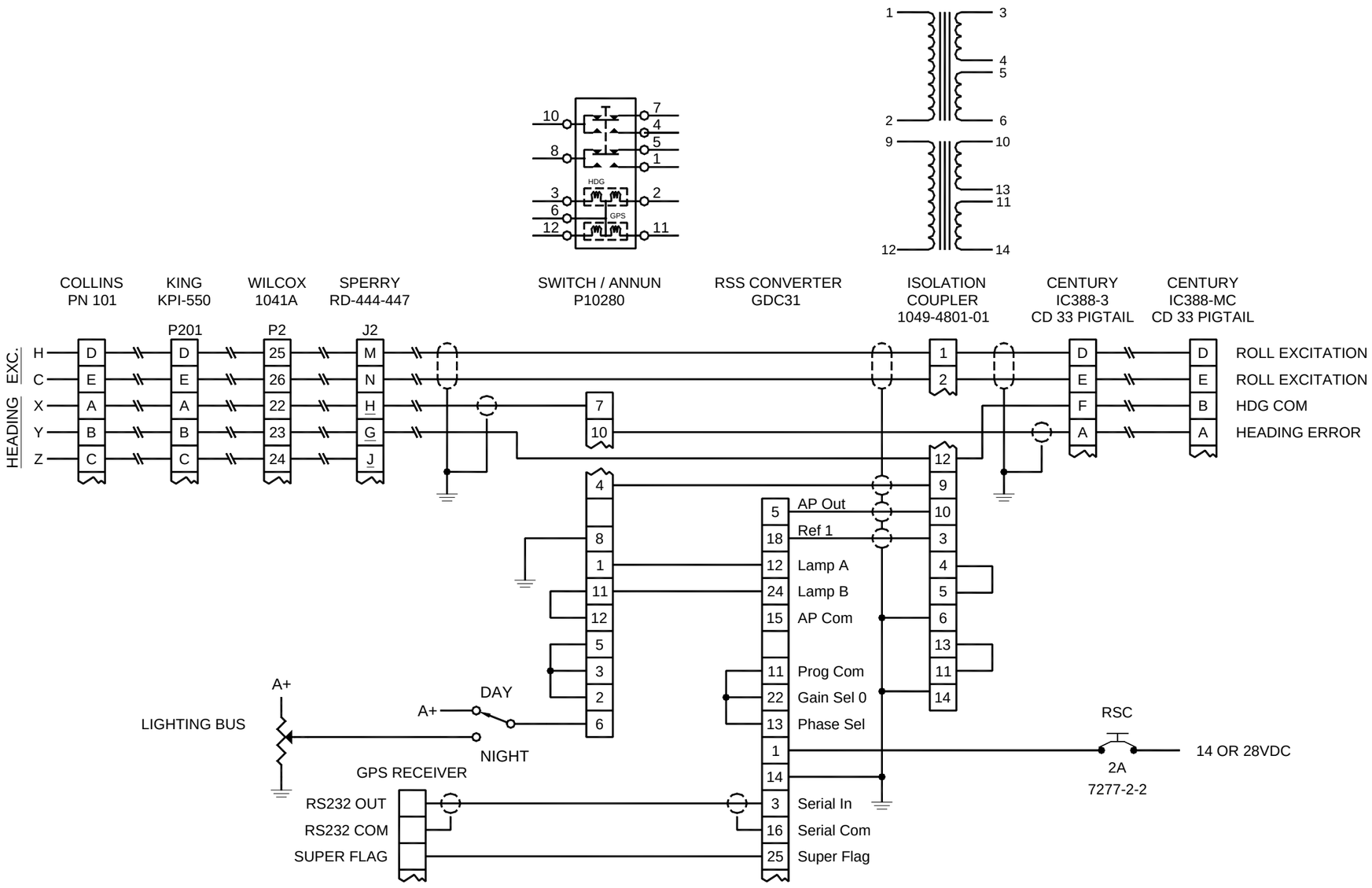


Figure 7 ARINC HSI with Century II or III

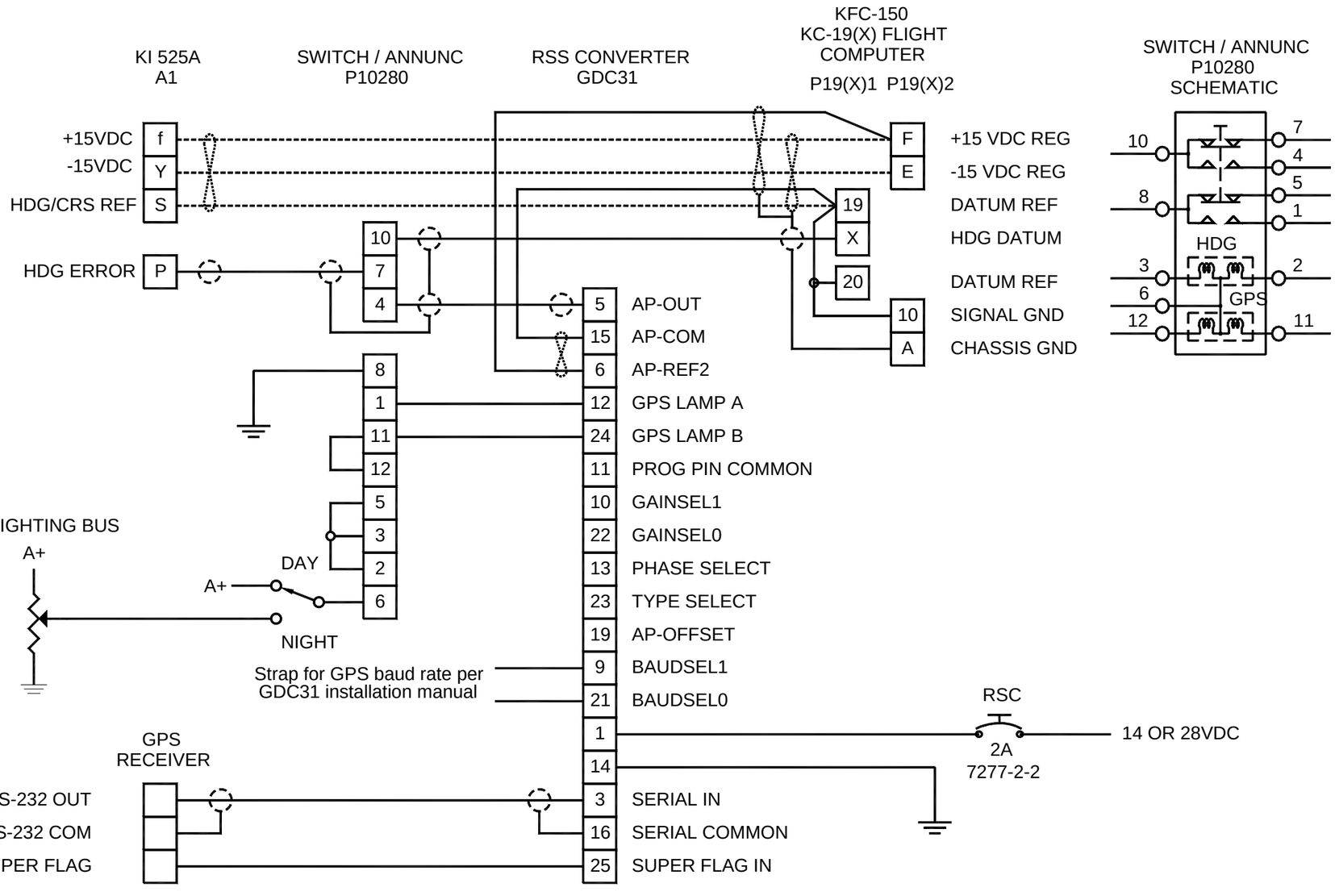


Figure 8 KI 525A with KFC 150

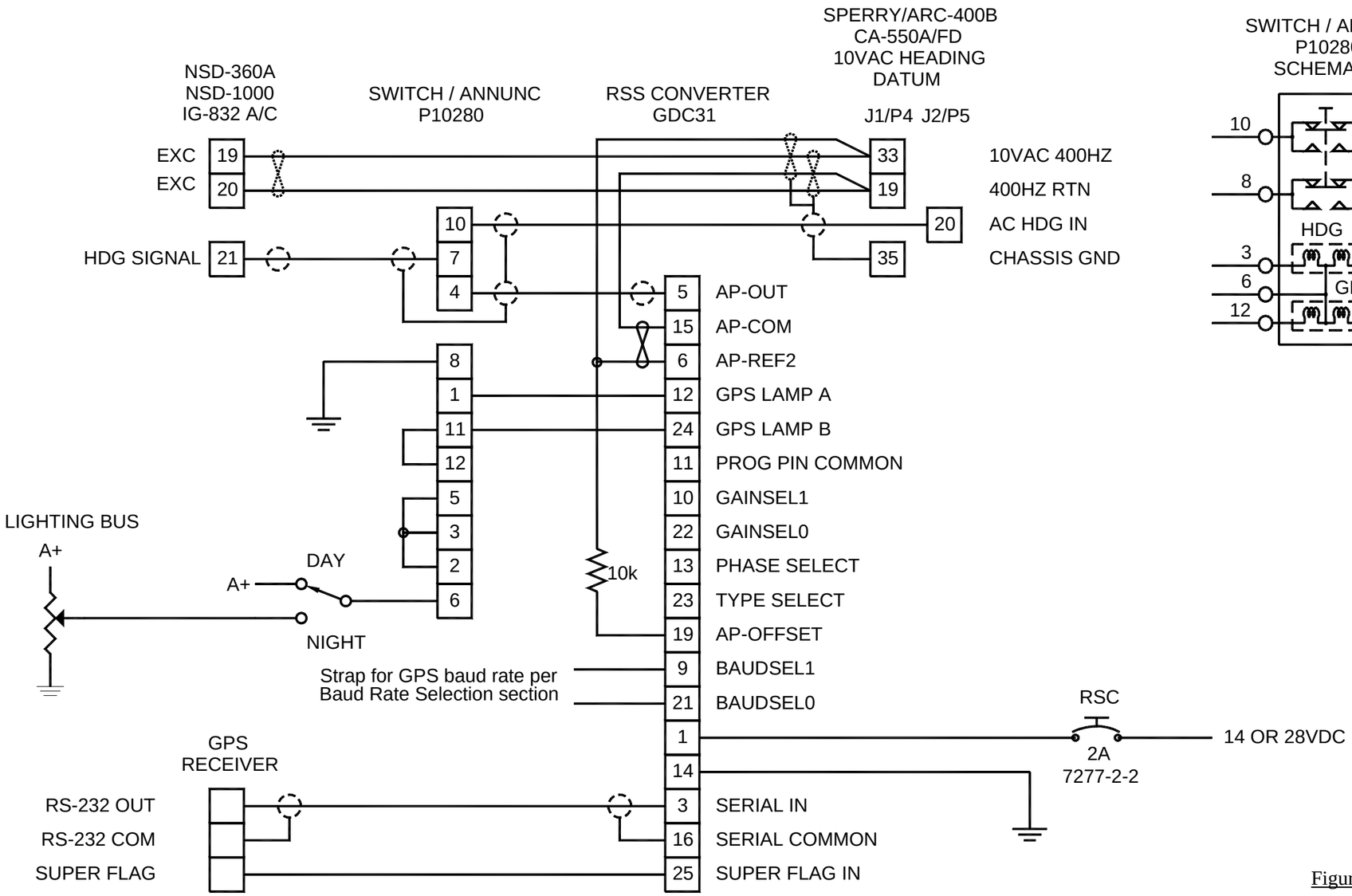


Figure 9 NSD 360 with ARC 400B (10VAC)

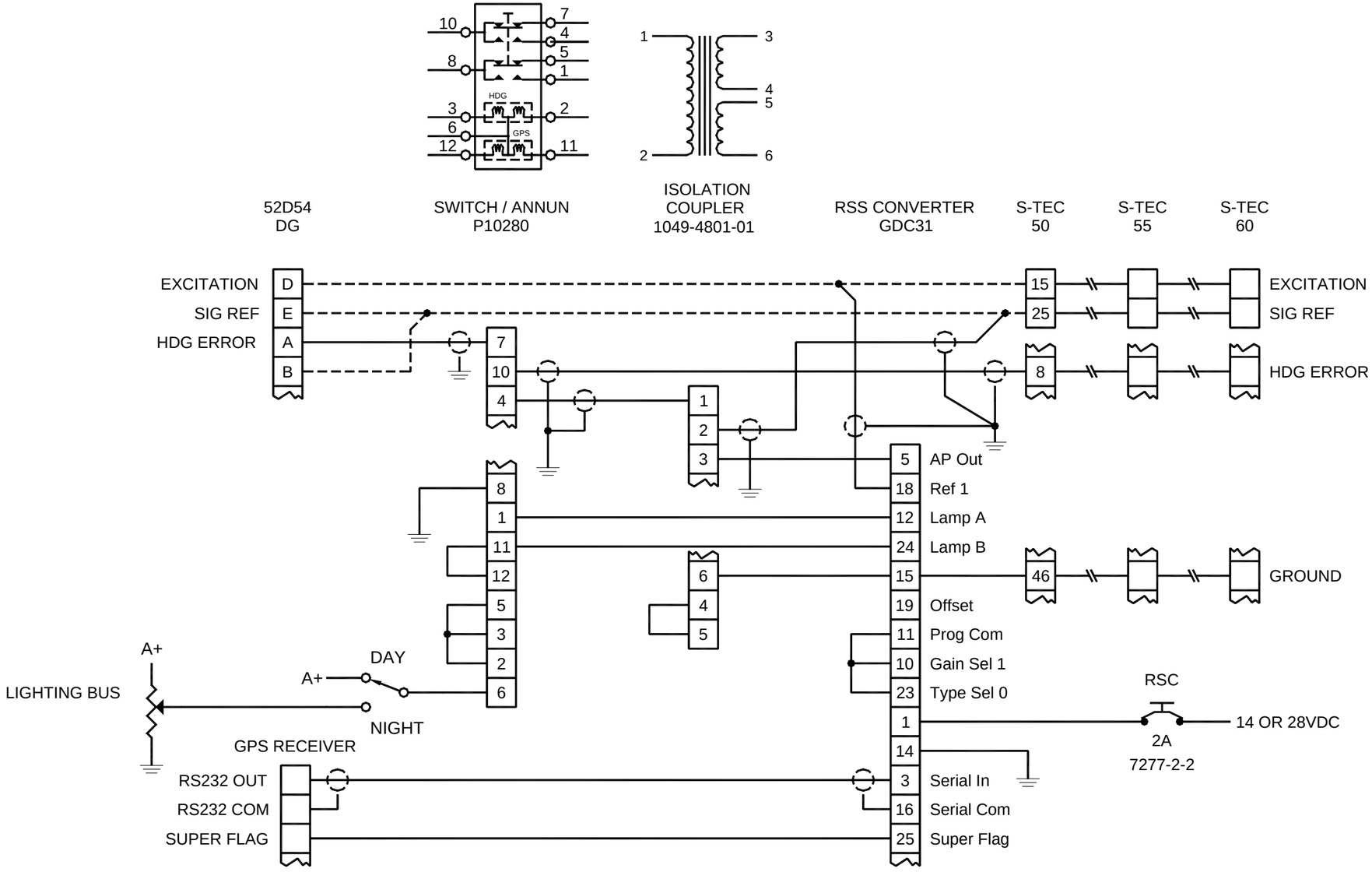


Figure 10 52D54 DG with STEC 50, 55 or 60

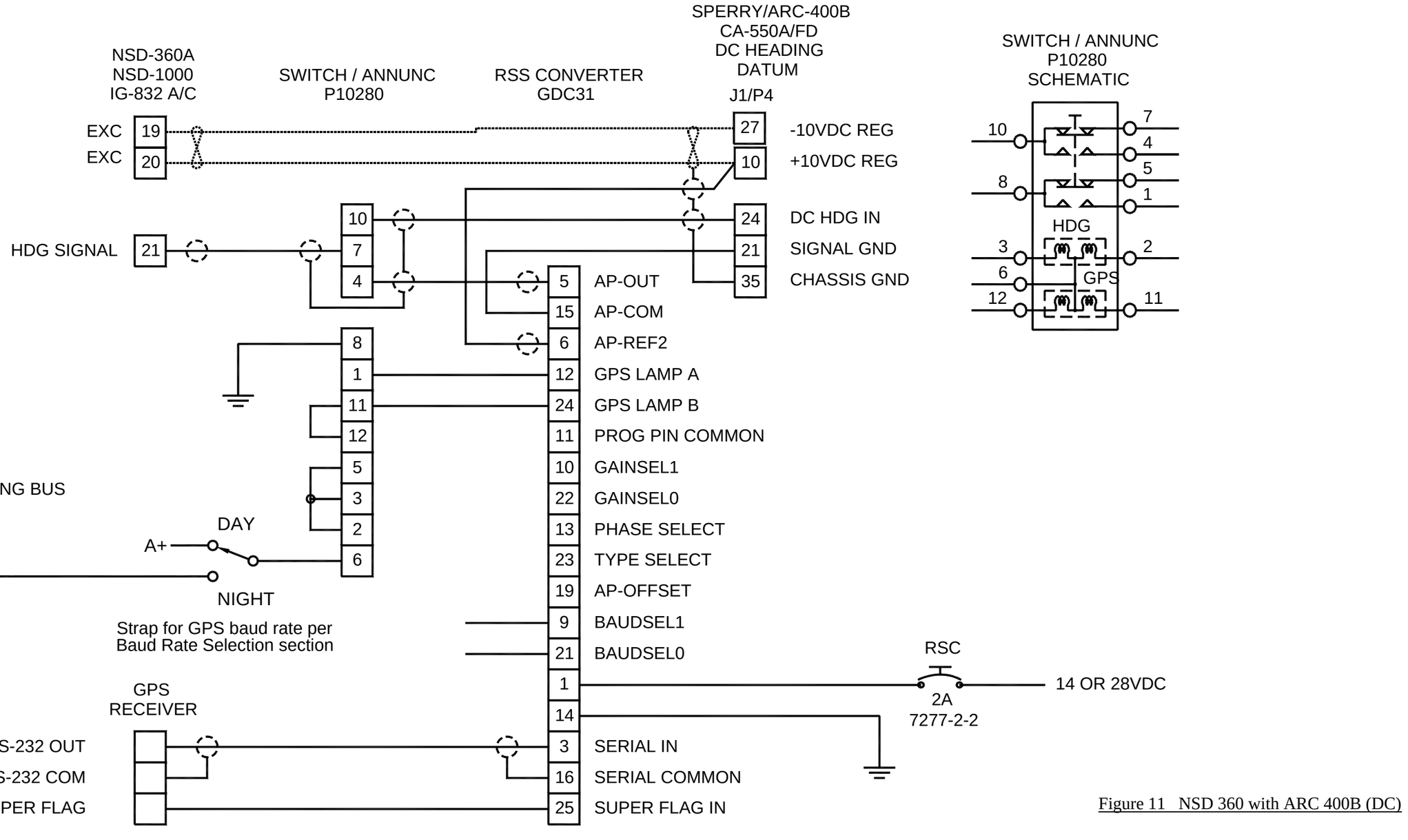


Figure 11 NSD 360 with ARC 400B (DC)

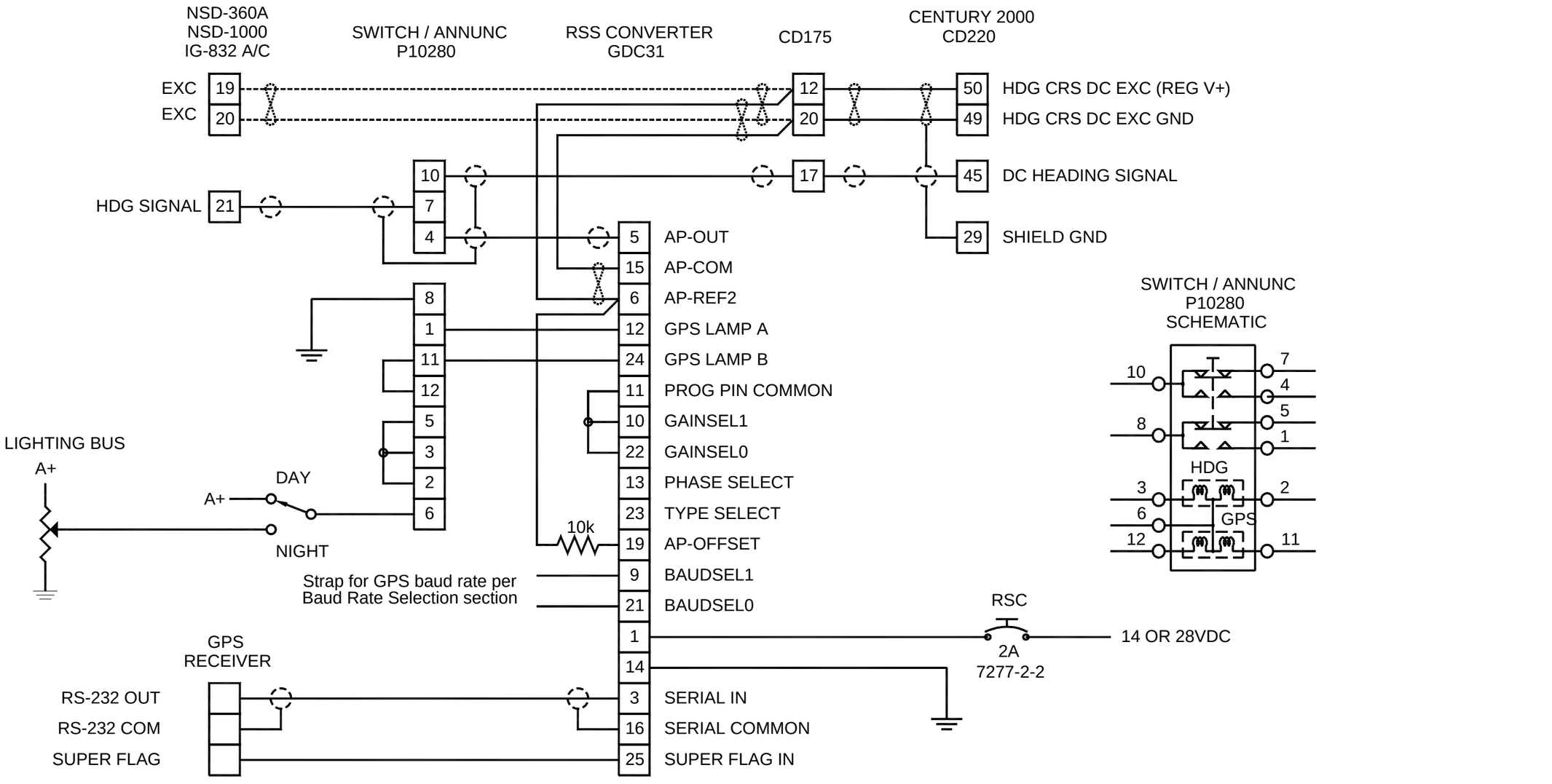
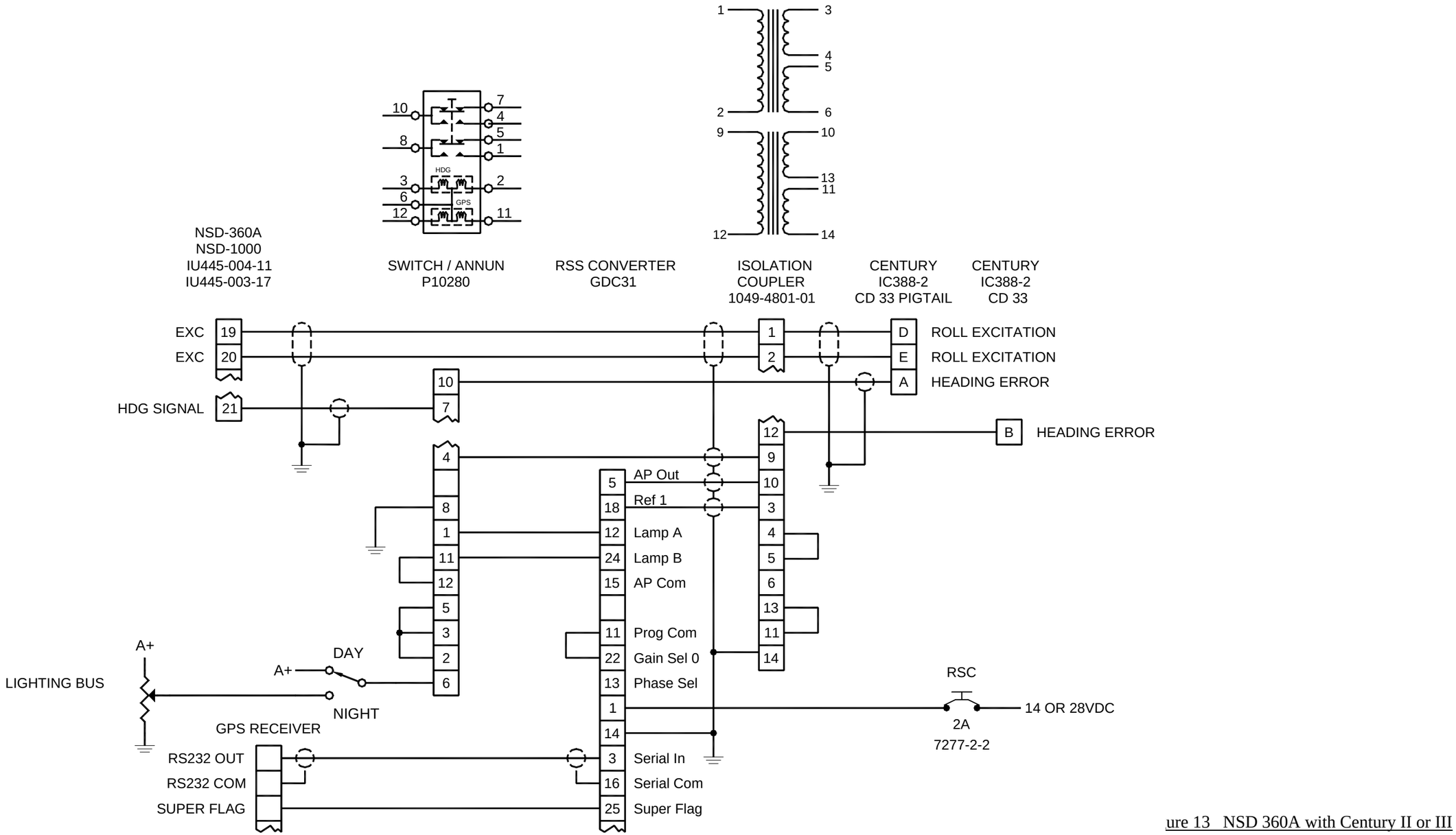
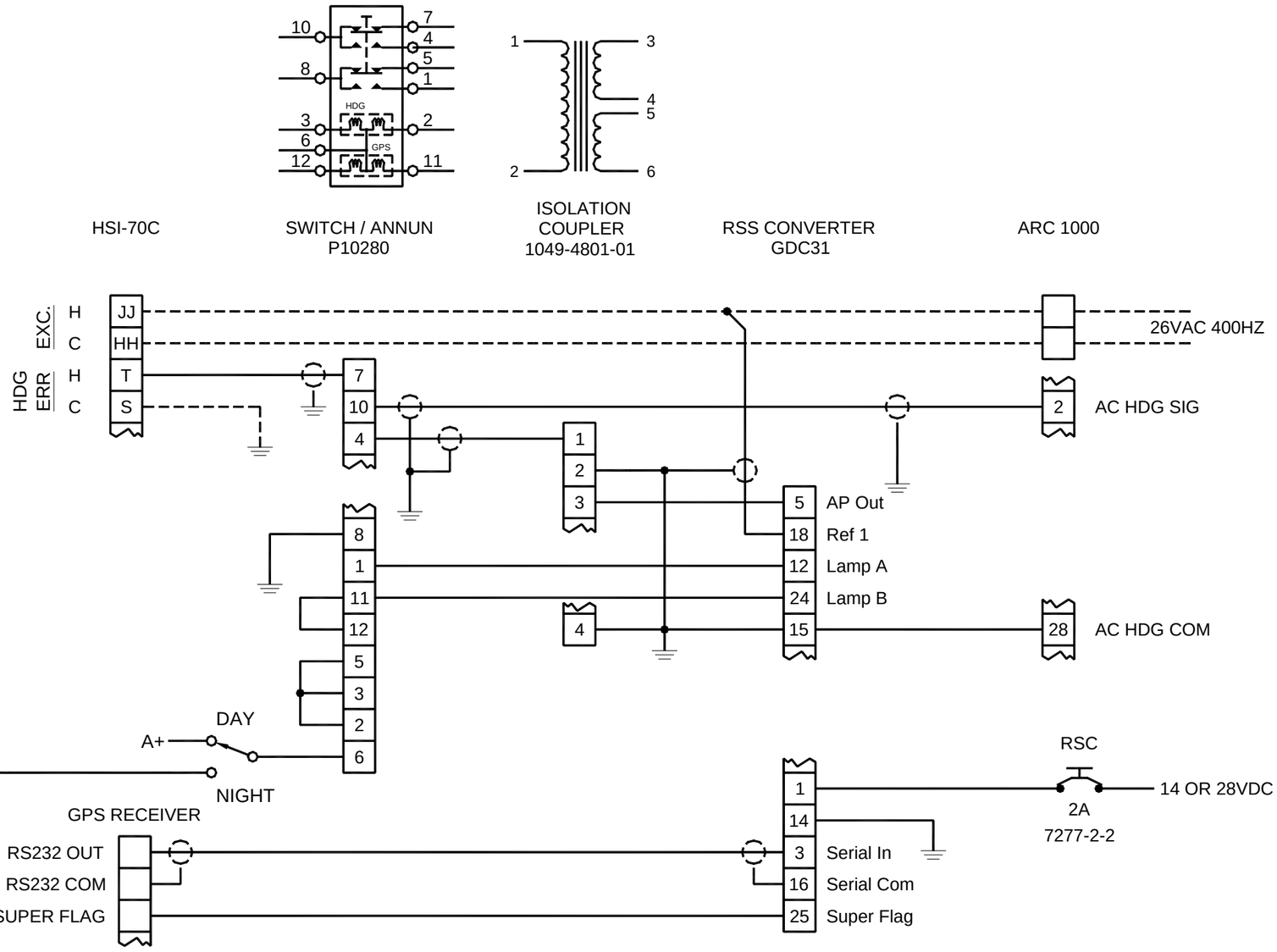


Figure 12 NSD 360 with Century 2000



ure 13 NSD 360A with Century II or III



ıre 14 HSI-70C with ARC 1000

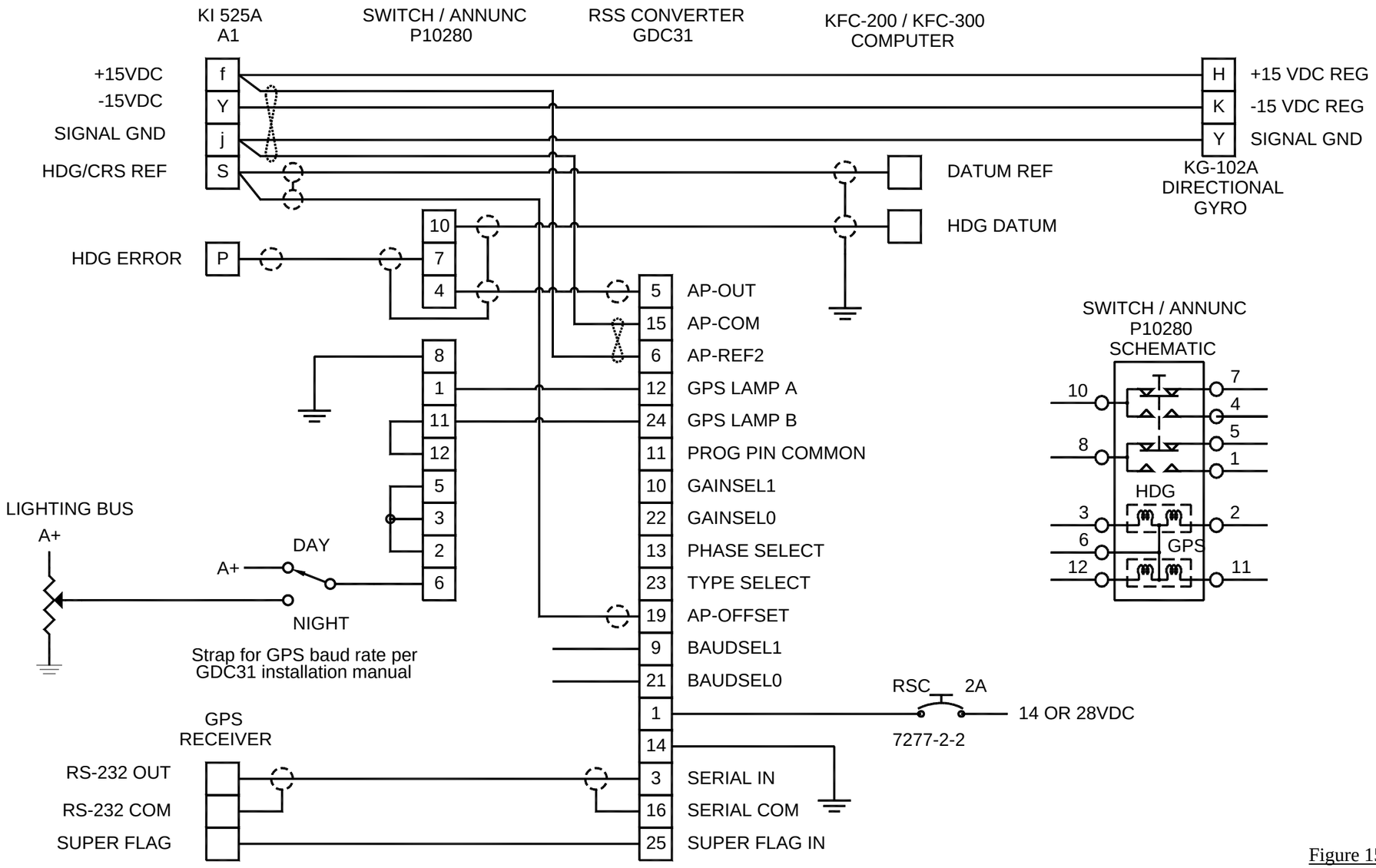


Figure 15 KI 525A with KFC 200 / 300