A-429 HS/LS TO SERIAL CONVERTER w/SM SELECT

PRODUCT P/N: 933612-02

INSTALLATION MANUAL

REV D

Shadin Avionics
6831 Oxford Street
St. Louis Park, MN 55426
USA

Sales: (800)-328-0584
Technical Support: (800)-388-2849
WWW.SHADIN.COM

MANUAL P/N: IM3612-02

PAGE CONTROL CHART

REVISION LOG

REV.	DATE	APP'D	CHANGE
–	06-14-02	ZK	Baseline Release
A	10-10-02	ZK	Changed SM Select Input Level Info
B	01-16-04	ZK	Removed "Pending" from Specifications.
C	12-28-04	ZK	Changed Company Name
D	03-22-06	CB	Changed Company Logo, IK9337, & Section 2.1

The information in this manual is subject to change without notification. To ensure complete and current updates, note the Revision Log above and call Technical Assistance for updated information.

1. OVERVIEW

1.1 THE MANUAL

This manual is intended to facilitate the proper installation of the A-429 HS/LS to Serial Converter w/SM Select. Installation instructions should be read and followed.

1.2 PRODUCT DESCRIPTION

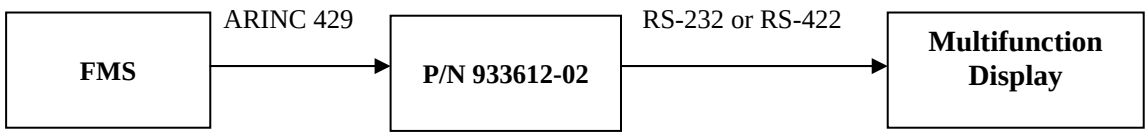
The converter will accept the following ARINC 429 input labels on the ARINC 429 input bus, and ignores all other labels which may be contained in the input: 074, 075, 113-116, 147, 251, 300-307, and 310- 313.

Labels 074, 075, 113, and 300-307 comprise a flight plan. The ARINC 429 flight plan uses and re-uses these same labels to describe each point in the plan. In one transmission of the group of labels they describe one point, and 100 milliseconds later the same labels are transmitted containing the data describing another point. This continues until the entire plan is sent, and then starts over again.

For most of the input labels, the serial output is in a format which is very similar to the ARINC input, with the converter acting as a protocol converter only. The converter does not convert the 32 bits of each ARINC 429 label in any way except to reproduce them as 4 eight bit characters in the serial output. This is true for labels 147, 251, 310-313, the non-flight plan labels.

The converter handles the flight plan labels differently. The flight plan is decoded, and the converter picks out the waypoint ID, labels 303 and 304, for two points in the plan: (1) the ‘active’ point, and (2) the ‘final’ point. Then this data is sent out using labels 303 and 304 for the active point, and using labels 301 and 302 to contain the data which was received on labels 303 and 304, respectively, for the final point.

The serial output is transmitted at 9600 baud with data bursts once a second as defined by the protocol for the multifunction display. Within the one second intervals the ARINC data is converted several times depending on the transmit rate of the ARINC labels which are typically every 200 ms or less. The actual conversion time of any data parameter is less than 1ms. This ensures that the data latency at the one second intervals is very small and much less than the TSO-129 requirement of 1.0 second. The block diagram below depicts the intended use of the converter in the aircraft installation.



1.3 EQUIPMENT LIMITATIONS

1.3.1 In order to remain compliant with TSO-C129a, in the Multifunction Display, the time from receipt of data to display of the information must be less than 500msec. This accounts for the processing time of the converter and the transmission time at 9600 baud.

1.3.2 Since the software is developed to DO-178B Level D, the equipment displaying this information must be placarded with “Advisory Information Only”.

1.4 SPECIFICATIONS

Physical

Dimensions:	3.0H x 3.2L x 3.2W (inches)
Weight:	0.6 lbs.

Electrical

Input Voltage:	+14 to +28VDC
Input Current:	100mA

Input Data

ARINC 429 Input Labels:	114, 115, 116, 147, 251, 310, 311, 312, 313, 275
Flight Plan Data:	074, 075, 113, 300-307
High/Low Select:	Open = High Speed, GND = Low Speed

Outputs RS-232 or RS-422 Serial Data

Environmental (By similarity to P/N 933612-00)

Categories:	F1XCAB[H(B,R)]XXXXXXZBABA[VVX]LXXXX
Operating Temperature:	-20°C to +55°C
Storage Temperature:	-55°C to +85°C
Altitude:	Up to 55,000 ft.
In-Flight loss of Cooling:	Equipment can run indefinitely with no cooling.
Regulatory:	TSO-C129a Class A1

1.5 INPUTS

This section specifies the interfaces for the Shadin ARINC 429 to Serial Converter.

This Converter takes in ARINC 429 high or low speed NAV. Data and Flight Plan Data and converts it to a serial data message.

ARINC 429 LABELS	DESCRIPTION
114	*Desired Track*
115	*Bearing to Waypoint*
116	*Cross Track Distance*
147	*Magnetic Variation*
251	*Distance to Go*
310	*Latitude*
311	*Longitude*
312	*Groundspeed*
313	*True Track Angle*
275	*Status is used to generate Serial data records 'S' and 'T'.*
074, 075, 300, 301, 302, 303, 304, 305, 306, 307, 113	*The Flight Data used by the converter*

The SM Select input discrete makes the determination as to what data, for SM (Status Matrix) on ARINC 429 Input Label 275, indicates valid data. The input levels are Open (SM 11) or GND (SM 00). This was incorporated into the 933612-( ) to receive the ARINC 429 information from a Honeywell NZ-2000. The Honeywell NZ-2000 uses the GAMA 429 specification in which a SM of 00 indicates Verified Data/Normal Operation for Discrete Data Words. In previous installations a SM of 11 indicated Verified Data /Normal Operation.

32	31-30	29-11	10-9	8-1
Parity	Status Matrix (00 or 11 is Valid, depending on strapping of J1:1)	Bit 29-HSI Valid (NAV Warning) 1 = Valid (Output Record, S-----) 0 = Invalid (Output Record, S----N) Bit 12-Dead Reckoning 1 = Reckoning (Output Record, T----A----- 0 = Not Reckoning (Output Record, T---------	SDI	Label

1.6 OUTPUTS

Serial Data Output in either RS-232 or RS-422 format.
Transmission Rate: Once per second.

Byte Format:
9600 baud, 8 bit, 1 start bit, 1 stop bit, no parity.
MARK is a logical 1 and SPACE is a logical 0.
START bit begins as MARK, goes to SPACE.

Order of transmission within each data byte:

START bit	Data bit 1 (LSB)	Data bit 2	Data bit 3	Data bit 4	Data bit 5	Data bit 6	Data bit 7 (MSB)	STOP bit

Serial Output format: Any data which is invalid or exceeds the data format will be filled with dashes.

'A- - - - - - - -', CR, LF	Current Latitude
'B- - - - - - - - -', CR, LF	Current Longitude
'C- - - 'CR, LF	Track (magnetic) deg.
'D- - - 'CR, LF	Ground Speed – Knots
'E- - - - -'CR, LF	Distance to Waypoint
'G- - - - -'CR, LF	Cross Track Error – Miles
'I- - - -'CR, LF	Desired Track – deg x 10 (mag)
'K- - - - -'CR, LF	Active Destination Waypoint
'L- - - -'CR, LF	Bearing to Active Waypoint (mag)
'Q- - - -'CR, LF	Mag. Var East/West deg x 10
'S- - - - -'CR, LF	Nav Valid Flag Status
'T- - - - - - - - -'CR, LF	Warnings, A=Accuracy
'W'	Flight Plan Waypoint record, including binary data. There will be a separate 'W' record for each waypoint in the plan.

2. INSTALLATION PROCEDURE

2.1 APPROVAL FOR INSTALLATION

The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those installing this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. TSO articles must have separate approval for installation in an aircraft. The article may be installed only if performed under 14 CFR part 43 or the applicable airworthiness requirements.

All work must conform to AC 43.13-1B.

2.2 MOUNTING

The Converter (P/N 933612-02) should be mounted in a dry location and the equipment may be installed in a temperature controlled, and non-pressurized location.

Use installation drawing, Drawing No: 4036-364 and-365 or -366 or -367, to connect the A-429 HS/LS to Serial Converter w/SM Select to the system. Use # 6-32 screws for mounting.

2.3 ELECTRICAL CONNECTIONS

Connection to Power Supply +28 VDC

933612-02		**Description**
J1:8	To	+14 to +28 VDC Power IN
J1:15	To	Power GND

Inputs

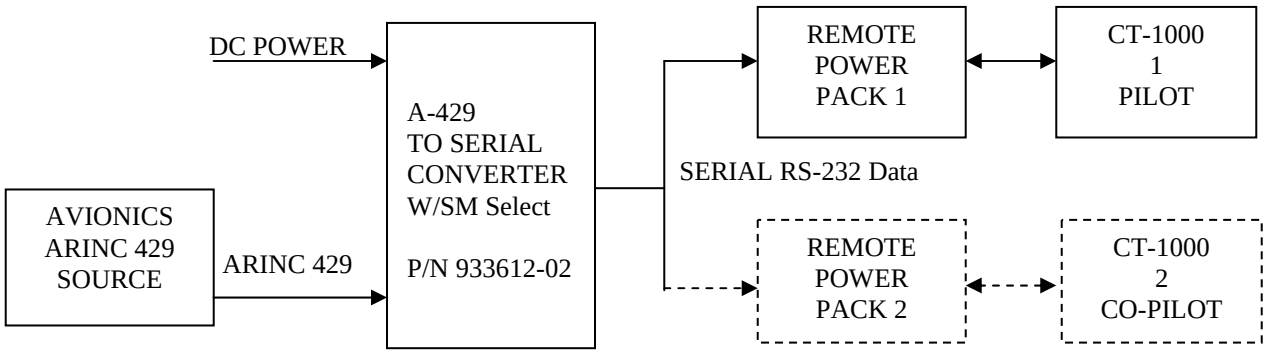
933612-02		**Description**
J1:1	To	SM Select
J1:5	To	RX+, ARINC 429 IN
J1:13	To	RX-, ARINC 429 IN
J1:9	To	High/Low Select

Pin 1 strapped to GND for the SM is 00. Left open the SM is 11.
Pin 9 strapped to GND for ARINC Low Speed applications, otherwise left open for high speed.

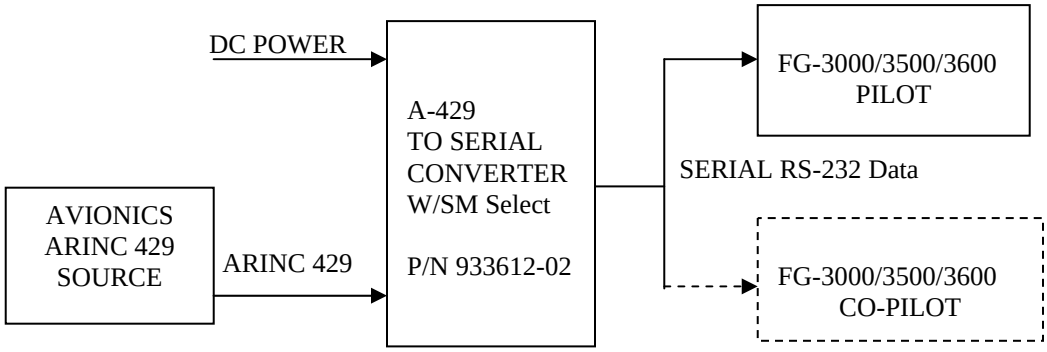
Outputs

933612-02		**Description**
J1:3	To	TX, RS-422(-)
J1:4	To	TX, RS-422(+)
J1:10	To	SIGNAL GND
J1:14	To	TX, RS-232

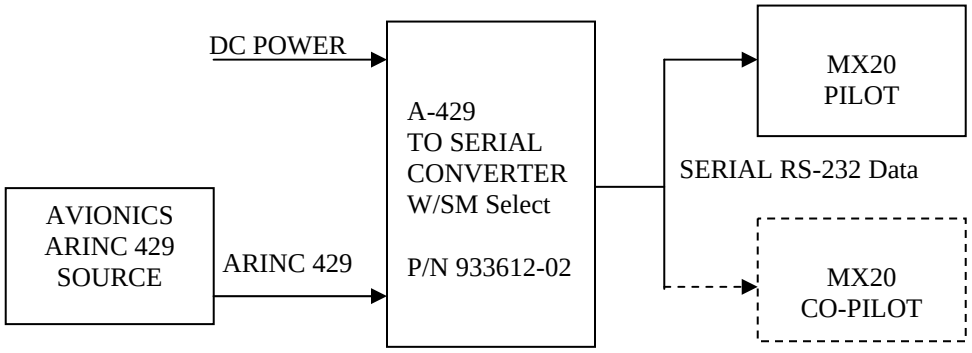
Use RS-232 or RS-422, but not both.



System Block Diagram of a typical installation of the converter with the Northstar CT-1000.



System Block Diagram of a typical installation of the converter with the ADR Models: FG-3000/3500/3600



System Block Diagram of a typical installation of the converter with the Apollo MX20

2.4 POST INSTALLATION CHECKOUT PROCEDURE

2.4.1 Northstar CT-1000 / Shadin ARINC 429 Converter Setup and Checkout Procedure

1. Ensure that avionics systems driving the CT-1000 are operational and set to ARINC 429 high speed. If the FMS system requires low speed output, ground J1 pin 9.
2. Power up the CT-1000. The Master Executive Control software should launch automatically after the booting process is complete.
3. Select the "Tools" tab.
4. Select the "GPS Server" tab.
5. Ensure that the "Comm Config" values are set to "COM 1 9600" (Comm Port 1 and 9600 bps). The GPS Type should be set to "Bendix/King".
6. The bottom window of the GPS server should now display the following parameters using values derived from the ARINC 429 data source:
   Latitude
   Longitude
   Heading
   Magnetic Deviation
   Speed
   Current Waypoint
7. Verify that these values are correct and consistent by comparing them to values on the source.
8. Save the settings by clicking on the exit icon. (3rd icon from the left on the toolbar).

The interface should now be properly configured and the moving map application (launched from the Northstar Main Menu) should indicate the actual position of the aircraft on the map.

2.4.2 FG-3000/3500/3600 and Apollo MX20 Setup and Checkout Procedure

1. Ensure that other avionics systems interfacing multifunction display are operational and set to ARINC 429 high speed. If the FMS system requires low speed output, ground J1 pin 9. See procedure above and consult Operators Manual for FG-3500, MX20 or other multifunction display.

2. Power up the system. The Master Executive Control software should launch automatically after the booting process is complete.

3. Select the input type to KLN88. Verify data displayed is correct. (See Operator Guide of Display for detailed instructions).

3. ENVIRONMENTAL QUALIFICATION FORM

This EQF pertains to P/N 933612-00 which is a different Shadin P/N. It is a superset of the hardware used in P/N 933612-02. This data can be used to qualify P/N 933612-02 to RTCA/DO-160D standards by similarity.

NOMENCLATURE: ARINC 429 HS/LS to Serial CONVERTER
TYPE/MODEL/PART NO: 933612-00 **TSO NUMBER:** C129a Class A1
MANUFACTURER'S SPECIFICATION AND/OR OTHER APPLICABLE SPECIFICATION:
Report 4036-12, RTCA/DO-160D
MANUFACTURER: Shadin Avionics
ADDRESS: 6831 Oxford Street, St. Louis Park, Minnesota 55426-4412

CONDITIONS	**SECTION**	**DESCRIPTION OF TESTS CONDUCTED**
Temperature and Altitude	4.0	Tested to Category F1.
Low Temperature High Temperature		
Altitude Decompression Overpressure		
Temperature Variation	5.0	Tested to Category C.
Humidity	6.0	Tested to Category A.
Operational Shock and Crash Safety	7.0	Tested to Category B.
Vibration	8.0	Tested to Category H (B, R).
Explosion	9.0	Identified as Category X. Not tested.
Waterproofness	10.0	Identified as Category X. Not tested.
Fluids Susceptibility	11.0	Identified as Category X. Not tested.

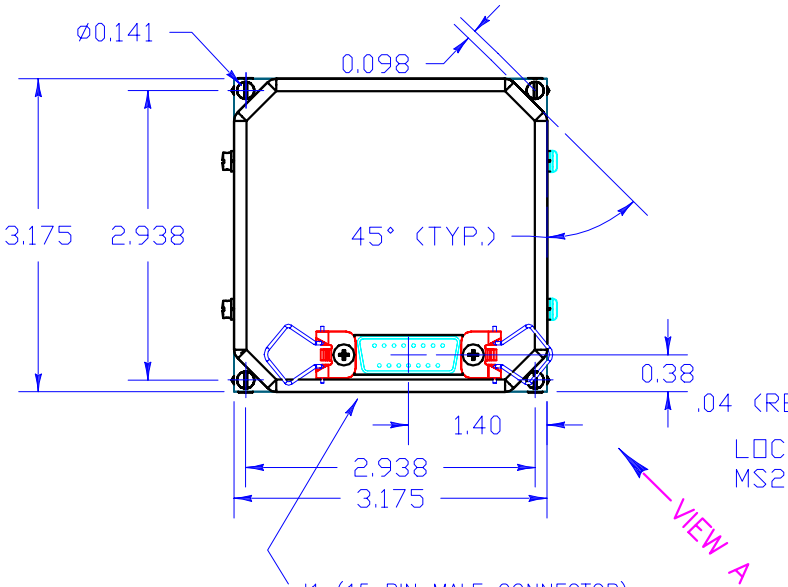
ENVIRONMENTAL QUALIFICATION FORM (Cont.)

CONDITIONS	SECTION	DESCRIPTION OF TESTS CONDUCTED
Sand and Dust	12.0	Identified as Category X. Not tested.
Fungus	13.0	Identified as Category X. Not tested.
Salt Spray	14.0	Identified as Category X. Not tested.
Magnetic Effect	15.0	Tested to Category Z.
Power Input	16.0	Tested to Category B.
Voltage Spike	17.0	Tested to Category A.
Audio Frequency Susceptibility	18.0	Tested to Category B.
Induced Signal Susceptibility	19.0	Tested to Category A.
Radio Frequency Susceptibility	20.0	Tested to Category VVX.
Radio Frequency Emission	21.0	Tested to Category L.
Lightning Induced Transient Susceptibility	22.0	Identified as Category X. Not tested.
Lightning Direct Effects	23.0	Identified as Category X. Not tested.
Icing	24.0	Identified as Category X. Not tested.
Electrostatic Discharge	25.0	Identified as Category X. Not tested.

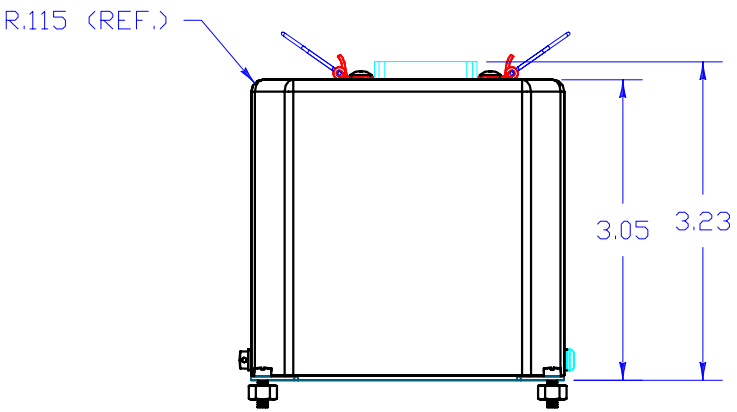
SECTION 4.0

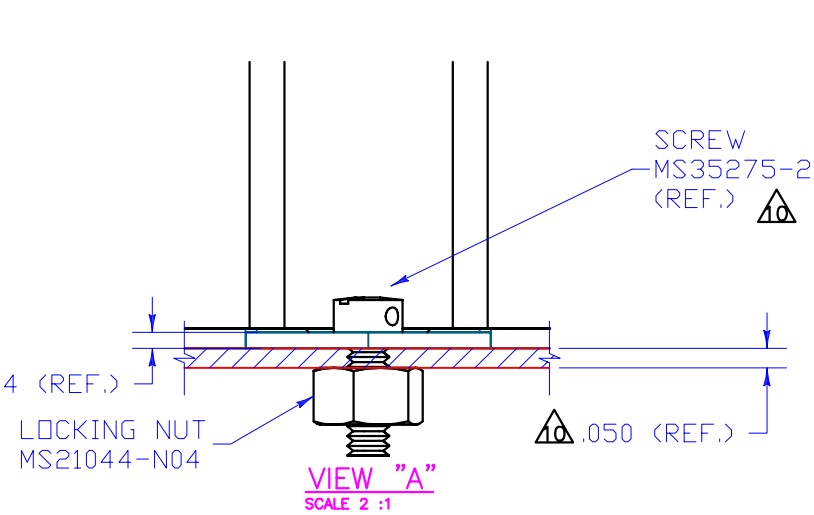
INSTALLATION DRAWINGS AND INSTALL KIT PARTS LISTS

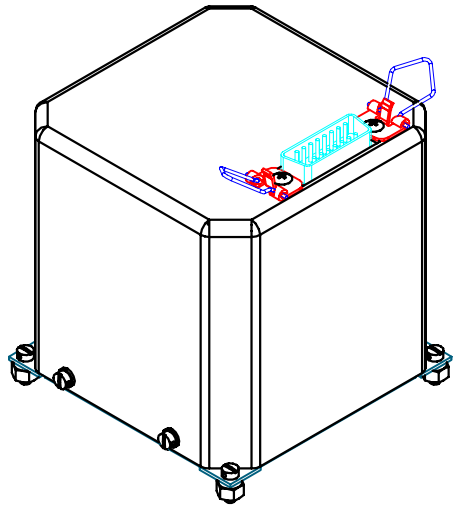
The following drawings are arranged in the sequence specified on page i of the Page Control Chart.



J1 (15 PIN MALE CONNECTOR)
MATING CONNECTOR:
AMPHENOL 17-DA15S OR EQUIVALENT
HOOD: CINCH # DA-24658
AMPHENOL 17-529 CLIPS (2)







SCREW TABLE (MS35275) 10		
LENGTH	SIZE	FULL P/N
1/4" (.250)	#4	MS35275-213
5/16" (.312)	#4	MS35275-214
3/8" (.375)	#4	MS35275-215
7/16" (.438)	#4	MS35275-216
1/2" (.500)	#4	MS35275-217
5/8" (.625)	#4	MS35275-218
3/4" (.750)	#4	MS35275-219
7/8" (.875)	#4	MS35275-220
1" (1.000)	#4	MS35275-221
1-1/4" (1.250)	#4	MS35275-222
1-1/2" (1.500)	#4	MS35275-223

CONNECTOR KEY	
PIN	FUNCTION
1	SM SELECT 11
2	N.C.
3	TX, RS-422 (-) 7
4	TX, RS-422 (+) 7
5	RX+, ARINC 429 IN
6	N.C.
7	N.C.
8	+12 TO 28 V DC POWER IN
9	HIGH/LOW SELECT 9
10	SIGNAL GND
11	N.C.
12	N.C.
13	RX-, ARINC 429 IN
14	TX, RS-232 7
15	POWER GND

NOTES:

1. THE CONVERTER CAN BE MOUNTED IN ANY ORIENTATION
2. 4" SPACING IS REQUIRED ABOVE CONNECTOR
3. NO COOLING IS REQUIRED
4. THE CONVERTER CAN BE INSTALLED IN A NON-PRESSURIZED AREA, PROVIDING TEMPERATURE DOES NOT DROP BELOW -20°C.
5. 1 AMP CIRCUIT BREAKER IS REQUIRED
6. NO SHOCK MOUNT REQUIRED

7 USE RS-232 OR RS-422 BUT NOT BOTH

8. WEIGHT: .6 lbs.
   POWER CONSUMPTION: 100 ma. @ 28VDC

9 PIN 9 STRAPPED TO GROUND FOR ARINC LOW SPEED OPERATION, LEFT OPEN FOR HIGH SPEED OPERATION.

10 MOUNTING SURFACE THICKNESS AND MS SCREW SHOWN ARE FOR REFERENCE ONLY. TO SELECT MOUNTING SCREW LENGTH NECESSARY FOR YOUR SPECIFIC INSTALLATION ADD .238" & THE THICKNESS OF YOUR DESIRED MOUNTING SURFACE. ROUND THIS SUM UP TO THE NEXT LONGEST SCREW SIZE (SEE TABLE).

11 PIN 1 STRAPPED TO GROUND FOR ARINC 429 LABEL 275 SM OF 00. LEFT OPEN, THE SM IS 11.

ECO #	REV.	DATE	BY	APP'D	DESCRIPTION
0412/045	A	12/28/04	PAB	ZK	CH COMPANY NAME & NOTES 4 & 8
0205/023	-	6/14/02	PAB	ZK	BASELINE RELEASE

3D CAD FILE AVAIL: YES

UNLESS OTHERWISE NOTED
DIMENSIONS ARE IN INCHES
TOLERANCES: X.X - ±0.1
X/X ± 1/64 X.XX - ±0.01
∠ - ±2° X.XXX - ±0.005

FINISH: N/A

MATERIAL: N/A

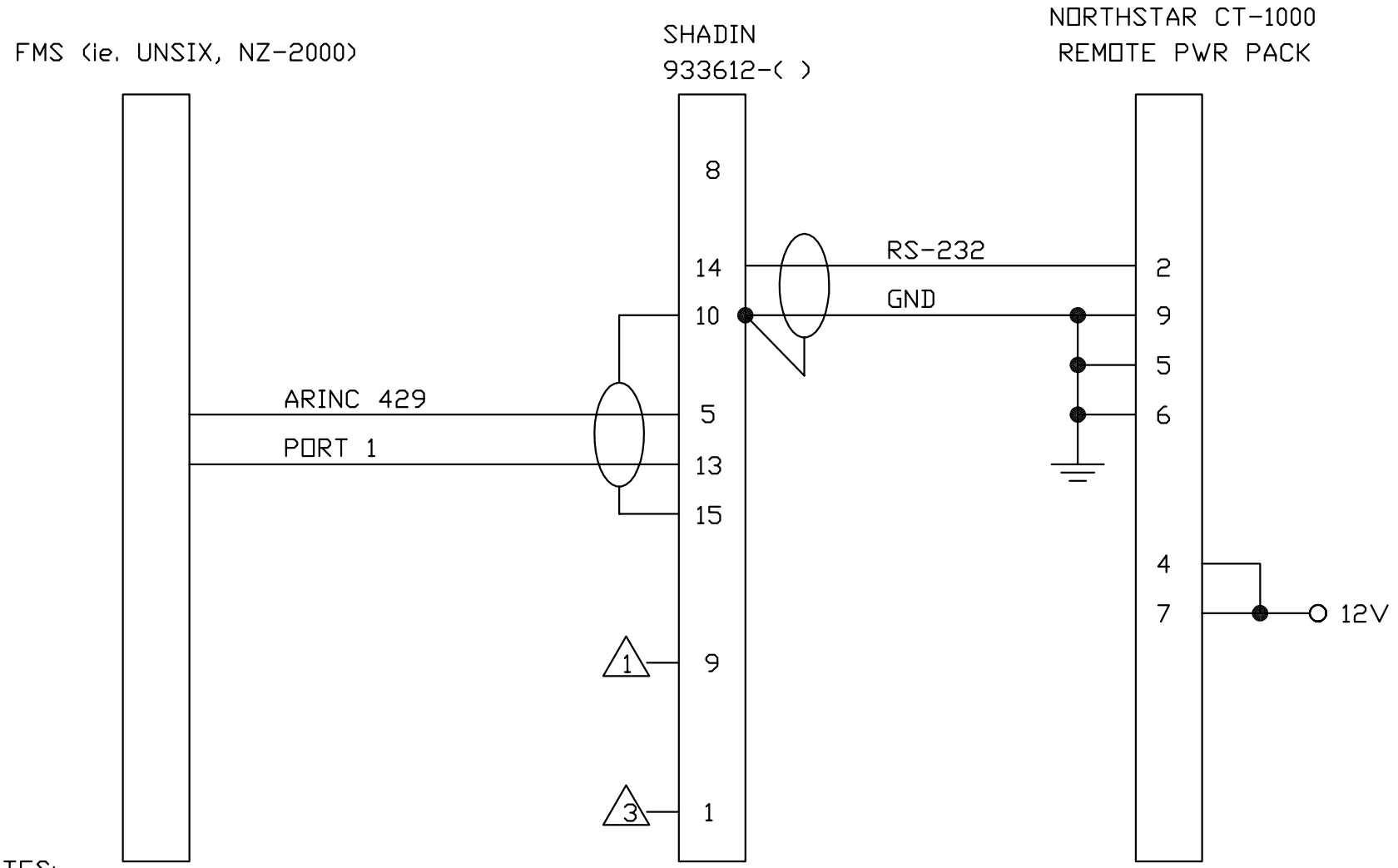
SCALE: 1 : 2

DRAWING DATE 6/14/02
DRAFTER PAB
APPROVED ZK
FILE NAME 933612-02AJ.DWG
DIRECTORY 933612-02
SHEET 1 OF 1

SHADIN MINNEAPOLIS, MN 55426

INSTALLATION DWG, A-429 HS/LS TO SERIAL CONVERTER W/SM SELECT

DRAWING NO. 4036-364 | SIZE A | P/N 933612-02 | REV A



NOTES:

1. SET FMS FOR ARINC 429 HIGH SPEED OUTPUT. IF LOW SPEED IS REQUIRED GROUND PIN 9.
2. SET NORTHSTAR CT-1000 FOR BENDIX INPUT.
3. PIN 1 STRAPPED TO GROUND FOR ARINC 429 LABEL 275 SM OF 00. LEFT OPEN, THE SM IS 11.

ECO #	REV.	DATE	BY	APP'D	DESCRIPTION
0412/045	A	12/28/04	PAB	ZK	CH COMPANY NAME
0205/023	-	6/14/02	PAB	ZK	BASELINE RELEASE

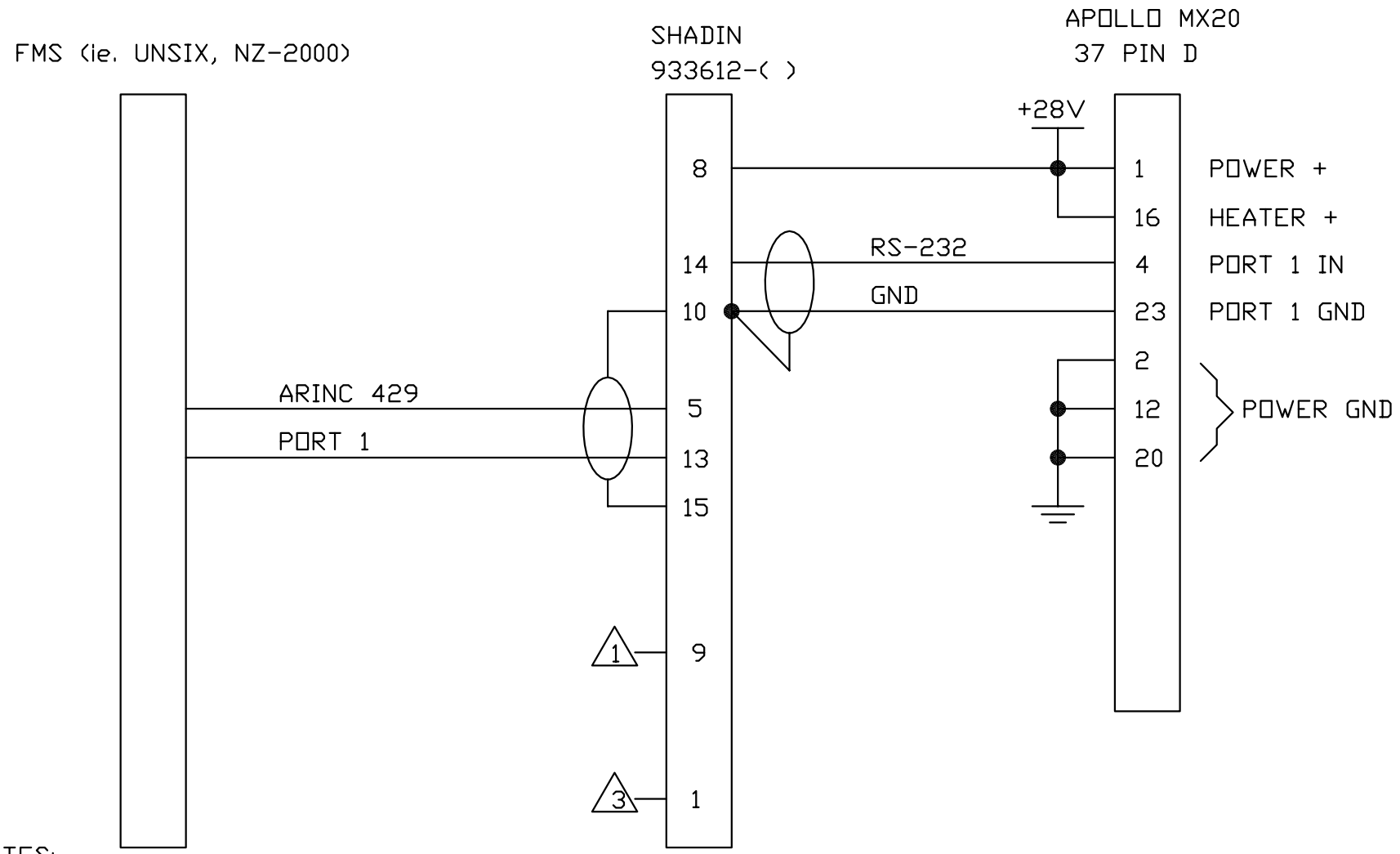
SCALE: NONE

DRAWING DATE 6/14/02
DRAFTER PAB
APPROVED ZK
FILE NAME 4036-365AJ.DWG
DIRECTORY 4036
SHEET 1 OF 1

SHADIN MINNEAPOLIS, MN 55426

INST WIRING, P/N 933612-( )
FMS TO CT-1000 NORTHSTAR

DRAWING NO. 4036-365 | SIZE A | P/N ------ | REV A



NOTES:

1. SET FMS FOR ARINC 429 HIGH SPEED OUTPUT. IF LOW SPEED IS REQUIRED GROUND PIN 9.
2. SET APOLLO MX-20 FOR BENDIX INPUT.
3. PIN 1 STRAPPED TO GROUND FOR ARINC 429 LABEL 275 SM OF 00. LEFT OPEN, THE SM IS 11.

ECO #	REV.	DATE	BY	APP'D	DESCRIPTION
0412/045	A	12/28/04	PAB	ZK	CH COMPANY NAME
0205/023	-	6/14/02	PAB	ZK	BASELINE RELEASE

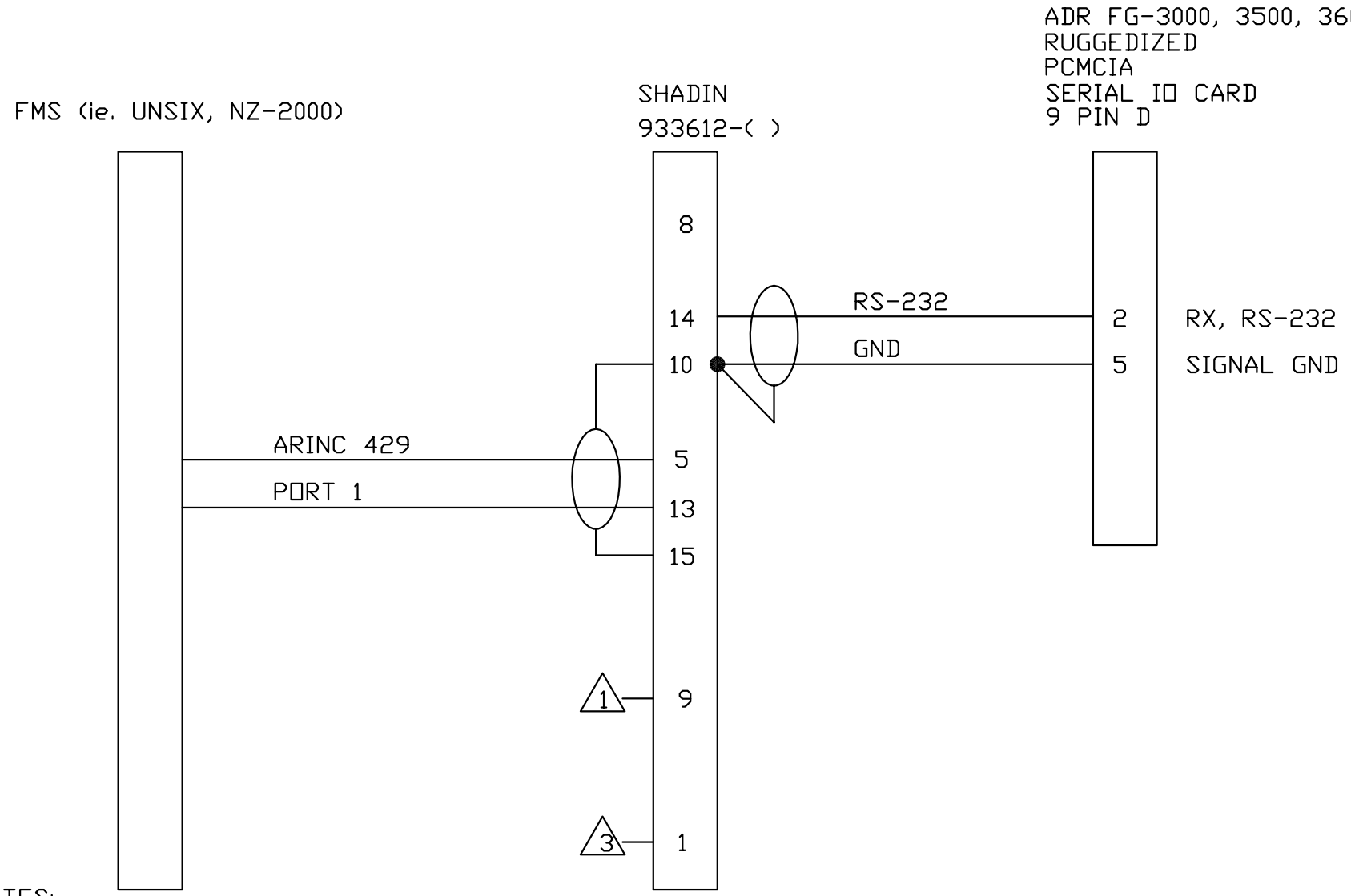
SCALE: NONE

DRAWING DATE 6/14/02
DRAFTER PAB
APPROVED ZK
FILE NAME 4036-366AJ.DWG
DIRECTORY 4036
SHEET 1 OF 1

SHADIN MINNEAPOLIS, MN 55426

INST WIRING, P/N 933612-( )
FMS TO APOLLO MX20

DRAWING NO. 4036-366 | SIZE A | P/N ------ | REV A



NOTES:

1. SET FMS FOR ARINC 429 HIGH SPEED OUTPUT. IF LOW SPEED IS REQUIRED GROUND PIN 9.
2. SET ADR FG-3000 (3500, 3600) FOR BENDIX INPUT.
3. PIN 1 STRAPPED TO GROUND FOR ARINC 429 LABEL 275 SM OF 00. LEFT OPEN, THE SM IS 11.

ECO #	REV.	DATE	BY	APP'D	DESCRIPTION
0412/045	A	12/28/04	PAB	ZK	CH COMPANY NAME
0205/023	-	6/14/02	PAB	ZK	BASELINE RELEASE

SCALE: NONE

DRAWING DATE 6/14/02
DRAFTER PAB
APPROVED ZK
FILE NAME 4036-367AJ.DWG
DIRECTORY 4036
SHEET 1 OF 1

SHADIN MINNEAPOLIS, MN 55426

INST WIRING, P/N 933612-( ) FMS TO ADR MODELS FG-3000, 3500, 3600

DRAWING NO. 4036-367 | SIZE A | P/N ------ | REV A

Report: 4037
ECO Date: January 11, 2006
Rev: F
Sec.: IX
Page 1 of 1

ECO # 0601/013
Release date: 1/11/06
Approved: CB

PARTS LIST

Part #: **IK9337**

Drawing #s: N/A

Description: **INSTALL KIT FOR 15PIN D-SUB**

FN	P/N	QTY.	DESCRIPTION	MFG.	MFG.#	DESIGNATION	COMMENTS
5	230019H-1	2	SPRING LATCH CLIP	SHA	4028-074		*
10	230050C	1	CONN, 15 Pin D-Sub F Crimp w/contacts	POS	M24308/2-2 (RD15F10000-50)		
15	230038	1	CONN HOOD, 15 Pin D-Sub	CIN	DA-24658		
20	511002	2	SCREW, 4-40 x 1/4 Phil Pan HD SS	MCM	91772A106		
25	512007	2	NUT, 4-40 3/16 x 1/16 SS	AFT	HNSP188 04C000		
27	512101	2	RETAINER CLIP, "Bow Tie" Style	KEY	2061K		*
30	541001	2	WASHER, #4 Split Lock, SS	MCM	92147A005		
32	753217	1	COMPUTER LABEL, 3.5"x 15/16"	AVR	4013		
35	PK1001	1	BAG, 2.5 x 3, 4 MIL Zip Lock				
45	PK1007	1	BAG, 6 x 8, 4 MIL				

15 items

* Use FN 5 Or FN 27, Not Both – Depending On D-Sub Connector Style Used.