SYNCHRO TO FREQUENCY FF CONVERTER

PRODUCT P/N: 930502-04

INSTALLATION MANUAL

REV F

Shadin Avionics
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MANUAL P/N: IM0502-04

PAGE CONTROL CHART

4.0 INSTALLATION DRAWINGS AND INSTALL KIT PARTS LIST

DWG No.	Description/ Part Number	DATE	REV
4005-A44	Installation DWG, P/N 930502-04	May 06, 1999	B
4005-C05	Installation Wiring, P/N 930502-04 with Shadin Fuel Mgmt. System	Nov 30, 1999	A
4005-C06	Installation Wiring, P/N 930502-04 with GNS-XLS FMS	Nov 30, 1999	A
N/A	Parts List, Install Kit, P/N IK0502	April 7, 2006	B

REVISION LOG

REV.	DATE	APP'D	CHANGE
–	4-09-98	VK	Release
A	1-04-99	TWM	Clarified product description, updated to new format, clarified setting table.
B	1-14-99	BVM	Add GNS-XLS Installation, include EQF and clarify installation procedures
C	5-13-99	PG	Change and update DWG 4005-A44 and IK0502, make formatting changes as required by current revision.
D	11-30-99	BVM	Added two installations, Twin Otter and B200 to both the table in section 2.0 and to the installation wiring diagrams
E	4-8-05	ALA	Reformatted document and changed company logo
F	4-14-06	CB	Updated Company Logo, Section 2.2, & IK0502

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.

1.0 OVERVIEW

1.1 The Manual

This manual is intended to facilitate the proper installation of the Synchro to Frequency FF Converter. Installation instructions should be read and followed.

1.2 Product Description

This product converts angular information received as synchro signals from a fuel flow transmitter into a digital signal suitable of use by a Fuel/Airdata computer and other aviation monitoring and control systems. Input signals into the converter, from synchro transmitters, are: X=S1, Y=S3 (S2 is grounded), and reference voltage of 26 Vrms. One unit supports conversion of fuel flow values for two engines. The design of the unit is based on a built-in microcontroller and unique software, which supports different applicable systems. Rotary micro switch SW1, on the converter, provides switching capabilities to select different fuel flow.

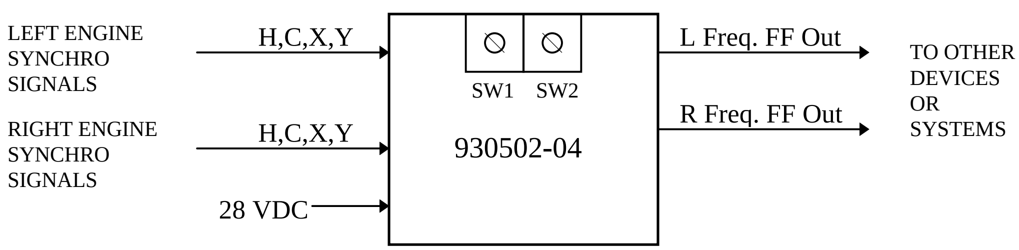


FIGURE 1 - FUNCTIONAL BLOCK DIAGRAM
SYNCHRO TO FREQUENCY FUEL FLOW CONVERTER

1.3 Figure 1 is a functional block diagram of the Synchro To Frequency Fuel Flow Converter. The synchro data entering the right side of the block diagram is converted from synchro data to a pulsating signal capable of sinking current only, and requiring a pull-up resistor. The output frequency is based on the input synchro value and the selection of SW1.

1.4 Specifications

Physical Specifications

Box Size (W x L x H)	3.0 x 5.25 x 2.125 (inches)
Weight	1.0 lb.

Electrical and Functional

Power Supply Voltage	14 to 28 VDC
Supply Current	150 mA at 28 VDC
Protection	Not internally fused

Inputs: (two for left and right engines)

Synchro Signals	11.8 Vrms
Reference Voltage	26 Vrms/400 Hz

Outputs: Frequency FF (two for left and right engines)

Square wave open collector signal, 50% duty cycle, adjustable to different transmitter

K-factor	10,000 - 80,000 ppg

Environmental (See Section 3.0)	RTCA/DO-160C
Operating Temperature	-30° to +55° C
Operating Altitude	-1,000 to 55,000 ft

Certification:	TSO-C44b

2.0 INSTALLATION PROCEDURE

2.1 Unpacking and Inspecting Equipment

2.1.1 Physical Inspection

Before unpacking the unit, look for any obvious damages which may have occurred during shipping. If damage has occurred immediately notify the shipping company. Save the shipping container and packaging material should it become necessary for you to ship the unit or for extended storage.

2.1.2 Electrical Inspection

Inspect all of the input/output connectors to assure that none of the pins were damaged during shipment. No electrical testing is performed prior to installation.

2.1.3 Packing List

Verify you have received the items identified in the attached parts list in section 3.

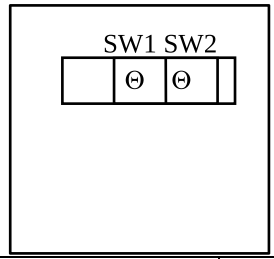
2.2 Mounting

The converter may be mounted in horizontal position on a rigid surface. Avoid locations where the unit could be exposed to hot air, cold air, deicing fluids or water. The converter has to be installed in a temperature-controlled environment. Fasten the mounting tray provided in the Install Kit to the aircraft. Use screws, with locking type washers, and nuts to secure against vibration. Attach the unit on the tray with the knurled knob after switch settings and electrical connections are done.

The conditions and test 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. The article may be installed only if performed under 14 CRF part 43 or the applicable airworthiness requirements.

2.3 Switch Settings

The applicable FF transmitter and its corresponding switch settings are shown in the following table. Set switches according to the transmitter P/N and K- factor used in the system. Remark the switch setting on the provided label and stick it on the can, over the switch hole.



Settings for use with Shadin Fuel Management Systems

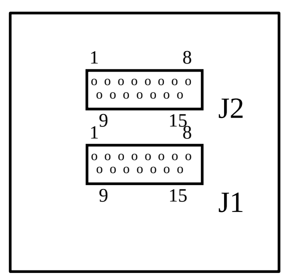
SW1	SW2	TRANSMITTER	INDICATOR	K-FACTOR	Used On
5	0	99251-9133-25B1	25122-B25A-2-A2 357-1211-9009 100-384073-1 2514-B25A-3-A3 357-1818-2001	42,000 ppg, FF=(50-520) pph	90/100 Series Twin Otter
C	8	99251-9136-81-C1	100-384081-1 101-384009-1 357-1212-0053	42,000 ppg, FF=(50-650) pph	C12 B200

Settings for use with GNS-XLS FMS

SW1	SW2	TRANSMITTER	INDICATOR	K-FACTOR	Used On
E	0	9133-25B1	25122-B25A-2-A2	26,256 ppg, FF=(50-520) pph	90/100 Series
Notes: - Frequency Scaling set for .92 HZ/PPH/HR (Aero Systems) on GNS-XLS. Frequency outputs must be attached to pull-up pins 3 & 4 (see installation Wiring)					

2.4 Electrical Connections

Use 15-pins D-sub connectors provided in the installation kit to make a wiring harness. Refer to the installation drawings, # 4005-A44. Use Teflon insulated stranded 22 AWG wires for harness.



2.4 (Cont.) Troubleshooting suggestions:

Problem	Reason & Corrective Action
Converter 180° off of Synchro Indicator	H & C Reversed. Can be Corrected by Setting SW2 from 0 to 8 or 8 to 0 (reversing). Also can be corrected in wiring harness.
Converter indicates flow moving in opposite direction from Synchro Indicator (decreasing when actually increasing)	X and Y reversed and must be corrected in the wiring harness.

2.4.1 Connection to the Power Supply +28VDC.

FF Converter J2:1 to	+28 VDC Power In, across the 1A circuit breaker.
FF Converter J2:9 to	Power GND.

2.4.2 Connection to the Magnesyn Signals

LEFT ENGINE FF	RIGHT ENGINE FF	SIGNAL
FF Converter J1: 1	FF Converter J1: 7	Hot (Ref. 26V, 400Hz)
FF Converter J1: 2	FF Converter J1: 8	Y Synchro Signal
FF Converter J1: 9	FF Converter J1:15	X Synchro Signal
FF Converter J1: 10	FF Converter J1: 14	Cold (Ref. 26V, 400Hz)

Use shielded cable with four 22 AWG conductors, for left and right synchro signals. Terminate the shield at the converter side only.

2.4.3 Connection to the System

FF Converter J1:11	Left Frequency FF Output
FF Converter J1:12	Right Frequency FF output
FF Converter J1:13	GND, Frequency FF output

Use shielded three 22 AWG conductors, with the shield terminated at the Airdata computer (or other user) side only. Output signals are open collector type, and they are closed with pull-up resistors of (10-47) kΩ on the receiver side.

GNS-XLS Installation requires the addition of pull-up resistors from the converter. These are provided on separate I/O pins (See Installation Wiring).

FF Converter J1: 3	5V pull-up
FF Converter J1: 4	5V Pull-up

3.0 ENVIRONMENTAL QUALIFICATION FORM

Page 1 of 2

NOMENCLATURE: Synchro to Frequency FF Converter
TYPE/MODEL/PART NO: 930502-04 **TSO NUMBER:** C44b
MANUFACTURER'S SPECIFICATION AND/OR OTHER APPLICABLE SPECIFICATION:

Report 4005G-04
MANUFACTURER: Shadin Avionics
ADDRESS: 6831 Oxford Street, St. Louis Park, Minnesota 55426-4412

CONDITIONS	**SECTION**	**DESCRIPTION OF TESTS CONDUCTED**
Temperature and Altitude	4.0	Equipment tested to Category F1.
Low Temperature	4.5.1	Low operating Temperature of -30°C
High Temperature	4.5.2 & 4.5.3	
Altitude	4.6.1	
Decompression	4.6.2	
Overpressure	4.6.3	
Temperature Variation	5.0	Identified as Category X. Not tested.
Humidity	6.0	Tested to Category A.
Shock	7.0	Not tested.
Operational	7.2	
Crash Safety	7.3.1 & 7.3.2.2	
Vibration	8.0	Tested to Category M,N
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.

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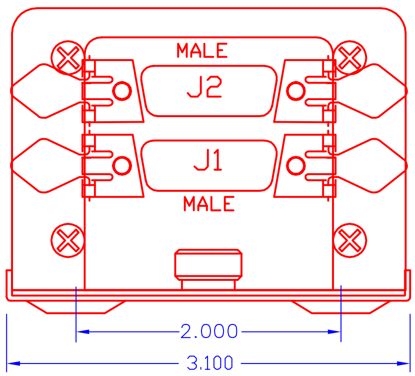
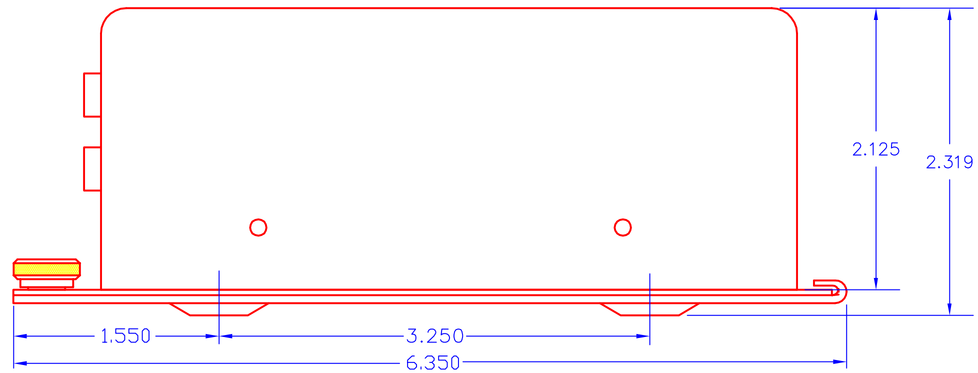
NOMENCLATURE: Synchro to Frequency FF Converter
TYPE/MODEL/PART NO: 930502-04 **TSO NUMBER:** C44b

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. Paragraph 16.5.2.1 only
Voltage Spike	17.0	Identified as Category X. Not tested.
Audio Frequency Susceptibility	18.0	Identified as Category X. Not tested.
Induced Signal Susceptibility	19.0	Identified as Category X. Not tested.
Radio Frequency Susceptibility	20.0	Identified as Category X. Not tested.
Radio Frequency Emission	21.0	Tested to Category Z.
Lightning Induced Transient Susceptibility	22.0	Identified as Category X. Not tested.
Lightning Direct Effects Test	23.0	Identified as Category X. Not tested.
Icing	24.0	Identified as Category X. Not tested.

SECTION 4.0

INSTALLATION DRAWINGS AND INSTALL KIT PARTS LISTS





J2

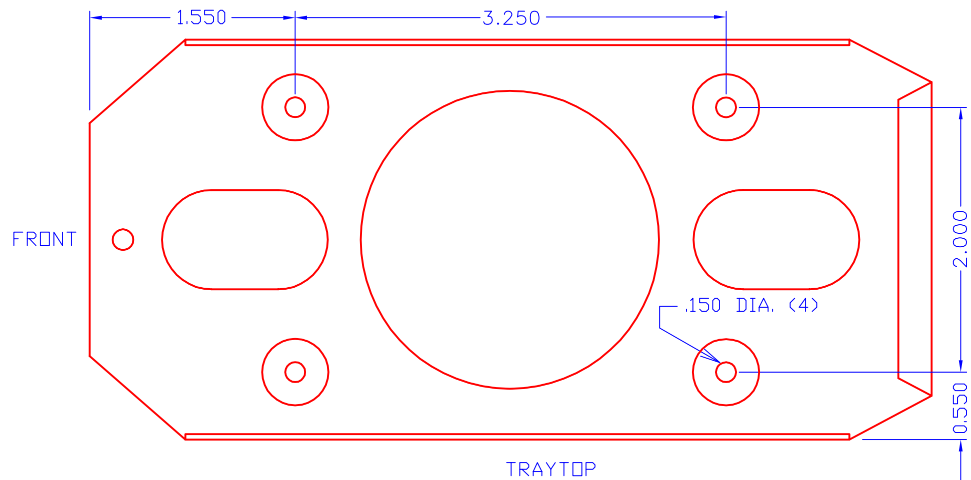
POWER IN & COMM.

PIN#	FUNCTION	
1.	+28V DC POWER IN	
9.	POWER GND	
3.	RX+ RS-422	FOR TEST ONLY
4.	RX- RS-422	
11.	TX+ RS-422	
12.	TX- RS-422	
5.	RX1 RS-232	
6.	TX1 RS-232	
13.	TX2 RS-232	
15.	RX2 RS-232	
14.	SIGNAL GND	
7.	RESERVED	
8.	RESERVED	
2.	N.C.	
10.	N.C.	

J1

SYNCHRO TO FREQ. FF. CONV.

PIN#	FUNCTION	
1.	H LEFT SYNCHRO F.F. IN	
2.	Y LEFT SYNCHRO F.F. IN	
9.	X LEFT SYNCHRO F.F. IN	
10.	C LEFT SYNCHRO F.F. IN	
7.	H RIGHT SYNCHRO F.F. IN	
8.	Y RIGHT SYNCHRO F.F. IN	
15.	X RIGHT SYNCHRO F.F. IN	
14.	C RIGHT SYNCHRO F.F. IN	
11.	LEFT FREQ. F.F. OUT	
12.	RIGHT FREQ. F.F OUT	
13.	GND, FREQ. F.F. OUT	
3.	5V PULL-UP	FOR GNS-XLS INSTALLATION ONLY
4.	5V PULL-UP	
5.	N.C.	
6.	N.C.	



ECO #	REV.	DATE	BY	APP'D	DESCRIPTION
9904/035	B	5/6/99	PAB	PG	TRAY DIMS REPRESENTED TRAY P/N 542801 REV –
9901/007	A	1/14/98	DMD	BM	ADD PULL-UP PINOUT
9804/019	–	4/15/98	DMD	VK	BASELINE RELEASE

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES
TOLERANCES:
±.015

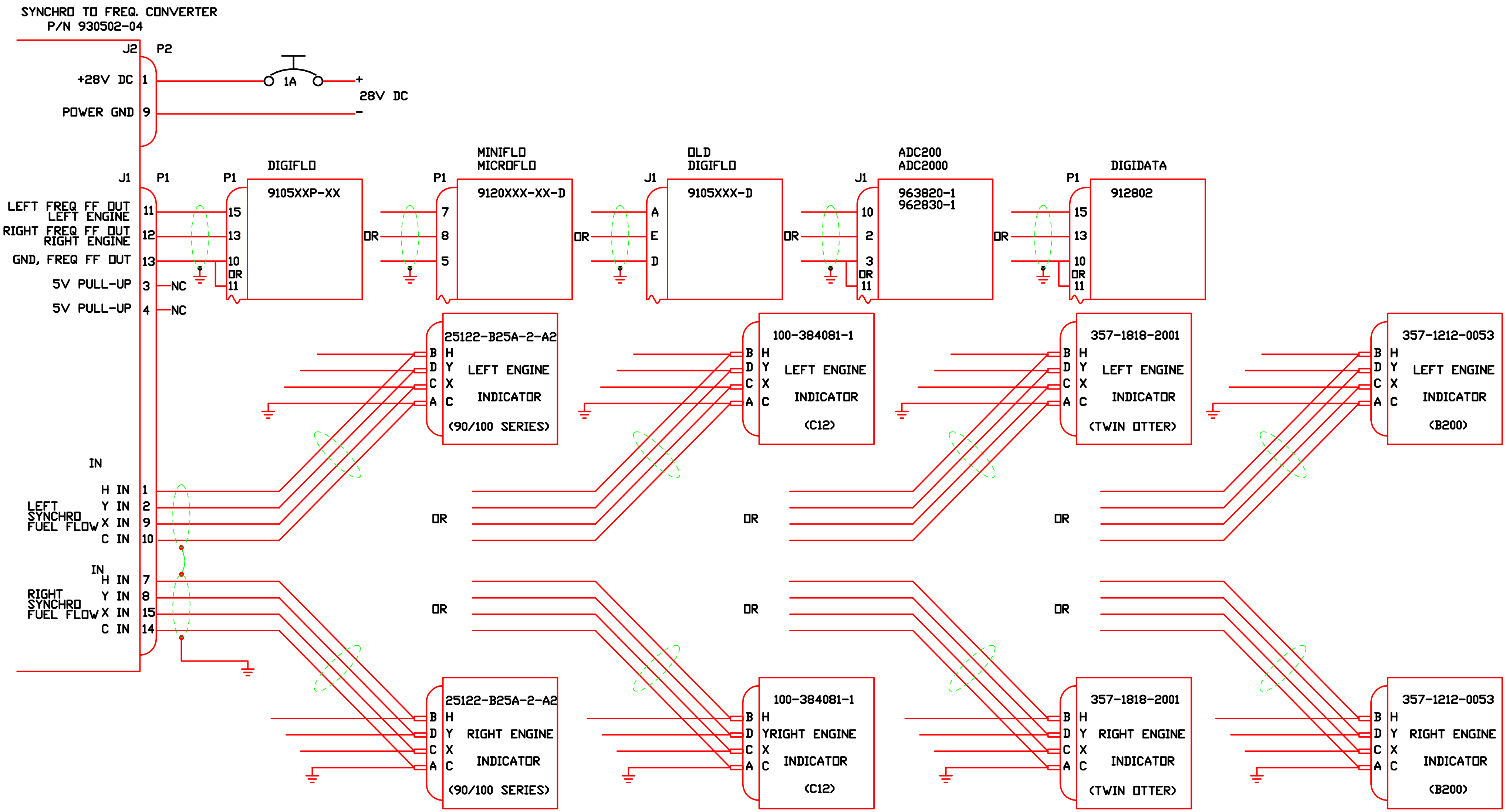
DO NOT SCALE

DRAWING DATE 4/15/98
DRAFTER DMD
APPROVED VK
FILE NAME 930502-04BJ.DWG
DIRECTORY 930502-04
SHEET 1 OF 1

SHADIN MINNEAPOLIS, MN 55426

INSTALLATION DWG, SYNCHRO TO FREQ. F.F CONVERTER

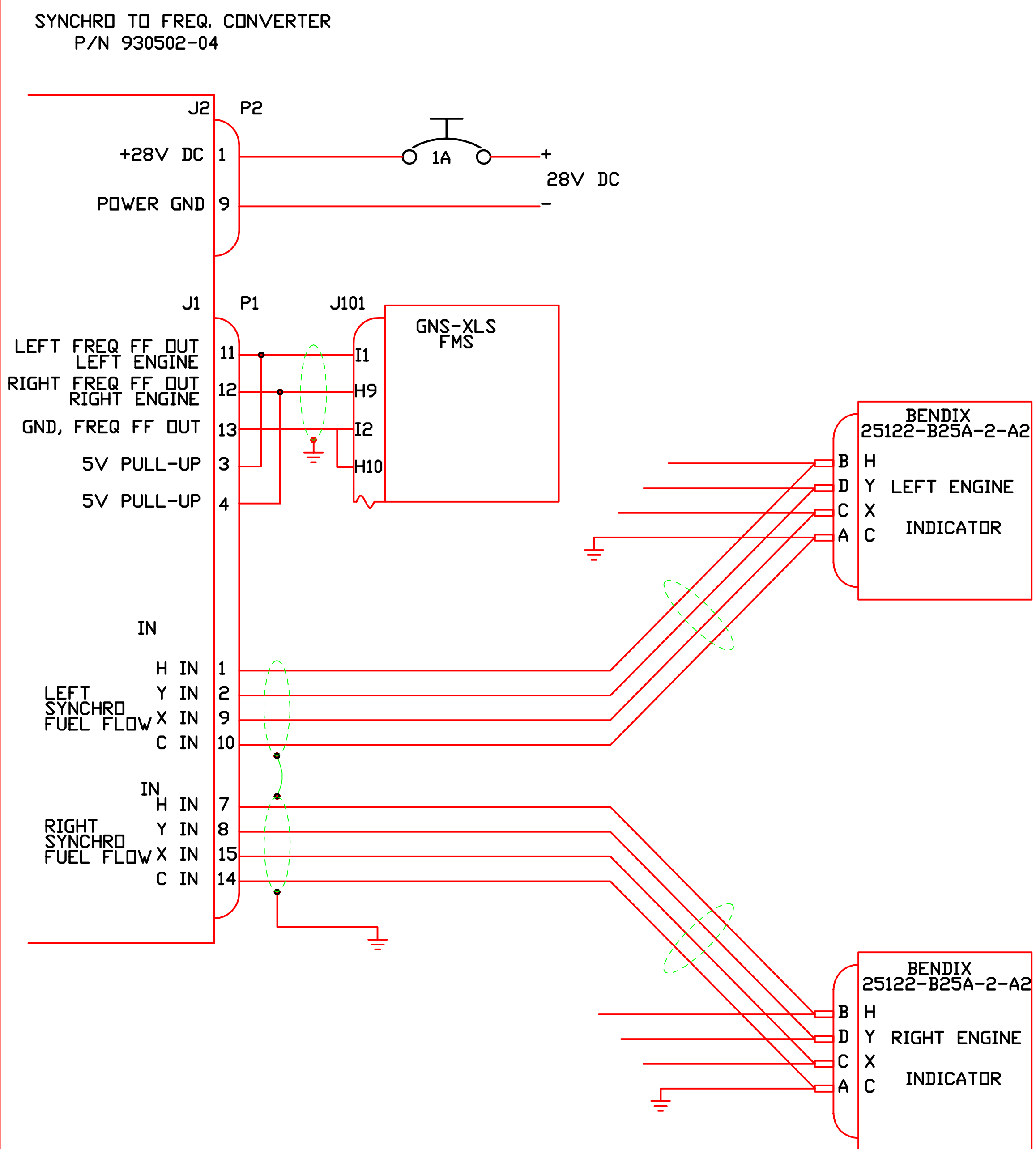
DRAWING NO. 4005-A44 | SIZE A | P/N 930502-04 | REV B



ECO #	REV.	DATE	BY	APP'D	DESCRIPTION
9911/014	A	11/30/99	LJM	BVM	CORRECTED PIN NUMBERS, ADDED TWIN OTTER & B200 INSTALLATIONS
9901/007	−	1-14-99	DMD	BVM	BASELINE RELEASE

DO NOT SCALE

DRAWING DATE 1/12/99	**SHADIN** MINNEAPOLIS, MN 55426
DRAFTER DMD	INSTALLATION WIRING, P/N 930502-04 WITH SHADIN FUEL MGMT SYSTEM
APPROVED BVM	
FILE NAME 4005-C05AJ.DWG	
DIRECTORY 4005	DRAWING NO. 4005-C05 — SIZE A — P/N − — REV A
SHEET 1 OF 1	



DRAWING DATE 1/12/99	***SHADIN*** MINNEAPOLIS, MN 55426
DRAFTER DMD	INSTALLATION WIRING, P/N 930502-04 WITH GNS-XLS FMS
APPROVED BVM	
FILE NAME 4005-C06AJ.DWG	
DIRECTORY 4005	DRAWING NO. 4005-C06 · SIZE A · P/N - · REV A
SHEET 1 OF 1	

ECO #	REV.	DATE	BY	APP'D	DESCRIPTION
9911/014	A	11/30/99	LJM	BVM	CORRECTED WIRING & PIN OUT
9901/007	-	1-14-99	DMD	BVM	BASELINE RELEASE

DO NOT SCALE

Report: 4005G-04
ECO Date: February 28, 2006
Rev: B
Sec.: IX

ECO # 0602/039
Release date: 4/7/2006
Approved: RJW

PARTS LIST

Part #: **IK0502**

Drawing #s: n/a

Description: **INSTALL KIT, TWO 15 PIN FEM D-SUB**

FN	P/N	QTY.	DESCRIPTION	MFG.	MFG.#	DESIGNATION	COMMENTS
5	230019H-1	4	SPRING LATCH CLIP	SHA	4028-074		
10	230036	2	CONN, 15 Pin D-Sub Socket	APH	17D-A15S		
15	230038	2	CONN, Hood 15 Pin D Sub	CIN	DA-24658		
20	511002	4	SCREW, 4-40 x ¼" Phil Pan HD SS	MCM	91772A106		
25	512007	4	NUT, 4-40 3/16 x 1/16 SS	AFT	HNSP188 04C000		
27	512101	4	RETAINER CLIP, "Bow Tie" Style	KEY	2061K		
30	541001	4	WASHER, #4 Split Lock SS	MCM	92147A005		
35	542801A	1	MOUNTING TRAY	SHA	4028-B05		
40	512014-1	1	KNURLED KNOB	SHA	4028-132		
43	753217	1	COMPUTER LABEL, 3.5"x 15/16"	AVR	4013		
45	PK1006	1	BAG, 5 x 9, 4 MIL				

28 items