

DWG NO
428-0282 SH **1**

REVISIONS				
LTR	DESCRIPTION	DATE	APVD	
AC	BW5175	ADDED -220	99-03-16	DAB
AD	BX1866	ADD -230	00-04-11	TEC
AE	BX3484	ADD -240, MISCELLANEOUS	01-01-09	TEC
AF	ECO-0014490	ADD -250/-310, MISCELLANEOUS	04-06-14	JMD

*10/6
Therrell
at 20077388
Lisa Colman*

STATEMENT A, UNLIMITED

1.0 SCOPE: THIS DRAWING DETAILS THE REQUIREMENTS FOR ETCHED, POLYTETRAFLUOROETHYLENE (PTFE) INSULATED ELECTRICAL HOOKUP WIRE IN ACCORDANCE WITH MIL-W-16878, EXCEPT THE SURFACE OF THE INSULATION IS ETCHED FOR BONDABILITY AND ADHESION OF MARKING.

THE PART NUMBER IS THE SEVEN (7) DIGIT DRAWING NUMBER PLUS THE APPLICABLE DASH NUMBER AS SPECIFIED IN TABLE I.

PARAGRAPH(S), TABLE(S), AND/OR FIGURE(S) FOLLOWED BY "I" INDICATE A CHANGE BY THE LATEST REVISION.

ALL SHEETS ARE THE SAME REVISION STATUS.

Authorized Vendors, Vendor Part Numbers, CAL Status, and CAGE or FSCM are as defined in the Rockwell Collins, Inc. database(s).

U/M: FEET (FT)		VENDOR ITEM DRAWING			
CONTRACT NO		ROCKWELL INTERNATIONAL CORPORATION COLLINS AVIONICS & COMMUNICATIONS DIVISION			
PREP J. ANDERSON 69-01-02		350 COLLINS ROAD N E CEDAR RAPIDS, IA 52498			
CHK J. SWANSON 69-01-02		WIRE, ELECTRICAL			
APVD J. HUDSON 69-01-02		SIZE A	CAGEC 13499	DWG NO 428-0282	REV AF
SCALE NONE			SHEET 1 OF 9		

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2.0 APPLICABLE DOCUMENTS: THE FOLLOWING DOCUMENTS OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BIDS FORM A PART OF THIS DRAWING TO THE EXTENT SPECIFIED HEREIN.

FEDERAL SPECIFICATIONS

TT-I-735

ISOPROPYL ALCOHOL

MILITARY SPECIFICATIONS

MIL-W-16878

WIRE, ELECTRICAL, INSULATED, GENERAL SPECIFICATION FOR

MIL-W-16878/4

WIRE, ELECTRICAL
POLYTETRAFLUOROETHYLENE (PTFE)
INSULATED, 200 DEG C, 600 VOLTS, EXTRUDED INSULATION

MIL-W-16878/5

WIRE, ELECTRICAL,
POLYTETRAFLUOROETHYLENE (PTFE)
INSULATED, 1000 VOLTS EXTRUDED INSULATION

MIL-W-16878/6

WIRE, ELECTRICAL,
POLYTETRAFLUOROETHYLENE (PTFE)
INSULATED, 250 VOLTS EXTRUDED INSULATION

OTHER

580-5321-001

ROCKWELL INTERNATIONAL PROCESS
DRAWING, MODULE ENCAPSULATION

839-0521

ETCHED TEFLON WIRE ADHESION PROCEDURE

3.0 REQUIREMENTS:

3.1 ELECTRICAL:

3.1.1 FOR -010 THRU -050, -090 THRU -230, AND -250 THRU -310: SHALL BE IN ACCORDANCE WITH MIL-W-16878/4.

3.1.2 FOR -060 THRU -080: SHALL BE IN ACCORDANCE WITH MIL-W-16878/6.

3.1.3 FOR -240: SHALL BE IN ACCORDANCE WITH MIL-W-16878/5.

3.2 MECHANICAL:

3.2.1 FOR -010 THRU -050, -090 THRU -230, AND -250 THRU -310: SHALL BE IN ACCORDANCE WITH MIL-W-16878/4.

3.2.2 FOR -060 THRU -080: SHALL BE IN ACCORDANCE WITH MIL-W-16878/6.

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AF

SCALE NONE

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- 3.2.3 FOR -240: SHALL BE IN ACCORDANCE WITH MIL-W-16878/5.
- 3.2.4 CONDUCTOR: SILVER COATED COPPER (SOLID) FOR -010 THROUGH -190 AND -210 THROUGH -310. SILVER COATED HIGH STRENGTH COPPER ALLOY (STRANDED) FOR -200. BOTH IN ACCORDANCE WITH MIL-W-16878.
- 3.2.4.1 CONDUCTOR AMERICAN WIRE GAGE (AWG) SIZE: SEE TABLE I.
- 3.2.4.2 CONDUCTOR STRANDING: SEE TABLE I.
- 3.2.5 INSULATION: POLYTETRAFLUOROETHYLENE IN ACCORDANCE WITH MIL-W-16878.
- 3.2.5.1 INSULATION DIAMETER: SEE TABLE I.
- 3.2.5.2 INSULATION COLOR: SEE TABLE I.
- 3.2.6 ETCHING: MEDIUM ETCH WITH A SODIUM ETCHING PROCESS.
- 3.2.6.1 ETCHED INSULATION SHALL HAVE A UNIFORM, DULL COLOR. SURFACES OF TREATED PARTS SHALL BE UNIFORM IN TEXTURE AND APPEARANCE. THERE SHALL BE NO BARE AREAS WHERE ETCHING WAS INTENDED.
- 3.2.7 BOND STRENGTH: 30 POUNDS PER SQUARE INCH (PSI) MINIMUM WHEN TESTED IN ACCORDANCE WITH 4.1.1.
- 3.2.8 MARKING: EACH REEL OR PACKAGE SHALL BE PERMANENTLY AND LEGIBLY MARKED WITH THE MANUFACTURER'S NAME OR TRADEMARK OR CAGE CODE AND MANUFACTURER'S PART NUMBER AS A MINIMUM.
- 3.3 ENVIRONMENTAL: THE UNETCHED WIRE SHALL CONFORM TO THE ENVIRONMENTAL REQUIREMENTS OF MIL-W-16878/4 AND MIL-W-16878/6.
- 3.3.1 TEMPERATURE RANGE: -65°C TO 200°C.
- 3.4 SHELF LIFE: SHELF LIFE SHALL BE 3 YEARS AFTER RECEIPT AT THE PROCURING ACTIVITY WHEN STORED UNOPENED AT 21-27°C, 30% - 70% RELATIVE HUMIDITY, AND IN A CLEAN, DARK PLACE. MATERIAL WHICH EXCEEDS MANUFACTURER'S SHELF LIFE SHALL NOT BE USED UNLESS RECERTIFIED. (SEE 6.2.)

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SCALE NONE		SHEET 3	

4.0 QUALITY ASSURANCE PROVISIONS: IN ACCORDANCE WITH MIL-W-16878.

4.1 QUALITY CONFORMANCE INSPECTION: THE SUPPLIERS SHALL BE RESPONSIBLE FOR THOSE IN-PROCESS CONTROLS AND INSPECTIONS NECESSARY TO SUPPLY A PRODUCT CONSISTENTLY CONFORMING TO THE REQUIREMENTS OF MIL-W-16878 AND THIS DRAWING. AS A MINIMUM, THE SUPPLIERS SHALL PERFORM ON EACH AND EVERY LOT INSPECTION VERIFYING CONFORMANCE TO THE REQUIREMENTS OF MIL-W-16878 USING THE TEST METHODS OUTLINED IN MIL-W-16878. A COPY OF THE TEST REPORT SHALL ACCOMPANY EACH LOT.

4.1.1 THE PROCURING ACTIVITY RESERVES THE RIGHT TO INSPECT FOR ANY OF THE REQUIREMENTS OF THIS DRAWING TO DETERMINE THE ACCEPTABILITY OF A LOT AND TO REJECT NONCONFORMING MATERIAL, OR LOTS CONTAINING NONCONFORMING MATERIAL, ON THE BASIS OF TEST RESULTS SO OBTAINED.

4.2 ADHESION INSPECTION: IN ADDITION TO THE QUALITY CONFORMANCE INSPECTION OF MIL-W-16878, THE FOLLOWING TEST SHALL BE PERFORMED ON EACH LOT OF WIRE ACQUIRED UNDER THIS DRAWING.

4.2.1 THREE RANDOM SAMPLES APPROXIMATELY 6 INCHES IN LENGTH, OF EACH LOT TO BE TESTED SHALL BE USED. THE ENDS TO BE POTTED SHALL BE CLEANED WITH ISOPROPYL ALCOHOL IN ACCORDANCE WITH TT-I-735 OR MICROCARE PROCLEAN (REFERENCE: ROCKWELL COLLINS PART NUMBER 005-2892-010). A POTTING APPARATUS CONSISTING OF THREE MINIATURE CUPS, WITH A MEANS OF VERTICALLY SUPPORTING THE SAMPLES INTO MID-SECTION OF THE CUPS, SHALL BE USED (SEE FIGURE 1).

4.2.2 THE POTTING COMPOUND SHALL BE PART NUMBER 30016-11 OF POLY-FREEZE INC., OR RTV 630, (ROCKWELL COLLINS PART NUMBER 821-0494-010) OR EQUIVALENT.

4.2.2.1 PREPARATION OF POLY-FREEZE:

4.2.2.1.1 THE POTTING COMPOUND SHALL BE POURED INTO THE CUPS TO A DEPTH OF ONE QUARTER INCH, AND CURED FIRST FOR ONE HOUR AT 65.6°C AND THEN AT 149°C FOR EIGHT HOURS.

4.2.2.2 PREPARATION OF RTV 630:

4.2.2.2.1 COAT SAMPLE WITH SS-4120 (ROCKWELL COLLINS PART NUMBER 005-1579-010) AND LET IT DRY FOR 60 TO 80 MINUTES AT 25°C ±5°C.

THE POTTING COMPOUND SHALL BE POURED INTO THE CUPS TO A DEPTH OF ONE HALF INCH AND CURED FOR A MINIMUM OF 1 HOUR AT 100°C ±5°C UNTIL A SHORE A DUROMETER HARDNESS OF 50 IS MEASURED.

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SCALE NONE		SHEET 4	

4.2.3 MEASURE THE ADHESIVE STRENGTH OF THE BOND BY PULLING THE SAMPLE OUT OF THE POTTING MATERIAL IN A TENSILE TEST MACHINE AT A CROSS HEAD SPEED OF 1 INCH PER MINUTE APPROXIMATELY AND RECORD THE MAXIMUM FORCE INDICATED AT WHICH THE INSULATION BREAKS LOOSE FROM THE POTTING COMPOUND.

4.2.3 (CONT'D):

THE BOND STRENGTH IN POUNDS PER SQUARE INCH (PSI) SHALL BE CALCULATED BY THE FOLLOWING FORMULA AND THE RESULTS AVERAGED.

$$\text{BOND STRENGTH} = \frac{A}{B \times C \times D}$$

A = FORCE AT POINT OF FAILURE, POUNDS

B = 3.14

C = INSULATION OUTSIDE DIAMETER, INCH

D = POTTING DEPTH OF SAMPLE, INCH

THE MINIMUM BOND STRENGTH SHALL BE 30 PSI.

4.2.4 ALTERNATE ADHESION PULL TEST: THE WIRE SHALL MEET A 9.5 LBS MINIMUM PULL STRENGTH WHEN TESTED IN ACCORDANCE WITH RCPN 839-0521-001. IF WIRE BREAKS BEFORE REACHING THE 9.5 LBS POINT, THIS IS AN INDICATION THAT THE ADHESION IS SUFFICIENTLY GREATER THAN THE STRENGTH OF THE WIRE, AND THEREFORE ACCEPTABLE.

4.3 CORROSION INSPECTION: IN ADDITION TO PERFORMING THE QUALITY CONFORMANCE INSPECTIONS REQUIRED BY MIL-W-16878, IF THE SUPPLIER USED A WATER BASED COOLANT PROCESS, THEY SHALL INSPECT EACH NEW LOT FOR ANY VISUAL SIGN OF RED PLAGUE CORROSION BY STRIPPING INSULATION FROM 0.5 INCHES OF WIRE. THE PROCURING ACTIVITY MAY PERFORM A VISUAL INSPECTION FOR RED PLAGUE AS A PART OF THE SHELF LIFE EXTENSION TEST. MATERIAL WHICH SHOWS ANY SIGN OF RED PLAGUE SHALL BE SUBJECT TO NONCONFORMING MATERIAL REVIEW PROCEDURES.

5.0 PREPARATION FOR DELIVERY: THE ETCHED SURFACE OF TREATED INSULATION CAN BE EASILY DAMAGED. CARE SHALL BE TAKEN SO AS TO NOT RUB, SCRUB, OR BRUSH THE ETCHED SURFACE EITHER BY OPERATOR HANDLING OR PARTS IN CONTACT WITH OTHER PARTS. THE PARTS SHALL BE PACKAGED IN A MANNER THAT WILL AFFORD ADEQUATE PROTECTION AGAINST CONTAMINATION, CORROSION, DETERIORATION AND PHYSICAL DAMAGE DURING SHIPMENT AND STORAGE. PARTS SHALL BE PACKAGED SO THEY WILL BE EASILY ACCESSIBLE WITHOUT DAMAGING THE PARTS.

5.1 MANUFACTURER SHALL PACKAGE AND STORE THE WIRE IN OPAQUE BAGS AS A MINIMUM.

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SCALE NONE		SHEET 5	

- 6.0 NOTES: THE INFORMATION CONTAINED IN THIS SECTION IS FOR REFERENCE ONLY.
- 6.1 MANUFACTURER'S CERTIFY SHELF LIFE FOR WIRE EXPOSED TO NORMAL LIGHTING CONDITIONS FOR APPROXIMATELY 30 DAYS. SHELF LIFE FOR WIRE STORED OUT OF UV LIGHT IS 3 YEARS.
- 6.2 SHELF LIFE EXTENSION: MATERIAL SHALL BE RECERTIFIED FOR SHELF LIFE EXTENSION BY TESTING TO MEET THE REQUIREMENTS OF 4.2 AND SUBSEQUENT APPROVAL BY ROCKWELL/COLLINS COMPONENT APPLICATION ENGINEERING.
- 6.3 EQUIVALENT REPLACEMENTS:
- 6.3.1 RCPN 422-2400-100 MAY BE USED IN PLACE OF THE DASH -060 WIRE FOR PLANAR REWORK PROVIDED IT IS ETCHED IN ACCORDANCE WITH RCPN 580-5029-000.
- 6.3.2 RCPN 428-4825-000 MAY BE USED IN PLACE OF THE DASH -210 WIRE FOR PLANAR REWORK PROVIDED IT IS ETCHED IN ACCORDANCE WITH RCPN 580-5029-000.
- 6.3.3 RCPN 439-0035-000 MAY BE USED IN PLACE OF THE DASH -240 WIRE FOR PLANAR REWORK PROVIDED IT IS ETCHED IN ACCORDANCE WITH RCPN 580-5029-000.
- 6.4 MILITARY PART NUMBER FOR UNETCHED WIRE: (FOR REFERENCE ONLY):

-010 - M16878/4BFA1	-160 - M16878/4BCA5
-020 - M16878/4BEA1	-170 - M16878/4BBA5
-030 - M16878/4BDA1	-180 - M16878/4BAA5
-040 - M16878/4BCA1	-190 - M16878/4BAA2
-050 - M16878/4BBA1	-200 - M16878/4DBB5
-060 - M16878/6BBA9	-210 - M16878/4BGA9
-070 - M16878/6BBA1	-220 - M16878/4BFB0
-080 - M16878/6BBA0	-230 - M16878/4BHA2
-090 - M16878/4BBA2	-240 - M16878/5BFB3
-100 - M16878/4BCA2	-250 - M16878/4BCA0
-110 - M16878/4BDA2	-260 - M16878/4BCA3
-120 - M16878/4BFA2	-270 - M16878/4BCA4
-130 - M16878/4BFA5	-280 - M16878/4BCA6
-140 - M16878/4BEA5	-290 - M16878/4BCA7
-150 - M16878/4BDA5	-300 - M16878/4BCA8
	-310 - M16878/4BCA9

SIZE
ACAGEC
13499

DWG NO

428-0282REV
AF

SCALE NONE

SHEET **6**

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6.5 POLY-FREEZE POTTING COMPOUND CAN BE PURCHASED FROM:

POLY-FREEZE INC.
16509 ARMINTA ST.
VAN NUYS, CA 91406
CAGE CODE: 56724
PHONE: 818-781-5600

6.6 FOR SIMILAR COMPONENTS SEE RCPN 422-1918, 422-2164, 858-0015,
858-0018, AND 858-0021.

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SCALE NONE		SHEET 7	

TABLE I
 ROCKWELL COLLINS DASH NUMBER, CONDUCTOR SIZE, INSULATION COLOR,
 INSULATION OUTSIDE DIAMETER, STRANDING

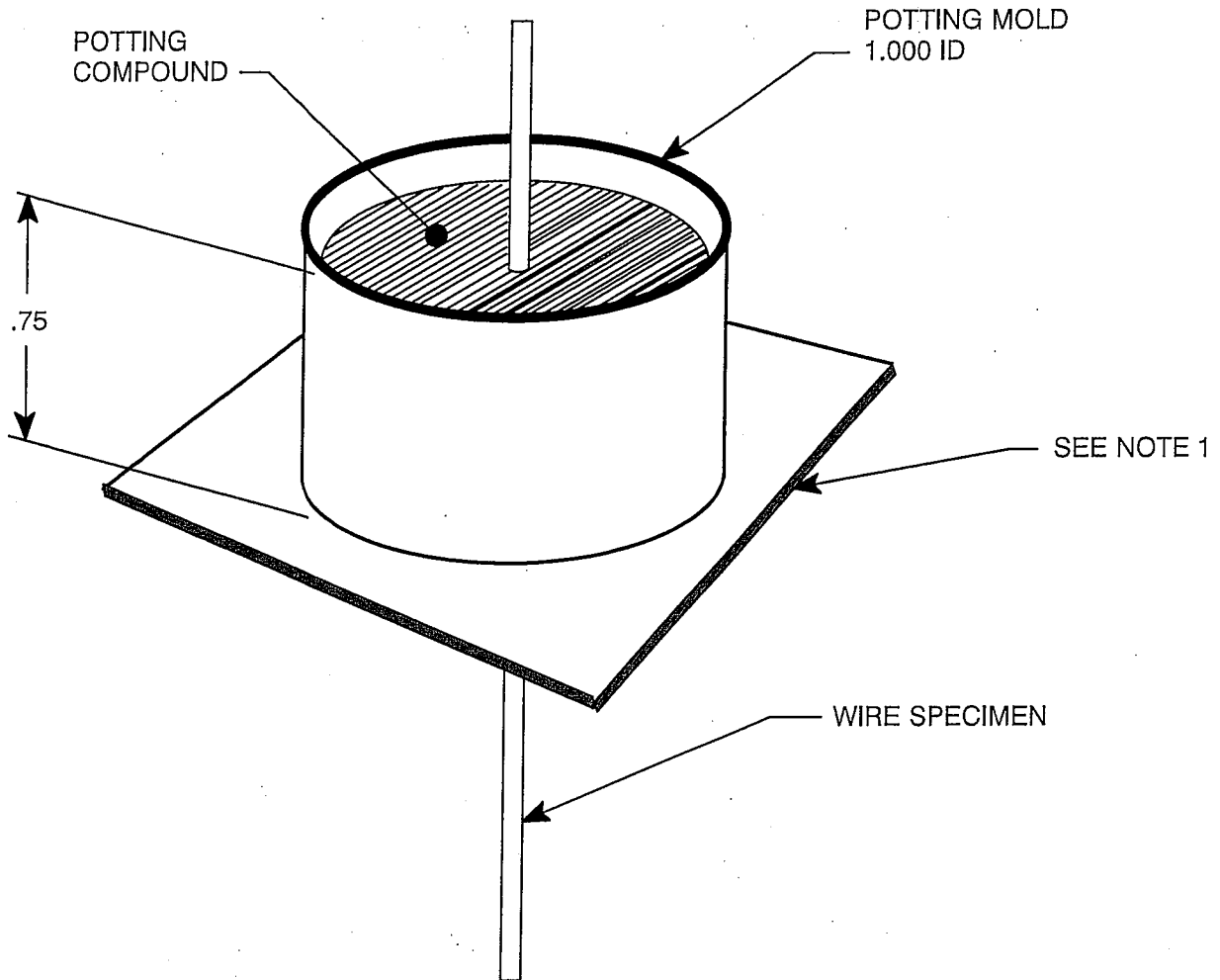
DASH NO.	CONDUCTOR SIZE	INSULATION COLOR 1/	INSULATION OUTSIDE DIAMETER (IN.)		STRANDING
			(MAX)	(MIN)	
010	22 AWG	BROWN	.049	.041	1 X 22
020	24 AWG	BROWN	.044	.036	1 X 24
030	26 AWG	BROWN	.040	.032	1 X 26
040	28 AWG	BROWN	.037	.029	1 X 28
050	30 AWG	BROWN	.034	.026	1 X 30
060	30 AWG	WHITE	.024	.020	1 X 30
070	30 AWG	BROWN	.024	.020	1 X 30
080	30 AWG	BLACK	.024	.020	1 X 30
090	30 AWG	RED	.034	.026	1 X 30
100	28 AWG	RED	.037	.029	1 X 28
110	26 AWG	RED	.040	.032	1 X 26
120	22 AWG	RED	.049	.041	1 X 22
130	22 AWG	GREEN	.049	.041	1 X 22
140	24 AWG	GREEN	.044	.036	1 X 24
150	26 AWG	GREEN	.040	.032	1 X 26
160	28 AWG	GREEN	.037	.029	1 X 28
170	30 AWG	GREEN	.034	.026	1 X 30
180	32 AWG	GREEN	.033	.025	1 X 32
190	32 AWG	RED	.033	.025	1 X 32
200 2/	30 AWG	GREEN	.036	.028	7 X 38
210	20 AWG	WHITE	.048	.056	1 X 20
220	22 AWG	BLACK	.054	.046	7 X 30
230	18 AWG	RED	.066	.056	1 X 18
240	22 AWG	ORANGE	.064	.051	7 X 30
250	28 AWG	BLACK	.037	.029	1 X 28
260	28 AWG	ORANGE	.037	.029	1 X 28
270	28 AWG	YELLOW	.037	.029	1 X 28
280	28 AWG	BLUE	.037	.029	1 X 28
290	28 AWG	PURPLE	.037	.029	1 X 28
300	28 AWG	GRAY	.037	.029	1 X 28
310	28 AWG	WHITE	.037	.029	1 X 28

NOTE 1/ TREATED WIRE SURFACE SHALL HAVE A DULL SURFACE APPEARANCE WITH A SLIGHT DARKENING OF ITS ORIGINAL COLOR.

2/ NOT APPROPRIATE FOR REPAIR AND/OR MODIFICATION OF CIRCUIT CARD ASSEMBLIES BECAUSE OF STRANDING. MIL-C-28809 REQUIRES WIRES FOR THESE APPLICATIONS BE SOLID CONDUCTOR WIRES.

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SCALE NONE		SHEET 8	

NOTES: 1. 1.50 X 1.50 X .10 METAL PLATE WITH HOLE IN CENTER EQUAL TO WIRE O. D. PLUS .02 APPROX.



DIMENSIONS
FIGURE 1

UNLESS OTHERWISE SPECIFIED DIM ARE:
IN INCHES: TOL ON: ANGLES: $\pm 1.0^\circ$
DECIMALS: .XX = $\pm .02$. .XXX = $\pm .008$

SIZE A	CAGEC 13499	DWG NO 428-0282	REV AF
SCALE NONE		SHEET 9	