Formula Arcobaleno

Build book and instruction manual

From the workbench of:
Date:

SERVICE CHECK

CAR No. ______ S/N: ______ TOTAL TIME: ______ DATE: ______

ENGINE

1. CHECK COMPARTMENT FOR CLEANLINESS AND LEAKS. ELECTRICAL WIRING AND HOSES FOR SECURITY, CHAFING, LEAKS, KINKS AND OTHER DAMAGE

2. CHECK ENGINE AND DRIVE TRAIN MOUNT FOR SECURITY, CHAFING, LOOSE OR MISSING FASTENERS

3. CHECK ENGINE EXHAUST SYSTEM FOR LEAKAGE, CRACKS, DISTORTION SECURITY, LOOSE OR MISSING FASTENERS.

4. CHECK DRIVE CHAIN FOR PROPER TENSION; CHAIN AND SPROCKETS FOR WEAR AND DAMAGE; LUBRICATE CHAIN AS REQUIRED

5. CHECK DRIVE TRAIN CONTROLS FOR PROPER FUNCTION, FREEDOM OF MOVEMENT

6. CHECK INTAKE AIR FILTERS FOR CLEANLINESS AND CONTAMINATION

7. CHECK ENGINE OIL AND COOLANT QUANTITY

ENGINE OIL: 300 V COMP. MOTUL 100% SYNTHETIC (ESTER) 15W50 4T

OIL QUANTITY ADDED [l] OIL CHANGE: [ ]

COOLANT ANTIFREEZE ALUMINIUM COMPATIBLE NON CORROSIVE 50/50 WATER MIXTURE

COOLANT QUANTITY ADDED [l]

OIL FILTER CHANGE: [ ] AIR FILTER CHANGE: [ ]

From the workbench of:
Date:

BODY WORKS

1. CHECK ENTIRE BODY FOR DAMAGE, CRACKING, DISTORTION, SECURITY, LOOSE AND MISSING FASTENERS. CAR UNDERSIDE FOR DAMAGE, WINGS AND WINGLETS FOR DAMAGE, SECURITY OF MOUNTING AND PROPER POSITIONING.

SUSPENSION AND TIRES

1. CHECK TIRES FOR WEAR, CUTS, ABRASIONS, AND FLAT SPOTS. PROPER INFLATION:
FRONT 13.1 PSI: REAR 14.5 PSI:

2. CHECK BRAKES, DISCS AND PADS FOR WEAR, SECURITY, LEAKAGE. LINES FOR LEAKAGE, SECURITY AND CHAFING

3. CHECK SUSPENSION COMPONENTS FOR BENDS, NICKS, DISTORTION, BEARING WEAR, JAM NUTS FOR TIGHTNESS AND SECURITY.

COCKPIT

1. CLEAN AND VACUUM COCKPIT, CHECK CUSHIONS AND SAFETY HARNESS
2. CHECK STEERING FOR FREEDOM OF MOVEMENT, PLAY AND NORMAL TRAVEL AND RESPONSE - COMPONENTS FOR SECURITY

3. CHECK INSTRUMENTS AND PANEL FOR SECURITY OF MOUNTING, PROPER INDICATION, SWITCHES AND LIGHTS FOR PROPER FUNCTION AND INDICATION; FIRE EXTINGUISHER DISCHARGE PANEL / CONTROL FOR SECURITY AND FUNCTION

FORWARD COMPARTMENT - NOSE CONE

1. CHECK BATTERY FOR SECURITY OF MOUNTING, LEAKAGE, STATE OF CHARGE, DRAIN LINES AS APPLICABLE FOR KINKS AND DISCHARGE ABILITY

2. FIRE EXTINGUISHER BOTTLE FOR STATE OF CHARGE, SECURITY OF MOUNTING.

3. BRAKE AND CLUTCH RESERVOIRS FOR PROPER QUANTITY, CONTAMINATION, LINES, CONNECTIONS AND CYLINDERS FOR LEAKAGE AND SECURITY OF MOUNTING

4. CHECK PEDALS INCLUDING ACCELERATOR FOR FREEDOM OF MOVEMENT, PLAY, BRAKE BIAS FOR FREE AND PROPER FUNCTION

From the workbench of:
Date:

SIDE PODS

1. CHECK OIL AND COOLANT RADIATORS FOR OBSTRUCTION, SECURITY OF MOUNTING, CLEANLINESS, HOSES FOR LEAKS, KINKS, CHAFING ETC.

2. CHECK ECU FOR SECURITY OF MOUNTING, WIRING FOR SECURITY, CHAFING

3. CHECK FUEL PUMP, HOSES AND WIRING FOR SECURITY AND LEAKAGE

4. CHECK SIDEPOD FLOOR PANELS FOR DAMAGE, DISTORTION ETC.

ADDITIONAL MAINTENANCE ITEMS

ALL COWLINGS AND FAIRINGS RE-INSTALLED

ALL ITEMS COMPLETED - DATE: ____________ TOTAL TIME: ____________

CAR READY FOR SERVICE

MECHANIC: ____________________

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From the workbench of: TEST DRIVE
Date:

CAR OR S/N: ____________ DATE: ____________ DRIVER: ____________

AMBIENT CONDITIONS O.A.T. : ____________
P.X : ____________

F.O.B. START: ____________

TEST DRIVE - HANDLING PROBLEMS

BRAKING INSTABILITY

DARTING:

PLOUGH OR PUSH:

TENDENCY TO SPIN :

CORNER ENTRY

UNDERSTEER:

OVERSTEER :

MID CORNER

UNDERSTEER :

OVERSTEER :

CORNER EXIT

UNDERSTEER:

OVERSTEER :

SLOW RESPONSE IN TRANSIENT MANEUVERS:

DIFFERENT CHARACTEISTICS IN LEFT OR RIGHT CORNERS:

REMARKS:

TEST COMPLETED:

FOB AT FINISH: ELAPSED TIME:

NO. OF LAPS :

From the workbench of:
Date:

RELEASE FOR SERVICE

CAR NO: ________ SN: ________ DATE: ________

TIRE PRESSURE FRONT 13.1 PSI AFT 14.5 PSI

LEFT FRONT	RIGHT FRONT
LEFT REAR	RIGHT REAR

F.O.B: ________

UPLIFT : ________

FINAL F.O.B: ________

CLUTCH RESERVOIR: ________

OIL QUANTITY : ________

AFT BRAKE RESERVOIR : ________

COOLANT QUANTITY : ________

FWD BRAKE RESERVOIR : ________

MANUAL FIREEXTINGUISHER ARMED - SAFETY PIN PULLED : ________

ALL ITEMS COMPLETED

MECHANIC: ________

DATE: ________

TIME ________

From the workbench of:
Date:

TIRE TEMPERATURE

CAR NO. / S.N: ______ NO. OF LAPS: ______ DATE: ______

ELAPSED TIME: ______ AMBIENT CONDITIONS O.A.T. ______

DRIVER: ______ P.X ______

FRONT

OUTBD.	CENTRE	INBD.

INBD.	CENTRE	OUTBD.

REAR

OUTBD.	CENTRE	INBD.

INBD.	CENTRE	OUTBD.

From the workbench of: TECHNICAL DATA
Date:

CHASSIS: CHROME-MOLY STEEL WELDED TUBULAR CONSTRUCTION
WITH RIVETED AND GLUED ALUMINIUM PANELS.

SUSPENSION: FRONT UPRIGHT DAMPERS ACTUATED BY PUSH-PULL RODS
AFT HORIZONTAL DAMPERS PUSH-PULL ROD ACTUATED
(12 ADJUSTMENTS EA.)

BRAKES: FRONT: SOLID DISC Ø 270.00 M/M × T. 11.50 M/M
AFT: VENTILATED DISC Ø 240.00 × T. 21.50 M/M
CALIPERS 4 PISTONS EA.

ENGINE: YAMAHA YZF 1000 CC. 4 CYLINDER 4 STROKE. 5 VALVES PER CYL.
PRESSURE LUBRICATION. OIL RADIATOR AND WATER COOLED
4 BARREL MIKUNI CARBURETOR 38.00 M/M
MAX. POWER 148 H.P @ 10.000 RPM TQ 9.60 KGM @ 9000 RPM.
MAX. RPM 12000
IDLE RPM 1050 TO 1150
OIL PX: HOT 1100 RPM 12.25 PSI. 88 KPA
RELIEF VALVE SETTING 53 TO 65 PSI 370-460 KPA
BY PASS VALVE SETTING 26 TO 31 PSI 181-220 KPA
GEAR BOX: ORIGINAL YAMAHA 5 SPEED SEQUENTIAL
POWER TRAIN: CHAIN AND SPROCKET - 4 DIFFERENT COMBINATIONS AVAILABLE
FOR MAX. VELOCITY FROM 165 TO 230 KMH.
RATIOS 13/42 - 14/38 - 16/40 - 17/39

GEAR RATIO: COMPRESSION RATIO 11.5 : 1.0

1	36 : 14	2.571
2	32 : 18	1.778
3	29 : 21	1.381
4	27 : 23	1.174
5	28 : 27	1.037

OIL TEMP. NORMAL OPE. O.O.T 60-70°C RACE CONDITION 120°C
WATER E.O.T. 80-85°C
FUEL: UNLEADED 95 OCTANE TANK CAPACITY [redacted] l 15 l
OIL: MOTUL 300V COMP. 100% SYNT. SAE 15W30 4T
OIL SYSTEM CAPACITY: 5.3 l

From the workbench of:
Date:

SPECIFICS. ENGINE MOD. NO: YZF 10CG1

ENGINE OIL: BARDAHL XTC SYNTHETIC (4 STROKE SPECIAL OIL)
CAPACITY INCL: FILTER, RADIATOR & HOSES 5.3 ℓ
(MOTUL 300V COMP. 100% SYNT. (ESTER) SAE 15W50 4T) OIL PRESENTLY IN USE.

FUEL: UNLEADED GASOLINE 95 OCTANE.
COMP. RATIO 11.5 TO 1.0 FUEL Px 2.8 PSI - 20 KPA - 0.2 KG/CM²

GLYCOL MIX 50/50

CHECKING OIL PROCEDURE: RUN 5 MIN - SHUT DOWN AND LET SIT 2 TO 3 MIN. OIL LEVEL SHOULD BE AT TOP OF WINDOW SYSTEM CAPACITY 5.3 ℓ

NORMAL RACE OPERATING TEMP. OIL = 120°C
WATER = 80°-85°C
(WARNING SET AT MXL 130°C 90°C)

NORMAL OPERATING O.I.T. 60°C TO 70°C

OIL PX OIL Px HOT - RPM 1100 12.25 PSI (88 KPA .88 KG/CM²)
MAX AT HIGH RPM - RELIEF VALVE SETTING 53 TO 65 PSI (370-460 KPA - 3.7 TO 4.6 KG/CM²
BY-PASS VALVE SETTING 26 TO 31 PSI 181-220 KPA 1.81 TO 2.2 KG/CM²

IDLE SPEED 1050 TO 1150 RPM GEAR RATIO

1 -	36:14	2.571
2 -	32:18	1.778
3 -	29:21	1.381
4 -	27:23	1.174
5 -	28:27	1.037

CHAIN CONNECTOR LINK P/N DID 5VMZJ (DID DAIDO KOGYO TO JAPAN)

CAR CHARACTERISTICS.

WHEELBASE: 2250 M/M
FRONT TRACK: 1400 M/M
REAR TRACK: 1355 M/M
MIN. GROUND CLEARANCE: 45 M/M
MAX HEIGHT: 1110 M/M
OVERALL LENGTH: 3550 M/M
OVERALL WIDTH: 1600 M/M
WEIGHT: 370.00 KG.

RIMS (MG) 6.5 × 13.0 IN FRONT
8.0 × 13.0 IN REAR

TYRES AVON FRONT: 6.0 × 19.5 × 13.0 IN
REAR: 8.0 × 19.5 × 13.0 IN CIRCUMFERENCE 1557 M/M

From the workbench of:
Date:

TIRES: AVON FRONT: RACING ONLY
6.0/ 19.5 - 13
AC 20 E23394
PX - RACING BASIC 13.05 PSI (0.9 BAR)
CIRCUMFERENCE 1525 MM

AVON REAR: COMPETITION ONLY
8.0/ 19.5 - 13
5368 TUIG
AC BD 02038M
PX - RACING BASIC 14.5 PSI (1.0 BAR)
CIRCUMFERENCE 1548 MM

YOKOHAMA FRONT: ADVAN 032 R SOFT
ADVAN 175/50 R13 77N
MAX PX: 44.00 PSI
CIRCUMFERENCE 1620 MM

YOKOHAMA REAR: ADVAN 032 R SOFT
ADVAN P215/50 R13 84V
MAX PX 44.00 PSI
CIRCUMFERENCE 1709 MM

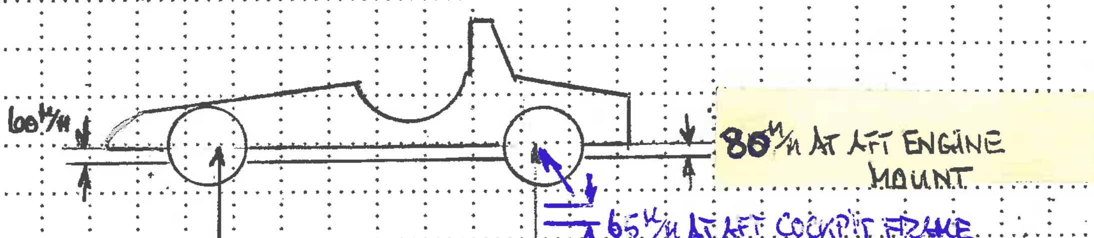
From the workbench of:
Date:

BASIC SET-UP

CAR ON LEVEL SURFACE - POSITION MARKED

SET TIRE PRESSURE FRONT: 0.9 BAR (13.05 PSI) BASIC PRESSURE FOR
REAR: 1.0 BAR (14.50 PSI) SET-UP AND RACE

DISCONNECT ONE LINK FROM TORSION BAR FWD. AND AFT.
SHOCK ABSORBER SET TO HIGH - BACK OFF 4 (FOUR) CLICKS (BOTH FRONT AND REAR)
YELLOW/SOFT - BLACK/MEDIUM - WHITE/HARD
RIDE HEIGHT FRONT - 60 M/M REAR - 65 M/M
WITH SPECIAL WRENCHES TIGHTEN SHOCK SPRINGS TO 4 (FOUR) THREADS
SHOWING (ADJUSTMENT AND LOCKNUT TIGHTENED) THIS BASIC SETTING
SHOULD GIVE THE PROPER RIDE HEIGTH
NOTE: TO ACCOMODATE FRONT SPRING ADJUSTMENT THE TORSION BAR MAY HAVE
TO BE REMOVED. AFTER ADJUSMENTS BOUNCE CAR AND ENSURE
RETURN TO CORRECT RIDE HEIGTH.
OBTAIN RIDE HEIGHT MEASUREMENT AT FOUR CORNERS OF TUB
BETWEEN ALL PANELS AND FLOOR



SET UP SCALES FOR WEIGHING AND BALANCING AS PER INTERCOMP WEIGHING
EQUIPMENT INSTRUCTIONS.
FRONT TO FRONT AND REAR TO REAR MUST BE WITHIN 5.00 KG OF EACH OTHER
LOWER THE CAR ON THE LIGHT SIDE TO CORRECT EXCESSIVE IMBALANCE BY ADJUSTING
THE TRANSVERSE PUSH-PULL ROD NOTE: THIS MAY AFFECT RIDE HEIGHT
HOWEVER BALANCE BY WEIGHT HAS PRIORITY.
BOUNCE CAR AND MOVE FORE AND AFT TO ENSURE RETURN TO EQUAL SETTINGS.
NOTE: DRIVING IN RAIN - RAISE THE CAR AND DISCONNECT ONE TORSION
BAR INPUT ROD BOTH FORE AND AFT. ALSO LOOSEN THE SPRING.

WINGS BASIC SETTING: FRONT/0 REAR AT MID POINT.
RIDE HEIGHT: FRONT ONLY - LENGTHEN TRANSVERSE MEMBER TO LOWER BODY
REAR ONLY - SHORTEN TRANSVERSE MEMBER TO LOWER BODY

W&B: LOWER BODY ON HEAVIER WHEEL TO DECREASE WEIGHT
RAISE BODY ON LIGHTER WHEEL TO INCREASE WEIGHT

From the workbench of:
Date:

SHOCKS

YELLOW - SOFT
BLACK - MEDIUM
WHITE - HARD

NOTE: INCREASING SHOCK TENSION WILL INCREASE THE RIDE HEIGHT HOWEVER ANY INCREASE BEYOND 6 THREADS SHOWING WILL ADVERSELY AFFECT THE SIDE TO SIDE AND FORE TO TRANSVERSE AFT SYMETRY SO THAT SYMETRY AND RIDE HEIGHT MAY NO LONGER BE RESTORED.

TRANSVERSE MEMBER ADJUSTMENT

RIDE HEIGHT: "FRONT ONLY" - LENGTHEN TRANSVERSE MEMBER TO LOWER THE BODY
AFT ONLY - SHORTEN THE TRANSVERSE MEMBER TO LOWER THE BODY

W&B: LOWER BODY ON HEAVIER WHEEL TO "DECREASE" WEIGHT
RAISE BODY ON LIGHTER WHEEL TO "INCREASE" WEIGHT.

From the workbench of:
Date:

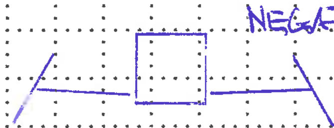
2

ALIGNMENT

WHEN RIDE HEIGHT IS ADJUSTED LOWER THE HEAVIER WHEEL TO BALANCE.
THE RIGHT SIDE IS USUALLY 2.00 M/M LOWER. IF HEIGHT DIFFERENCE LEFT TO RIGHT DIFFERS BY 2 TO 4 M/M THIS IS ACCEPTABLE, WEIGHT BALANCE HAS PRIORITY.
IF WEIGHT IS CORRECT BUT HEIGHT DIFFERENCE EXCEEDS 4 M/M MARK PUSH/PULL ROD NUTS ON ONE SIDE AND TURN EQUALLY TO DERIVE AT EQUAL WEIGHT.

RIDE HEIGHT: FRONT 60MM REAR 65MM

NEGATIVE CAMBER



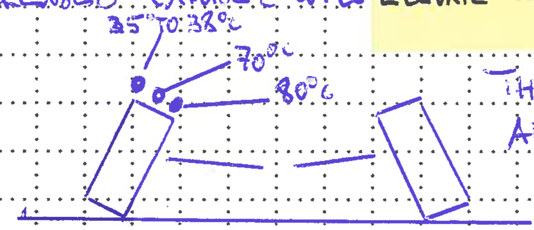
CAMBER. − /\ +

CALIBRATE PROTRACTOR ON SUPPORTING SURFACE

AVON TIRES FRONT 1.5°
REAR 1.75° TO 2.00°

MICHELIN FRONT 3.0° TO 3.5°
REAR 3.5° TO 4.0°

INCREASED CAMBER WILL ELEVATE TIRE HEAT ON THE PRONOUNCED CONTACT SIDE



THE TEMP Δ SHOULD NEVER EXCEED 20 TO 25°C.
ALSO INCREASED CAMBER WILL DECREASE THE SPEED.

NOTE: ONE TURN OF BALL JOINT (BOTH TOP & BOTTOM SPINDLE) APPROX. .75°
TOP SPINDLE BALL JOINTS ARE INITIALLY BOTTOMED OUT - LOWER SPINDLE BALL JOINT APPROX. 4 TO 5 THREADS SHOWING.
ALLOWABLE TOLERANCE - 0.3° Δ

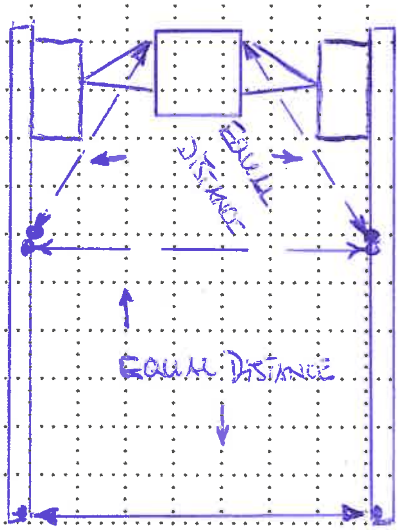
From the workbench of:
Date:

TOE IN / TOE OUT ADJUSTMENT.

FRONT: INSTALL GREASED ANTIFRACTION PLATES UNDER EACH FRONT WHEEL
IMMOBILIZE CAR (BRAKE BAR)

IMMOBILIZE STEERING IN CENTERED MODE.

ATTACH LEVELING BARS TO FRONT WHEEL HUBS, DO NOT OVERTIGHTEN, RECHECK STEERING IN NEUTRAL, BARS FACING FORWARD - USE LOWER FRONT "A" ARM AFT ATTACHMENT BOLT HEAD AS REFERENCE POINT - MEASURE TO EQUI-DISTANT MARK INSTALLED ON BOTH LEFT & RIGHT LEVELING BARS - ENSURE EQUAL DISTANCE - MAKE REQUIRED ADJUSTMENT ON BY ROTATING STEERING ADJUSTMENT RODS.



WHEN ADJUSTING TURN BOTH STEERING ADJUSTMENT RODS EQUALLY TO OBTAIN DESIRED RESULTS, INSTALL REFERENCE MARKS ON COMPLETION.
SET-UP DEPENDS ON PREFERENCE - "O" IS DESIREABLE.

AFTER ADJUSTMENT AND TIGHTENING - RECHECK DIAGONAL MEASURMENTS

REAR: ATTACH REAR SET OF LEVELING BARS FACING FWD. LOOSEN FRONT LEVELING BARS, FOLD AFT TO RIDE OVER REAR BARS - TIGHTEN FRONT LEVELING BARS ADJUST REAR TO "O" - AFFECT ADJUSTMENT BY MEANS OF AFT ADJUSTR. ROD - SET REAR WHEELS TO "O" - RECHECK LEVELING BARS TO PARALLEL EACH-OTHER - TIGHTEN ADJUSTMENT RODS AND WITNESS MARK. UNDO ALL LOCKING DEVICES, ROCK REAR OF CAR TO SETTLE SUSPENSION

From the workbench of:
Date:

4

REAR CAMBER ADJUST.

RE-CALIBRATE PROTRACTOR TO REAR SUPPORTING SURFACE

REAR CAMBER SHOULD BE THE SAME AS THE FRONT

DO NOT ALLOW MORE THEN 5 THREADS SHOWING - IF MORE, INSTALL SECOND NUT.

CASTER

SHOULD BE "0", IS ALWAYS NEGATIVE, NEVER POSITIVE - PREFERENTIAL SETTING

From the workbench of:
Date:

DIPSTICK MIN. LENGTH 70.00CM

GRADUATIONS l/MM. S.G. GASOLINE 0.74 KG/l

l		m/m	KG
3	—	46	- 2.22
4		55	- 2.96
5		64	- 3.70
6	—	73	- 4.44
7		84	- 5.18
8		95	- 5.92
9	—	105	- 6.66
10		116	- 7.40
11		126	- 8.14
12	—	137	- 8.88
13		148	- 9.62
14		159	- 10.36
15	—	171	- 11.10

BUILD UP SEQUENCE

1. ROLL BAR, AFT LINKAGE - BALLJOINT ASSY.
2. GEAR SHIFT LEVER ASSY (PART 1)
3. FRONT SUSPENSION LINKAGE ROD ASSY.
4. STEERING COLUMN AND "U" JOINT ASSY.
5. SHOCK TOWER CROSS MEMBER
6. MASTER CYLINDER BRAKE CLUTCH ASSY.
7. HOSE BRAKE CLUTCH ASSY.
8. FRONT SHOCK ABSORBER ASSY.
9. FRONT TORSION BAR & TIE ROD ASSY.
10. FRONT FLUID RESERVOIR INST.
11. FRONT SUSPENSION / PULL ROD
12. ENGINE MOUNT MOUNT TO ENGINE AT BUILD-UP (35)
    INSTALL FILTER, HOSES ETC AND MOUNT TO FRAME
13. INSTALL DRIVE SPROCKET ASSEMBLE COMPLETE AFT DRIVE MECHANISMS. CHAIN, AFT BRAKE ETC.
14. INSTALL OIL AND ENGINE COOLANT RADIATORS AND HOSES.
15. INSTALL AFT SHOCK ABSORBERS.
16. INST. REAR TORSION BAR AND ROD ASSY'S
17. COMPLETE AFT SUSPENSION ASSY.
18. COMPLETE FWD & AFT DRIVE SHAFT AND HUB ASSY.

19. INSTALL RACK & PINION STEERING BOX

20. INST. FIRE EXT. AND BATTERY SUPPORT BRACKET

21. INST. FRONT AND AFT BRAKE PUCKS.

22. INST. FIRE EXT. SYSTEM

23. INSTRUMENT PANEL ASSY.

24. INST. STARTER SOLENOID

25. INST. WIRING HARNESS -

26 INST. REAR RED LAMP.

27. INST. CARBURETOR

28 INST. EXH. MUFFLER

29 INST. CLUTCH HYDR. CYLINDER - BLEED - INSTALL ENGINE COVER

30 INST. STEERING WHEEL

31 INST. SPOILERS.

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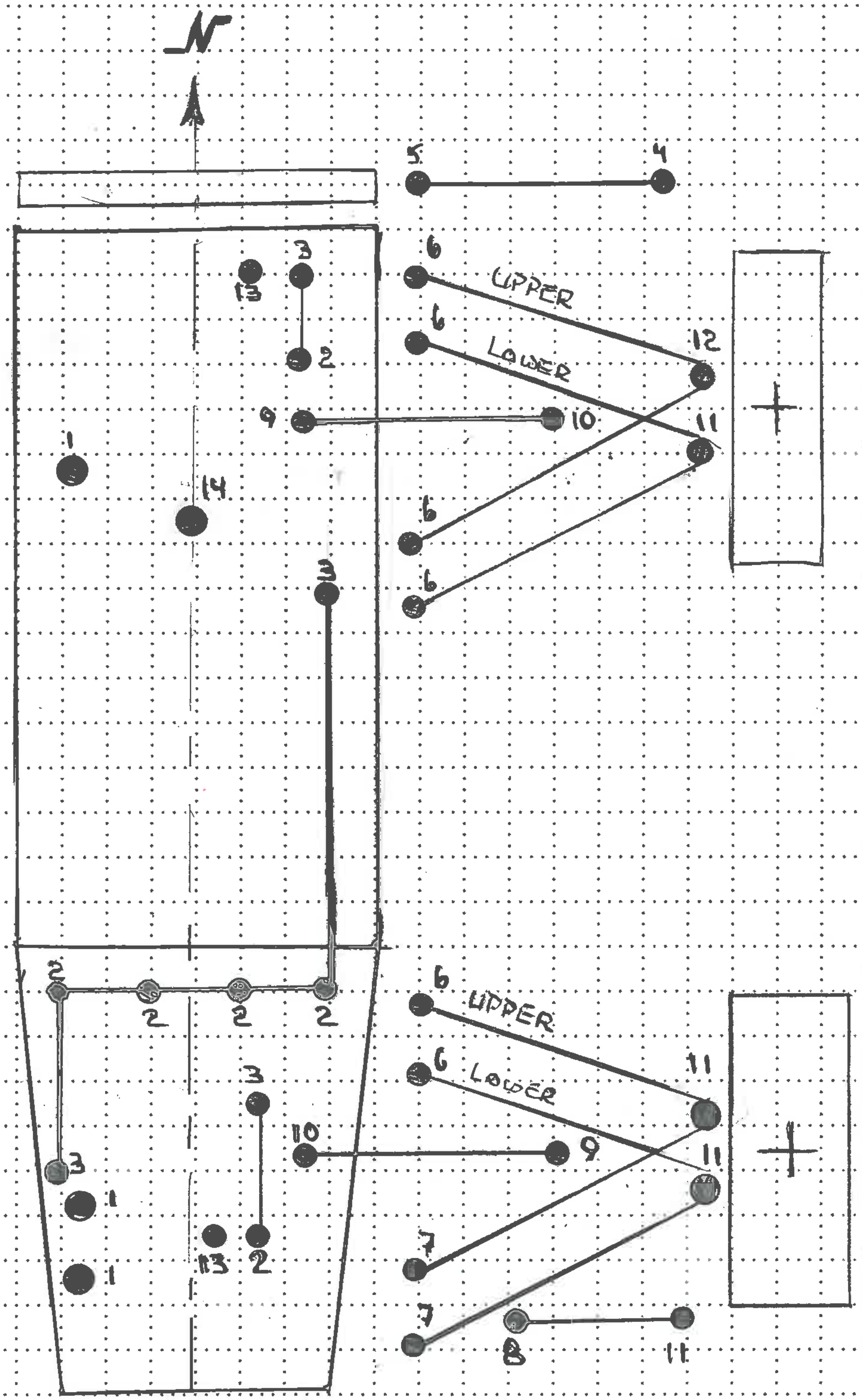
From the workbench of:
Date:

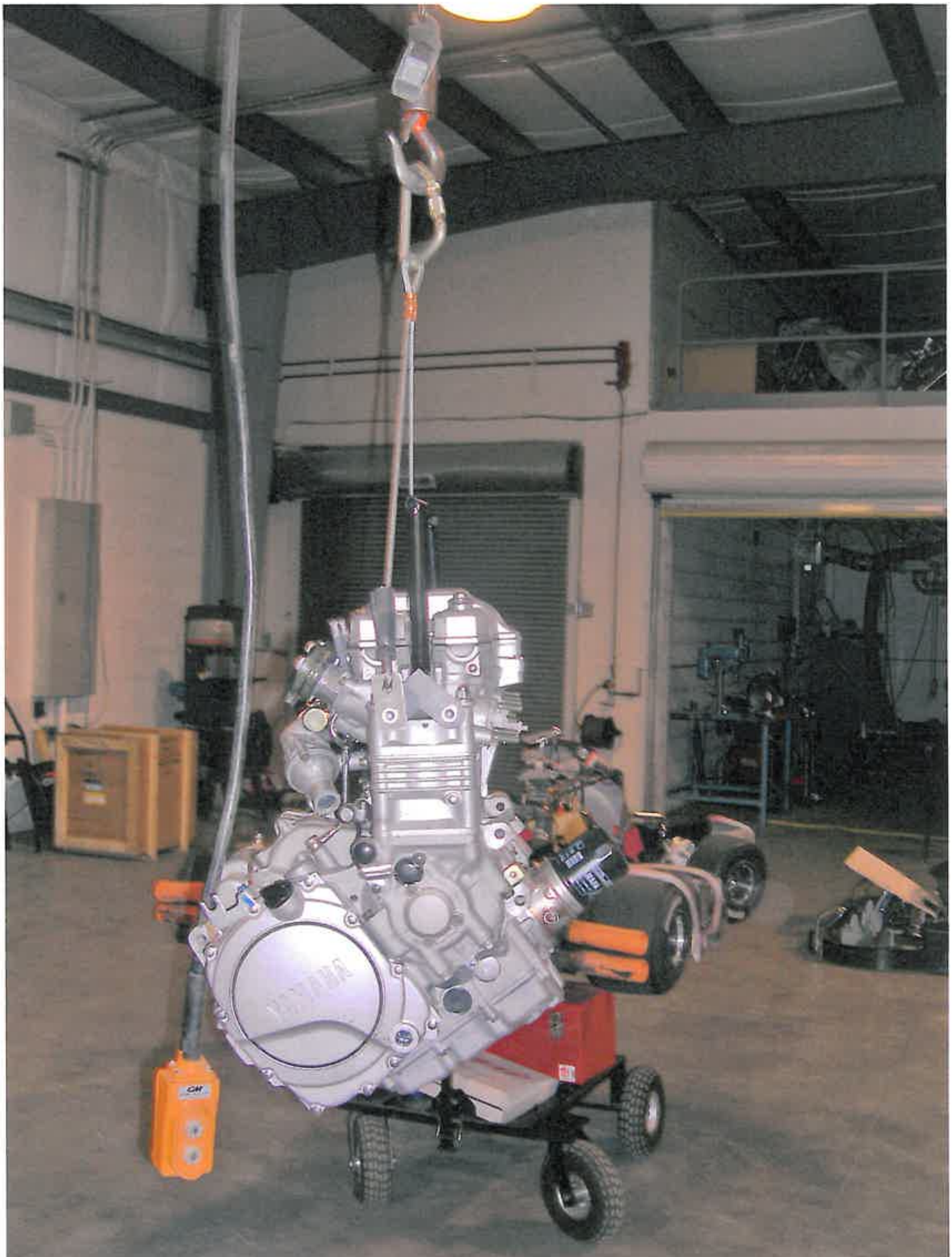
ROD-END BEARING CHART

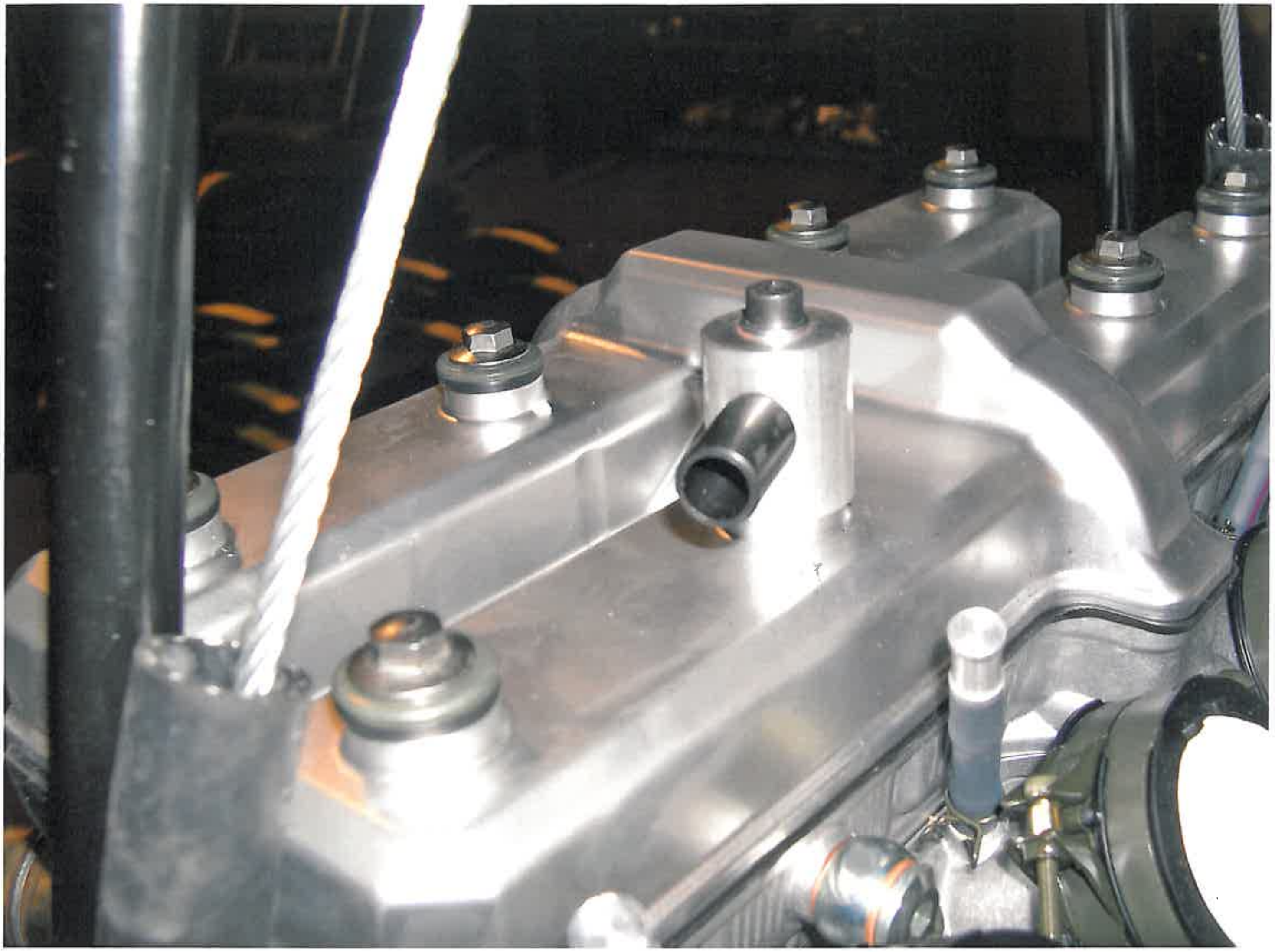
	P/N	Q	PITCH
** 1	SMG40	3	6 × 1
* 2	SMG 8ST	8	8 × 1.25
3	POSL8	6	8 × 1.25SX
4	SMGM8.51	2	8 × 1
5	SMLGM8.51	2	8 × 1 SX
6	SMG 10.40	12	10 × 1.5
7	SMGM10.50	4	10 × 1.5
8	SMLGM10.51	2	10 × 1 SX
9	SMG 12-40	4	12 × 1.75
10	SMLG12.10	4	12 × 1.75SX
11	SMGM 12.51	8	12 × 1.5
12	SMGM 14.52	2	14 × 1.5
13	SMG 8.40	4	8 × 1.25
14	GE 15 C	1	



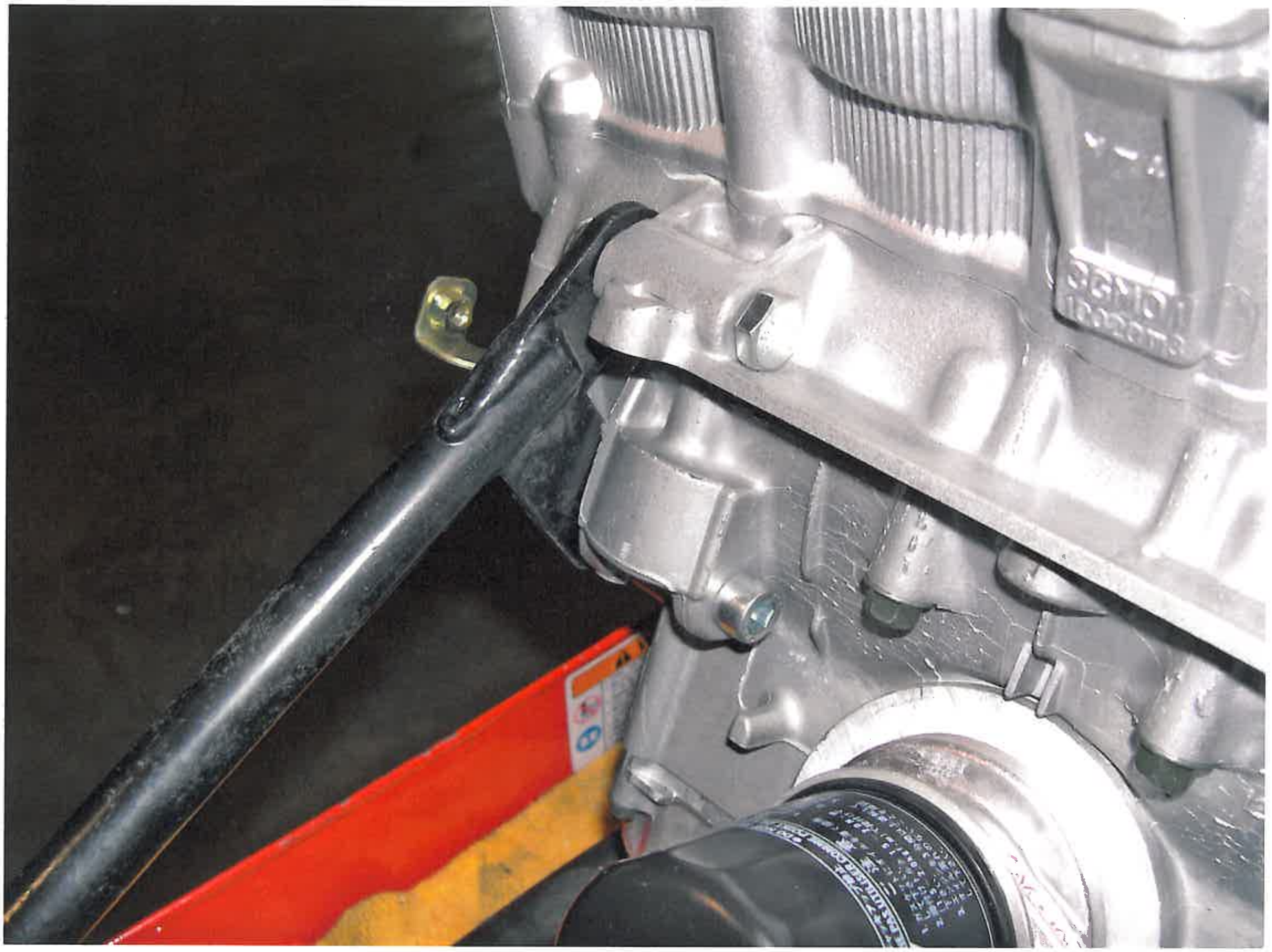
* SUBSTITUDE SMG 840

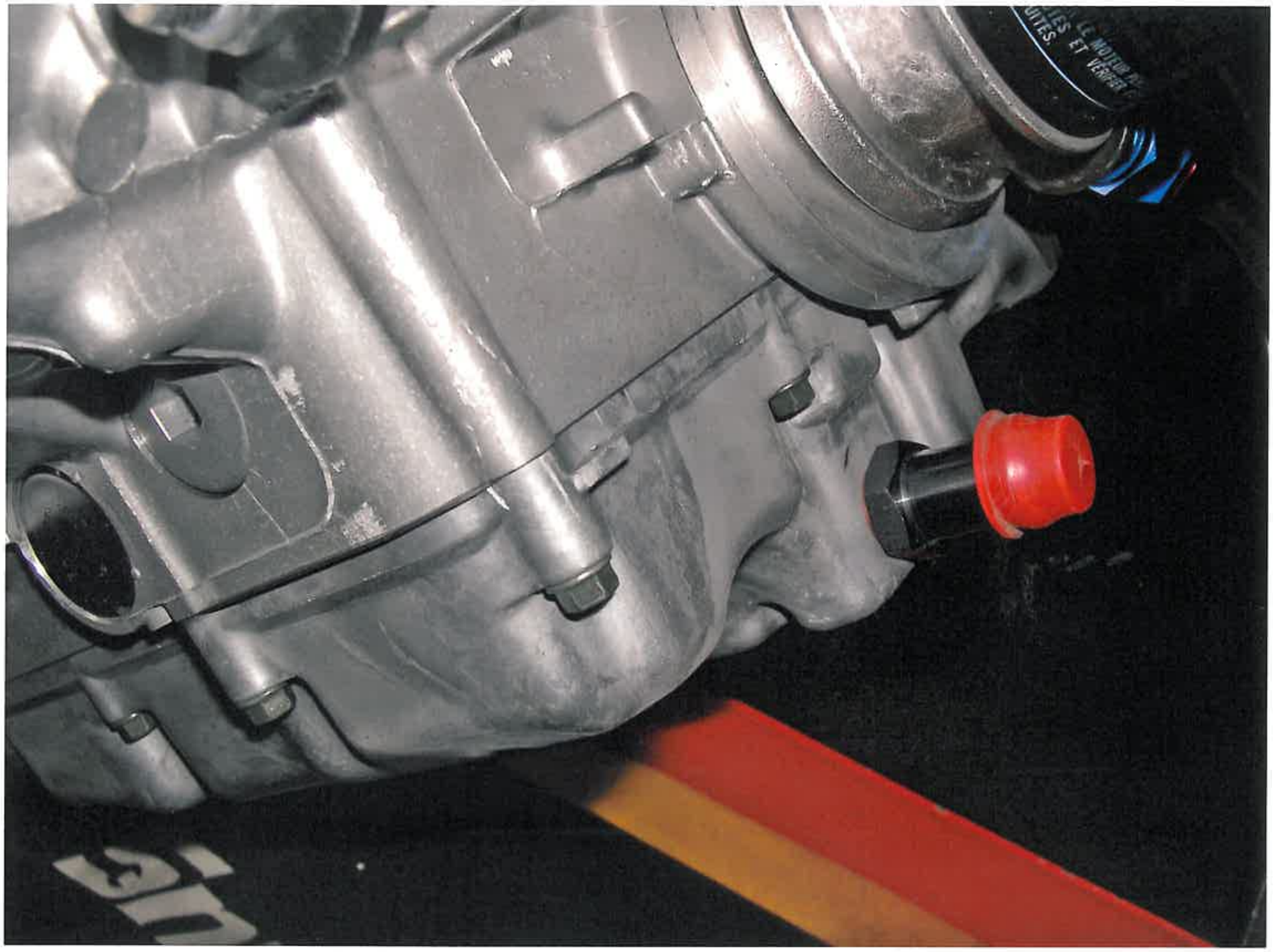
** REDUNDANT WITH REVERSE RE[illegible]

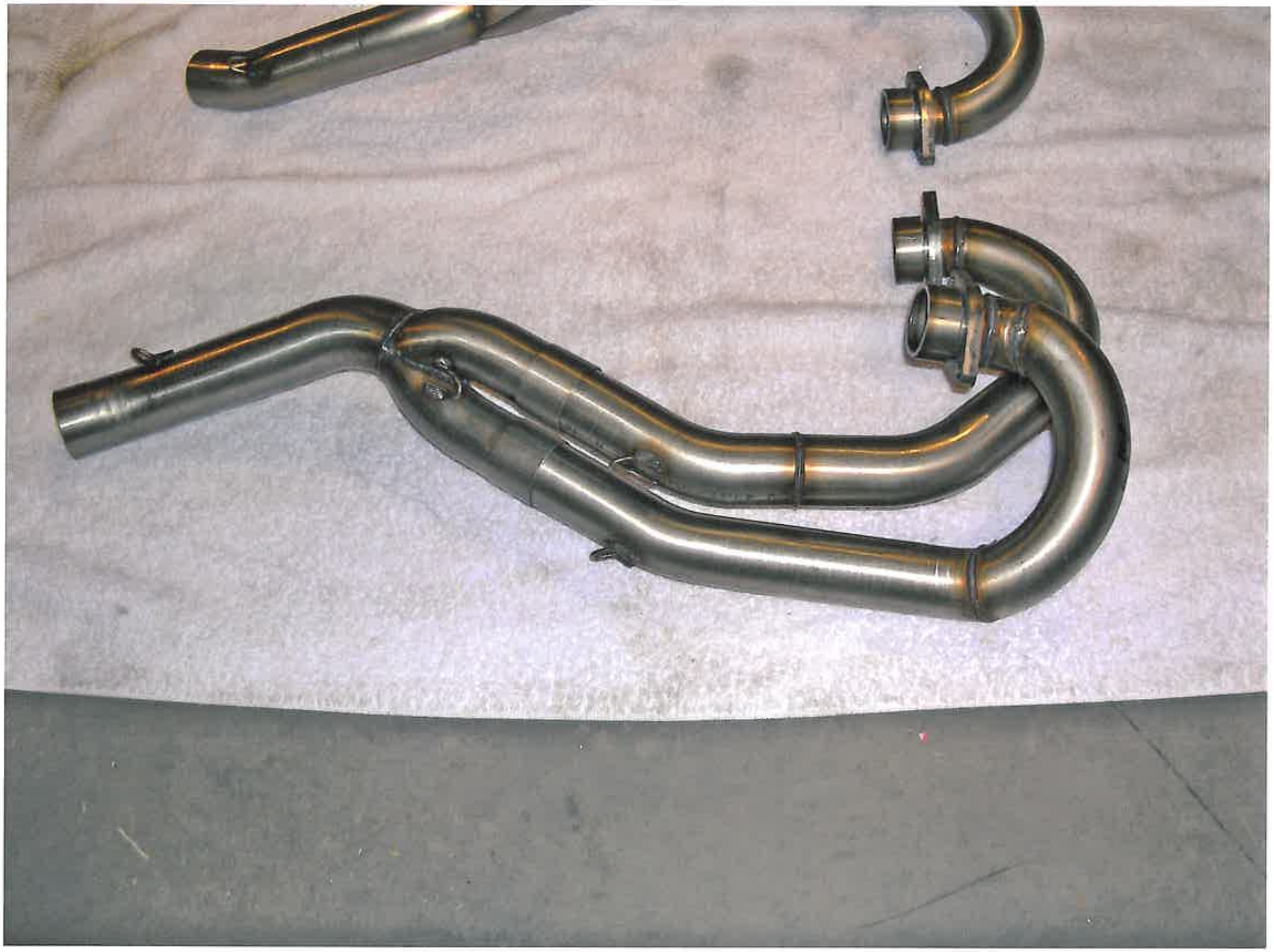


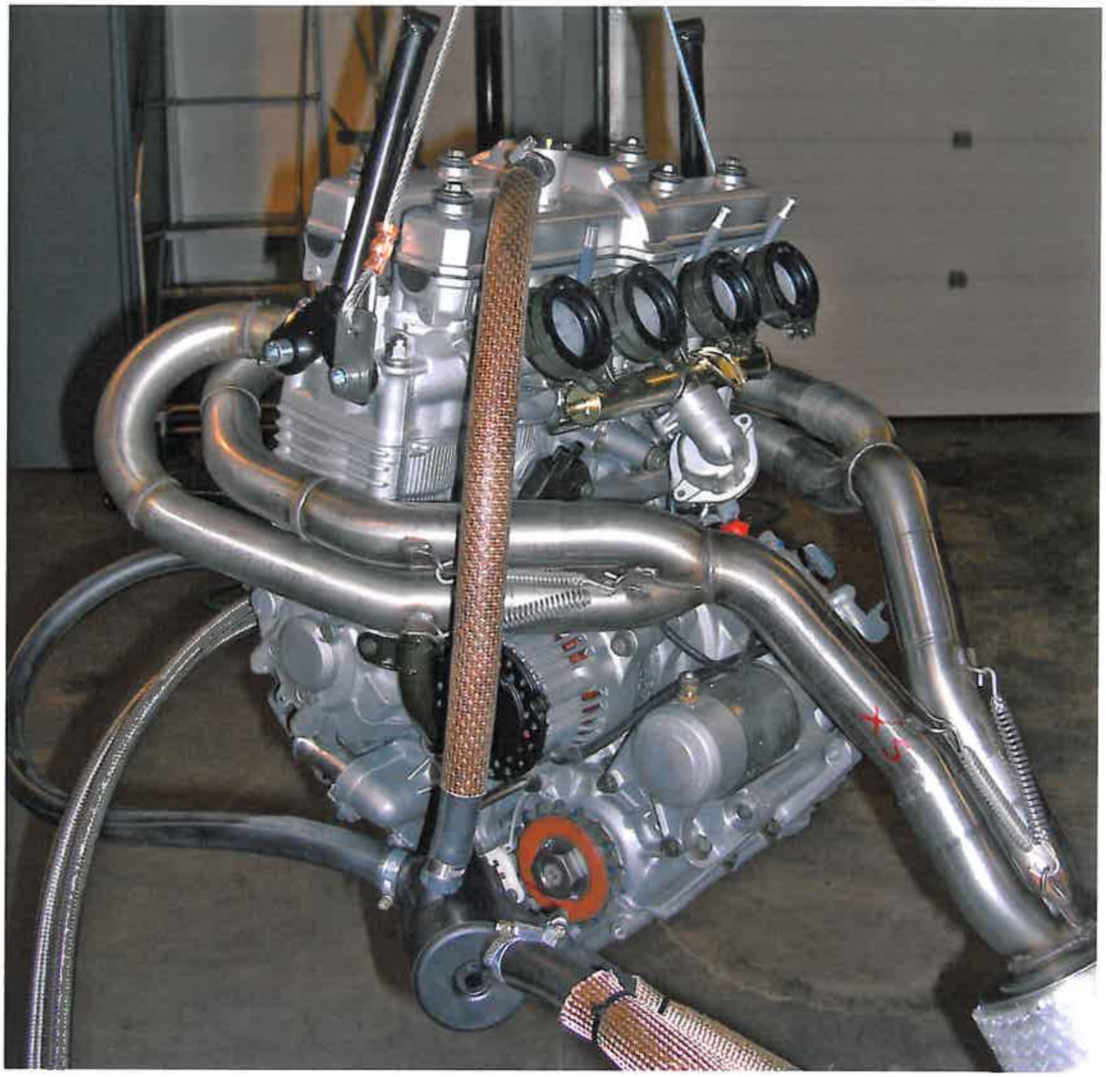


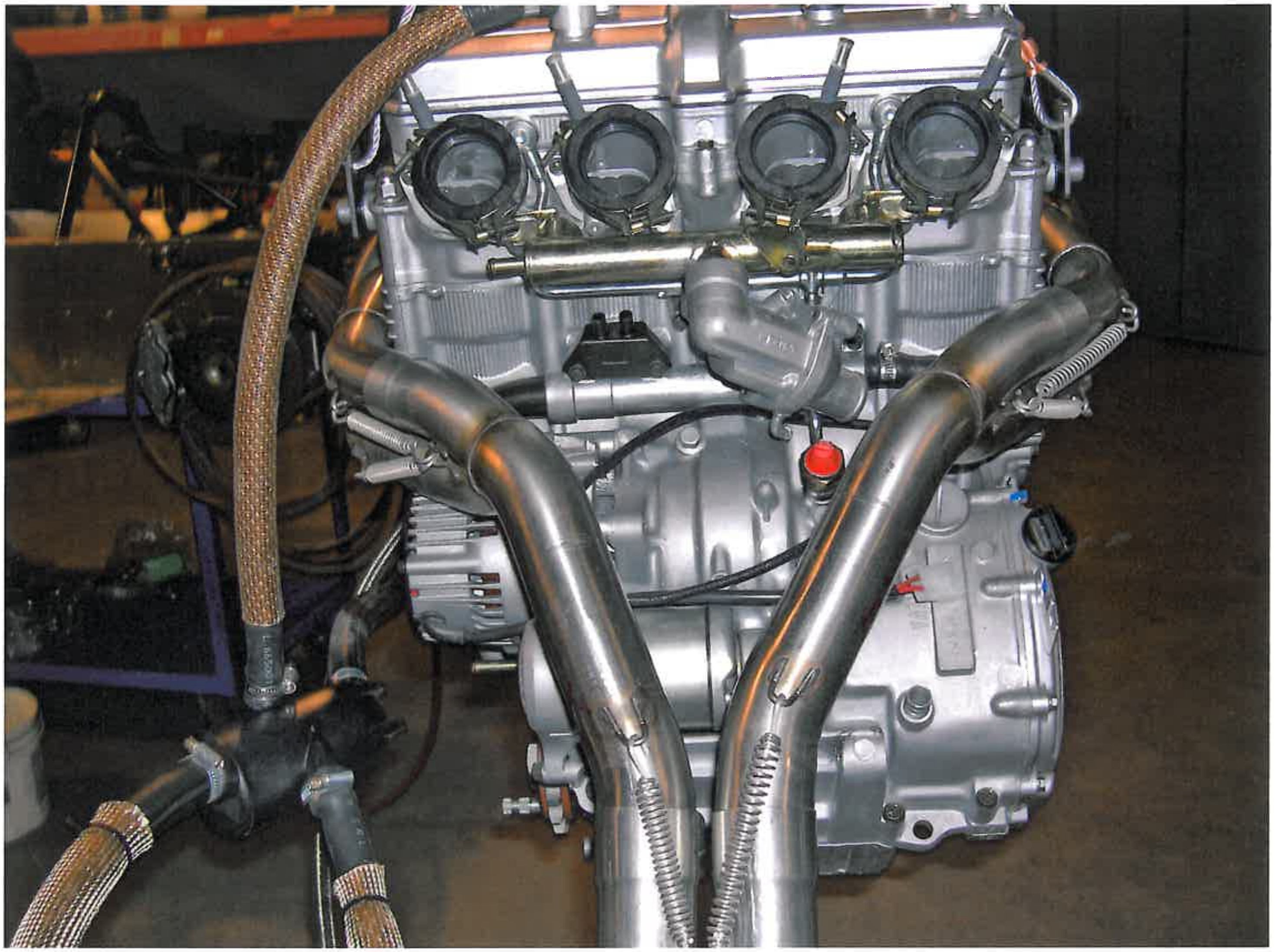

CAUTION











TO ENGINE

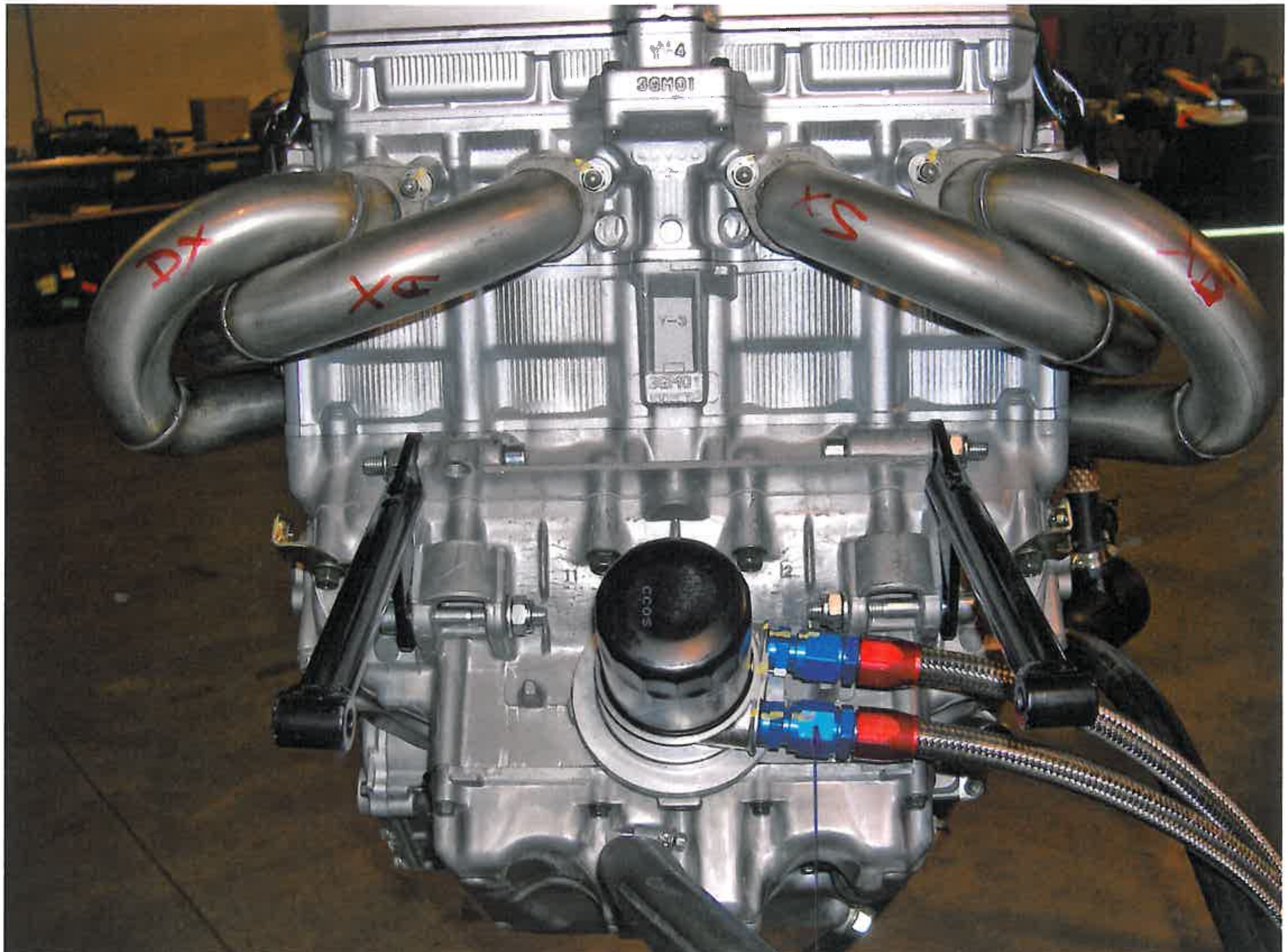
INTERNAL WRENCHING 8.0MM ALLEN WRENCH
NUT WRENCH SIZE 17.0MM
TORQUE 80.0NM

LOWER SUPPORT STRUT SHOWN

BOLT UPPER DIN960 M10×60 HEX HEAD
(ROUND INBD FLAT FOR FLUSH FIT)
BOLT LOWER DIN912 M10×65 ALLEN HEAD

TO FRAME

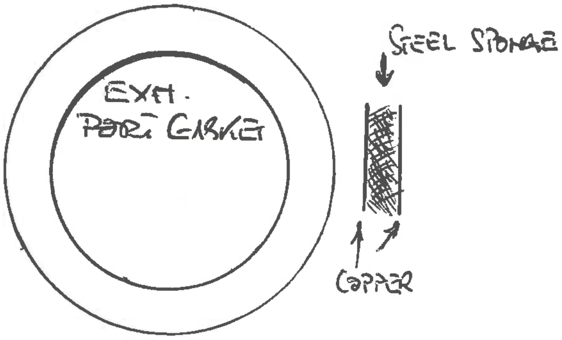
"UPPER" SUPPORT STRUT BOLT Ø10.0MM 8.0MM ALLEN INTERNAL WRENCHING
45.0 MM GRIP 2 EA.
"LOWER" SUPPORT STRUT BOLT Ø 10.0 M 8.0MM ALLEN INTERNAL WRENCHING
50.0 MM GRIP 2 EA
NUTS 4, WRENCH SIZE 17.0MM TORQUE 80.0 NM



EXHAUST SYSTEM – INSTALL WITH WASHERS
AND SPECIAL EXHAUST NUTS. 8.0 MM
10.0MM WRENCH TORQUE 60.0NM

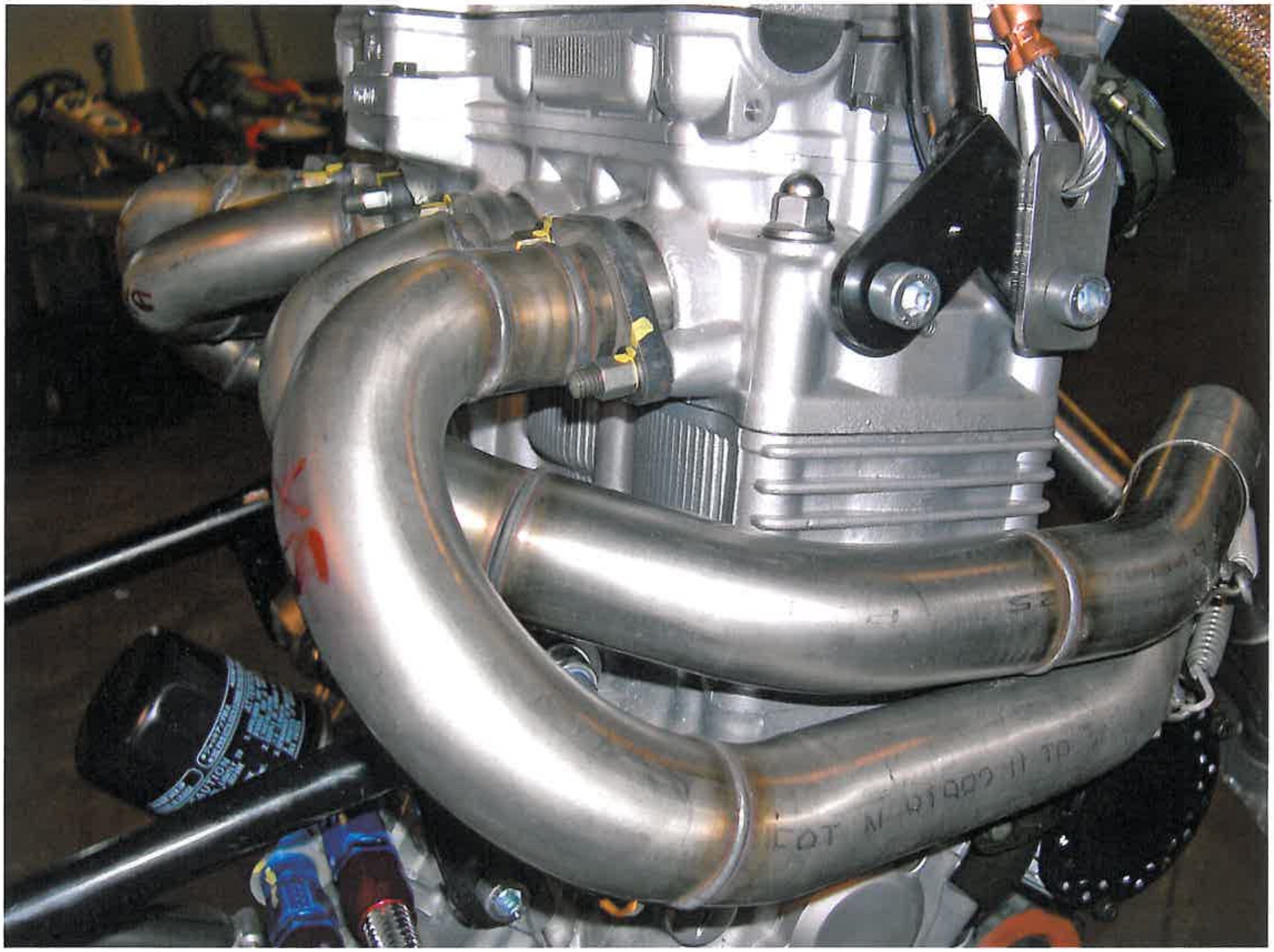
BOTTOM – SHORT OIL LINE TO OTBD. SIDE
OF OIL COOLER

TOP TO INBD. SIDE OF COOLER

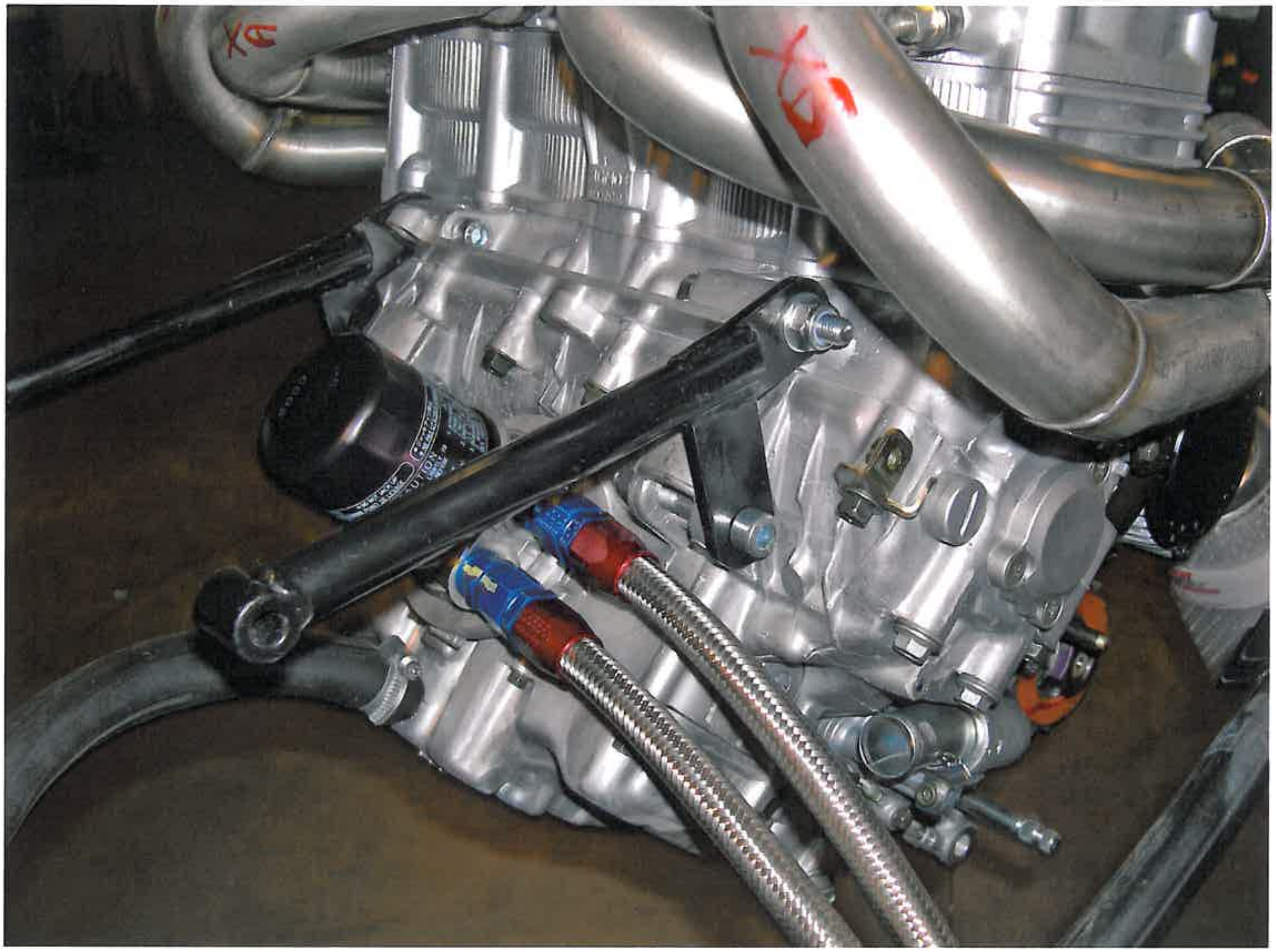


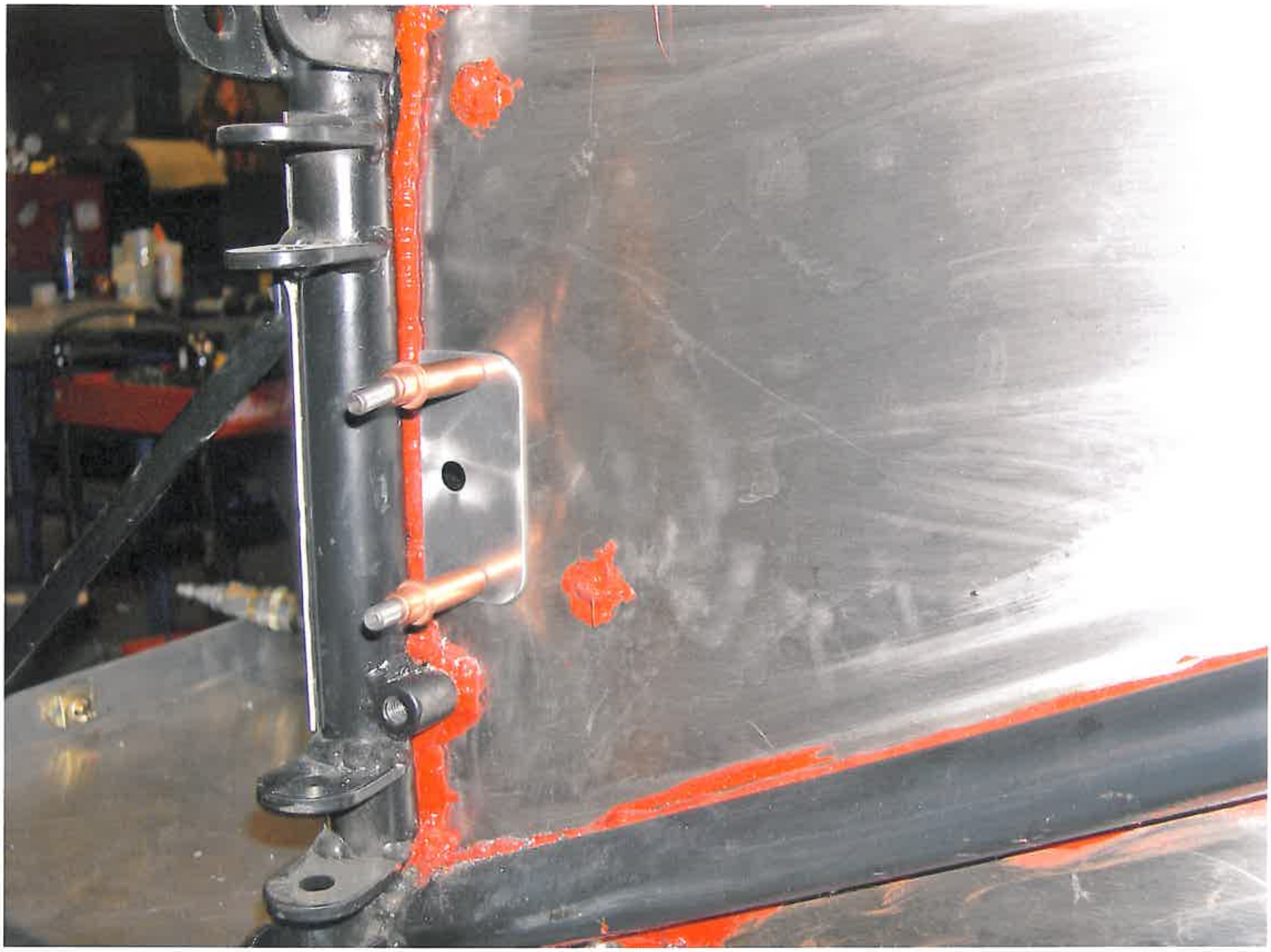
OIL FILTER P/N

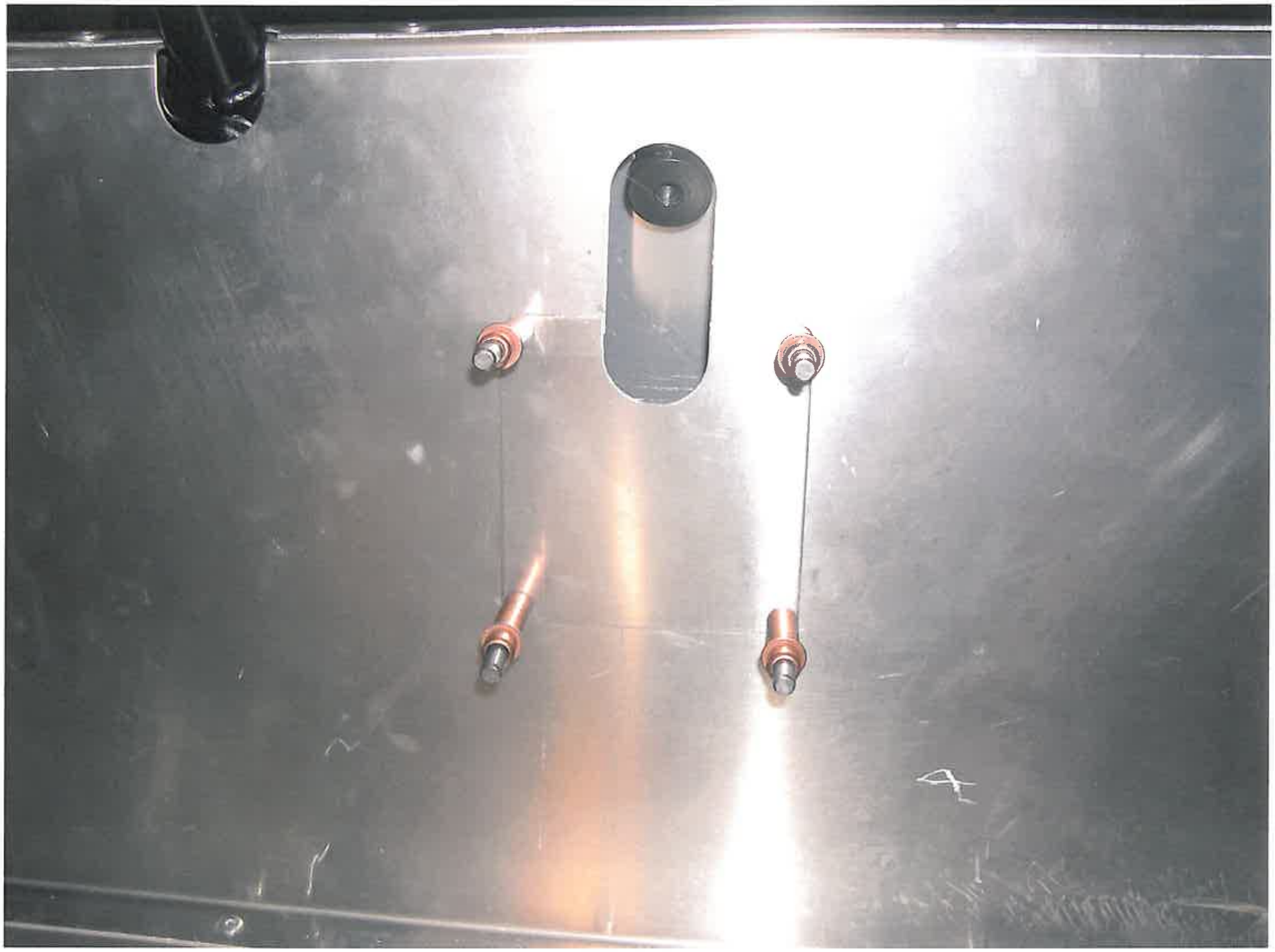
YAMAHA 5GH-13440-00

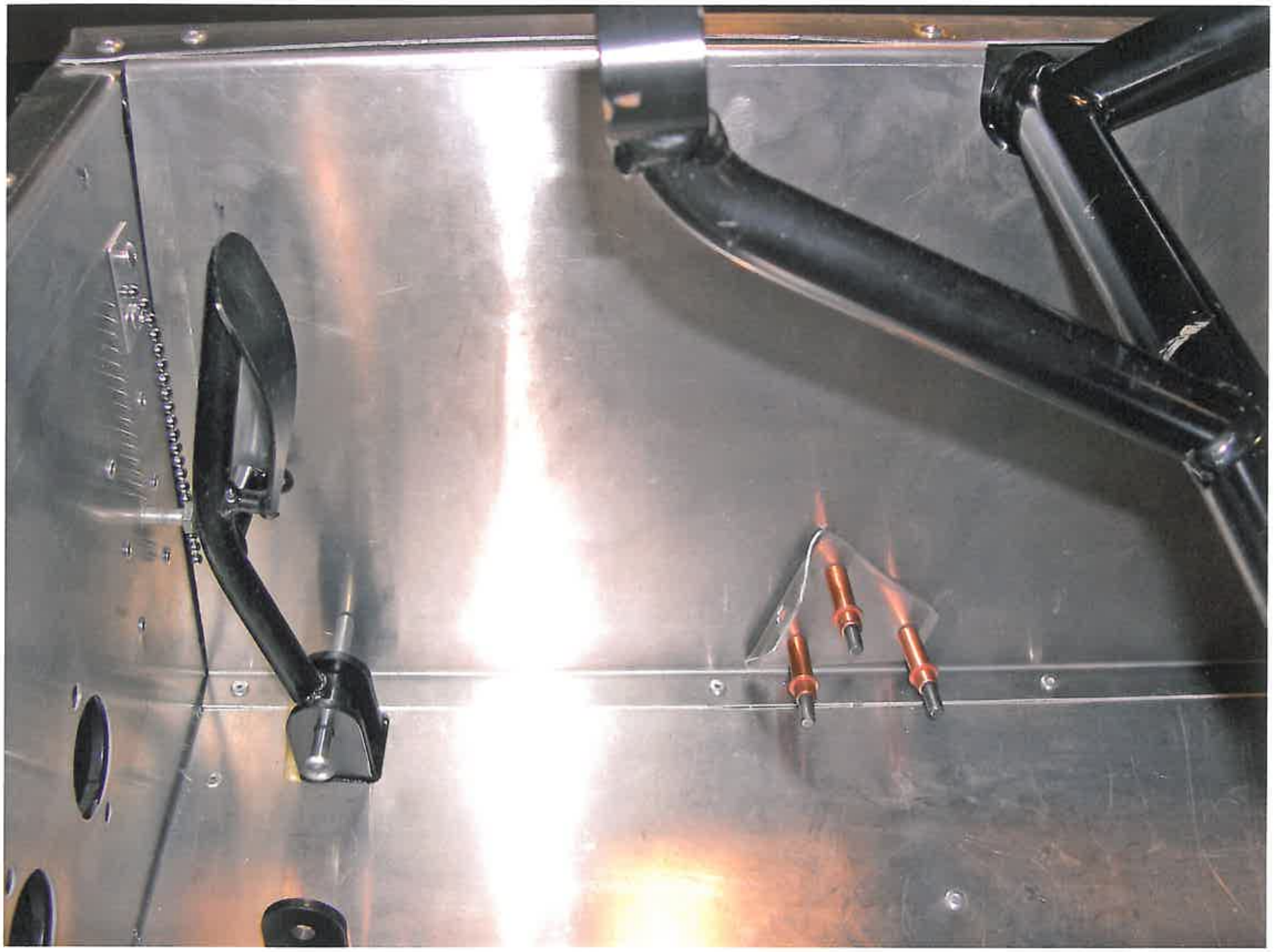


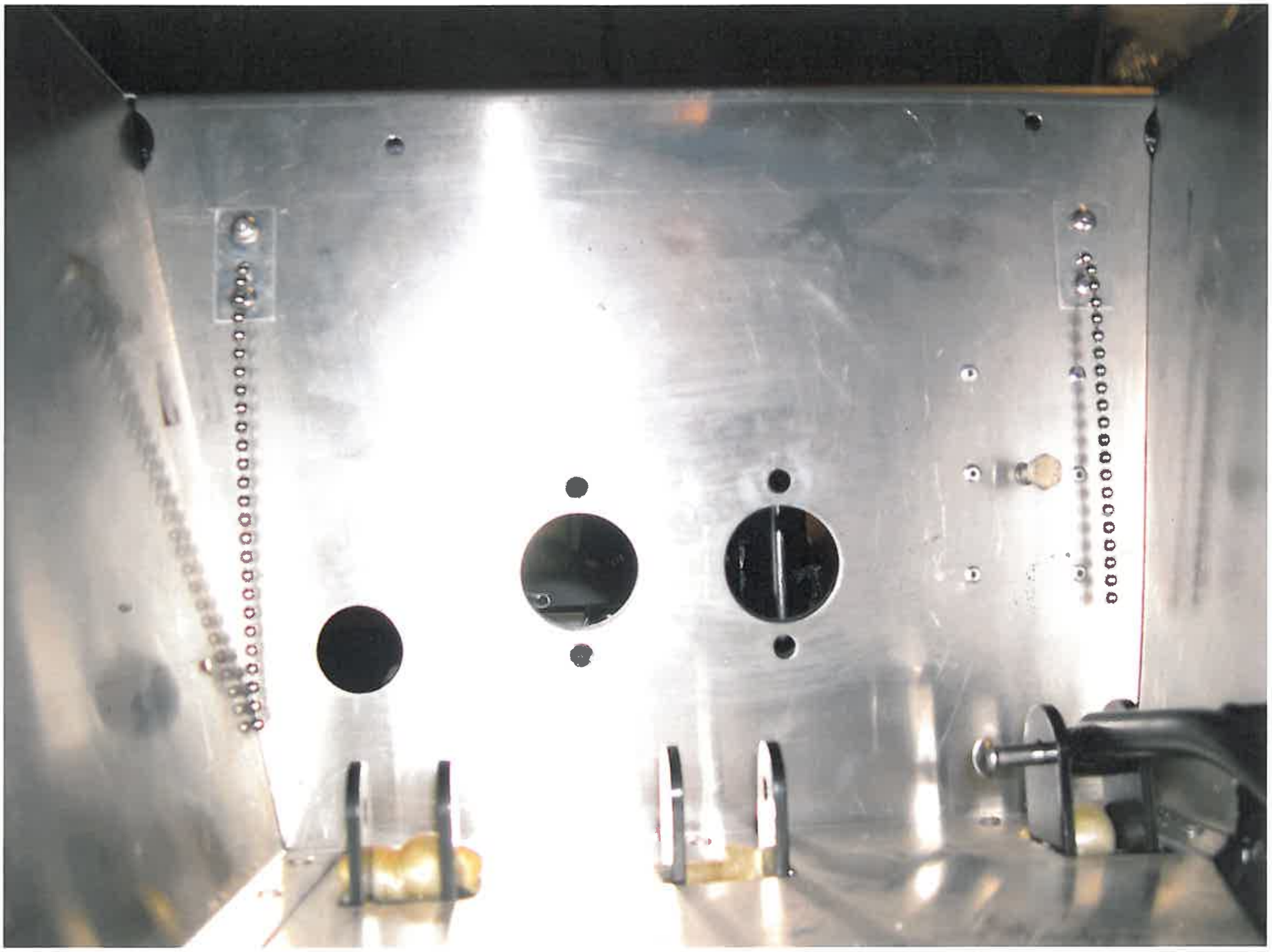
ATTACH SLING TO AFT LUGS
BOLTS " FINE THREAD 10.00 × 20.00 MM







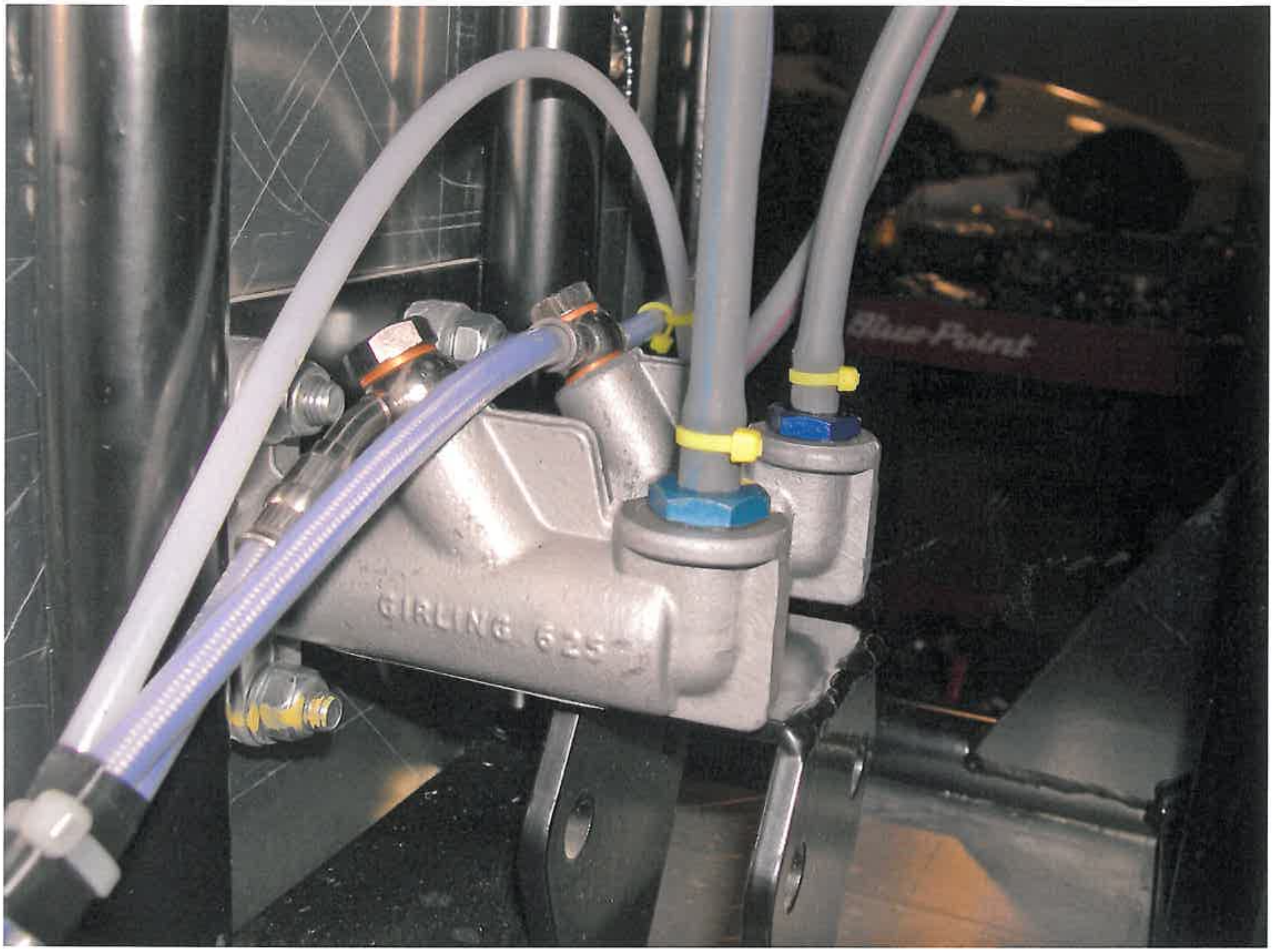




From the workbench of:
Date:

CLUTCH - FOOT REST INSTALLATION

DIMENSIONS AND SPECS - CHECK DRAWINGS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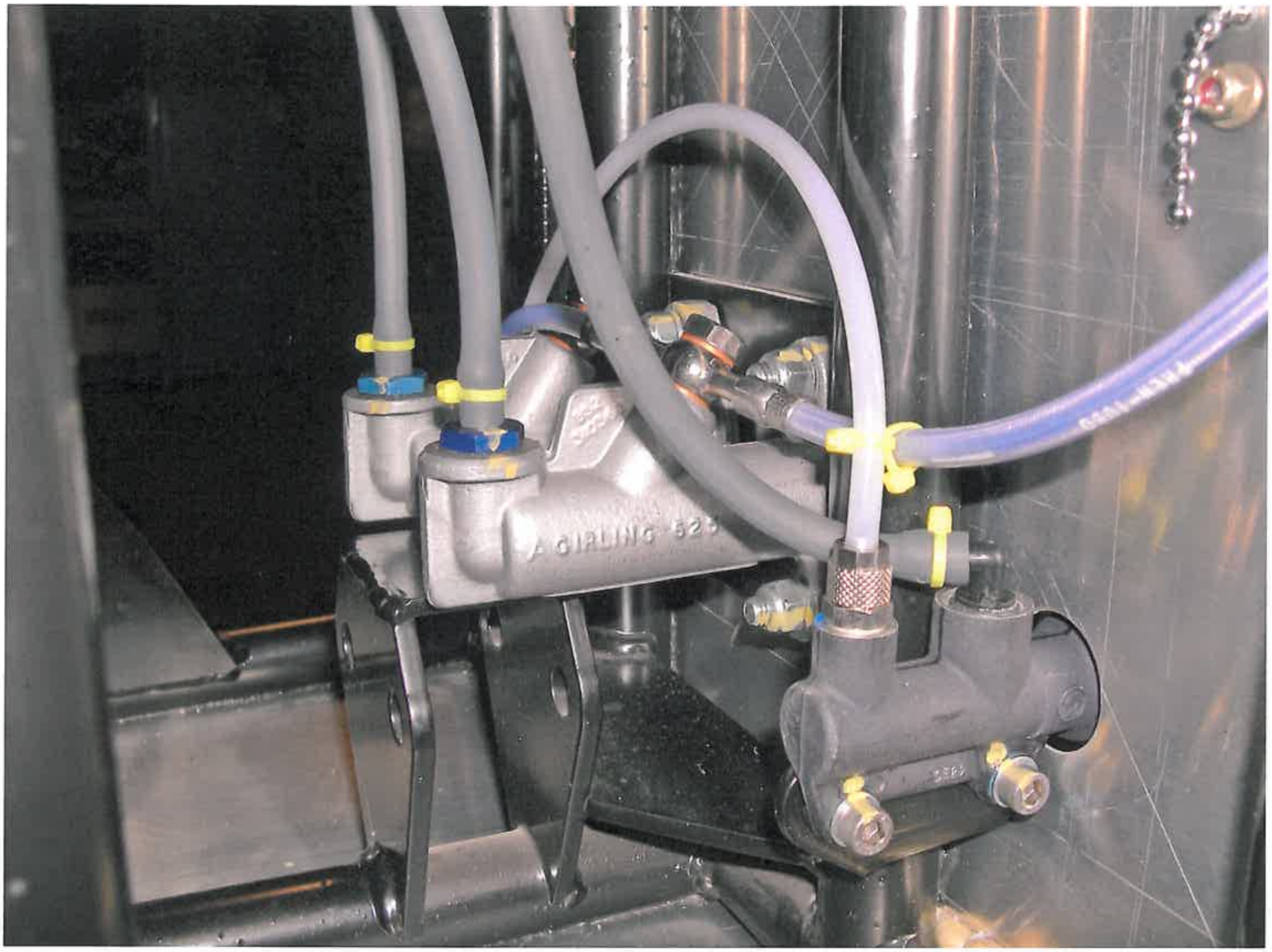
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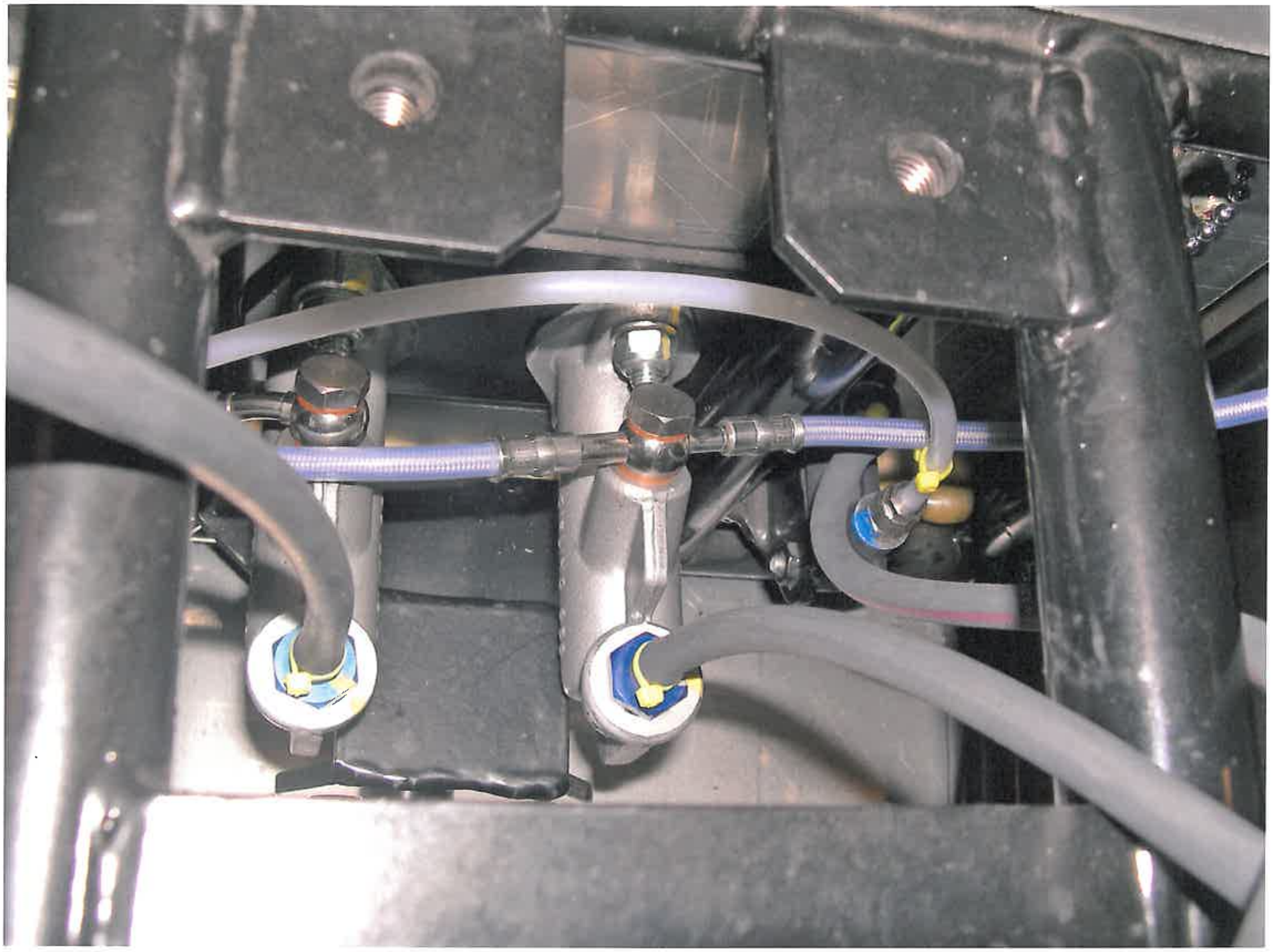
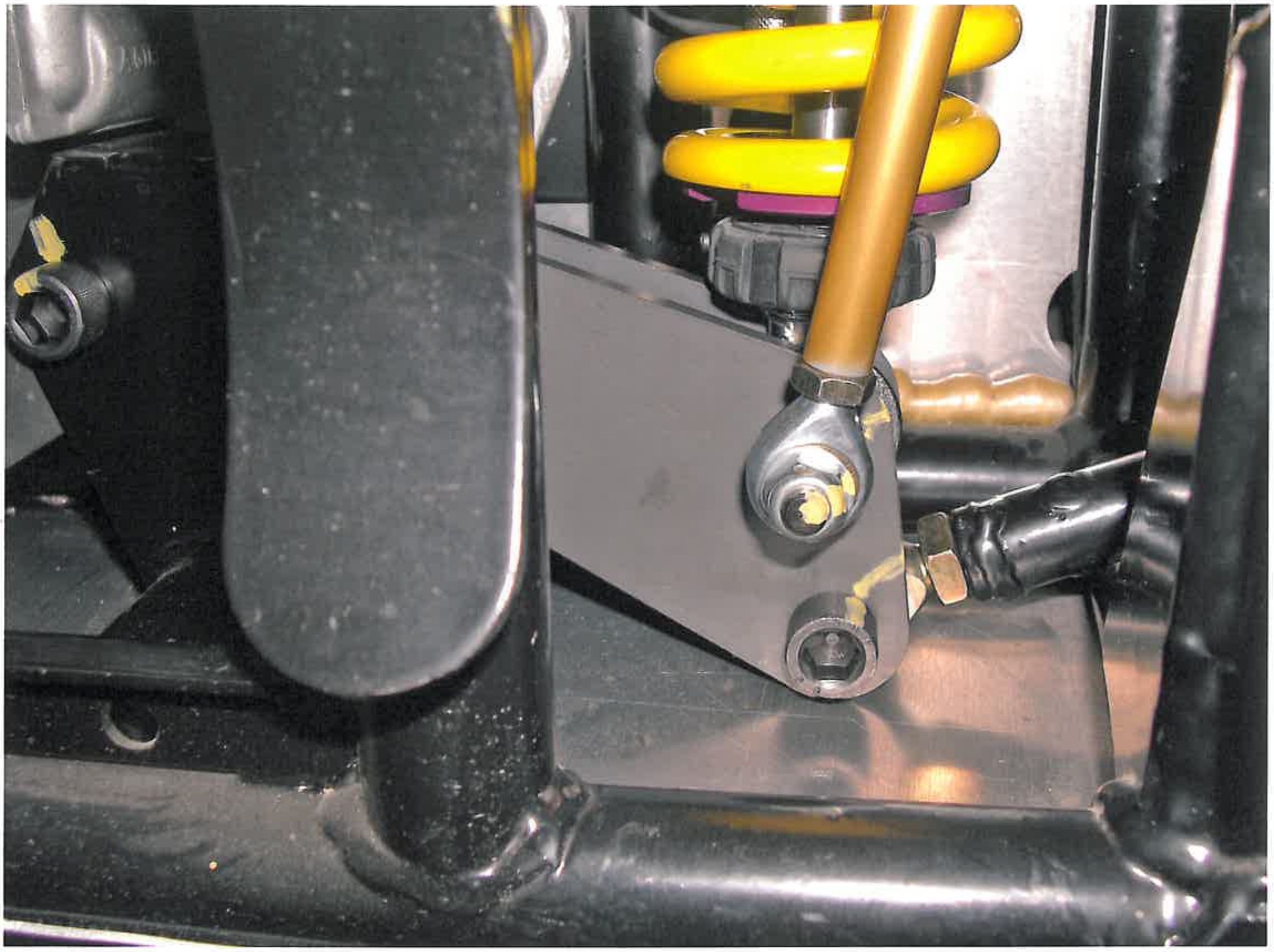
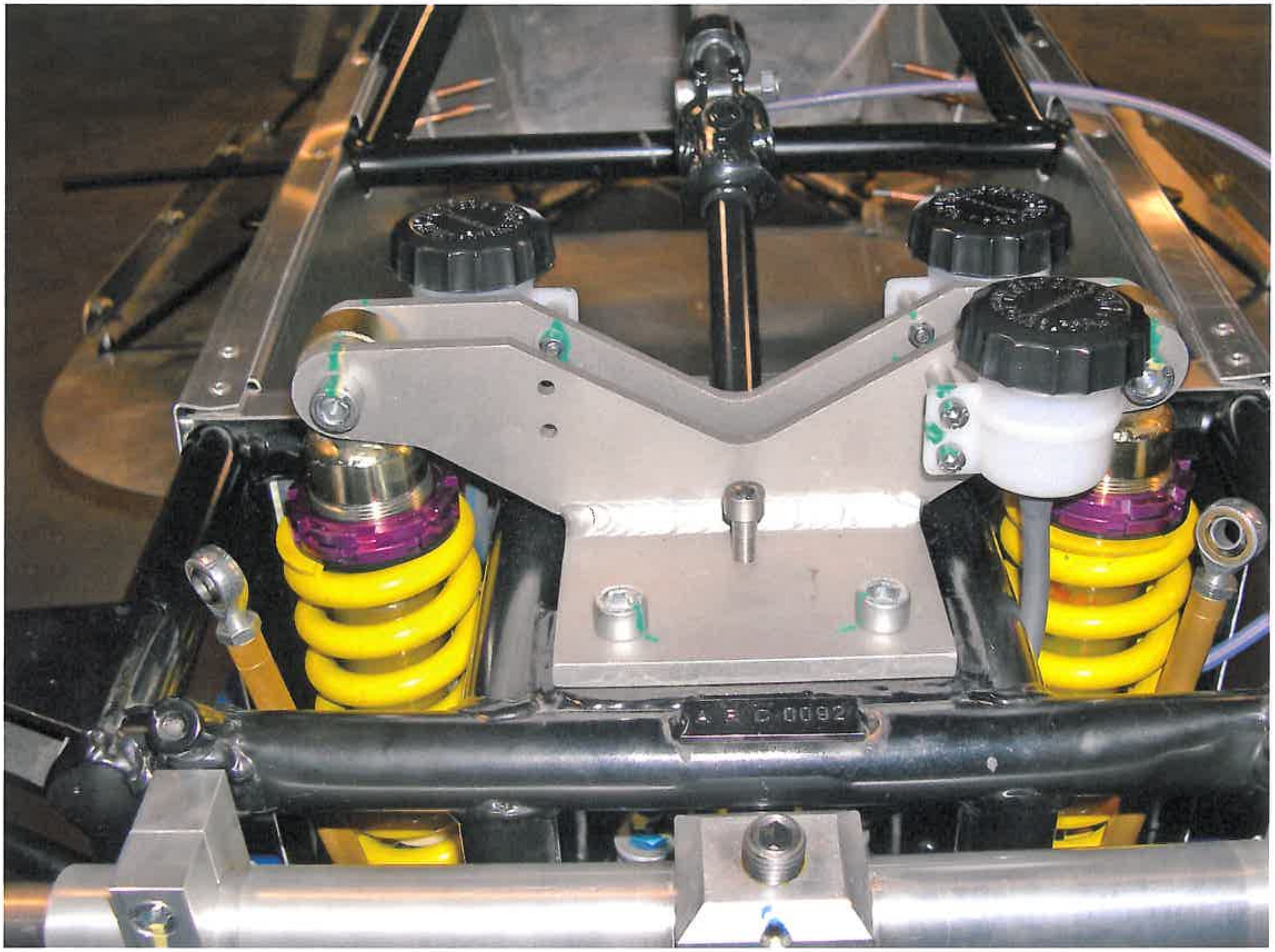
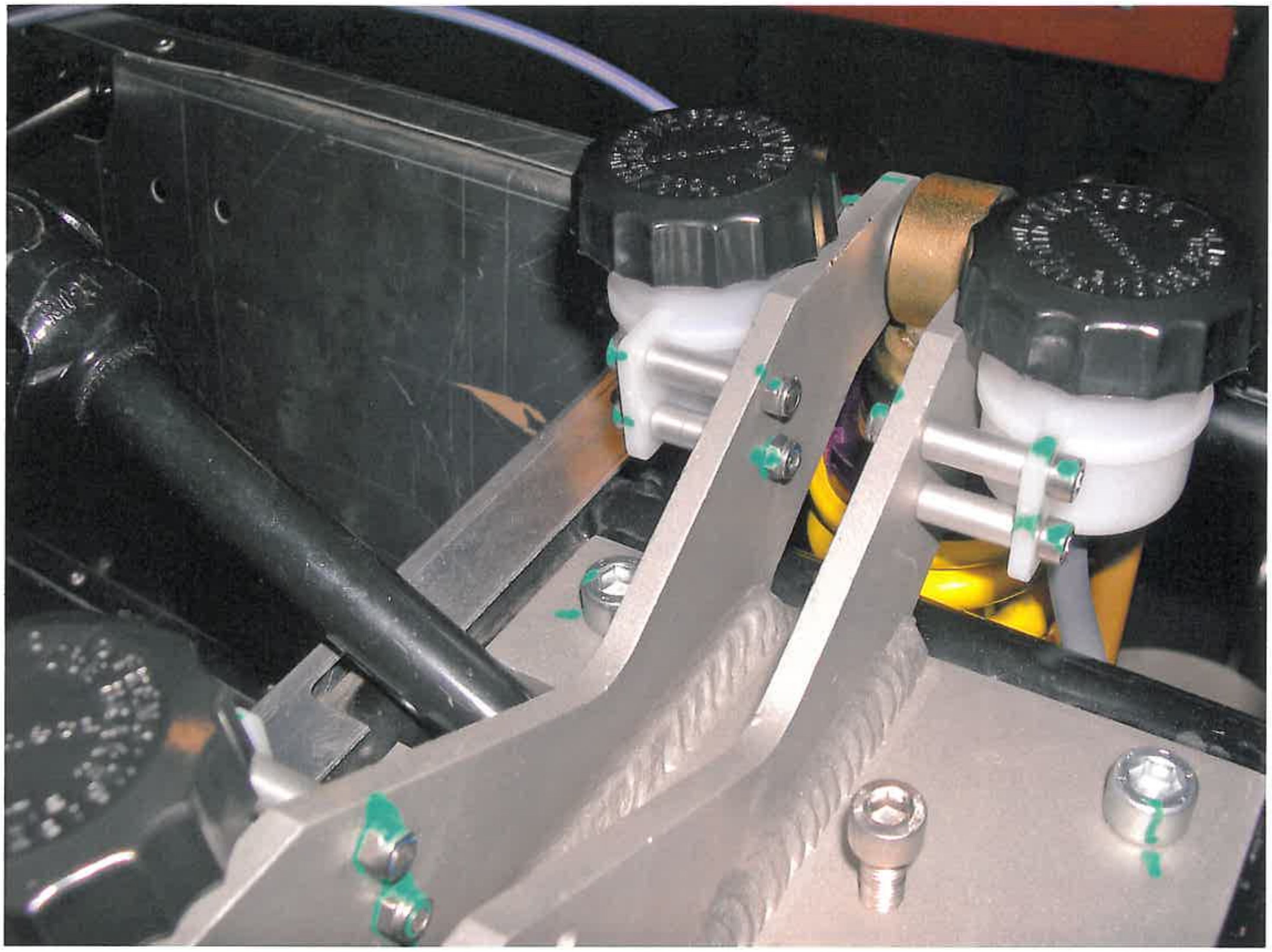


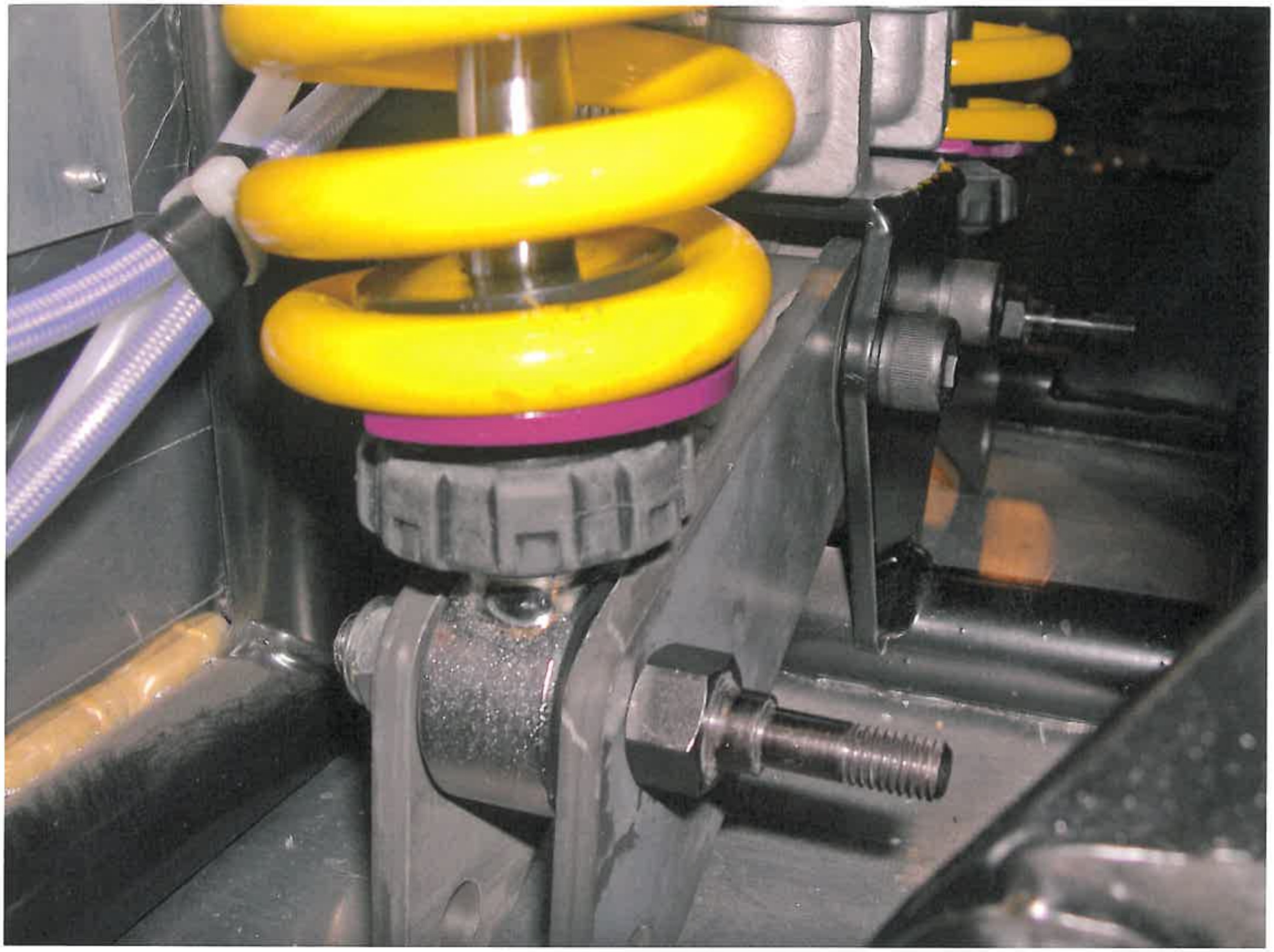


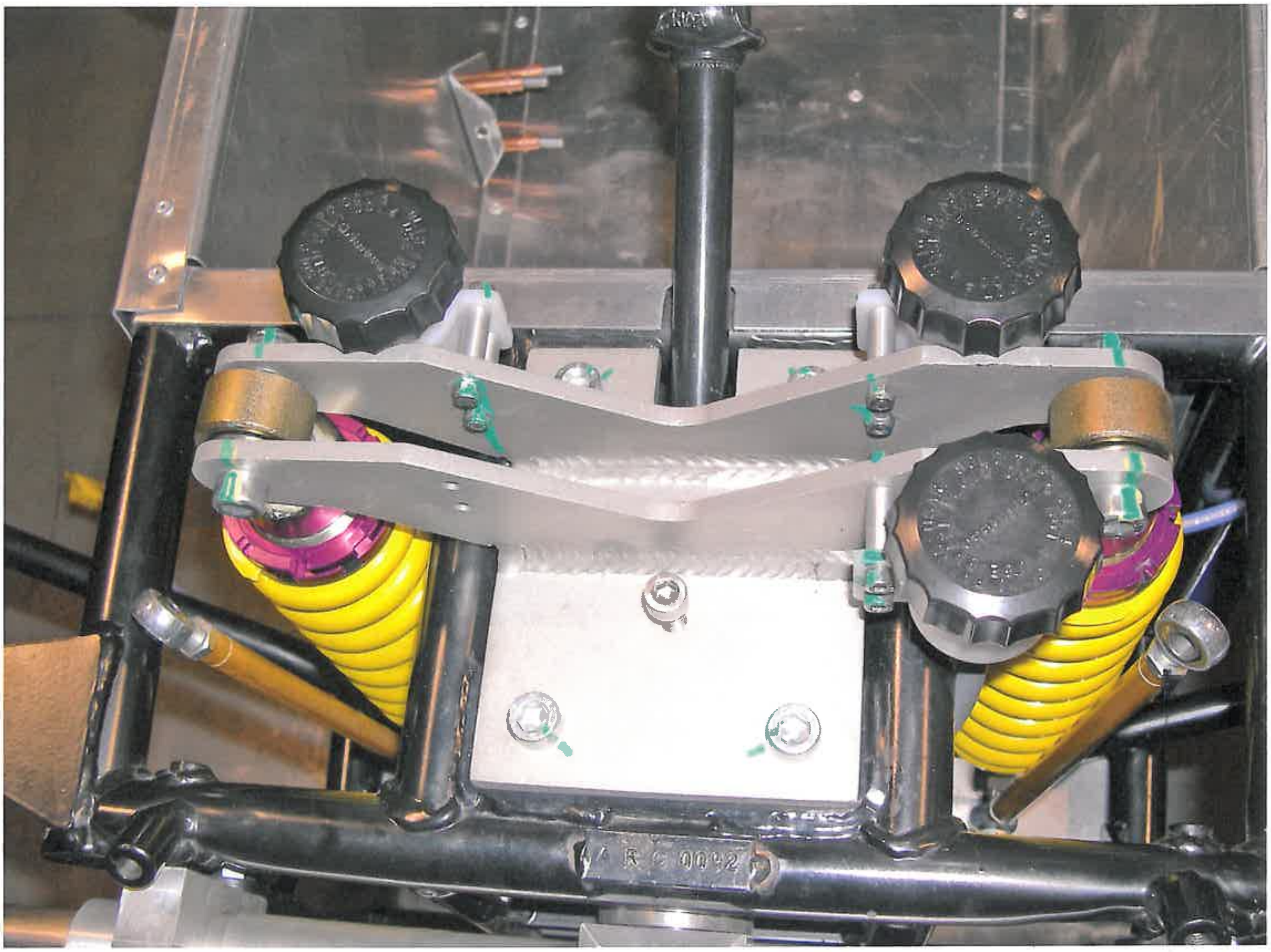

ARC 0092



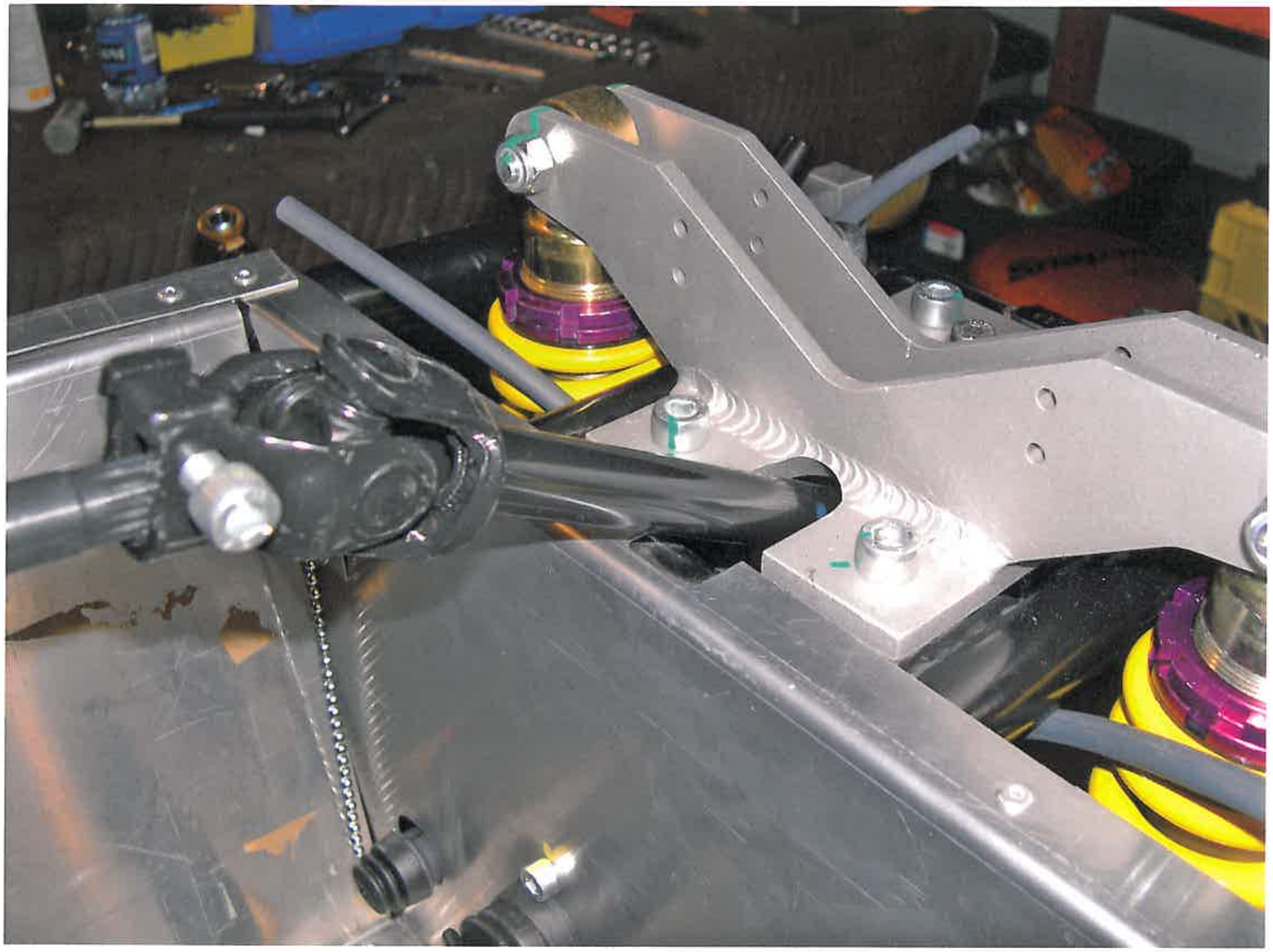
TRANSVERSE ROD L = 37.60 CM
L.H THREAD TO UPPER OUTER SIDE
BEARINGS L.H. SMLG 1240
R.H SMG 1240

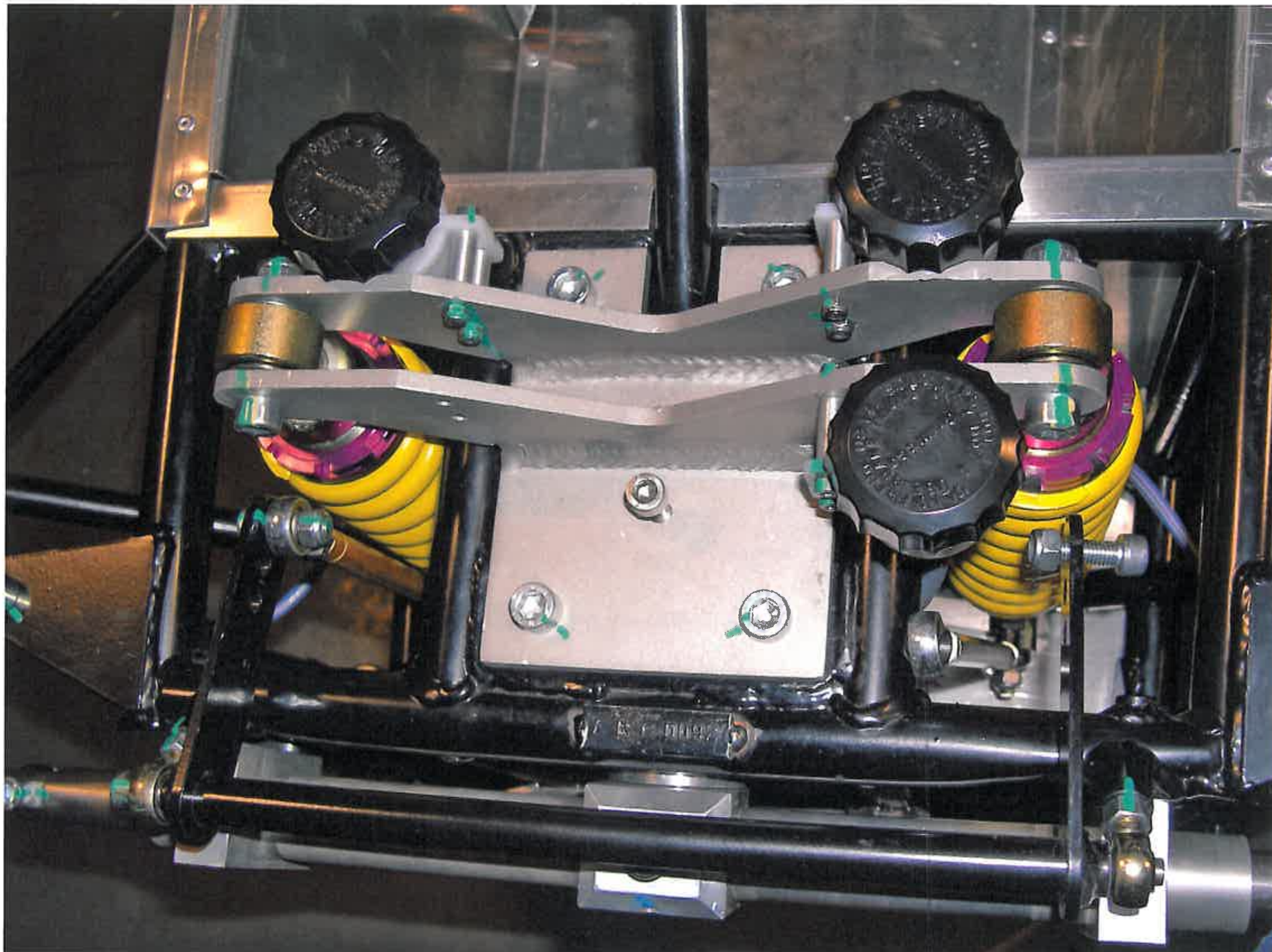
SPACER - STEEL I.D 11.50
O.D 16.50
L. 6.50





NOTE	RETRO





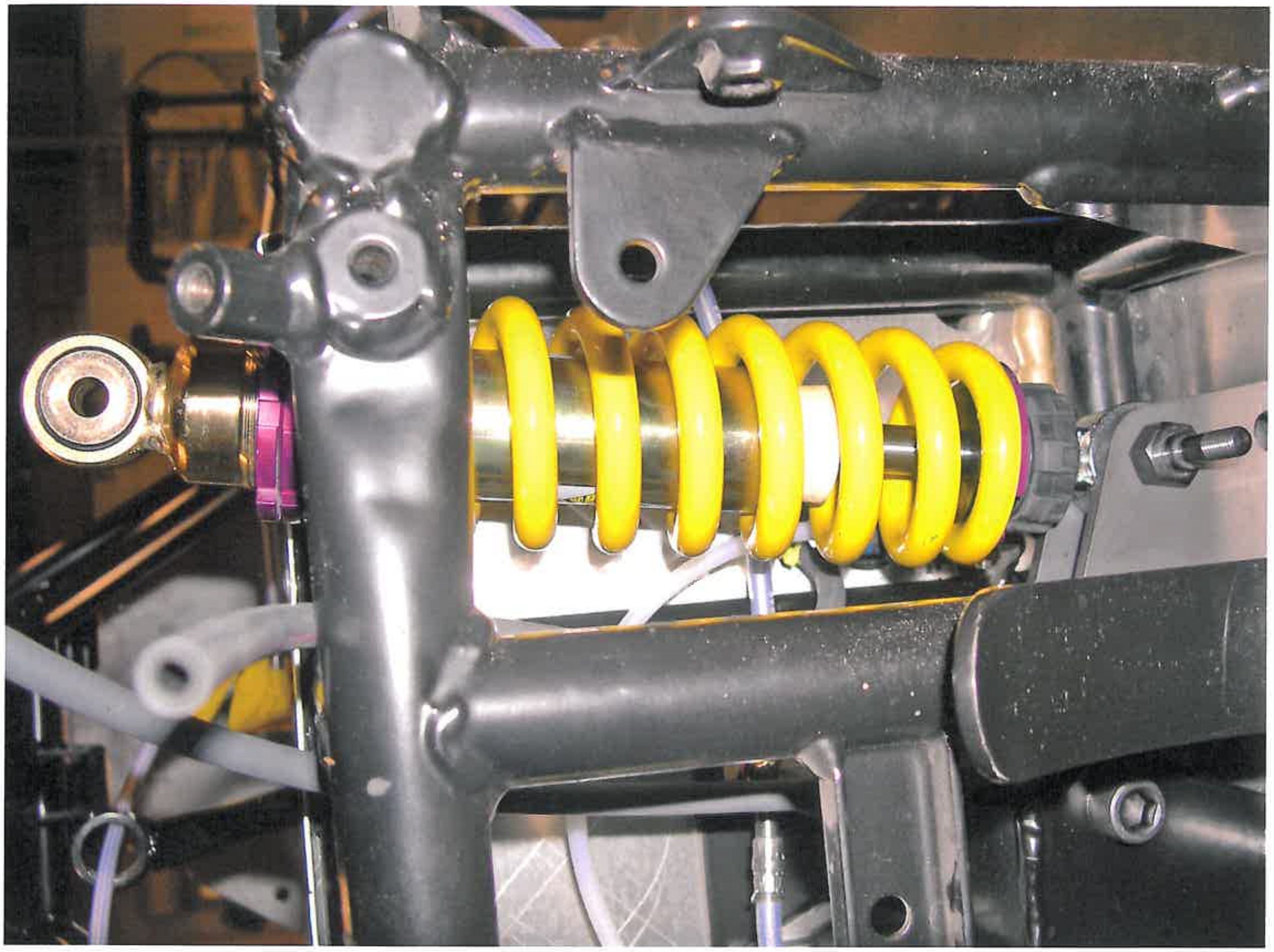
REAR BRAKE

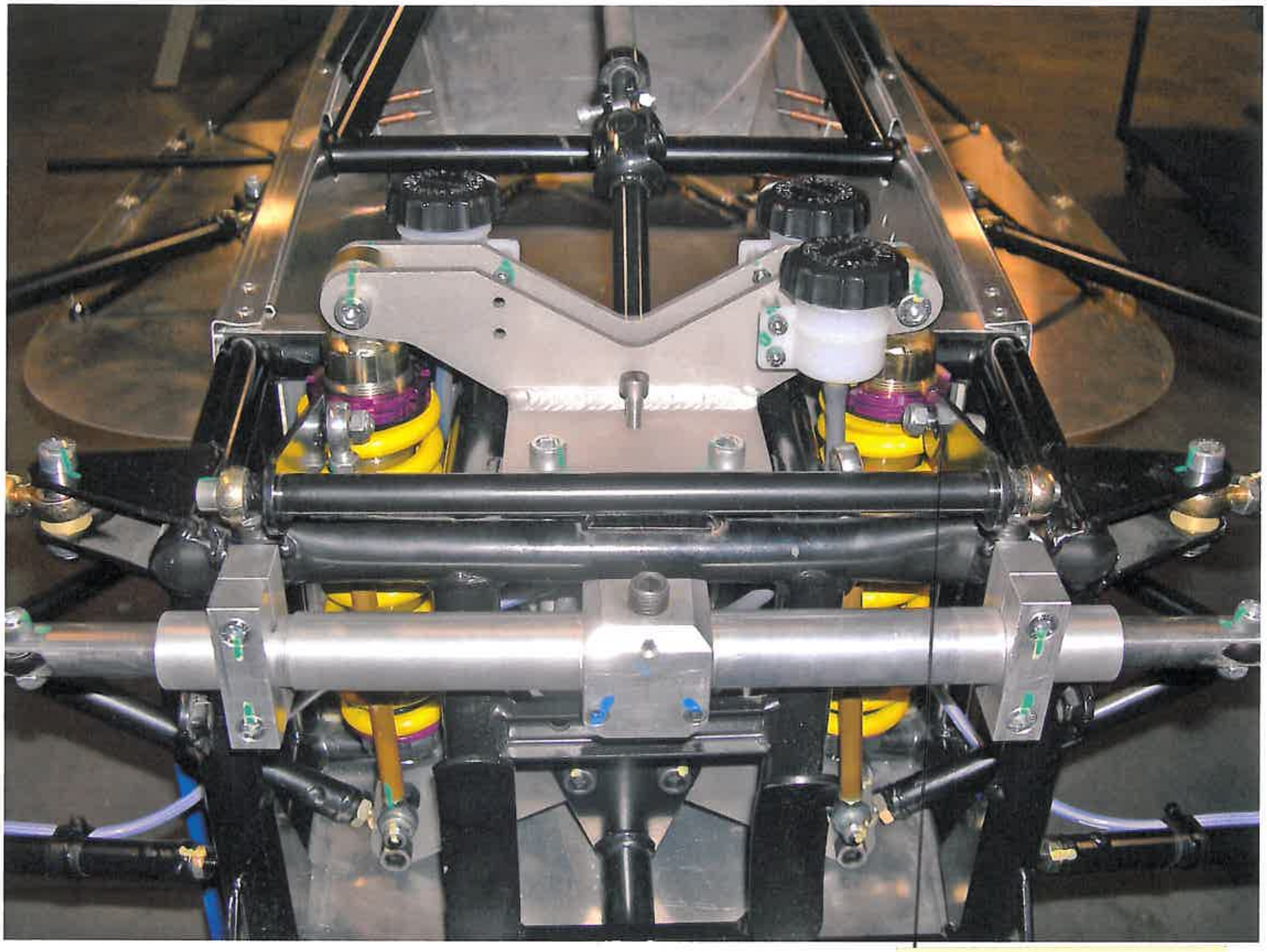
FRONT BRAKE

CLUTCH.

NOTE

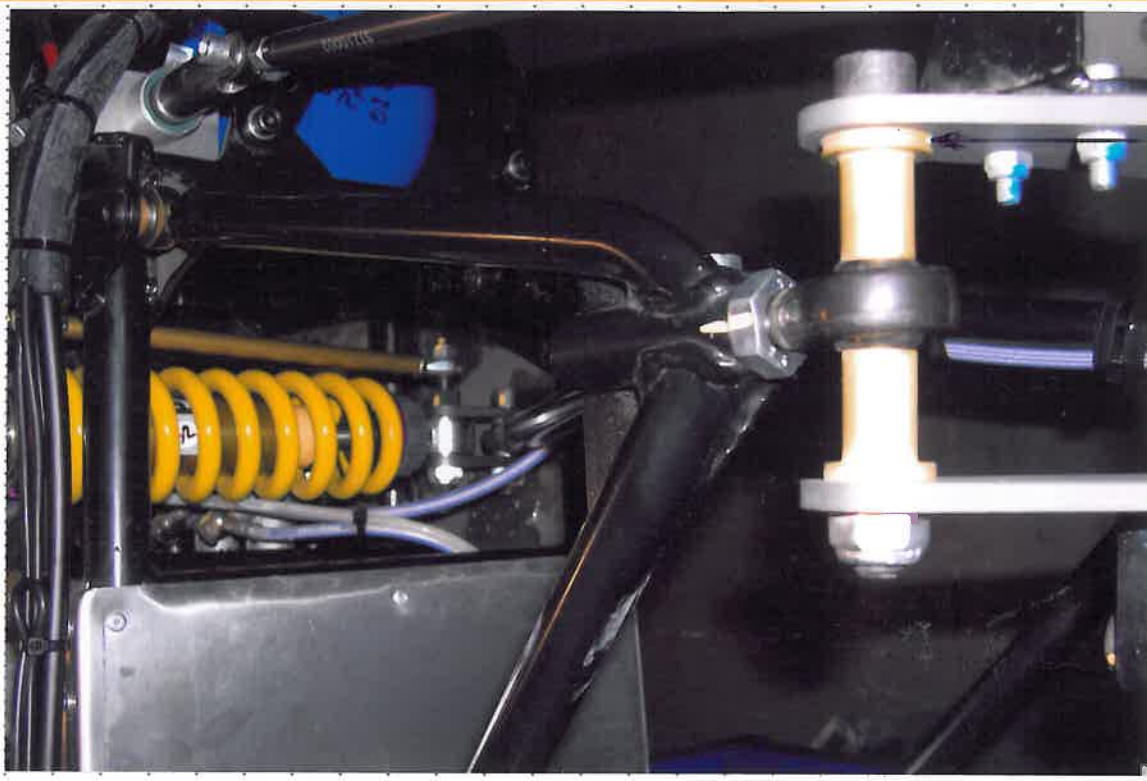
REDO
NEXT PAGE





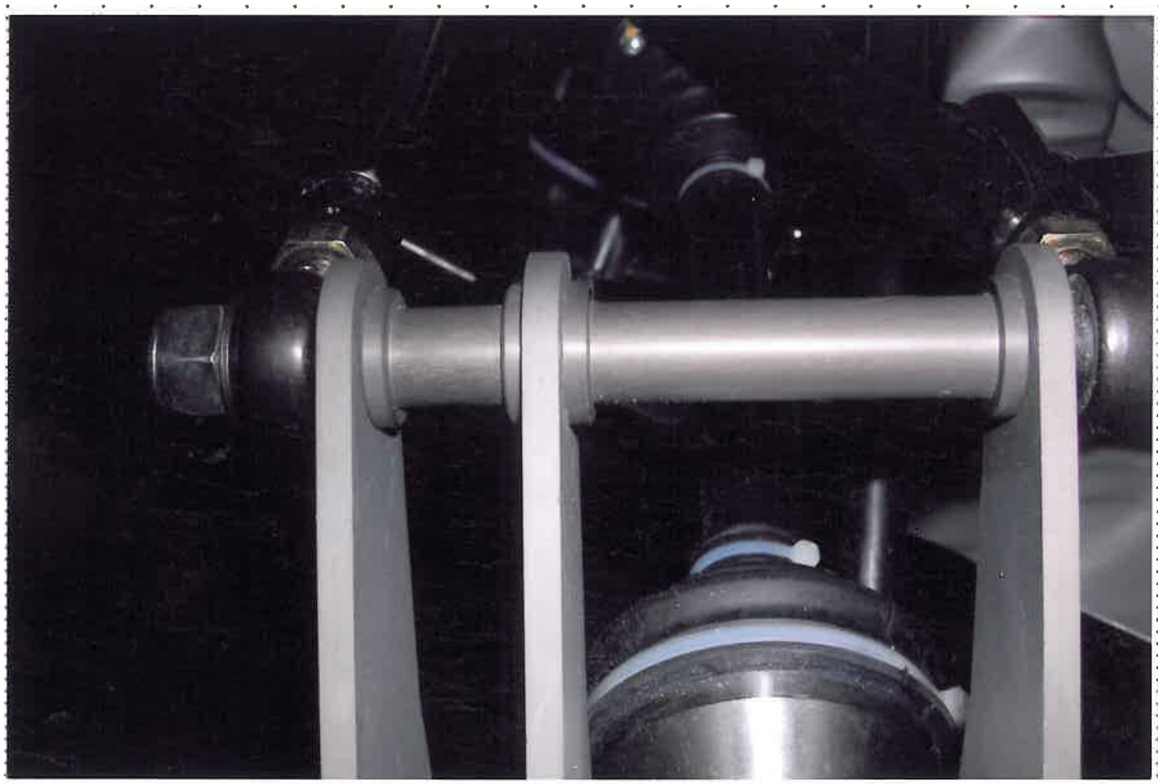
NOTE: RETRO:
INSTALL HEX HEAD-
SHALLOWER BOLT
TO ENSURE
SUFFICIENT CLEAR-
ANCE BETWEEN
BOLT HEAD AND
FWD. BRAKE
RESERVOIR.


A R C 0092



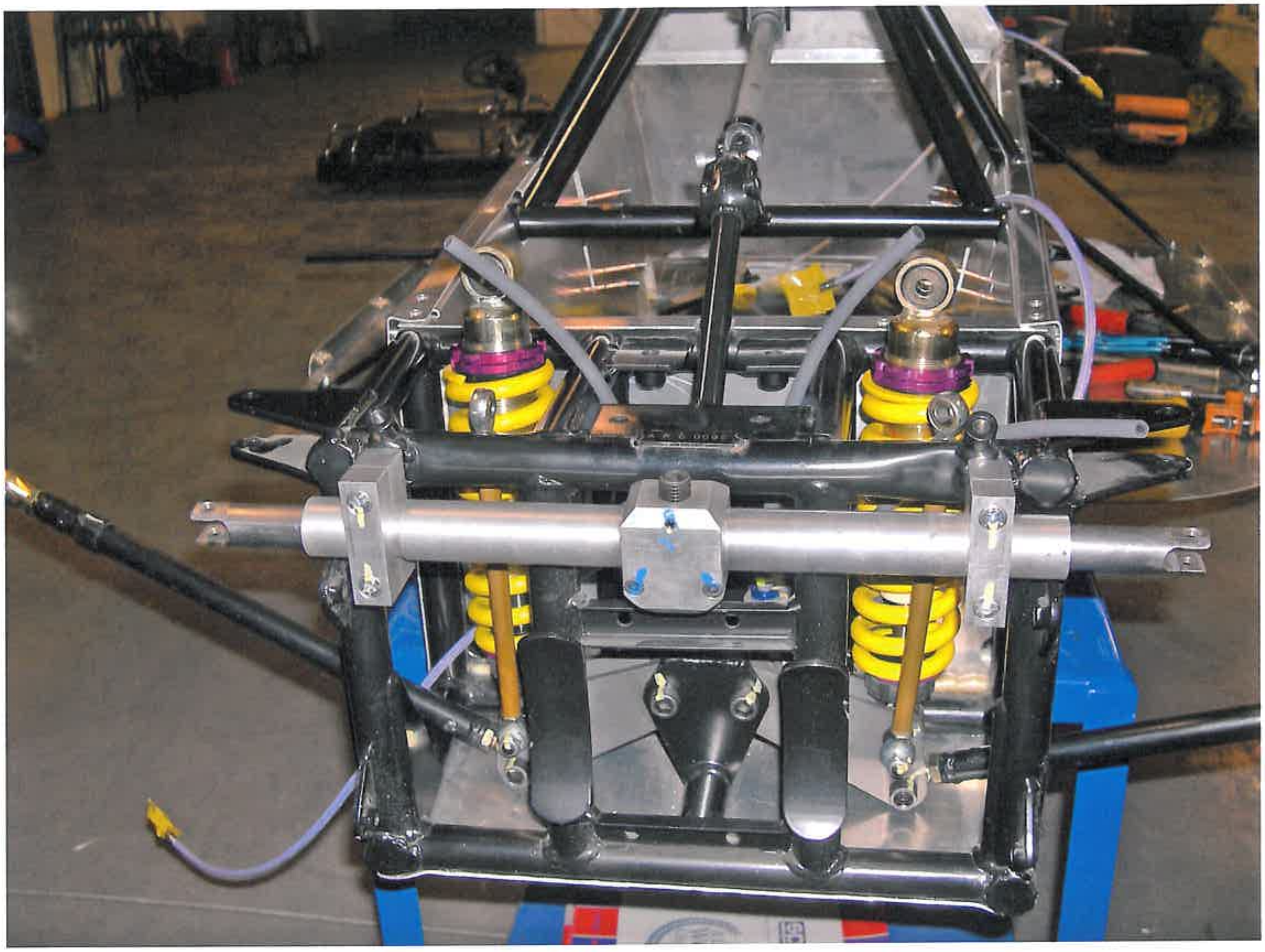
FRONT SUSPENSION
NOTE: GROOVED SPACER TO FRONT (CASTOR ADJUSTM.)

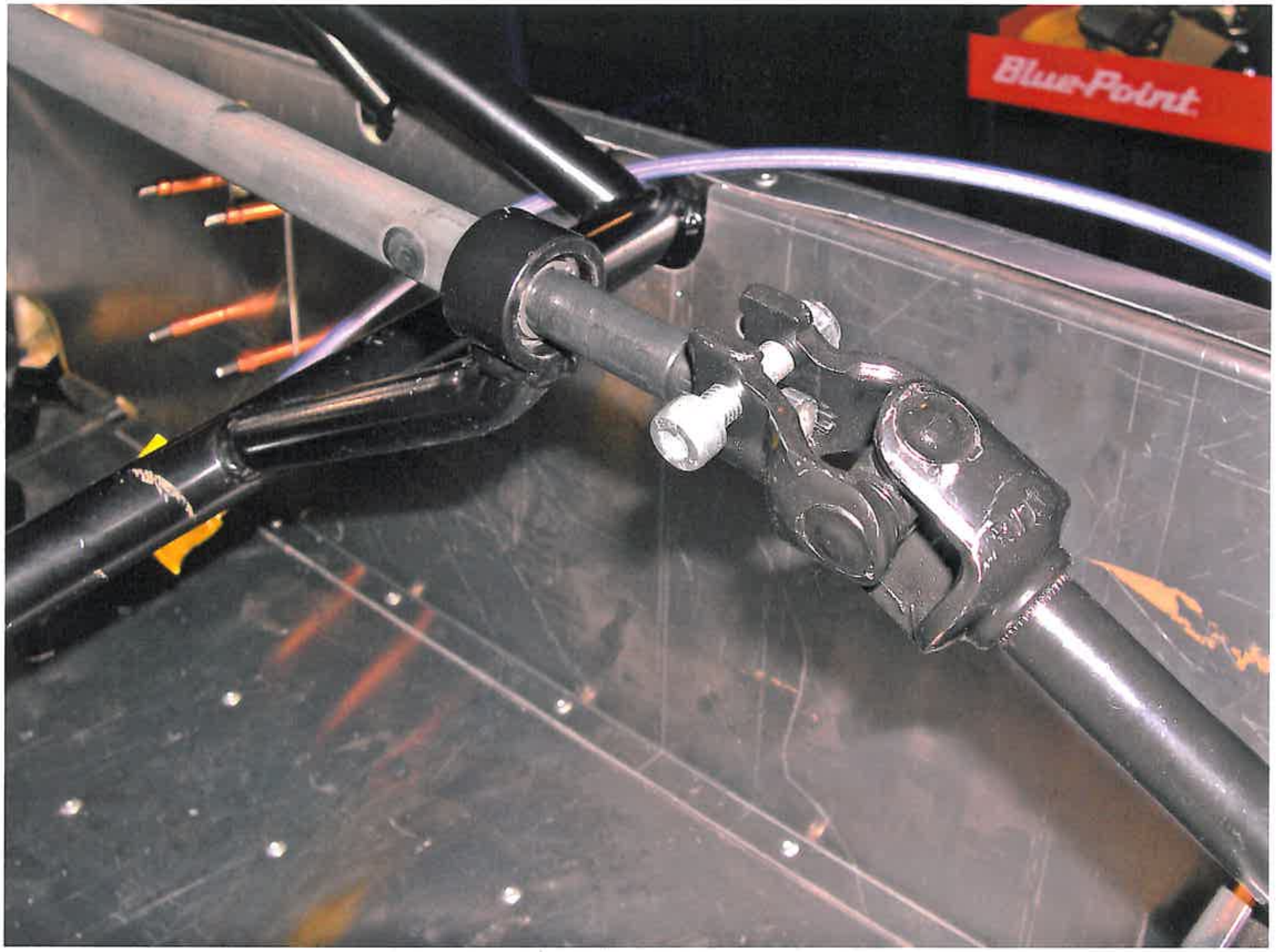
FWD.



AFT SUSPENSION

FWD.

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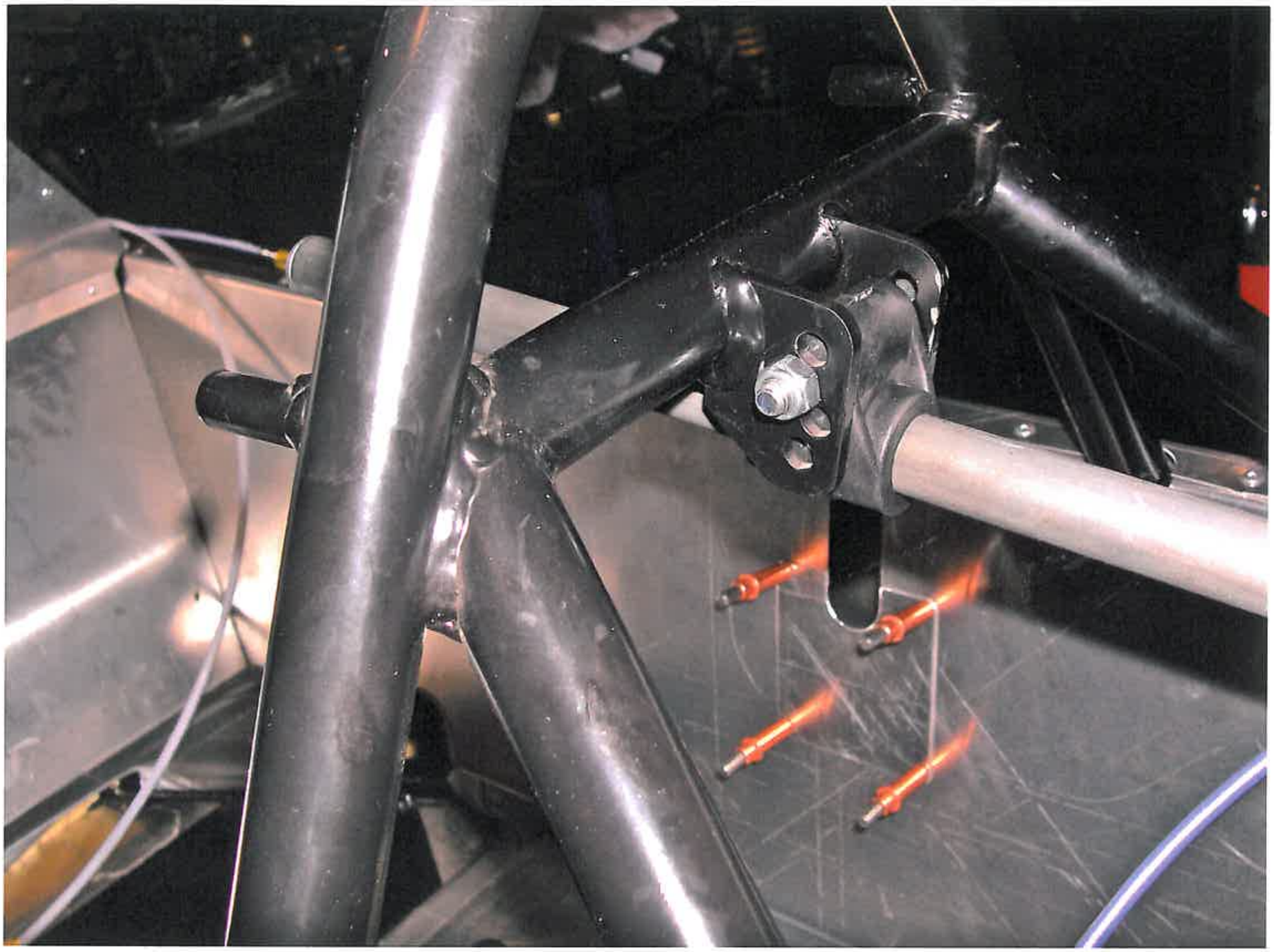

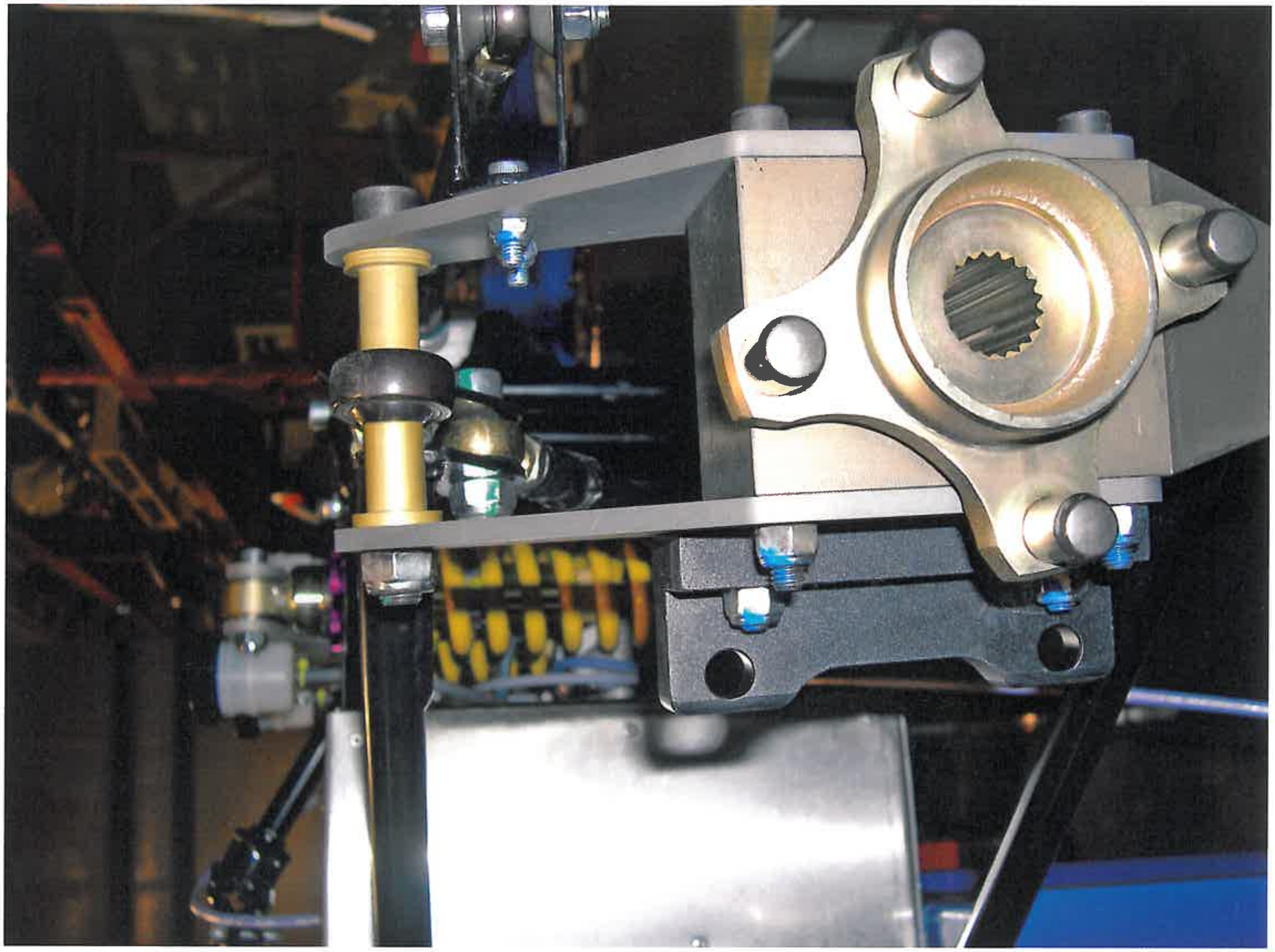

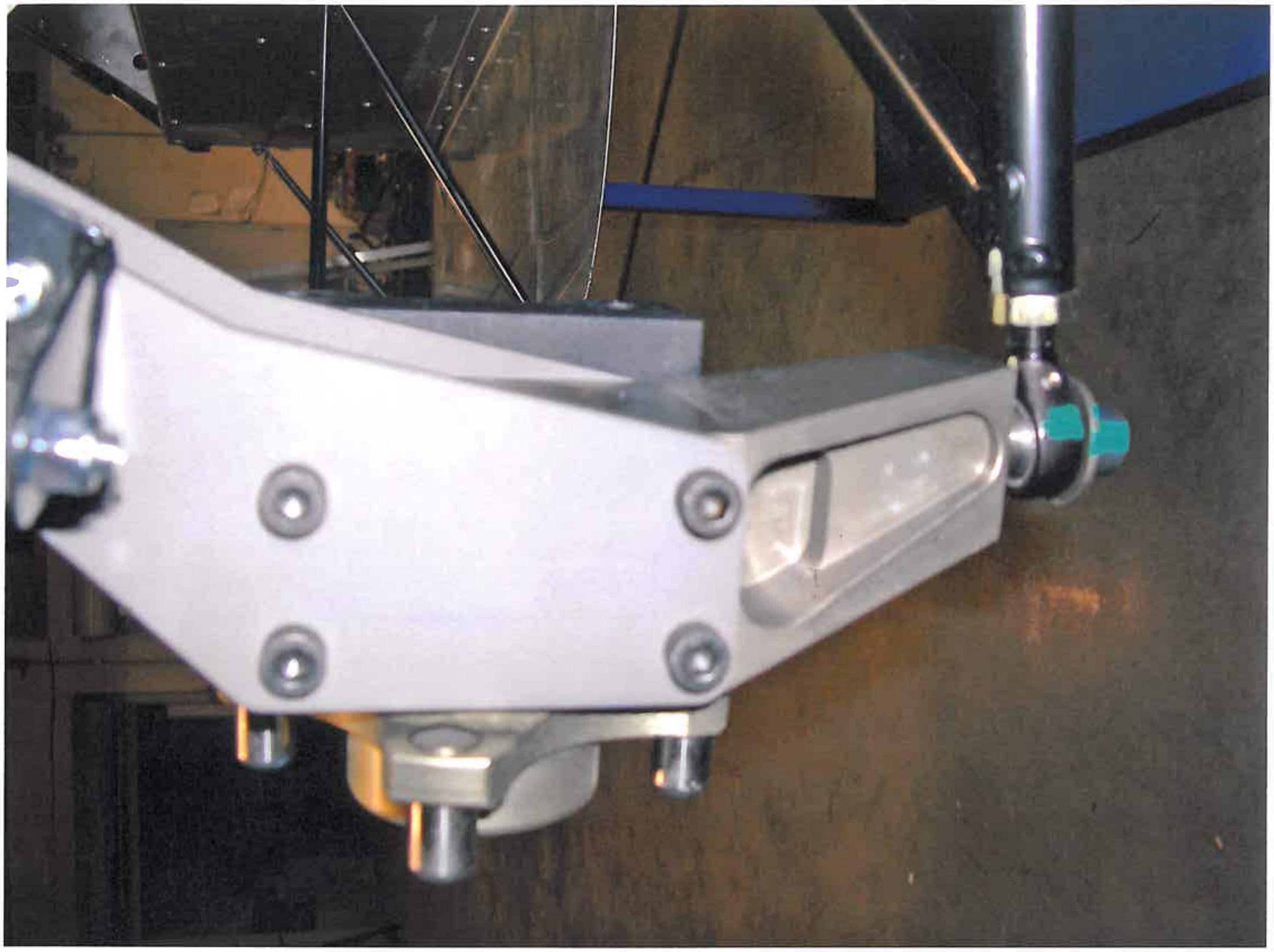

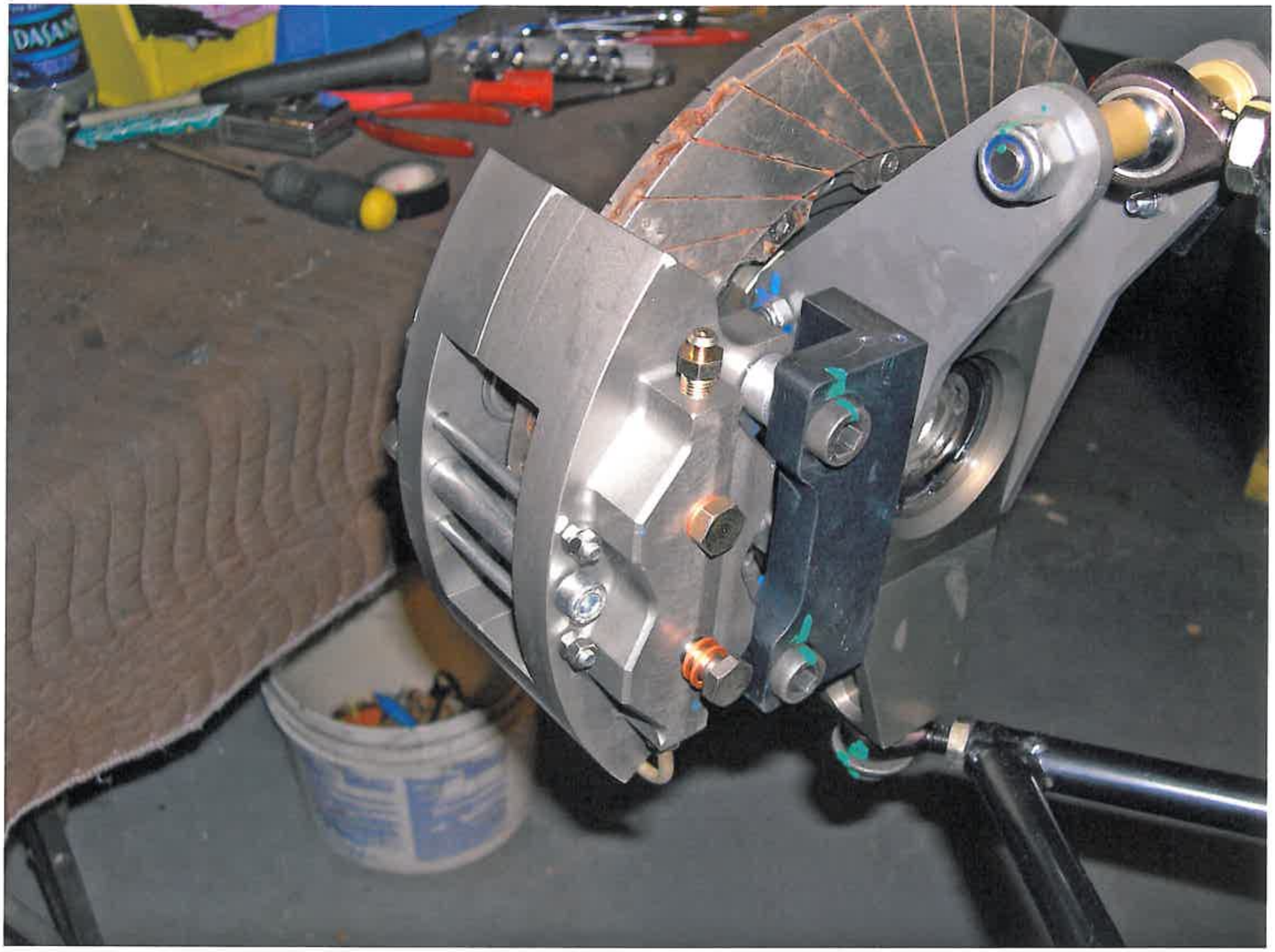
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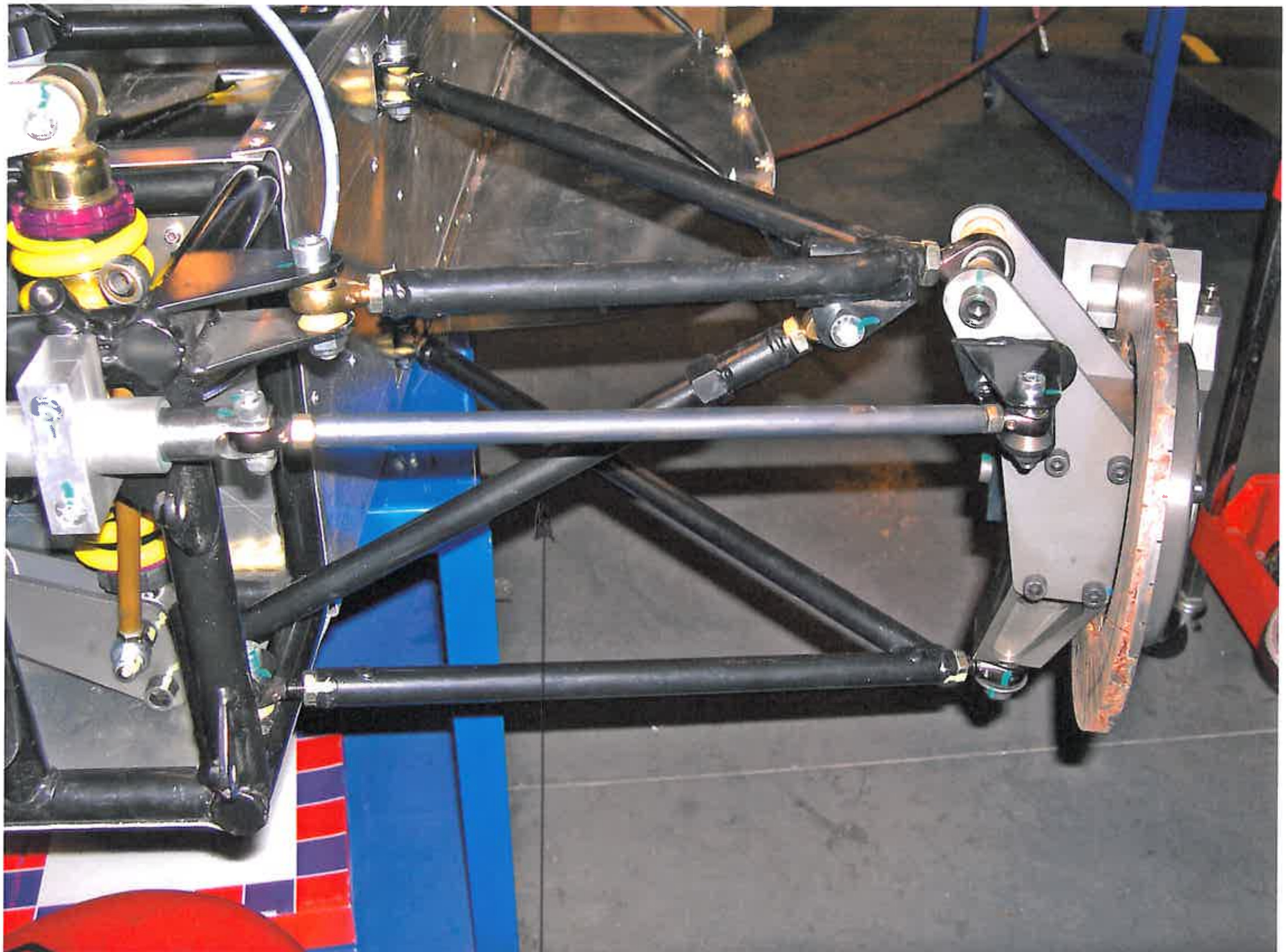
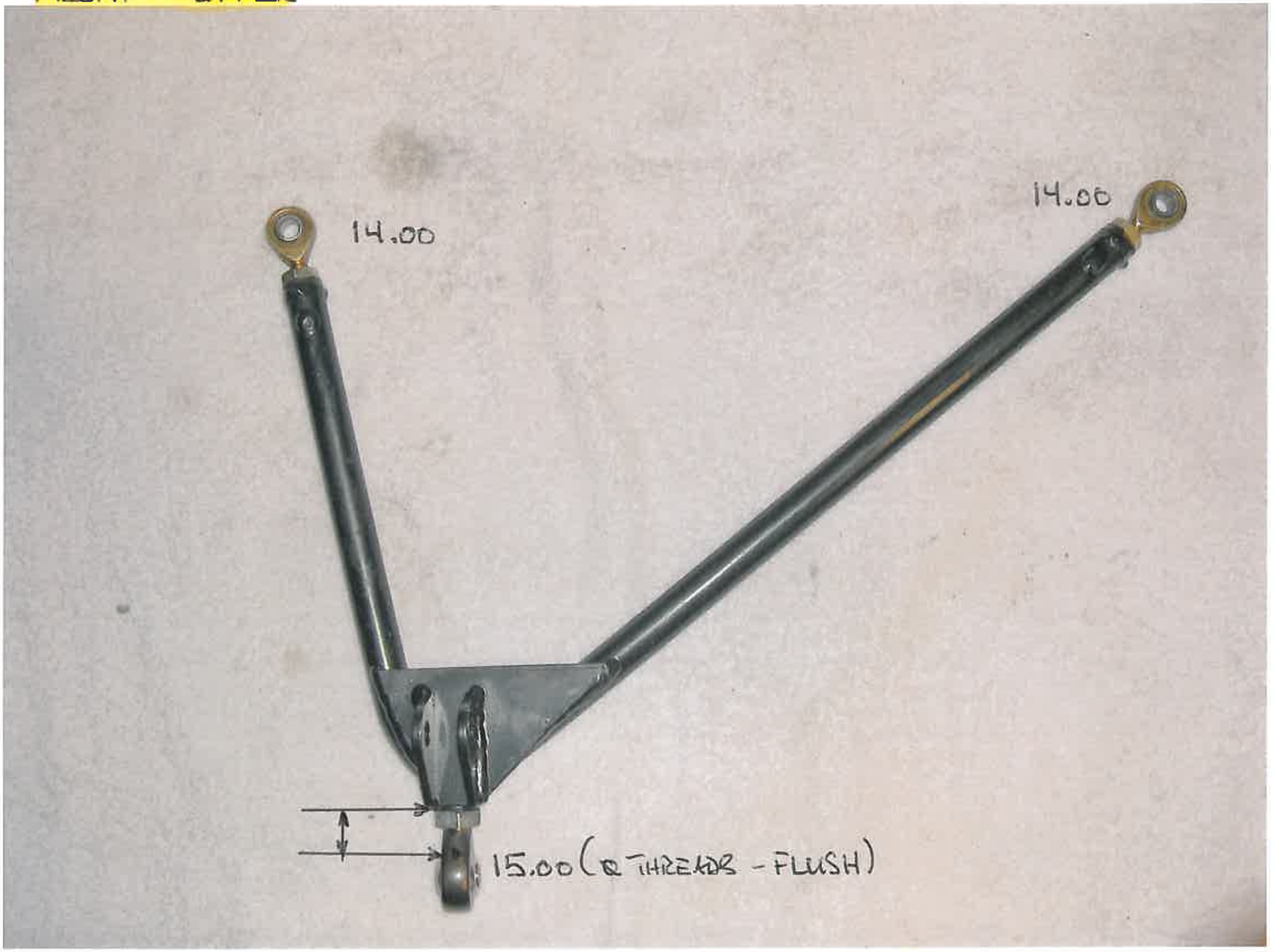


NOTE: FWD. DIAGONAL "L" 371.00 M/M

FRONT UPPER



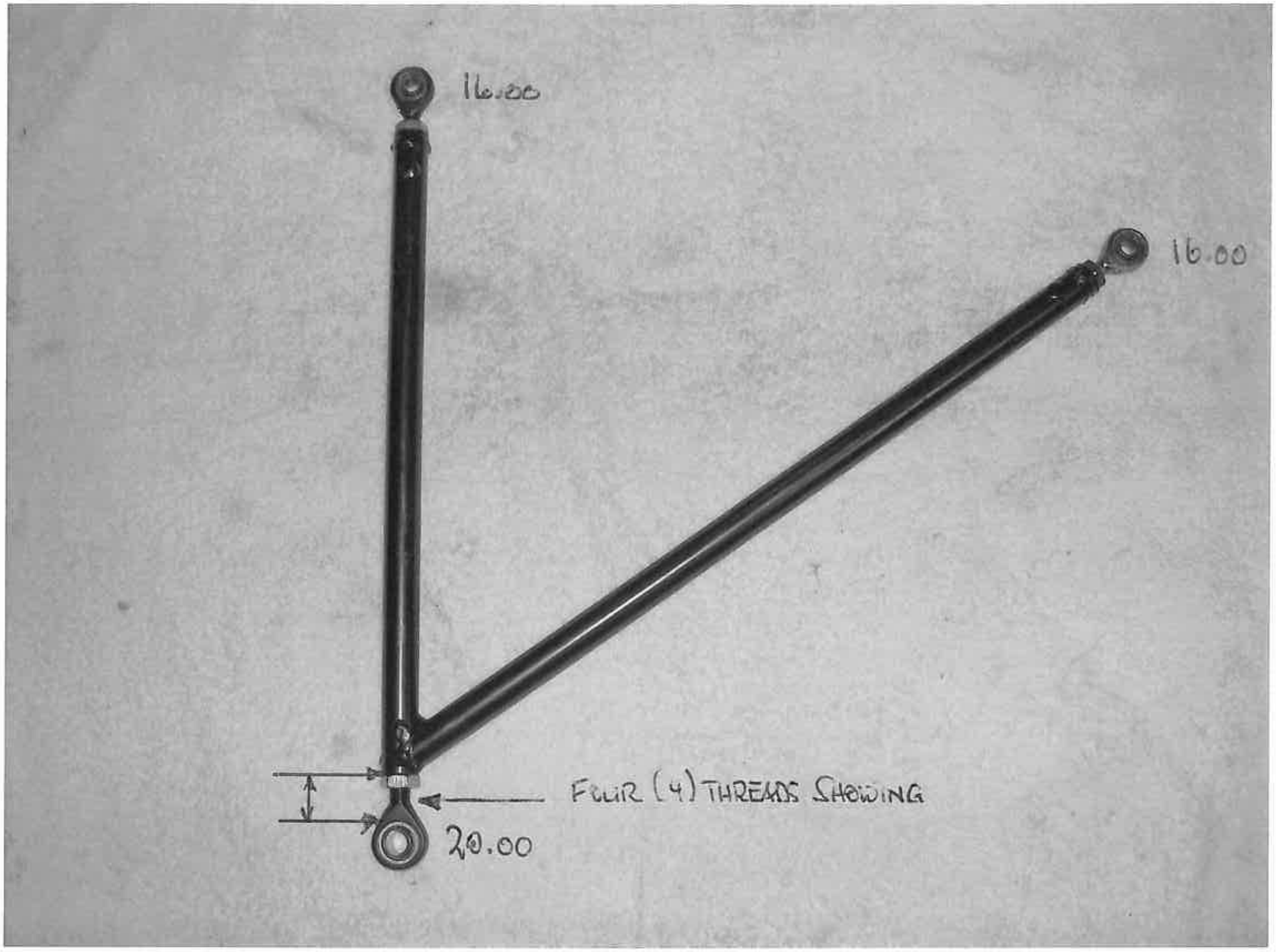
MEASUREMENT FROM GREASE NIPPLE TO BASE OF JAM NUT

DIAGONAL ROD. INITIAL SETTING BOLTHEAD OUTER TO BOLTHEAD OUTER 455.00

460.00

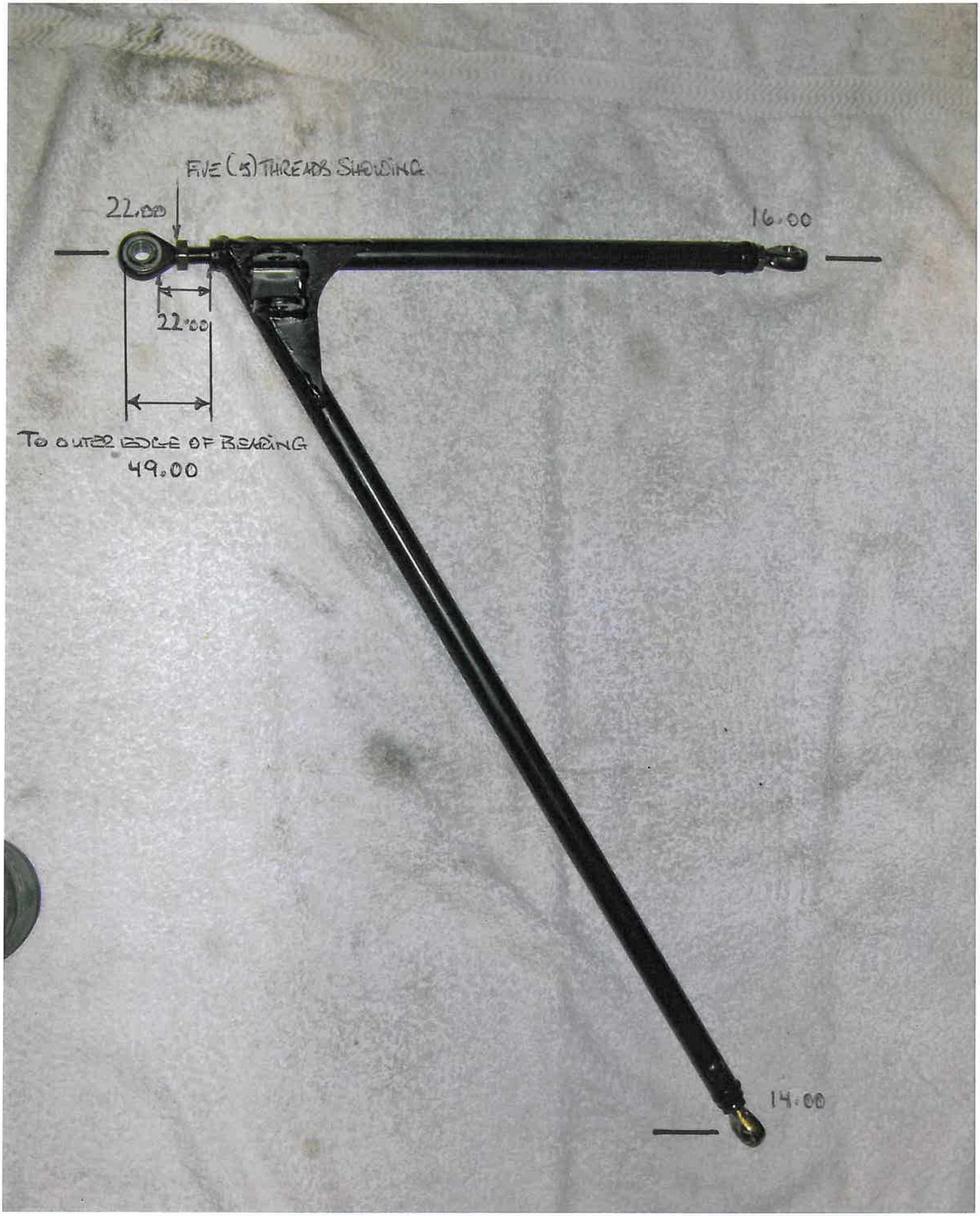
NOTE: ROD. DIAGONA 'L' 371.00 m/m

FRONT LOWER



MEASUREMENT FROM GREASENIPPLE CENTRE TO
BASE OF JAM NUT

REAR LOWER

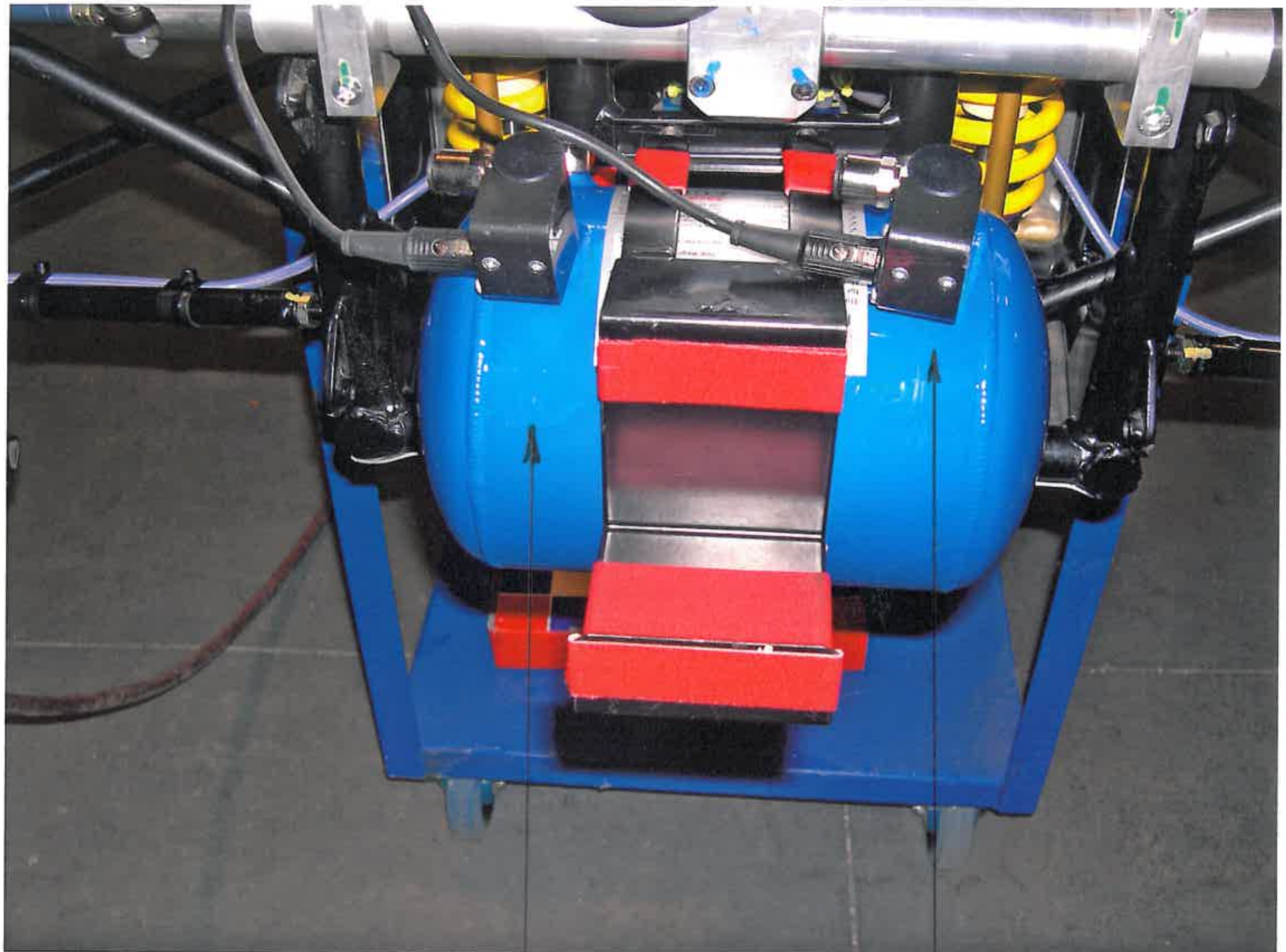


MEASUREMENT FROM GREASE NIPPLE CENTRE TO BASE OF JAM NUT

REAR UPPER

MEASUREMENT FROM GREASE NIPPLE CENTRE TO BASE OF JAM NUT

DIAGONAL AFT INITIAL SETTING BOLTHEAD OUTER TO BOLTHEAD OUTER 475.00 (480.00)



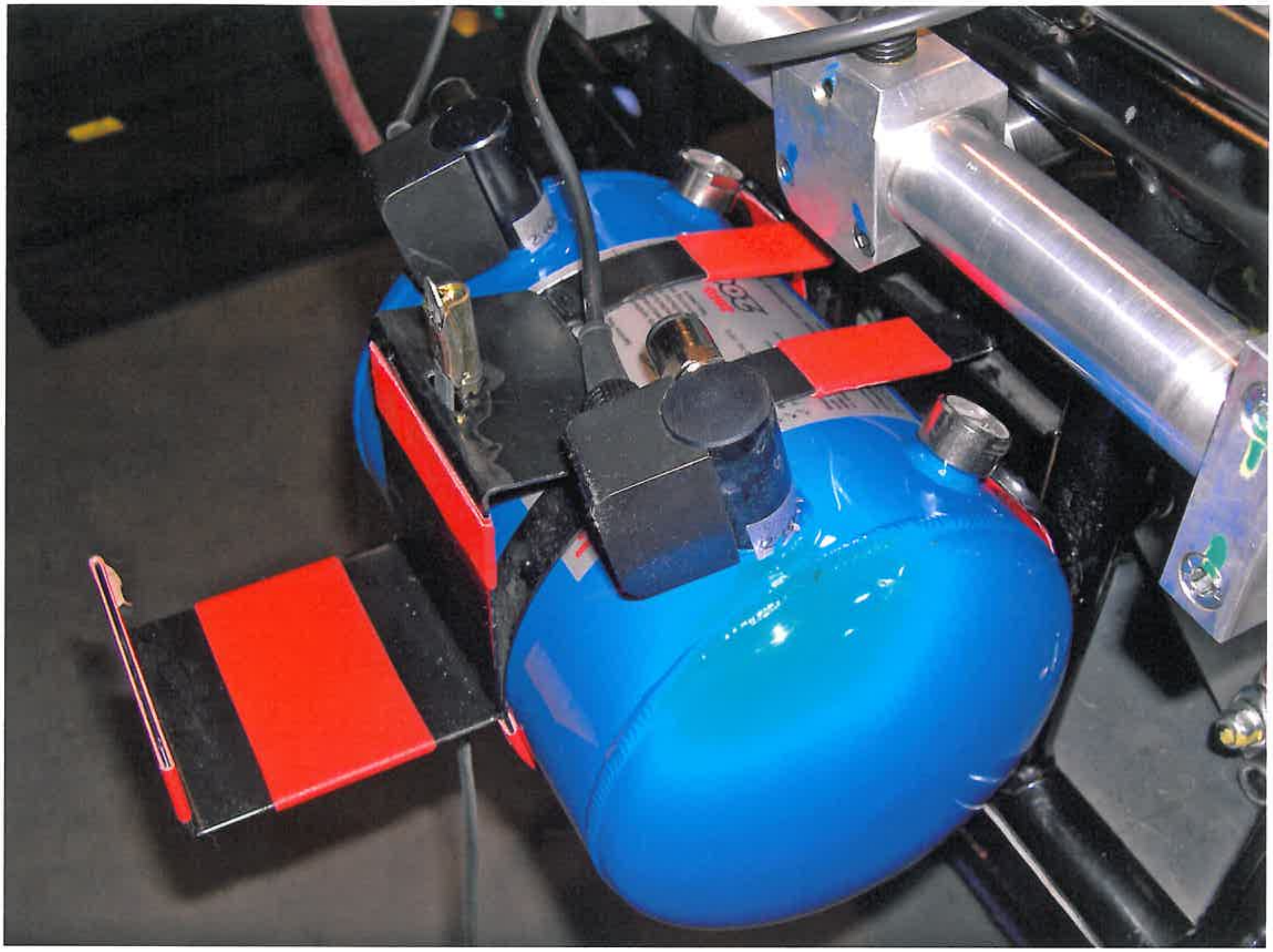
L.H. SIDE - ENSURE SUFFICIENT CLEARANCE FOR SQUIB PLUG AND PRESSURE GAUGE

ENGINE COMPT.

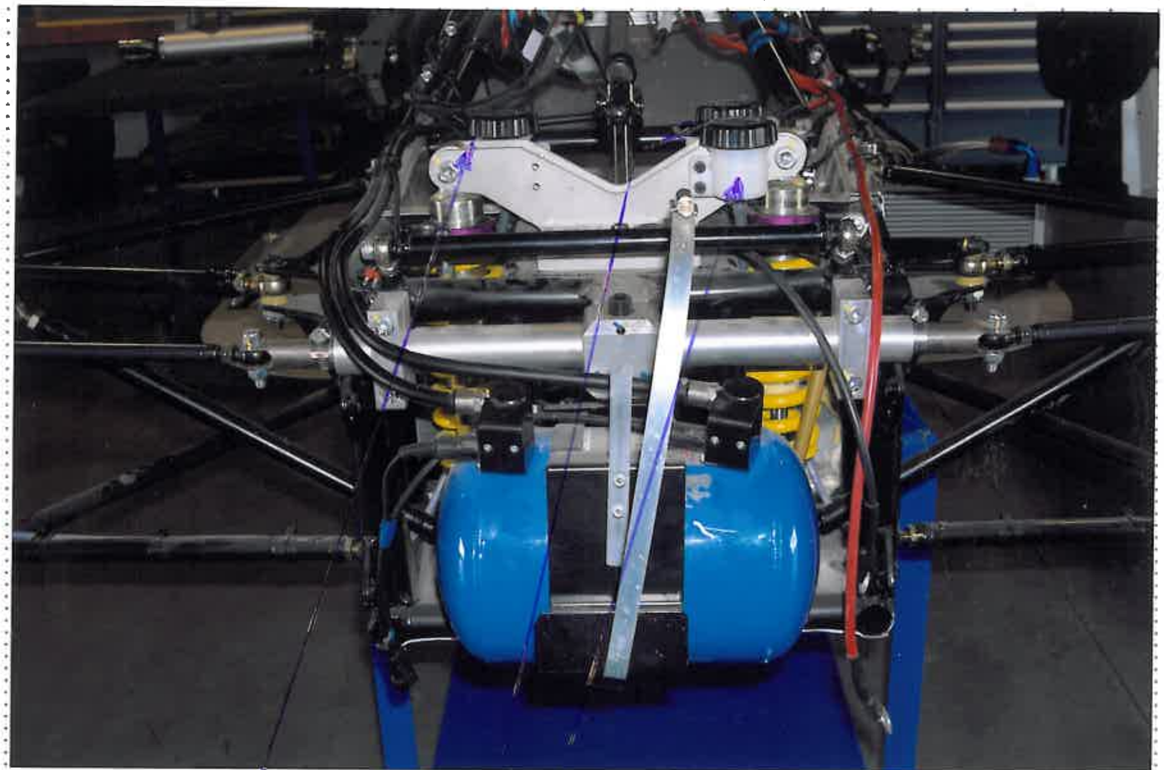
DISCHARGE TO ENGINE

COCKPIT COMPT.

DISCHARGE TO COCKPIT



From the workbench of:
Date:



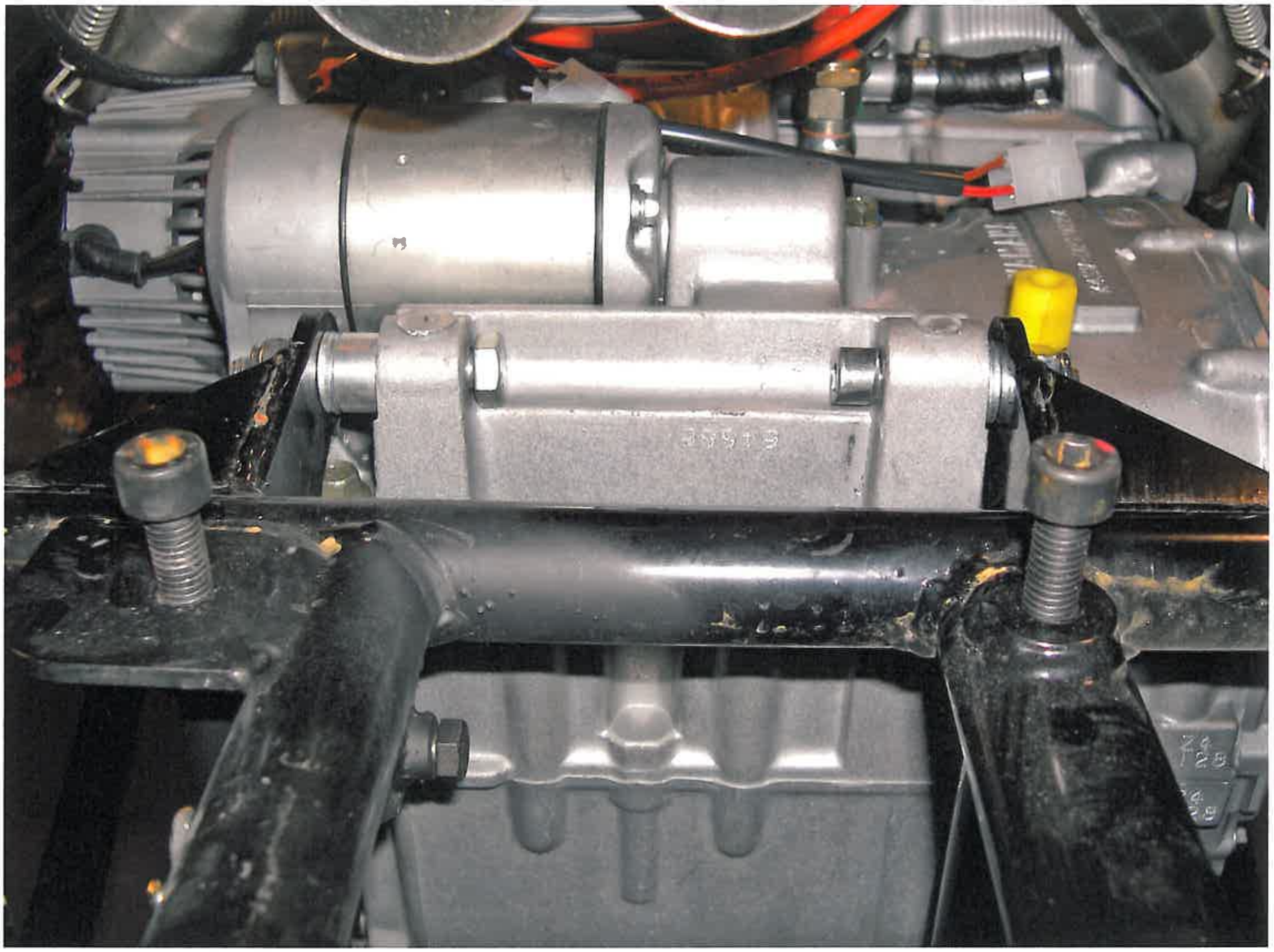
REAR BRAKE

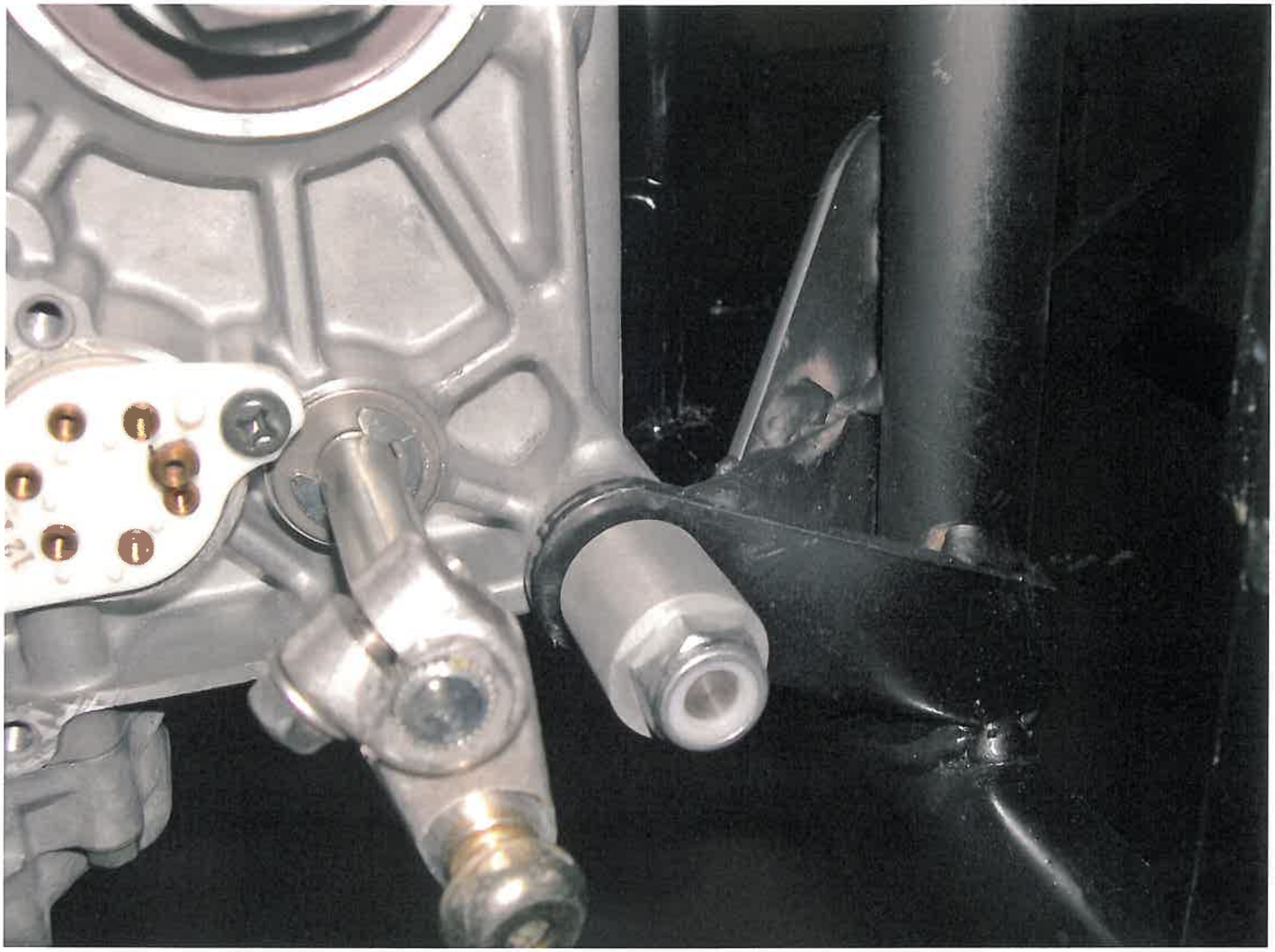
FRONT BRAKE

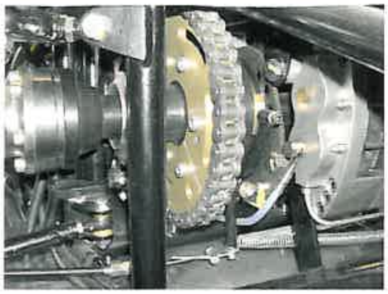
FRONT - FACING AFT

CLUTCH

BRAKE FLUID
RESERVOIRS



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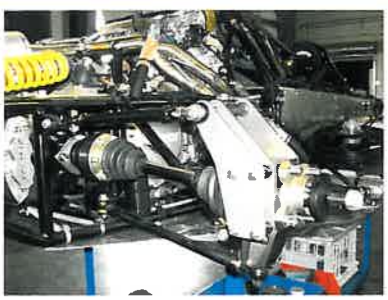
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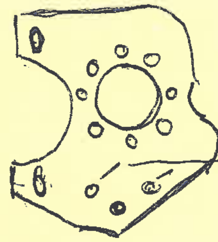
"AFTER FINAL TIGHTENING - INSTALL WITNESS MARKS"

NOTE: INSTALL COMPONENT IN THEIR PROPER SEQUENCE, PLANETARY GEAR DISASSEMBLED TO ACCOMMODATE INSERTION, INSTALL SHAFT FROM RIGHT TO LEFT.

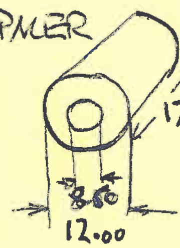
REAR CENTRE MAIN AXLE

INSTALL IN SEQUENCE "UNASSEMBLED)
PRIOR TO INSERTION ATTACH ADAPTOR FLANGE TO BRAKE DISC - ATTACH FLANGE TO FLAT SIDE OF DISC,
USE BLACK BOLTS - ALLEN HEAD.
BOLTS INSIDE TO OUTSIDE
BOLT SIZE Ø6.00 L35.00 GRIP 12.00 MIN.
INSTALL PLAIN NUTS PLUS PAL NUTS - WITNESS MARK - INSTALL LOOSELY ON INSERTED SHAFT - FLANGE TO R.H. OUTSIDE
NEXT FROM LEFT LOOSELY INSTALL REVERSE SUPPORT PLATE - PRIOR TO INSERTION INSTALL BALL JOINTS (6MM - TO SUPPORT SLIPRING YOKE) IN CENTRE INSTALL STOP BOLT Ø6.00M HEX HEAD, BLACK, ADJUST NUT PLAIN AN FIBRE LOCKNUT

PLATE P/N TRM 2006



ATTACH BOLTS HEX HEAD - PLAIN Ø8.00MM L=35MM HEAD 13.00MM
BALL ENDS. SM 6.40
STOP BOLT ALLEN HD 6×20
STOP BOLT
SPACER



SEQUENCE

1. INSTALL CENTRE SHAFT IN FRAME
2. LOOSELY INSTALL BRAKE DISC TO SHAFT
3. LOOSELY INSTALL PLATE TRM 2006 ON SHAFT - SECURE NONE OF THE ABOVE ITEMS.
4. INSTALL REVERSE GEAR ASSY. (LUBE PRIOR TO INSTALLATION WD40)
5. INSTALL PLATE TRM 2006 ATTACH BOLTS, SPACERS AND WASHERS, DO NOT YET TIGHTEN FULLY
6. INSTALL CENTRE SHAFT BEARINGS SHELLS OUTSIDE OF BRACKETS - BOLT Ø10.00MM L=25.00MM BLACK FIBRE LOCKNUTS. SECURELY TIGHTEN. PRIOR TO BEARING INSTALLATION ENSURE SET SCREWS ARE REMOVED.
7. SECURELY TIGHTEN PLATE TRM 2006 ATTACH BOLTS ENSURE PROPER ALIGNMENT OF REVERSE GEAR HOLDING PINS.
8. MOUNT BRAKE DISC TO SHAFT FLANGE, USE BLACK BOLTS, ALLEN HEAD Ø8.00MM GRIP 14.00MM L.45.00MM, FEED BOLTS INSIDE TO OUTSIDE, INSTALL PLAIN NUTS AND PAL NUTS

REAR CENTRE MAIN AXLE

NOTE: INSTALL BRAKE CALIPER PRIOR TO INSTALLING YOKE AS THE LOWER BOLT WILL NOT CLEAR THE YOKE INSTALLED.

9. INSTALL CENTRE TO OUTER SHAFT ADAPTER FLANGES.
PROTECT SPLINES WITH CSA OR DRY MOLY
INSTALL LOCKNUT AND TORQUE TO 150 NM

10. ASSEMBLE REVERSE YOKE (PART M) - USE RIVNUTS OD 9MM
ID 6.00MM THREAD L 13.00MM FOR FORK BUSHINGS - ENSURE
THEY ARE TURNING FREELY - INSTALL FWD. SHOE, INSTALL
SPACER WASHER TO ENSURE FREE ROTATION / MOVEMENT
SECURE SHOE BOLT WITH REMOVEABLE LOCTITE (242)
INSTALL FORK ASSY. IN PLATE INSTALLED ROD END
SECURE BOLTS WITH LOCTITE 242, ENSURE
FORK ASSY FREEDOM OF MOVEMENT - INSTALL AFT
SHOE WITH SPACER, SAME AS FWD. SHOE
BOLTS - ALLEN HEAD Ø 6.00MM GRIP 30.00MM
LUBE SLIPRING WITH DRY MOLYCOTE (LOCTITE 3484)
ENSURE FREE AND PROPER FUNCTIONING OF
REVERSE MECHANISM

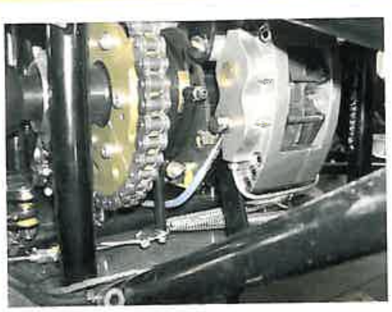
DSCN0225.JPG

11. INSTALL PREASSEMBLED OUTER DRIVE SHAFTS. ENSURE
ALL BEARINGS ARE PACKED WITH MOLY GREASE
COAT SPLINES WITH DRY MOLY OR CSA COMPOUND
PRIOR TO ASSEMBLY. AFTER BEARING INSTALLATION
INSTALL EXTERNAL RETAINING RING IN SHAFT GROOVE
(ID 25.00MM)
INSTALL FLANGE BOLTS (6 - Ø 8.00 GRIP 45.00MM) SMOOTH HEAD.
ALLEN HEAD, SECURE WITH LOCKTITE 242
SLIP ON DUST COVERS AND SECURE WITH PLASTIC TIES.

DSCN0204.JPG

12. INSTALL BRAKE CALIPER
LOWER BOLT HEX Ø 12.00MM L 40.00 MM
LOWER SPACER L 14.00MM I/D 12.50MM O/D 25.00

UPPER BOLT HEX Ø 12.00 L 45.00
SPACER L - 26.00M I/D - 12.50MM O/D - 25.00
ENSURE ROTATION AFTER COMPLETION OF INSTALLATION
IS DRAG FREE, ADJUST SPACER LENGTH IF REQUIRED
SECURE BOLTS WITH LOCTITE 242
WITNESS MARK FASTENERS ON COMPLETION
OF INSTALLATION



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13. INSTALL SPROCKET & DRIVE CHAIN

ENGINE DRIVEN SPROCKET Z 13
DRIVE SPROCKET Z 42

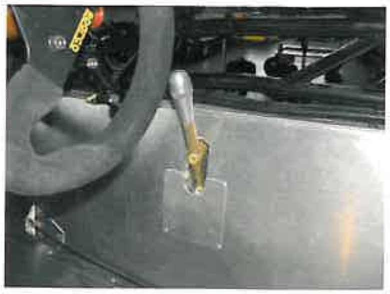
NOTE: THESE ARE SPECIAL SPEC. FOR LOCAL TRACK. PROVIDED CHAIN IS OF INSUFFICIENT LENGTH AND REQUIRES THE INSTALLATION OF AN ADDITIONAL LINK PLUS 2 (TWO) CONNECTOR LINKS.

SPROCKETS INSTALLED ON ENGINE FROM FACTORY Z 17

(CONNECTOR LINK P/N: DID 50VMZJ
DID DAIDO KOGYO LTD. JAPAN.

DRIVE SPROCKET ATTACH BOLTS

6 ONLY Ø 8.00MM GRIP 16.00MM
LENGTH TOTAL 25:00MM



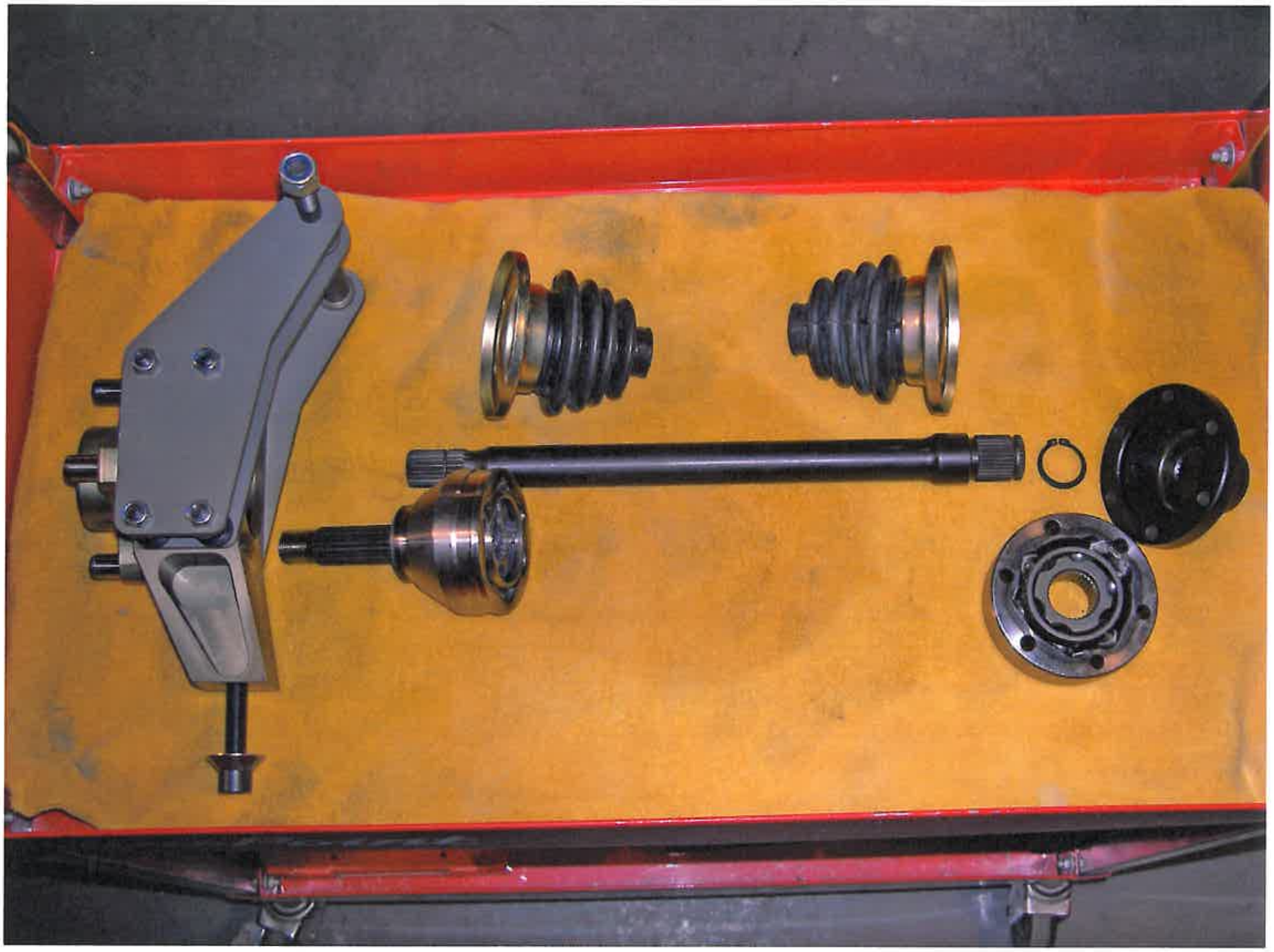
DSCN0208.JPG

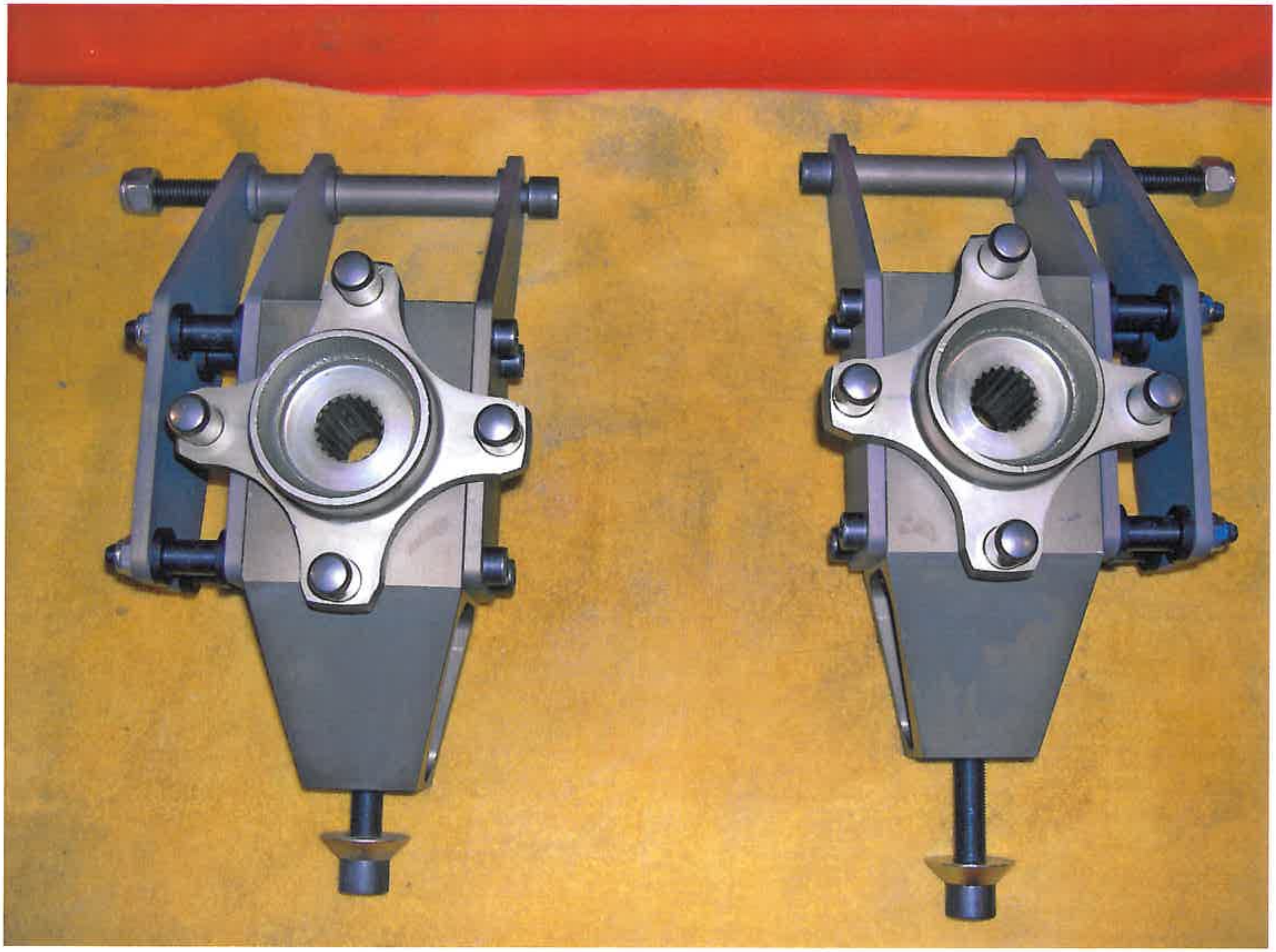
DSCN0209.JPG

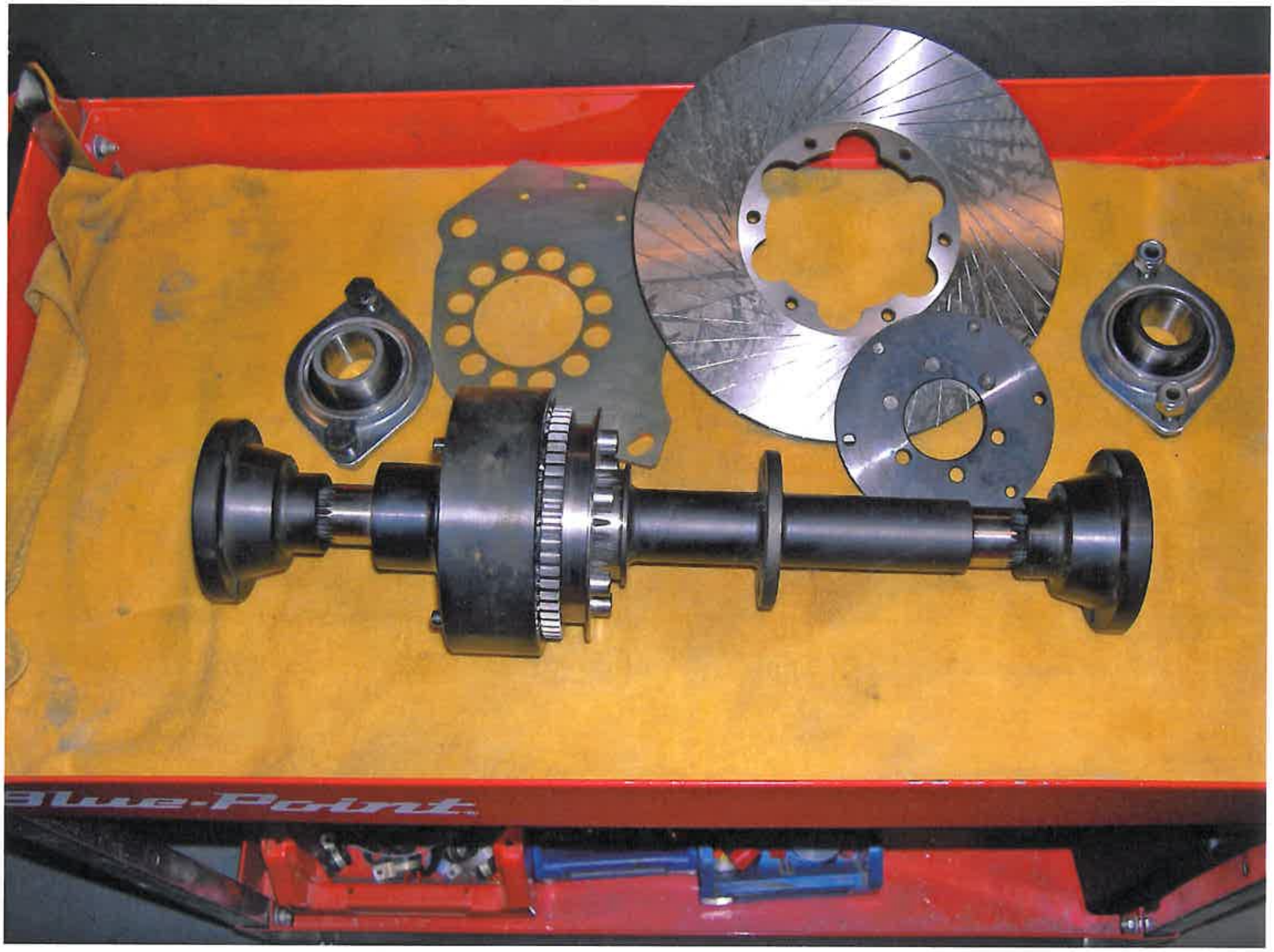
DSCN0202.JPG

DSCN0203.JPG

INSTALLATION OF GEARSHIFT PUSH-PULL ROD
AFT FIREWALL TO ENGINE
ROD LENGTH 38.00CM ROD END (BALL END)
THREAD 8.00 MM L.H. ATTACH TO FIREWALL
BELL CRANK - BOLT REQUIRED ALLENHEAD
Ø 8.00MM GRIP. 45.00MM - SPACER ID 8.00MM
LENGTH 12.00MM. INSTALL SPACER AT FIREWALL
CRANK TO AVOID FOULING ON WATER PUMP
OUTLET HOUSING. ROD END FOR ENGINE END
IS PREASSEMBLED, NO PROVISION EXISTS IN THIS
POSITION FOR SPACER INSTALLATION. THREAD-
ADAPTER AND LOCKNUT ARE REQUIRED.
INSTALL ROD WITH COCKPIT ACTUATOR HANDLE
PERPENDICULAR TO FLOOR - ENGINE CRANK
AT APPROX. 86° ORIENTED DOWN.



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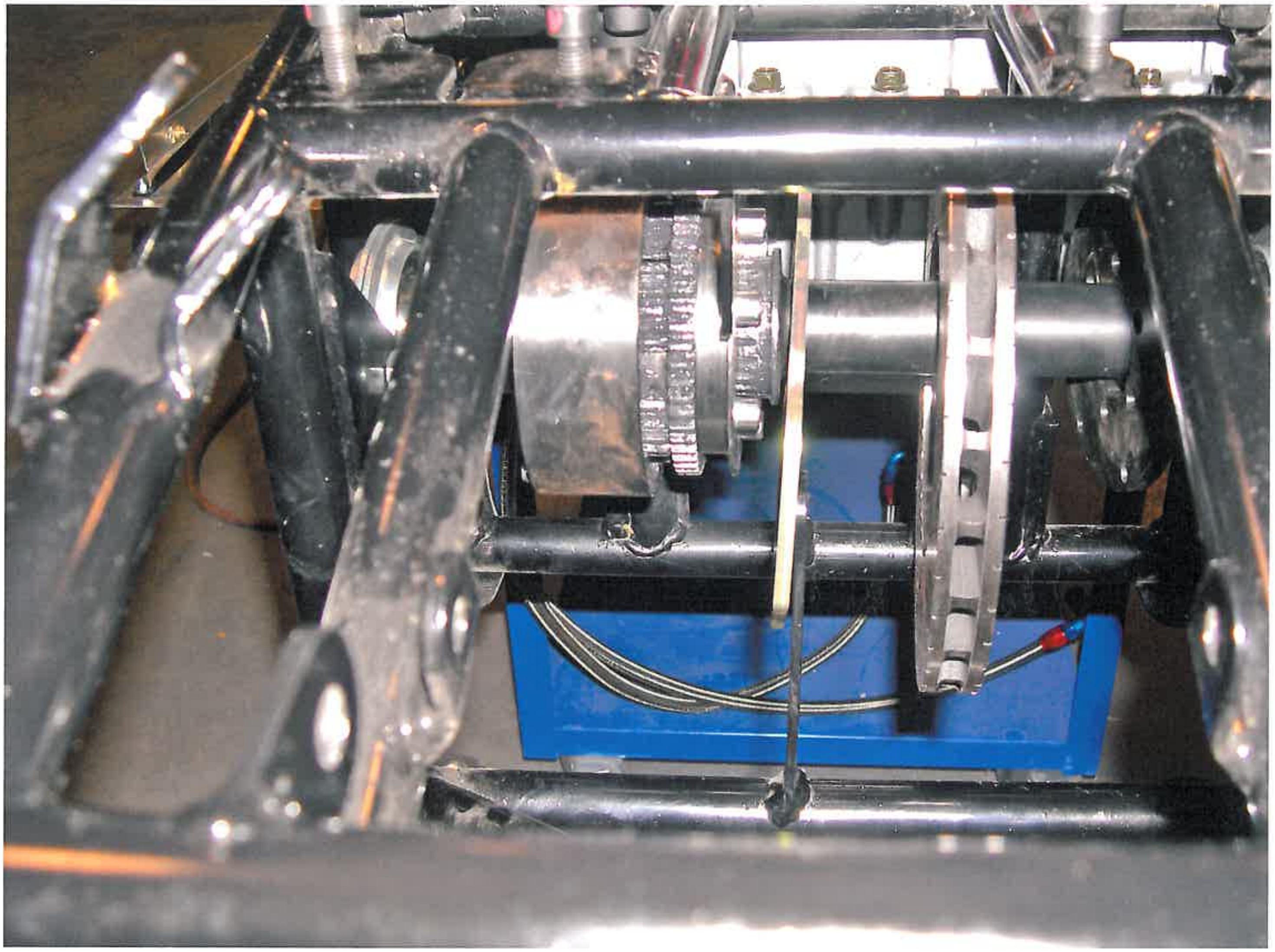
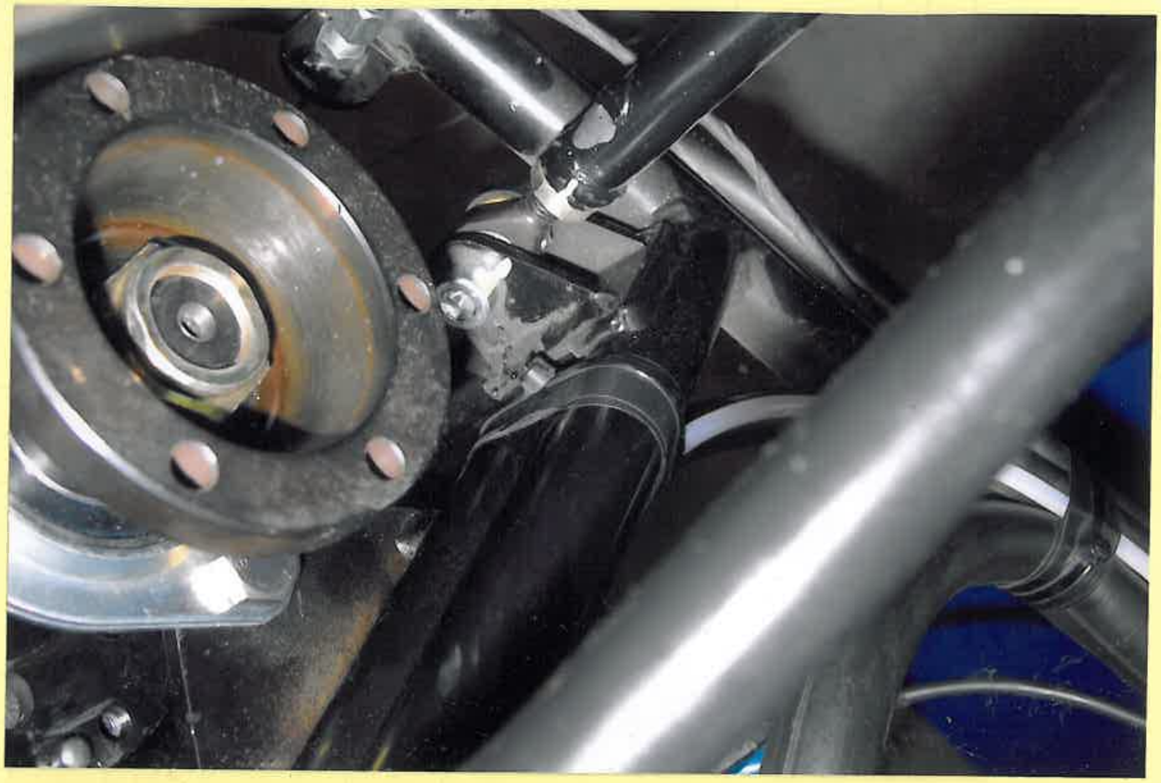
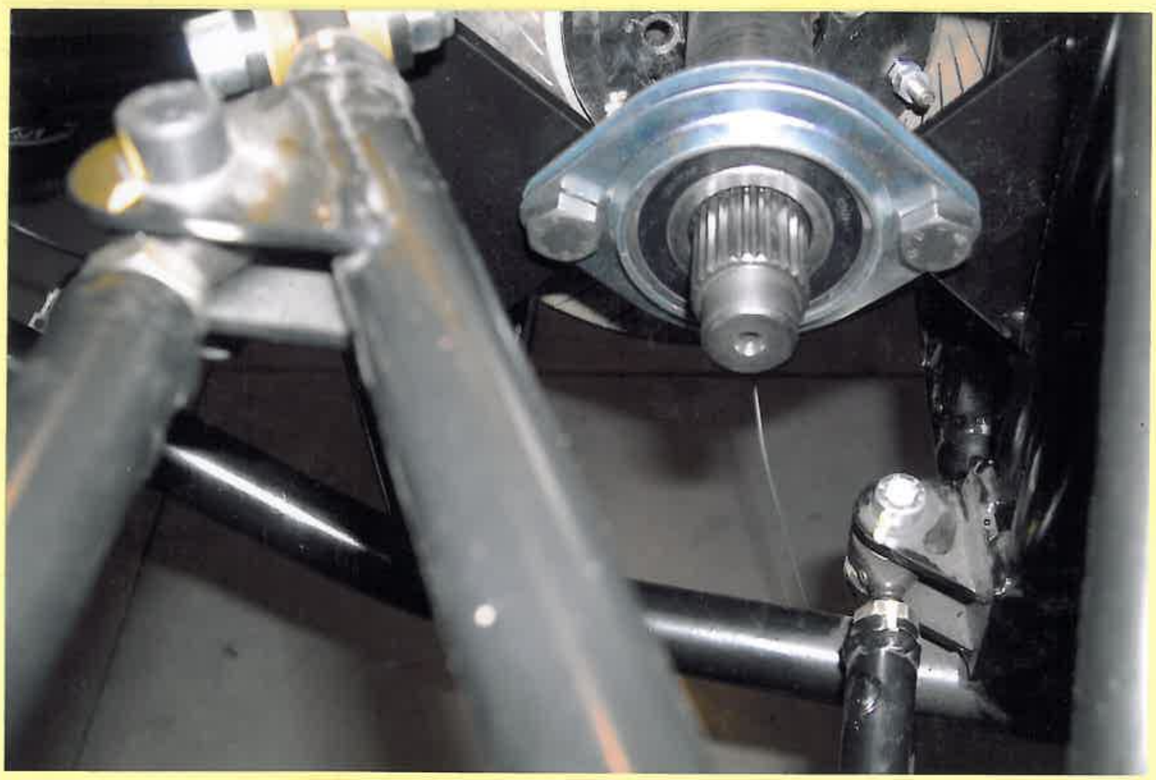
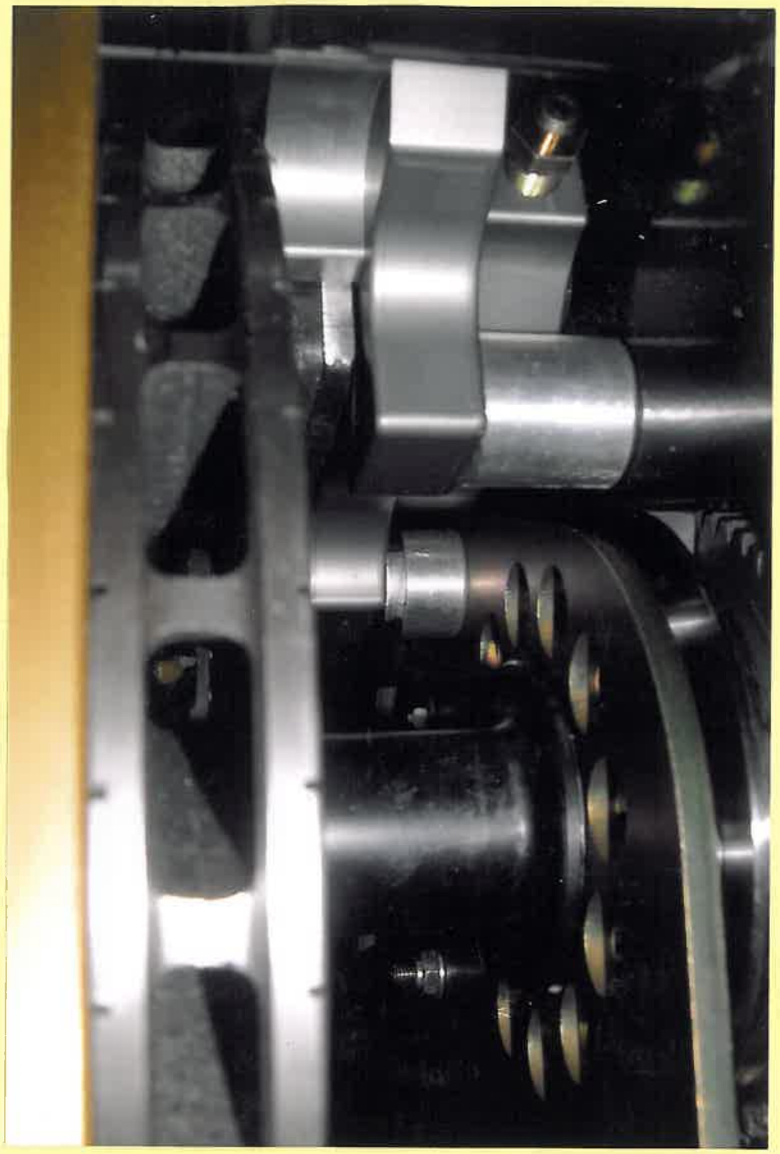
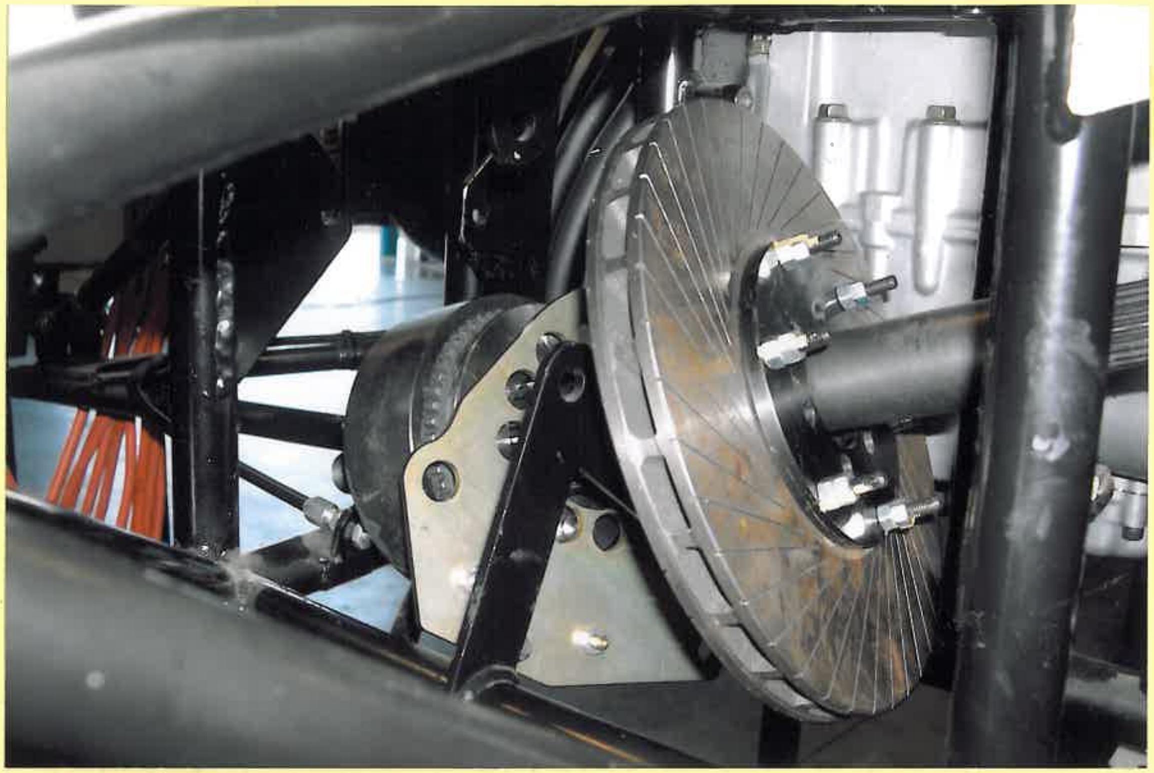
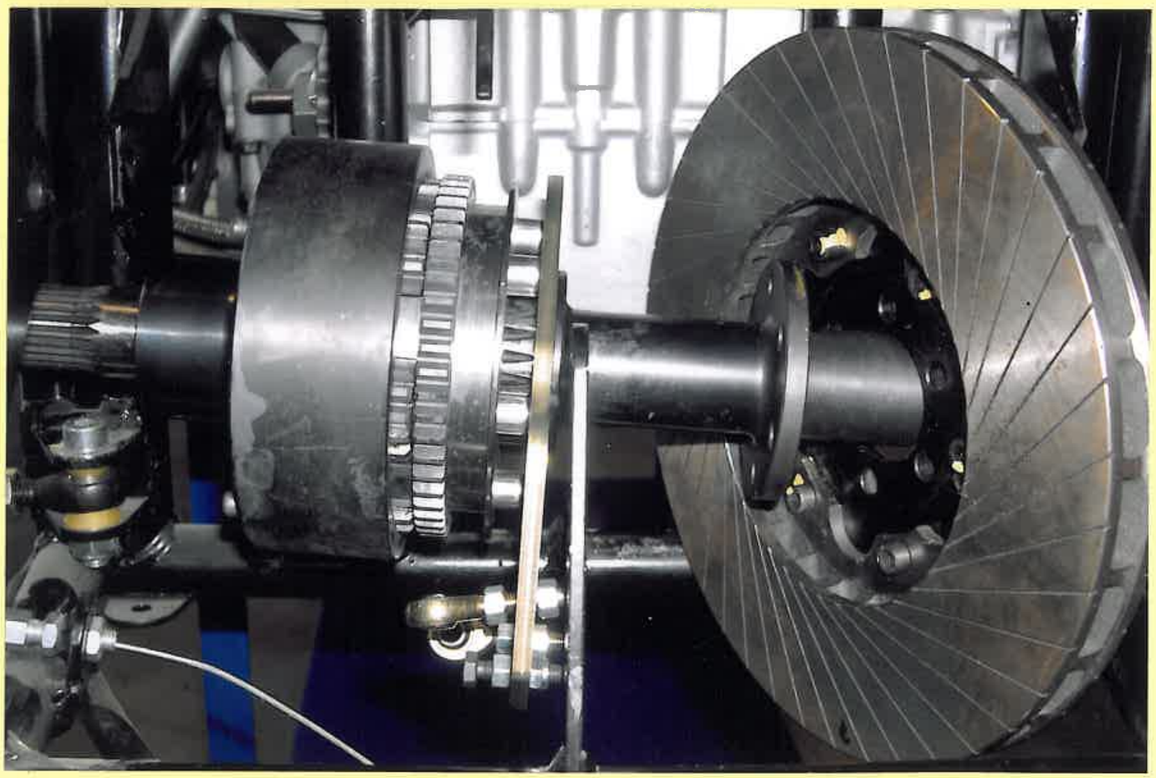


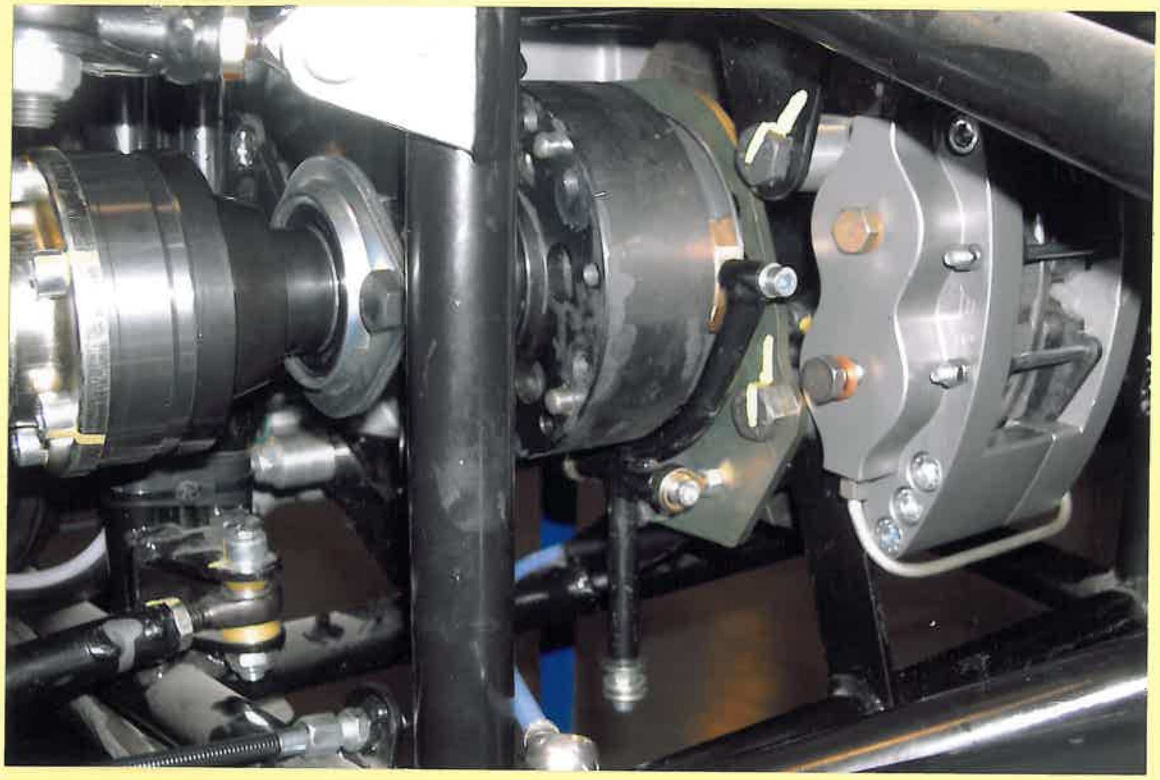


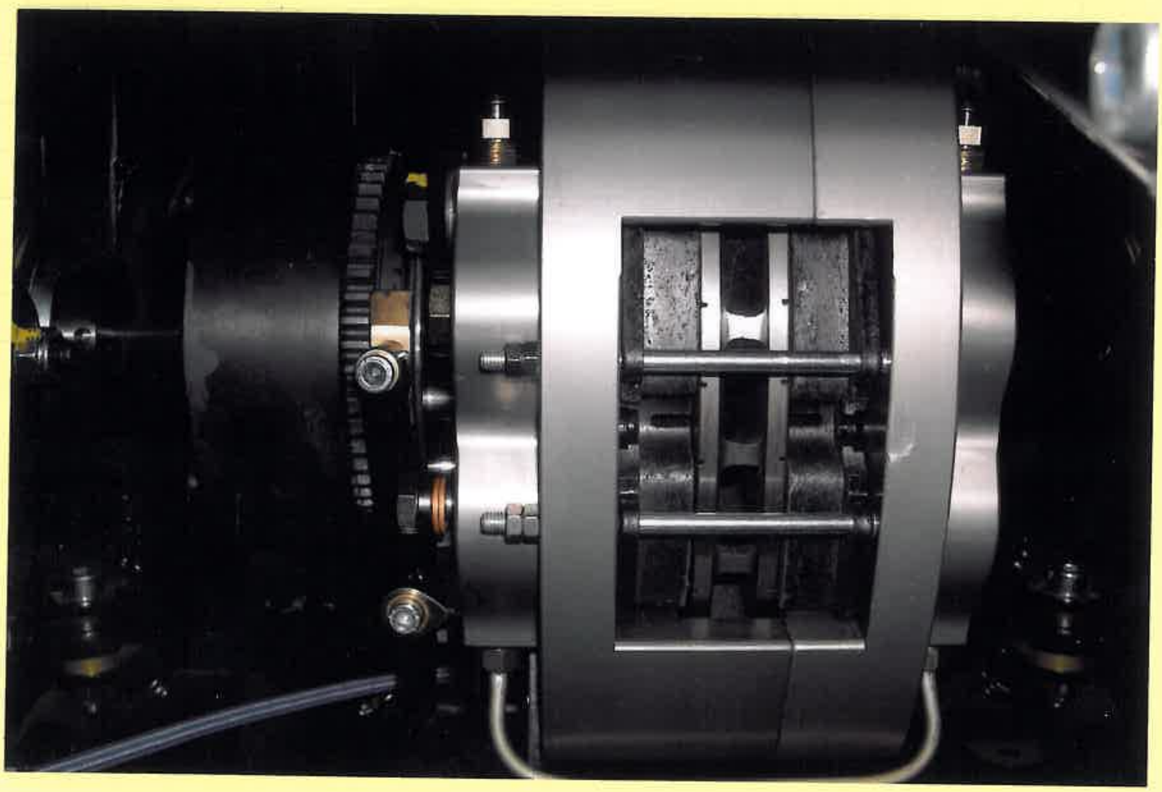


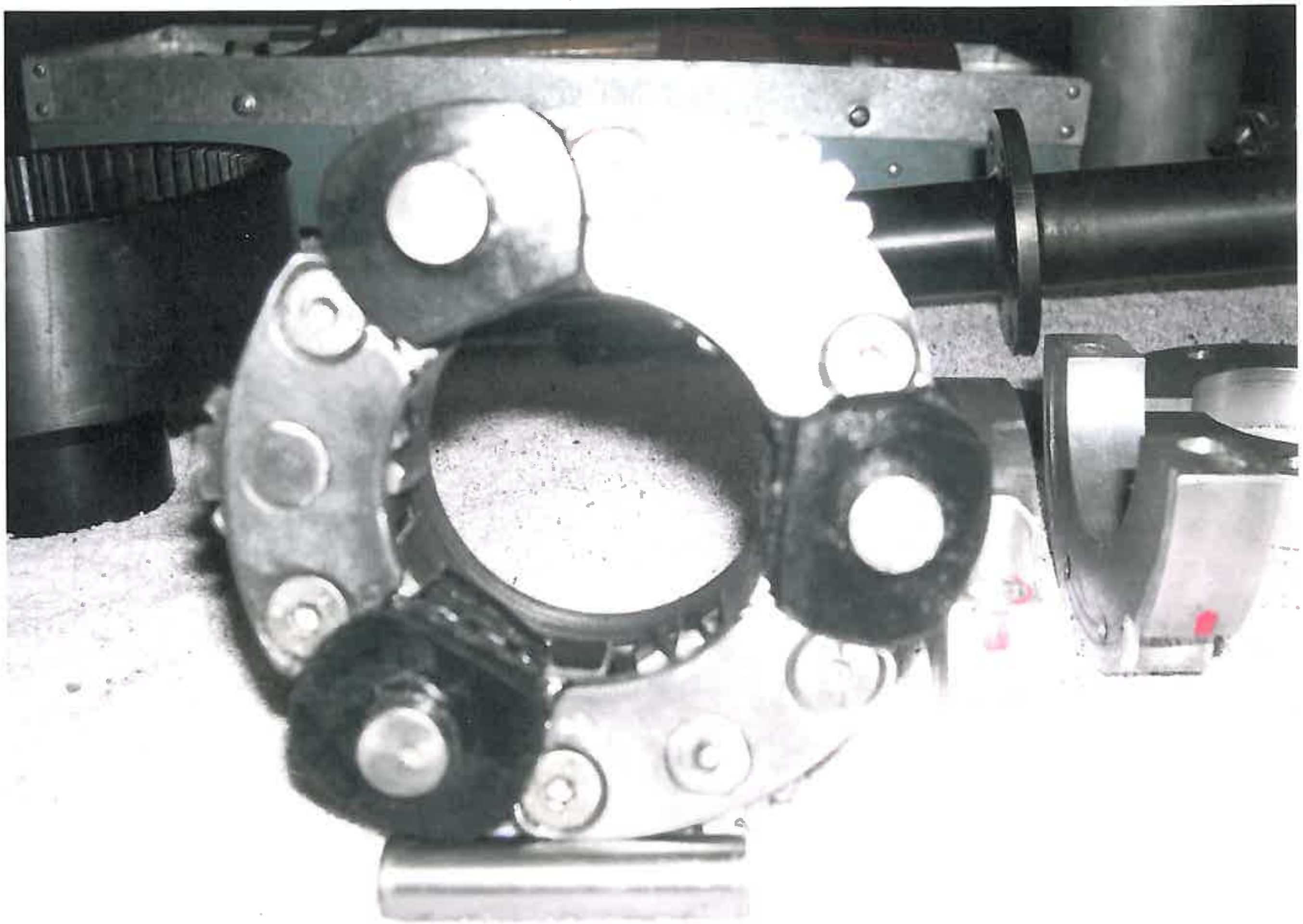


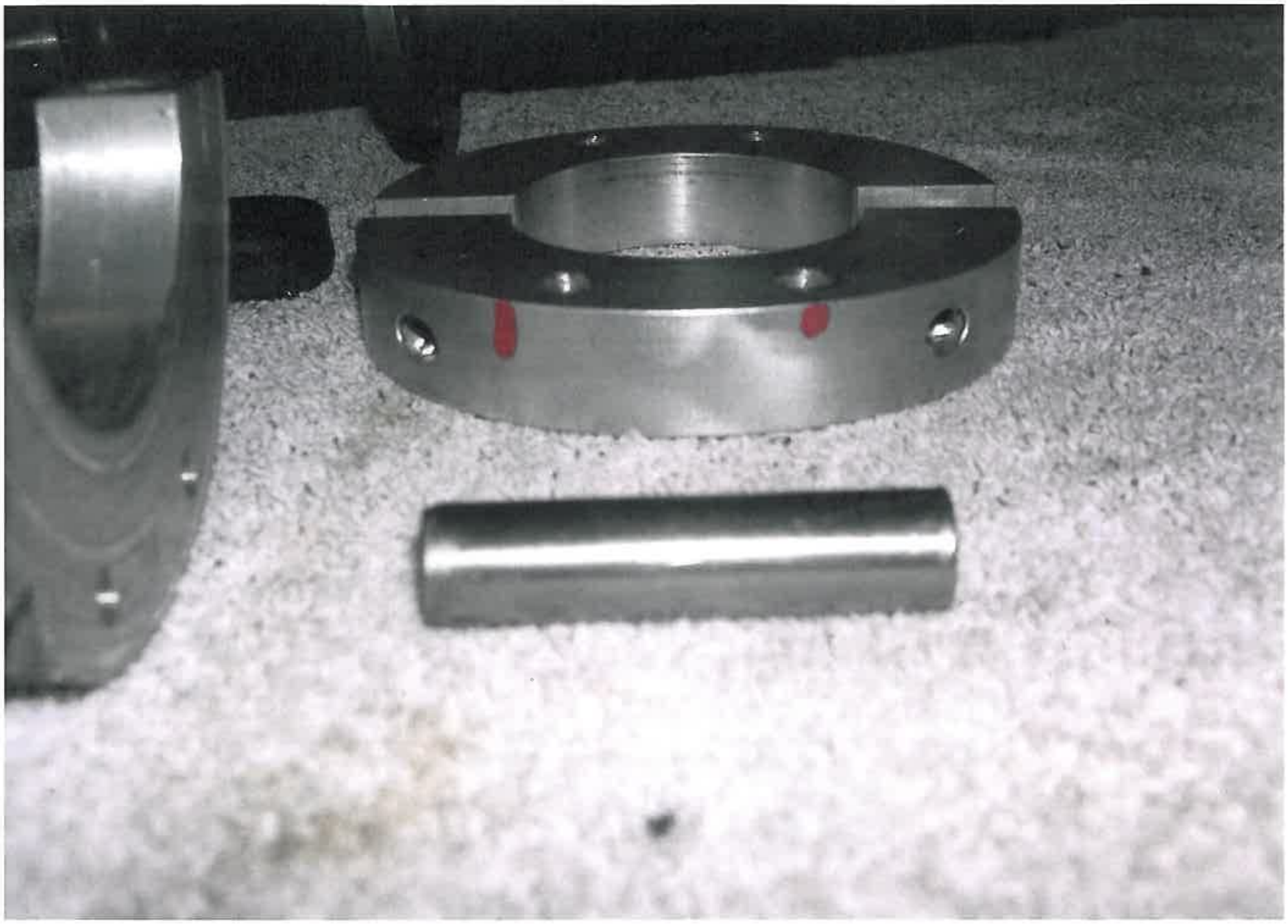


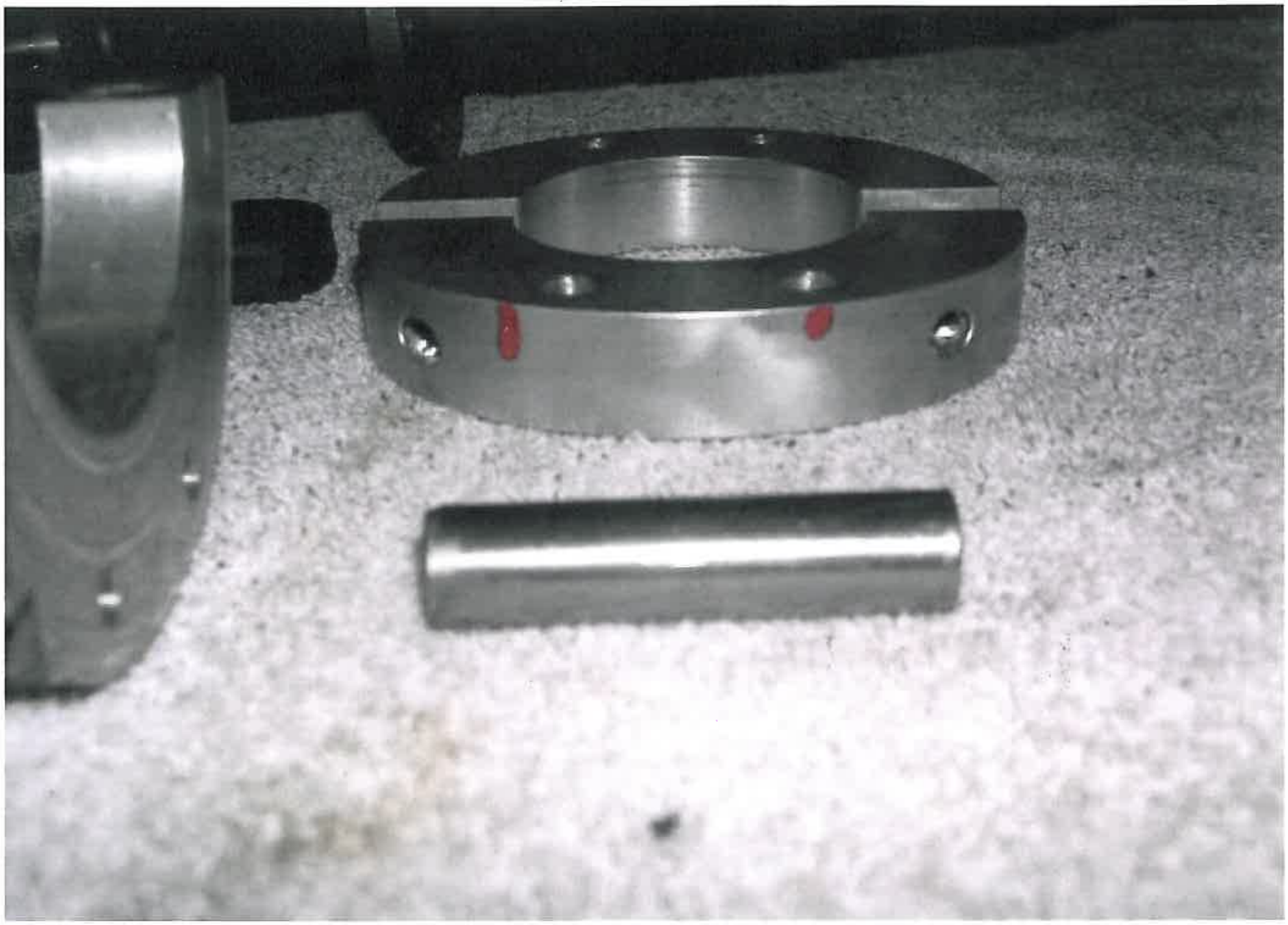


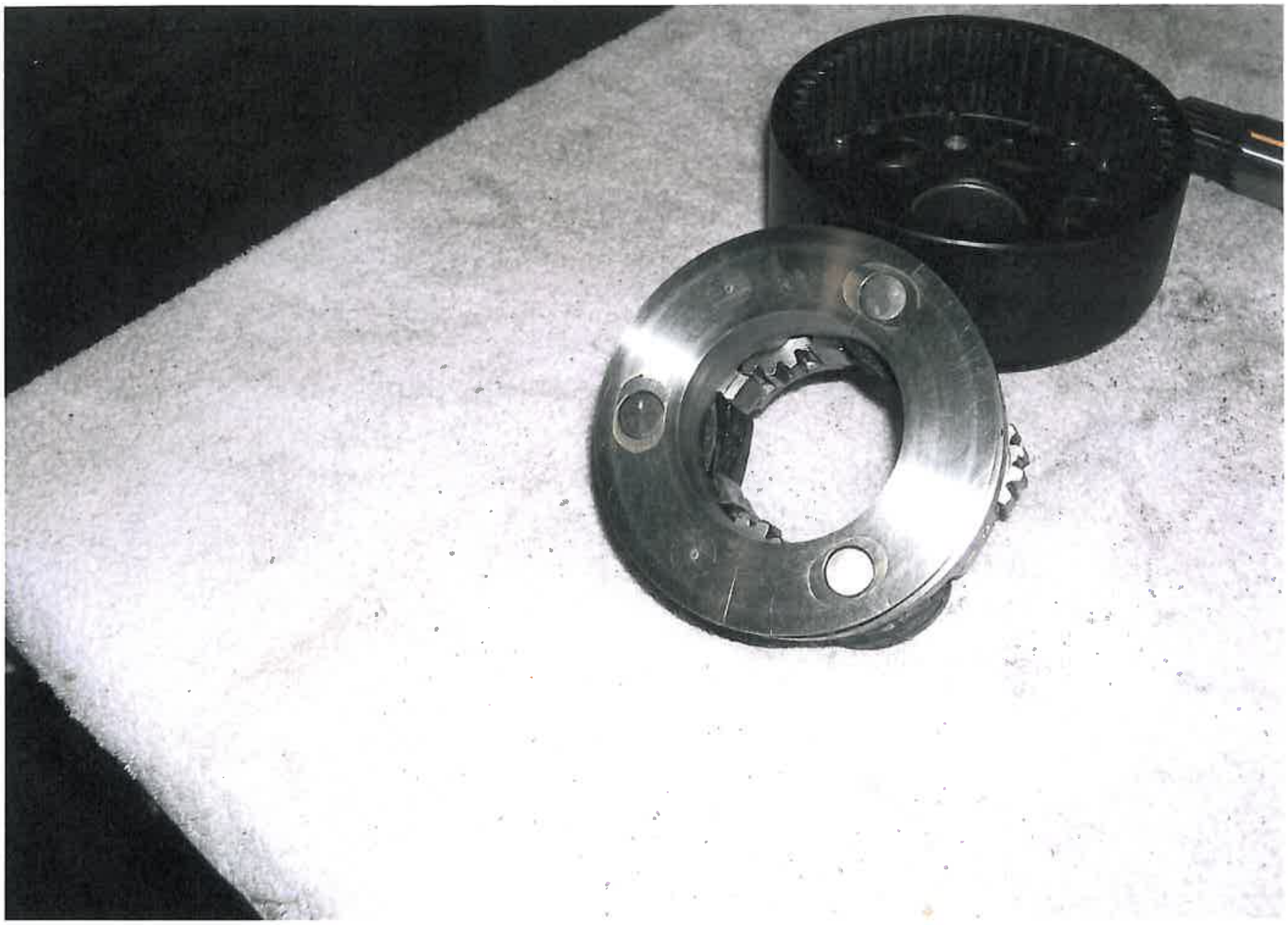


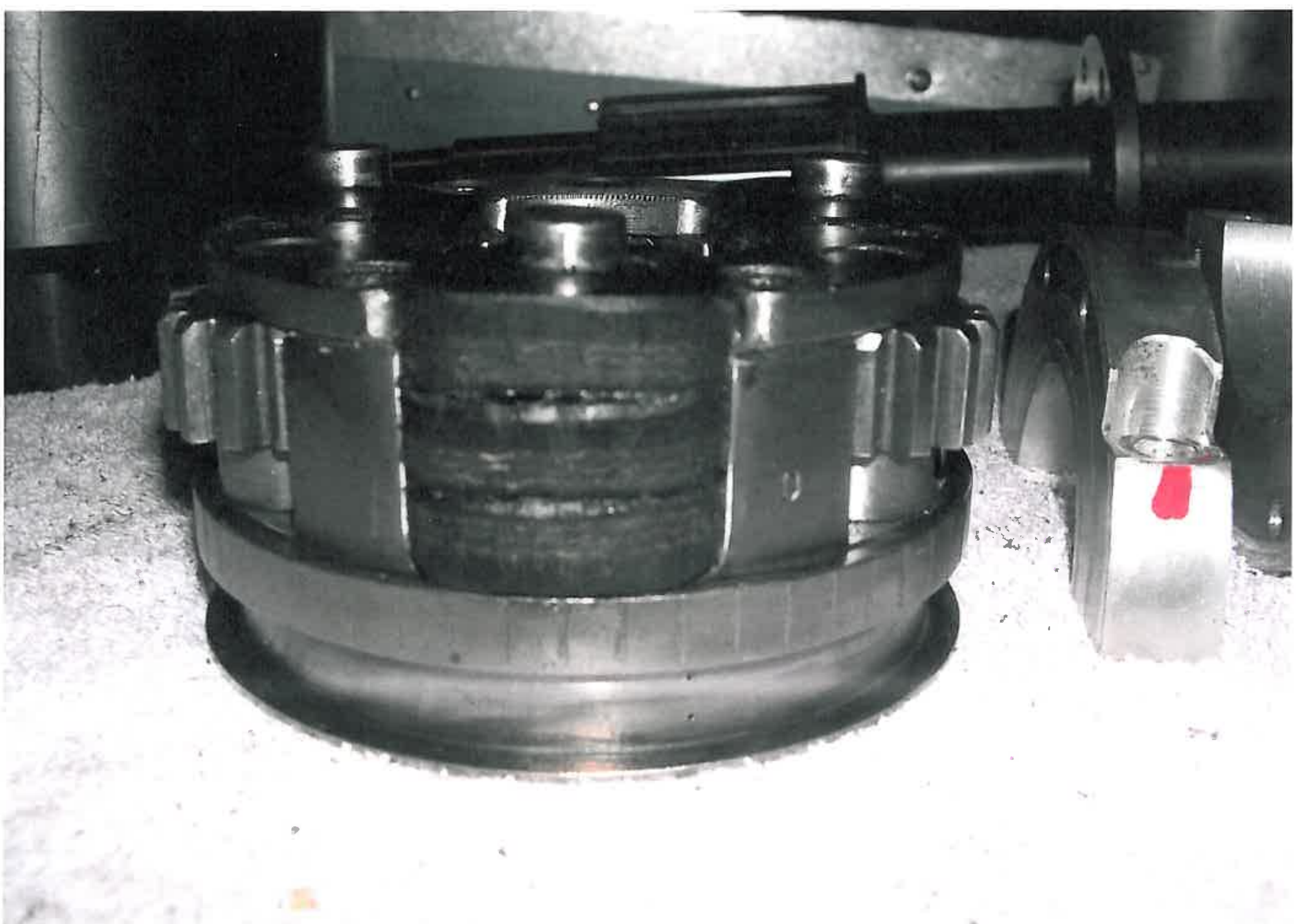


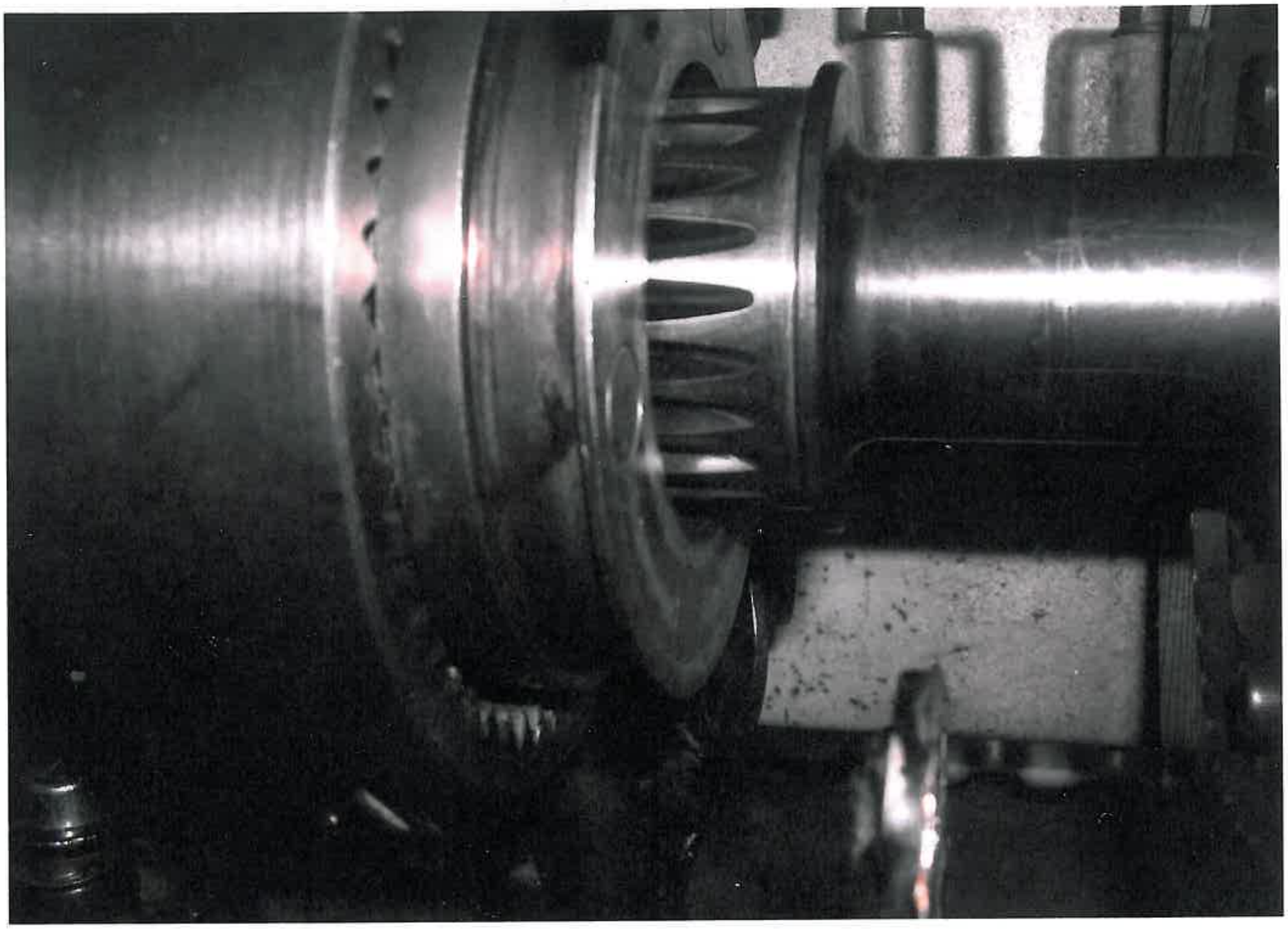


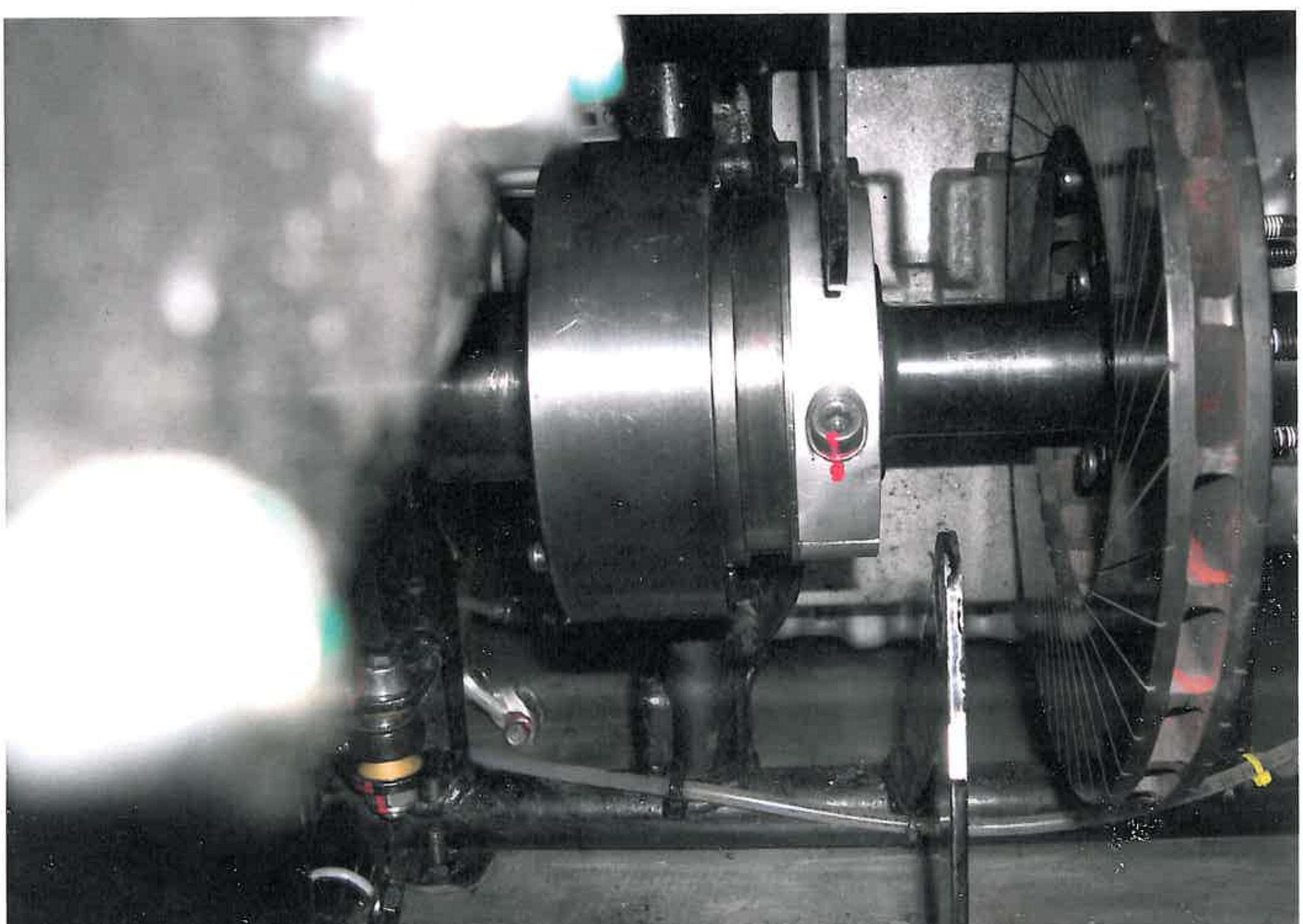


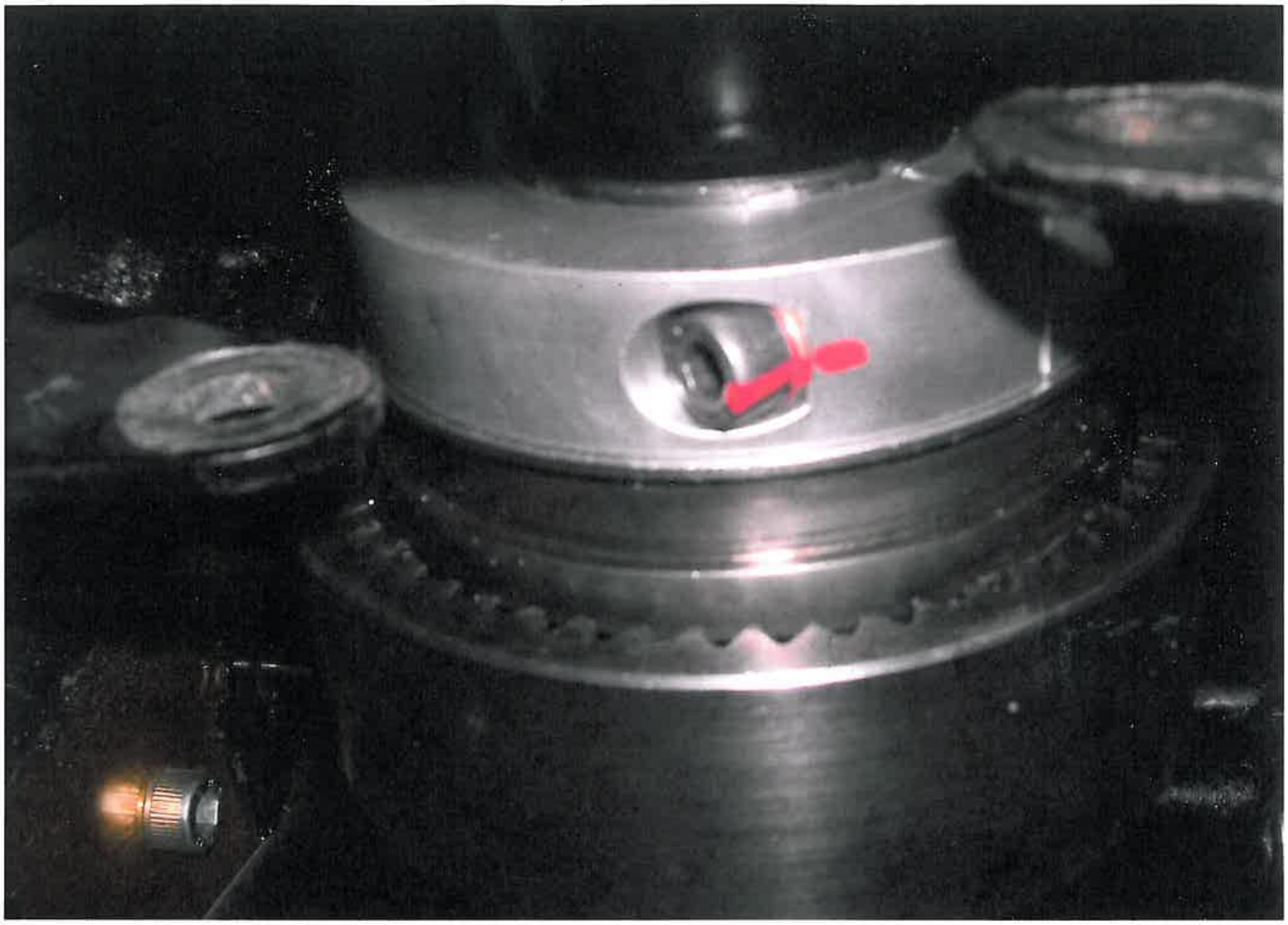


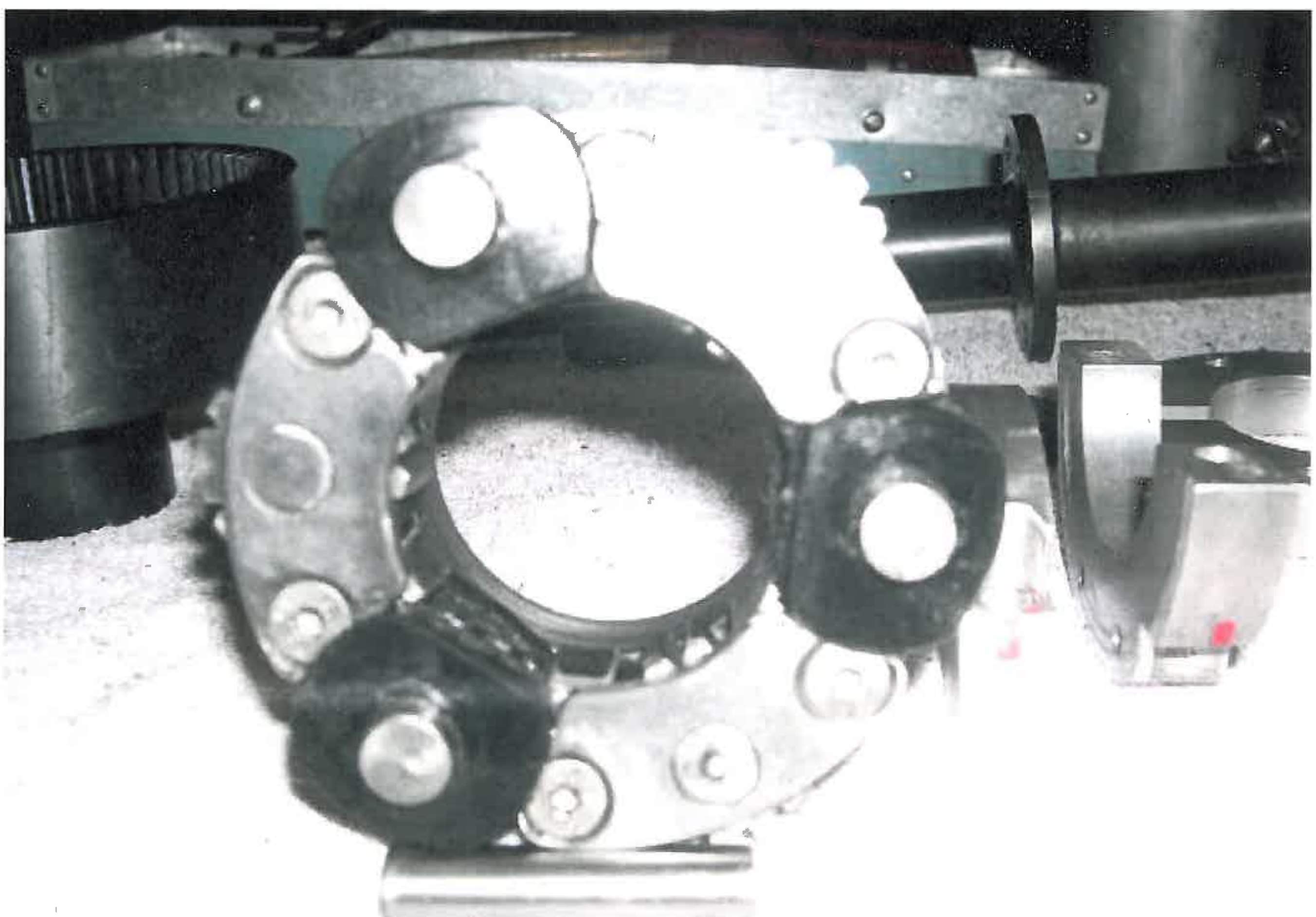


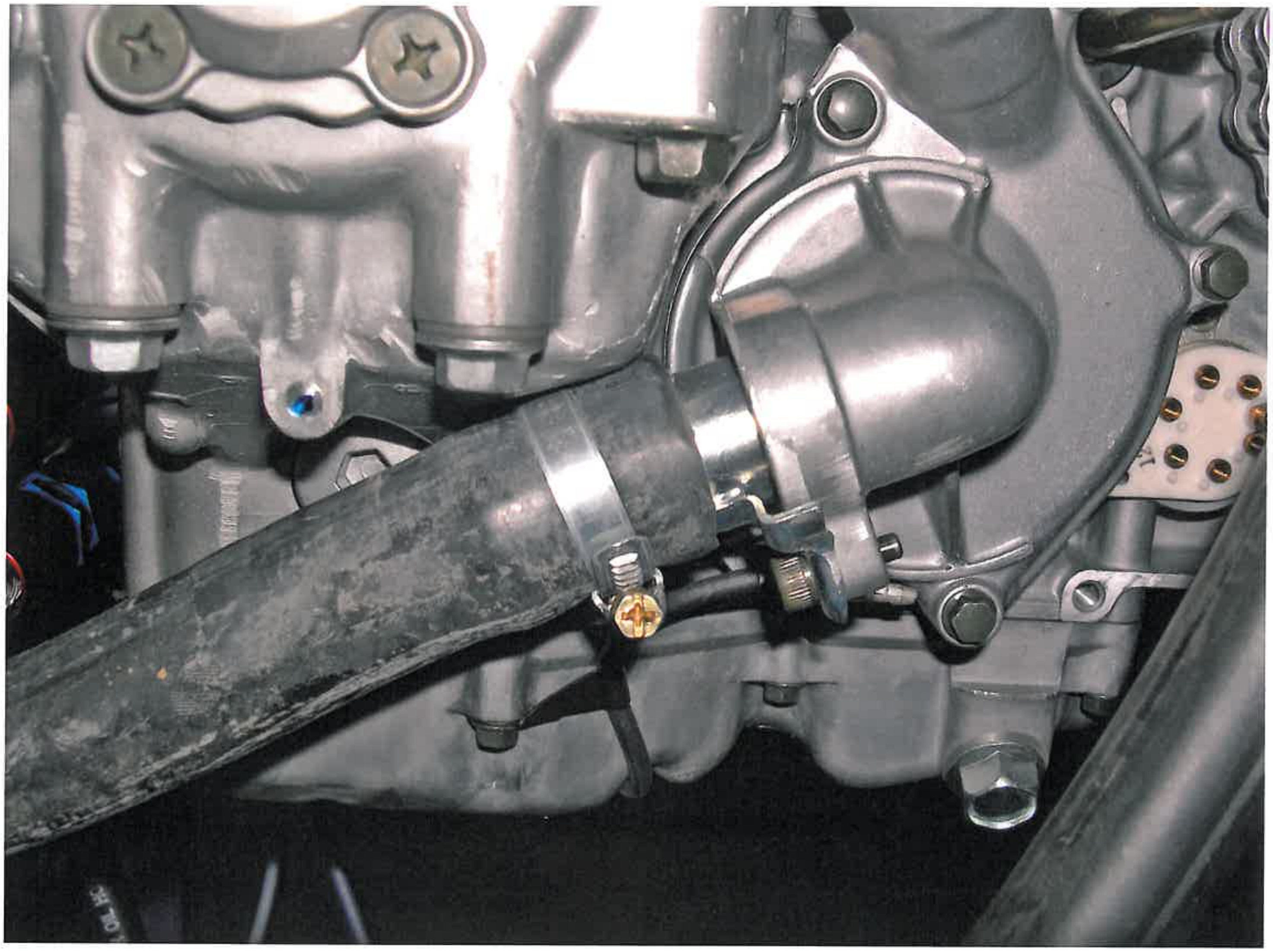






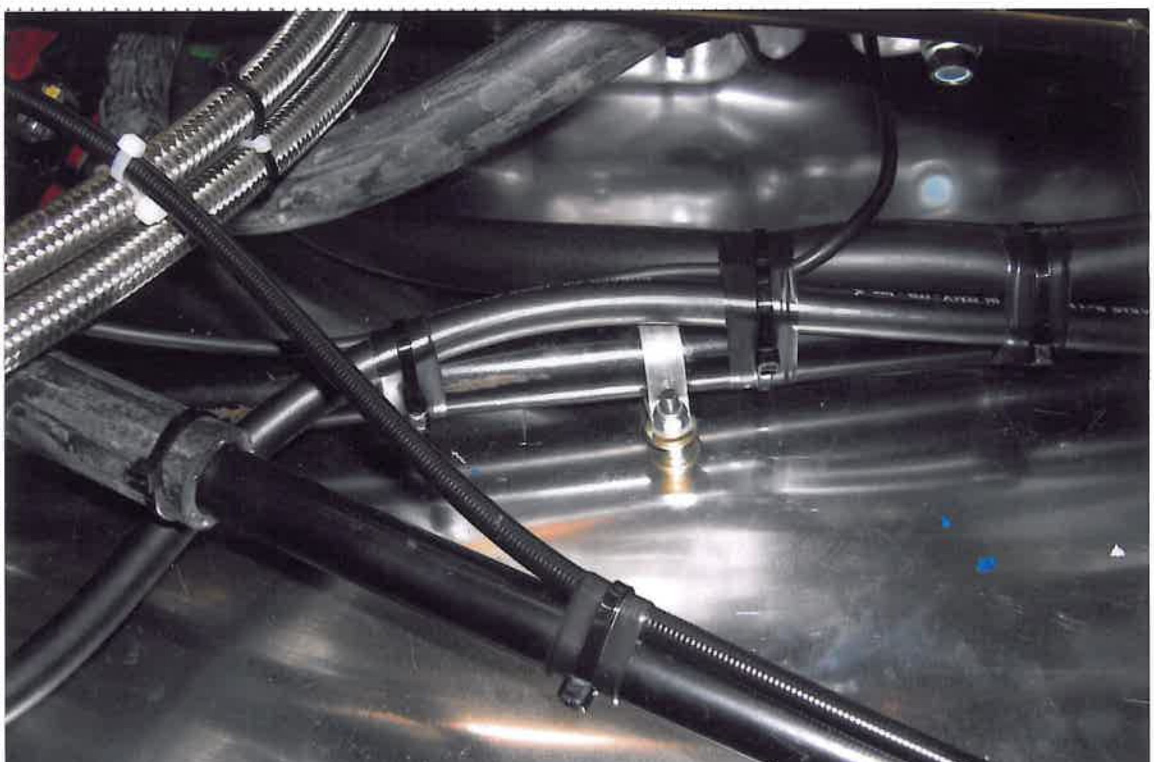






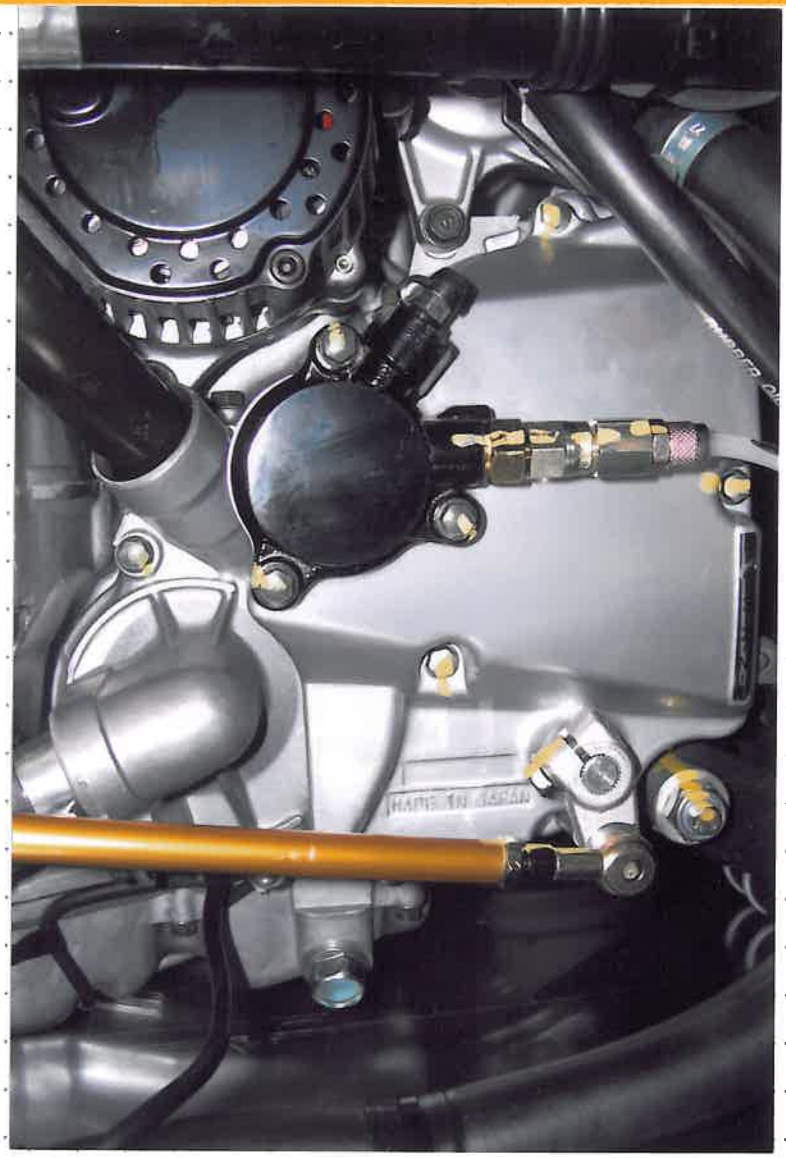
FWD →

OIL-TEMP
THERMOCOUPLE
LOCATION



OIL - FUEL - LINES REVERSE CABLE CLUSTER

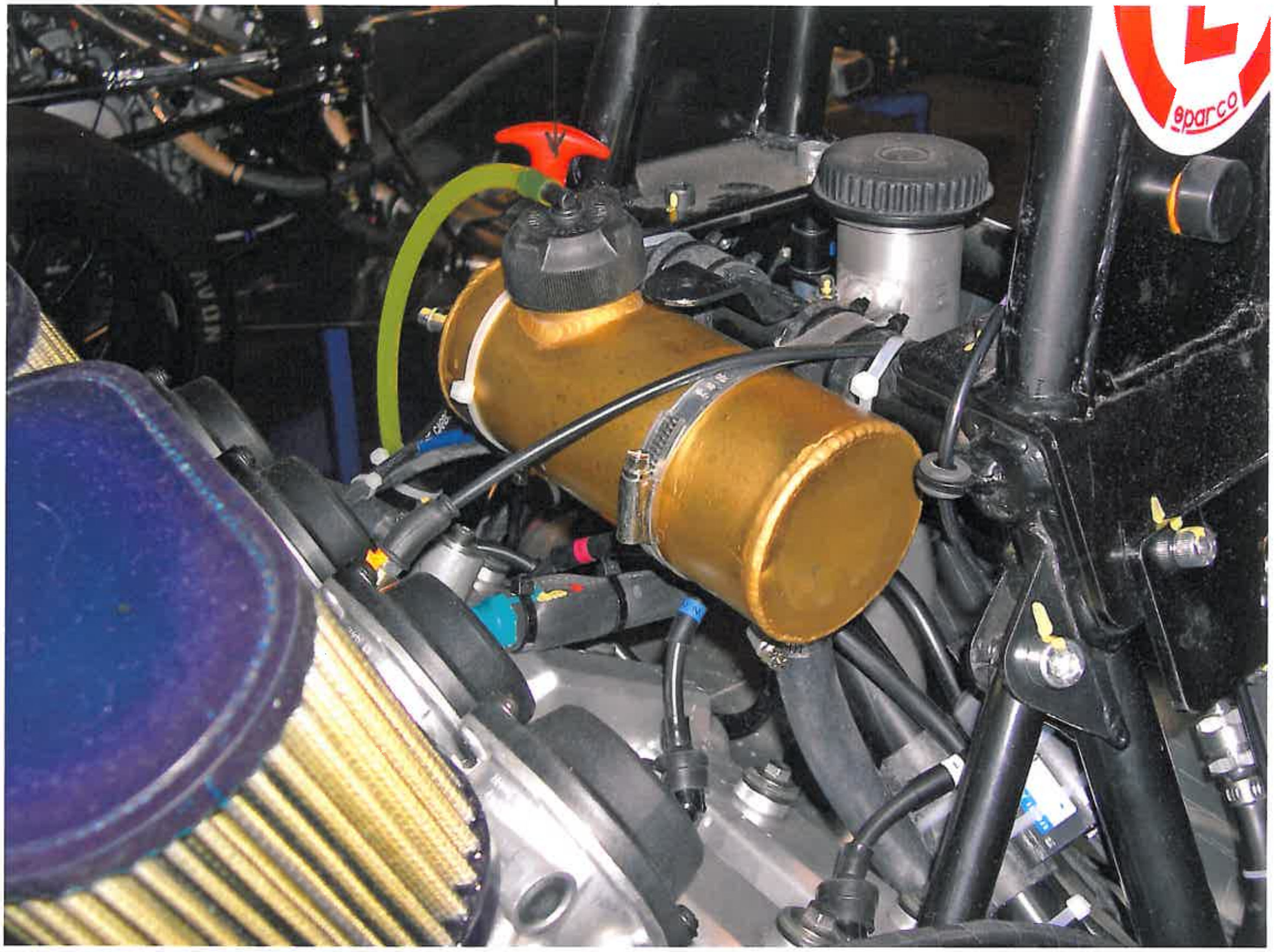
AFT →



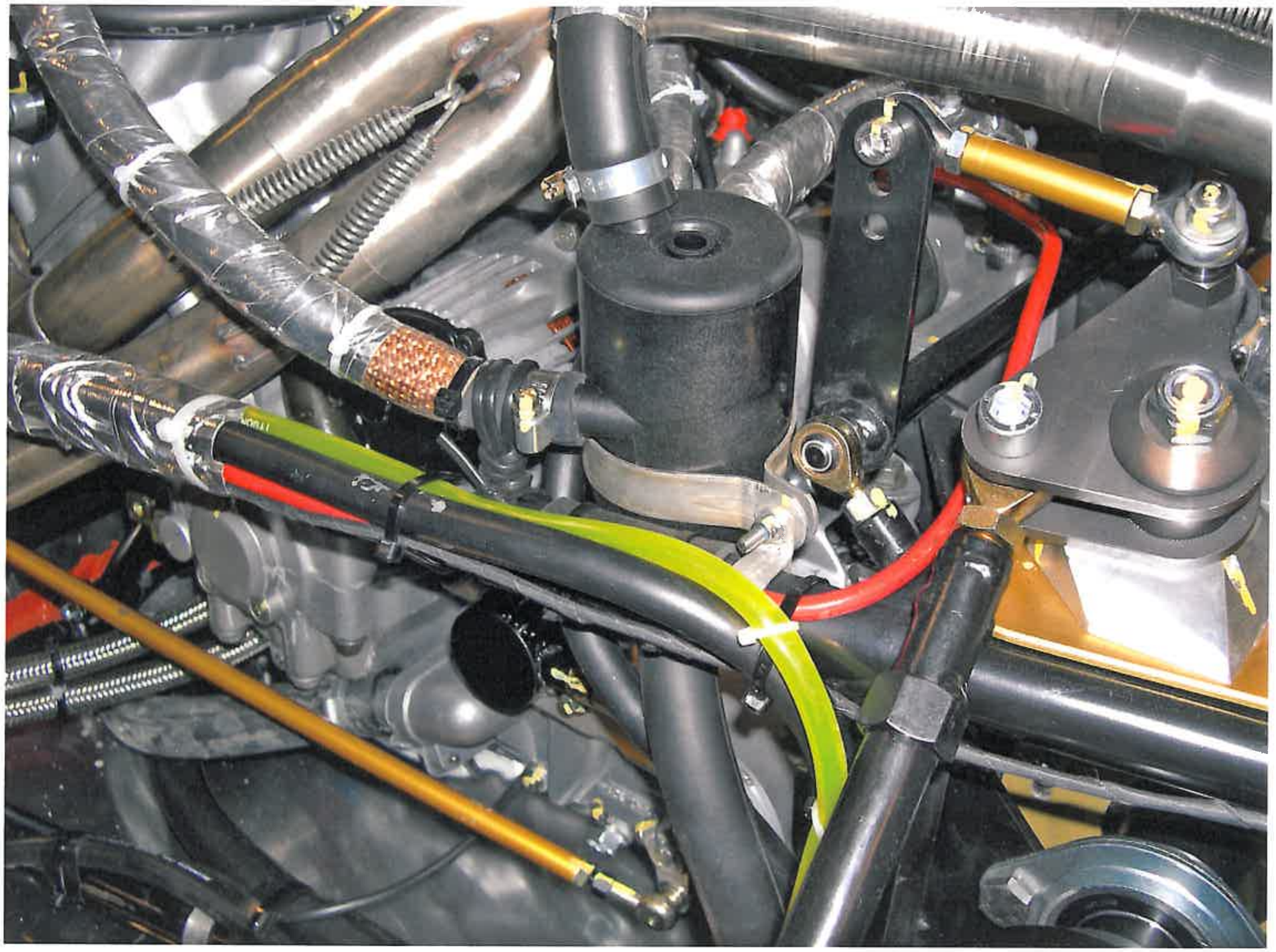
AFT →

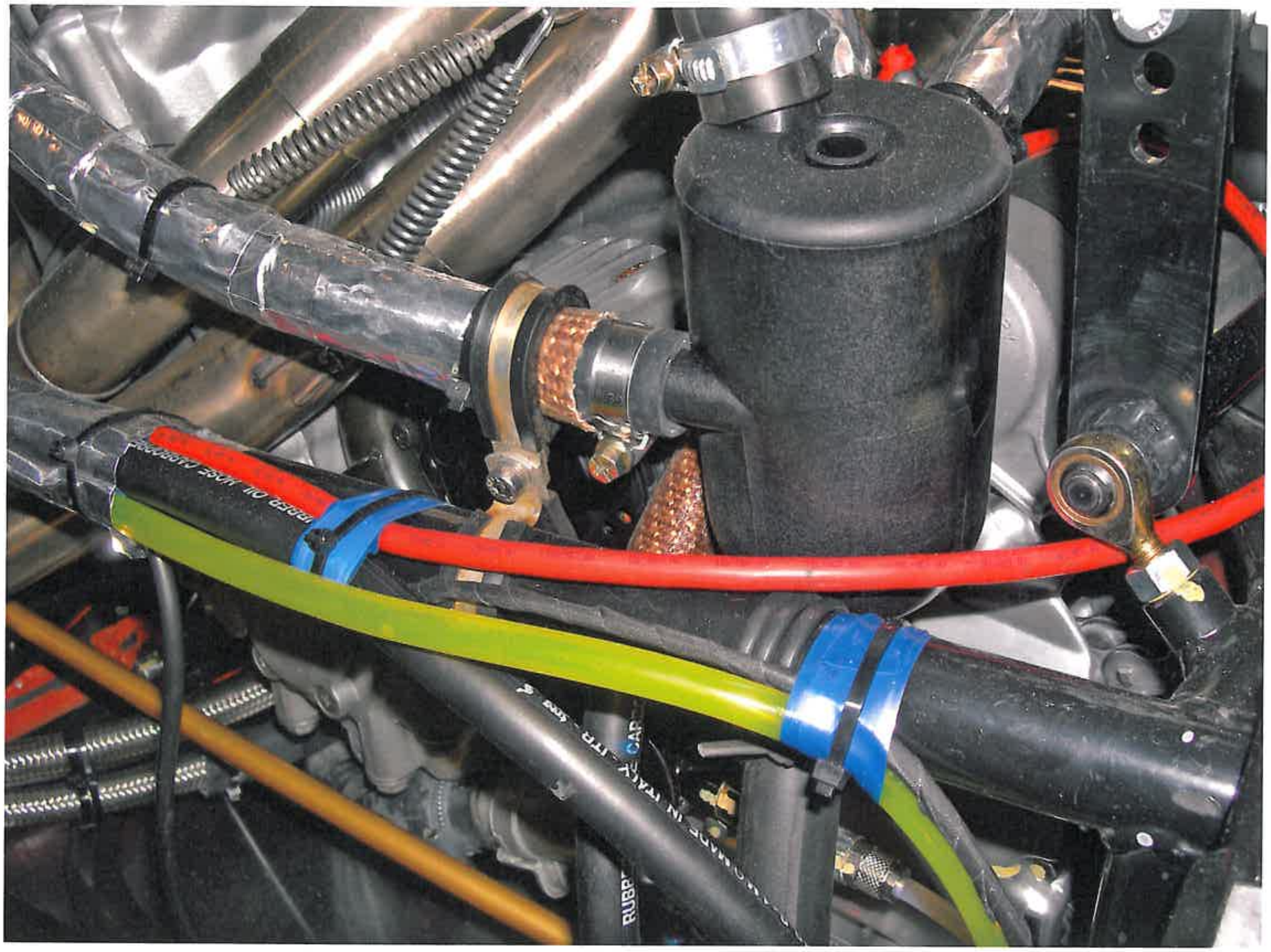
GEAR SELECTOR HYDR. CLUTCH ASSY.

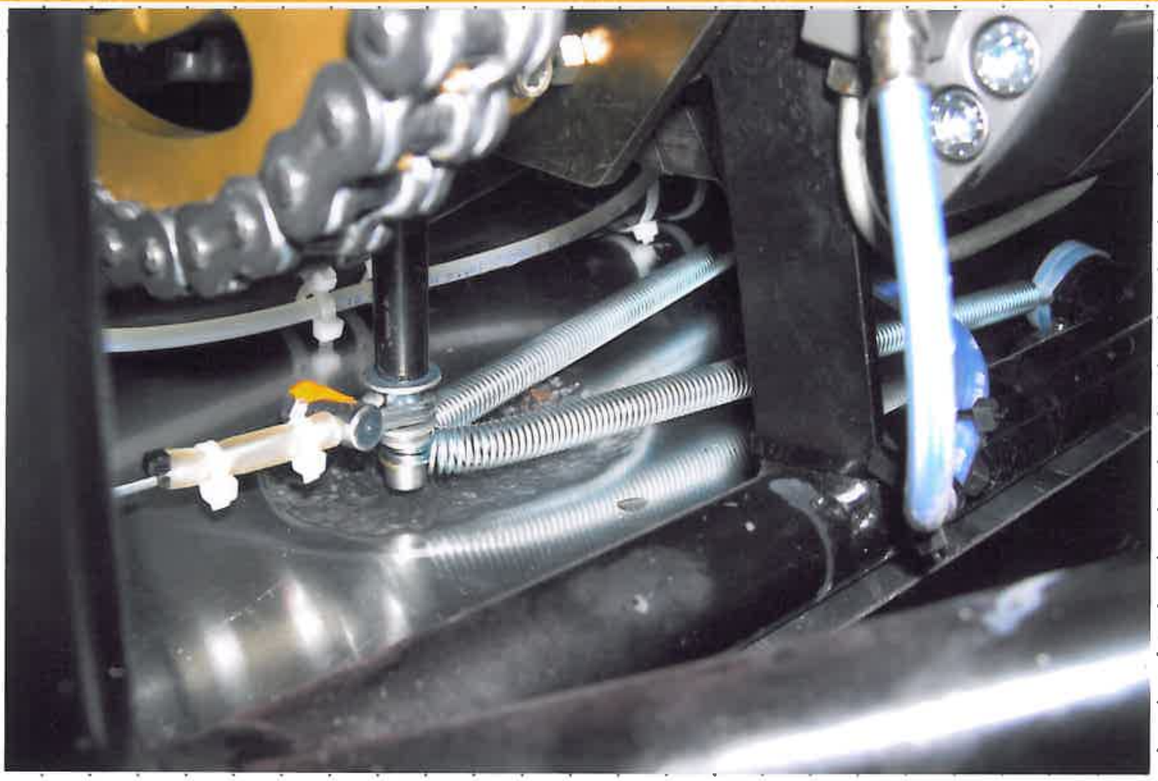
GEAR SELECTOR CRANK POSITION
IN NEUTRAL



* INSTALL EMERGENCY CUT-OUT "T" HANDLE
PRIOR TO INSTALLING HEADER TANK







REVERSE SPRING INSTALLATION

COLLECTOR BOTTLE

BOLTS (3) M8×30

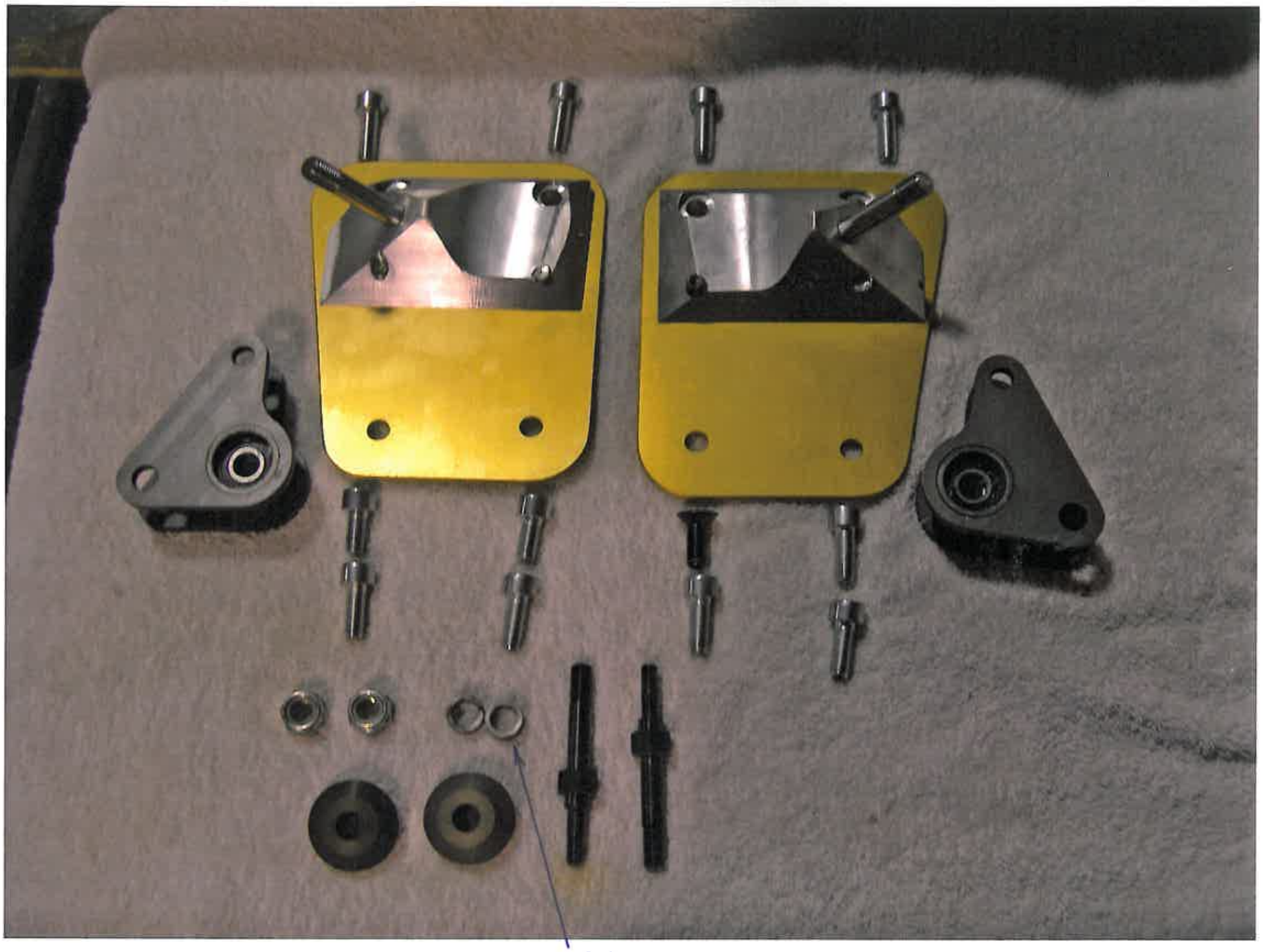
BALLJOINT SMLG1240 (UPPER END) (2) ATTACH BOLT M 12×45 (2) SPACER 12×18×3 (4)

LOWER BALLEND SMG1240 (2) ATTACH BOLT M 12×45 (2)

TORQUE TUBE LINK _ BALLENDS SMG8 / SMLE8 (2EA)
BODY 'L' 50.00 mm
THREAD 8.00mm L;RH

TORQUETUBE SUPPORT BALL ENDS SMG840 (2EA)

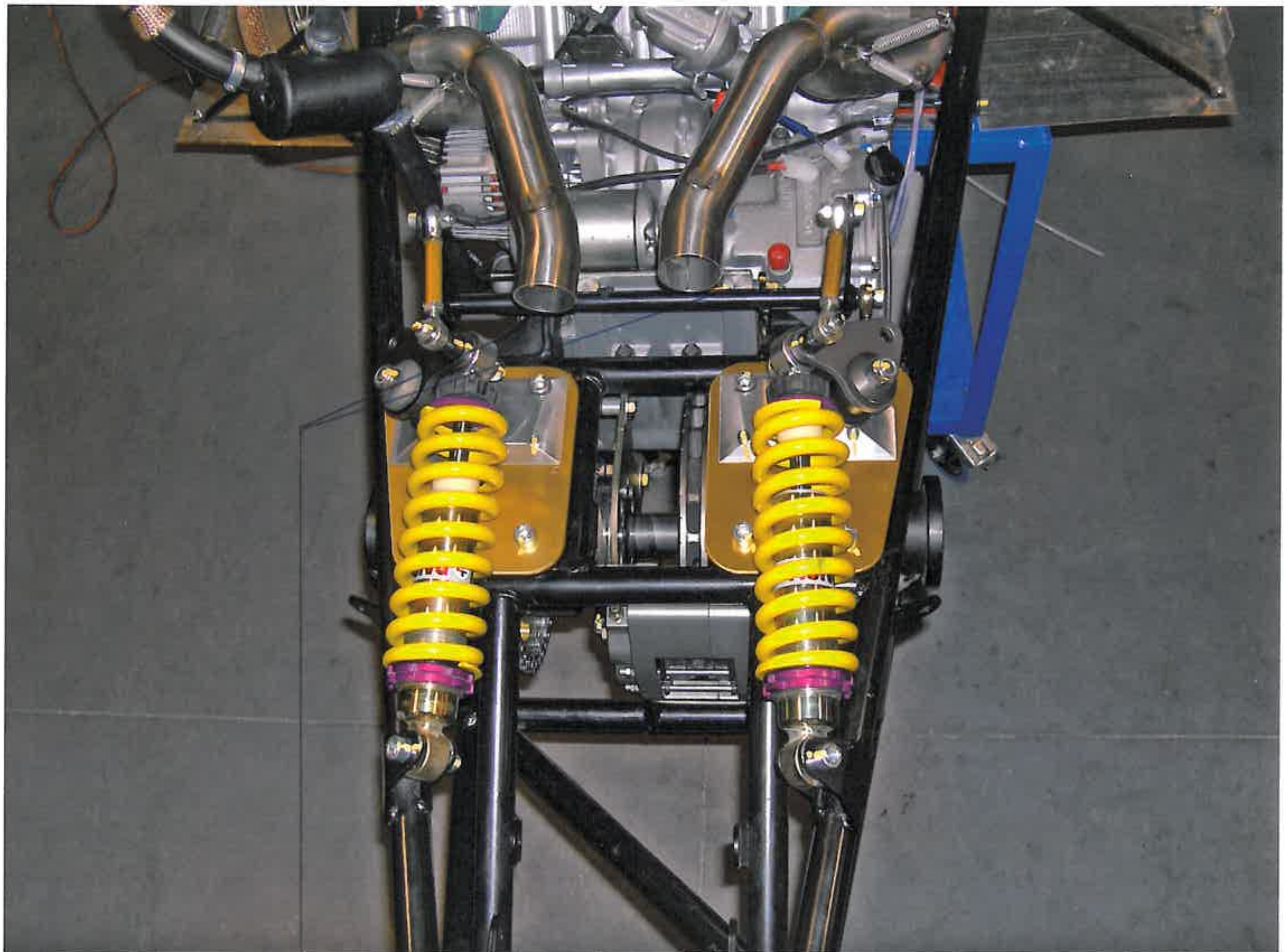
SHOCK SPRINGS YELLOW _ SOFT
WHITE _ HARD
BLACK _ MEDIUM



SPACERS (2) STEEL OD 17.00 ID 12.00 L 7.00

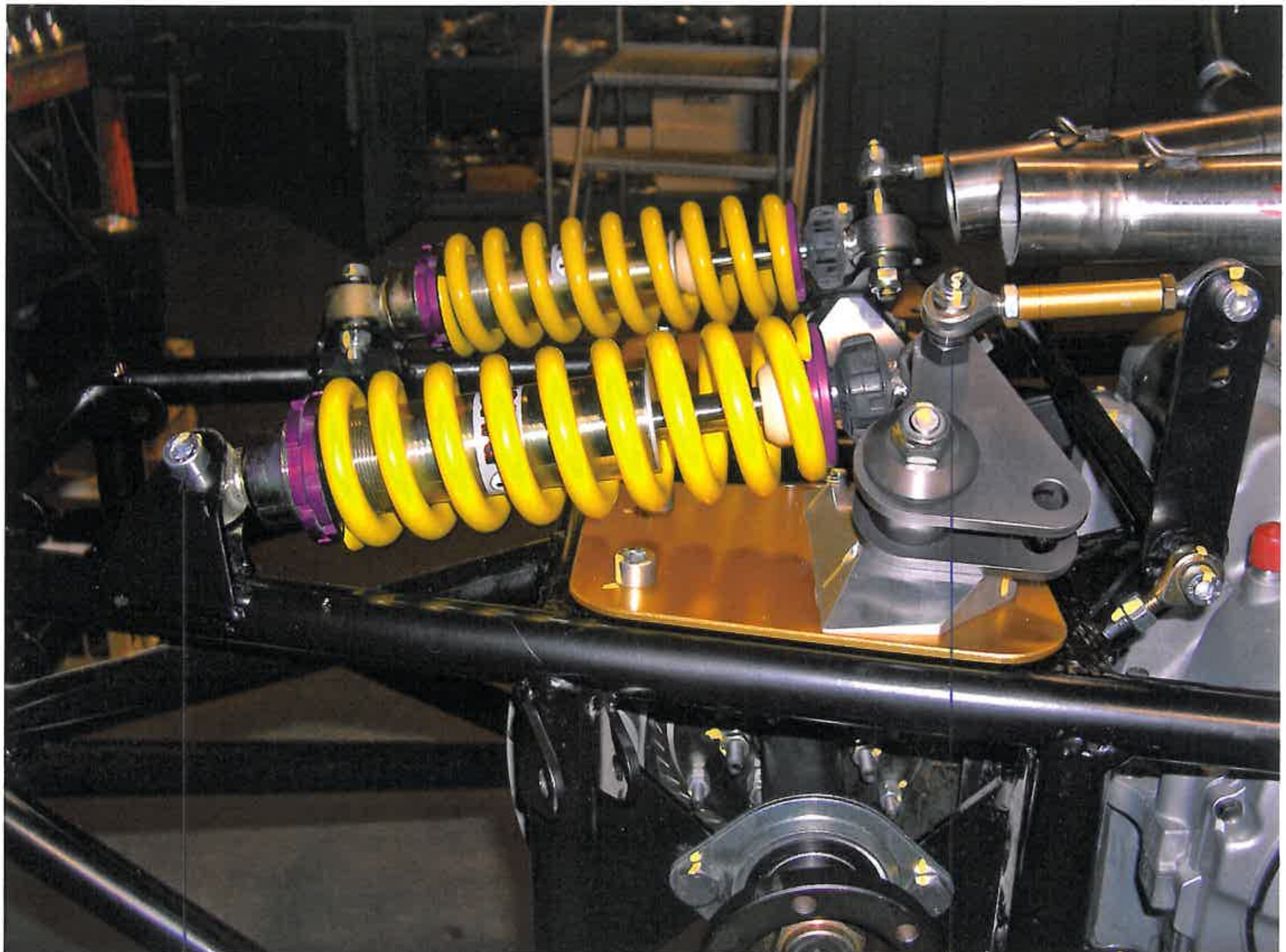
BOLTS	QTY.	L (MM)	Ø	
	4	35.00	10.00	
	4	30.00	10.00	
	3	20.00	10.00	— TORQUE 40 NM
	1 CSK.	20.00	10.00	← TORQUE 40 NM

TORQUE 80.00 NM - BOLTS
USE LOCTITE 242 - ALL



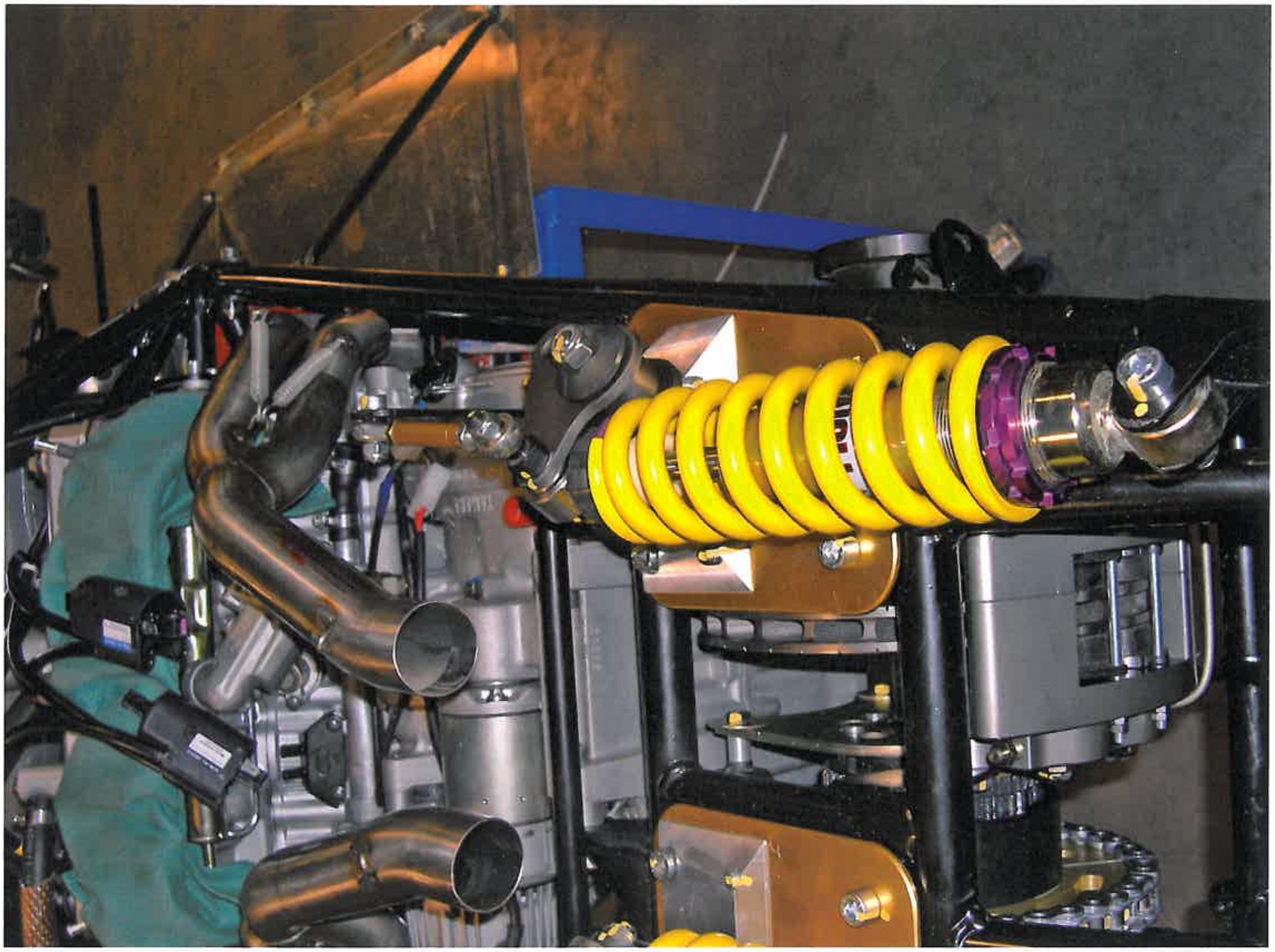
AFT ENGINE MOUNT BOLTS 2/L 50.00 MM Ø 10.00 MM, R.H. BOLT HEAD REQUIRE
A SLIGHT DIMENSIONAL CHANGE TO ALLOW PROPER FIT (GRIND)
WRENCH SIZE ALLEN (HEAD) 8.00 MM NUT WRENCH SIZE 17.00 MM

LOWER BOLT (NOT SHOWN) SPECIAL BOLT - LONG SHOULDER Ø 11.00. SHOULDER "L" 205.00
TOTAL "L" 245.00 MM THREADED PORTION Ø 10.00 MM. WRENCH SIZE HEAD. 19.00 MM, NUT. 17.00 MM
BOTH UPPER AND LOWER BOLTS REQUIRE SPACERS.



BOLT 10 x 45

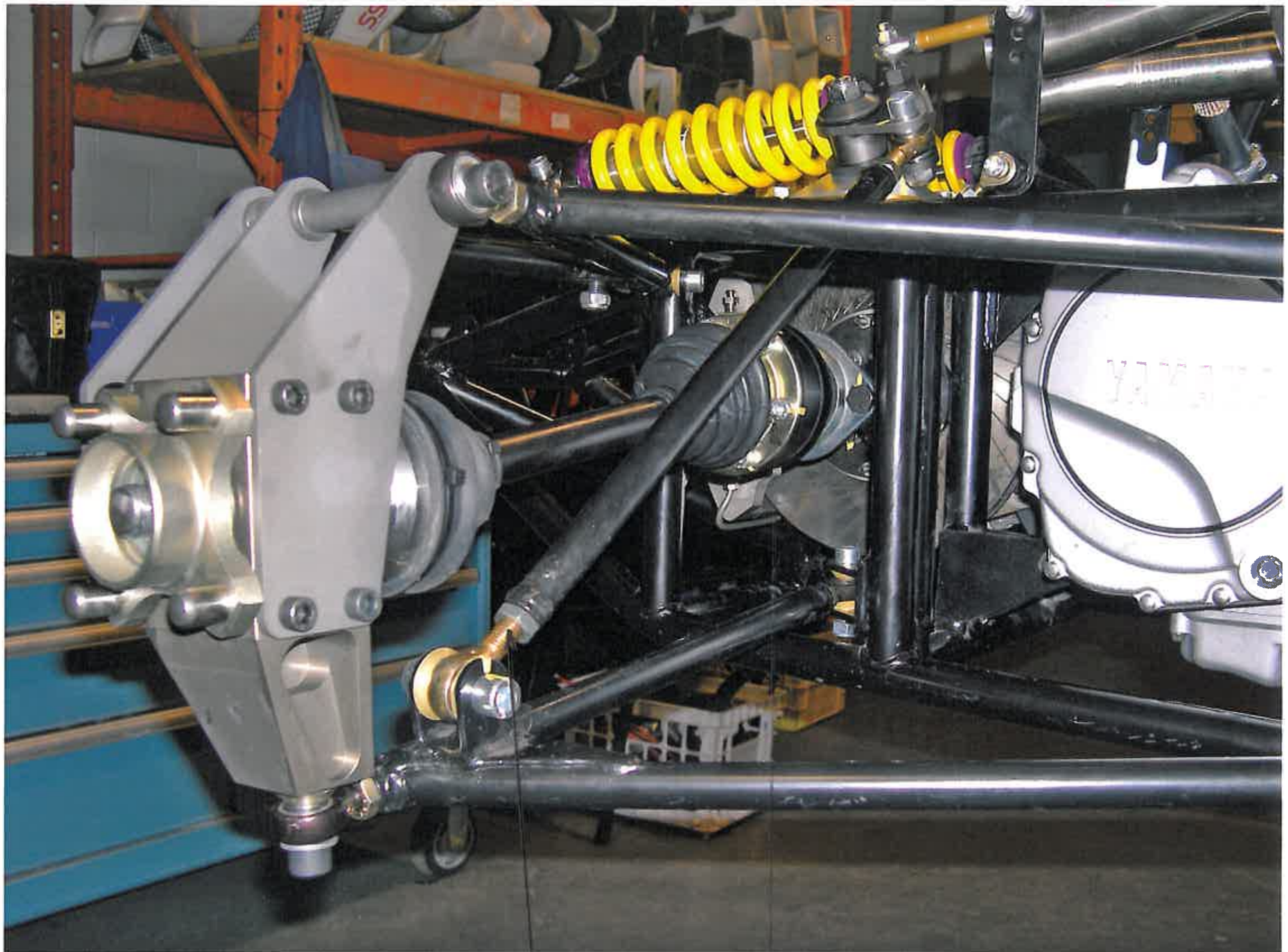
SPECIAL BOLT.



From the workbench of:
Date:

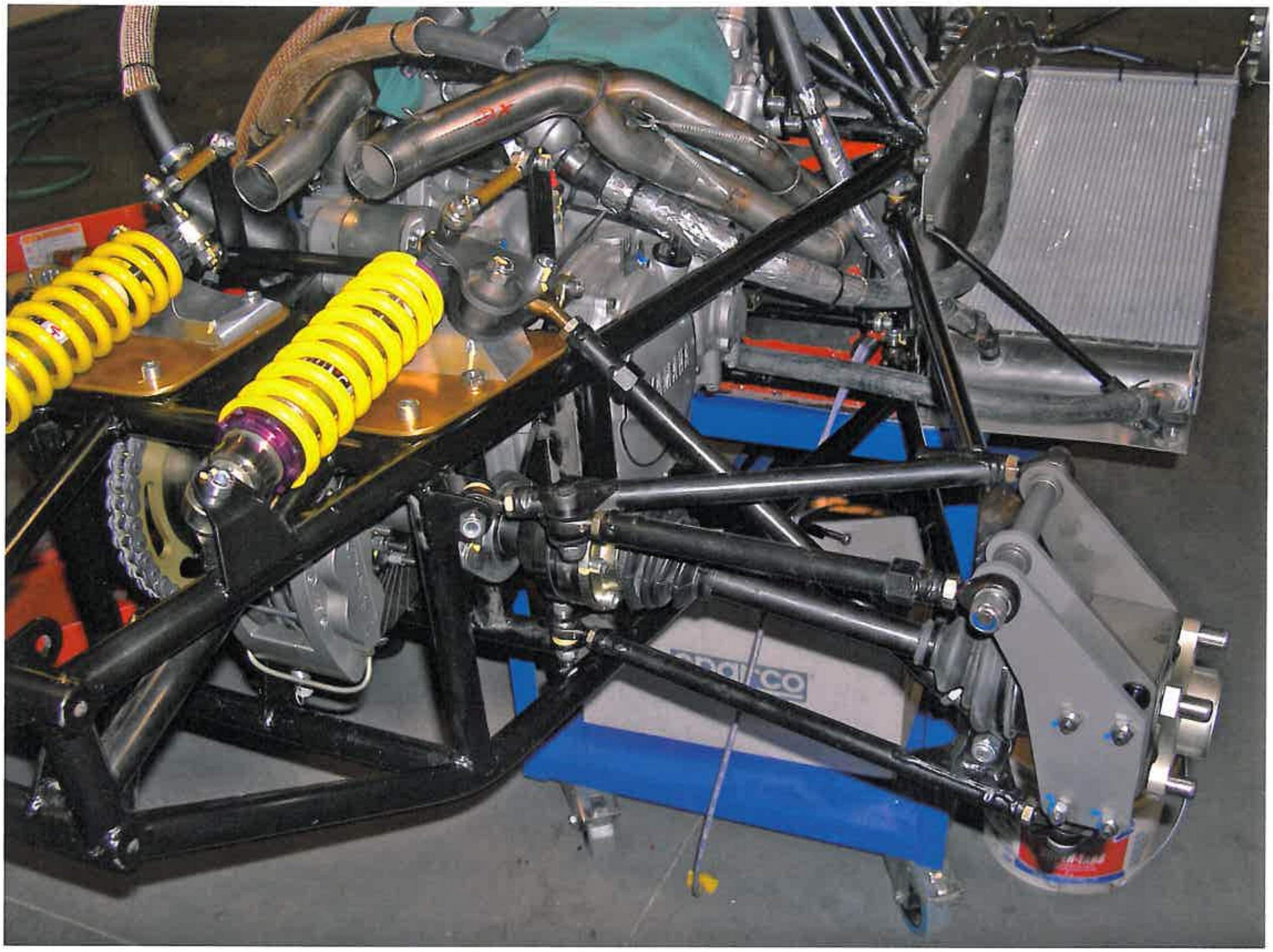
AFT WING SUPPORT BRKT ATTACH BOLTS
R.H AFT UPPER - FWD 1 EA
Ø 10.00 M/M L 25.00 M/M
R.H AFT LOWER. 1 ONLY Ø 8.00 M/M L 25.00 M/M

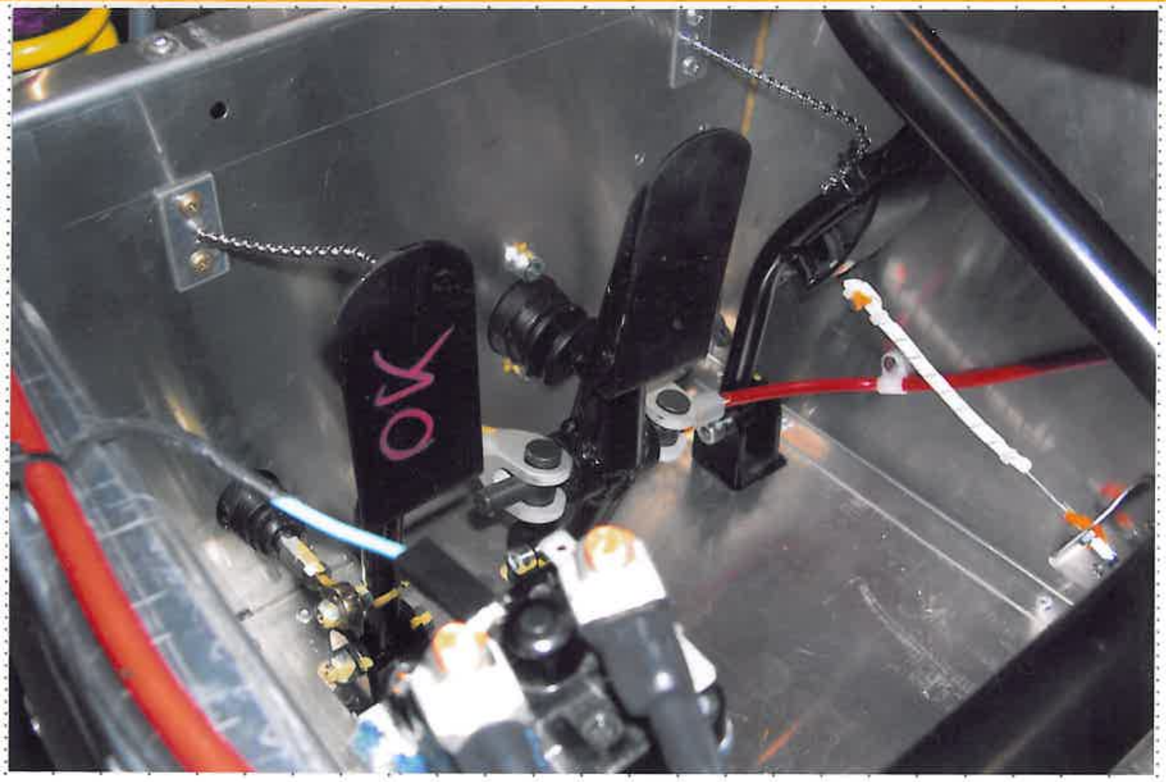
L.H AFT - UPPER Ø 10.00 L 90.00 M/M
SPACER H PROFILE I D 10.00 L 62.00 M/M
L.H FWD Ø 10.00 M/M L 25.00 M/M
L.H AFT LOWER Ø 8.00 M/M L 25.00 M/M
1 EA.
CORRESPONDING FIBRE LOCK NUTS

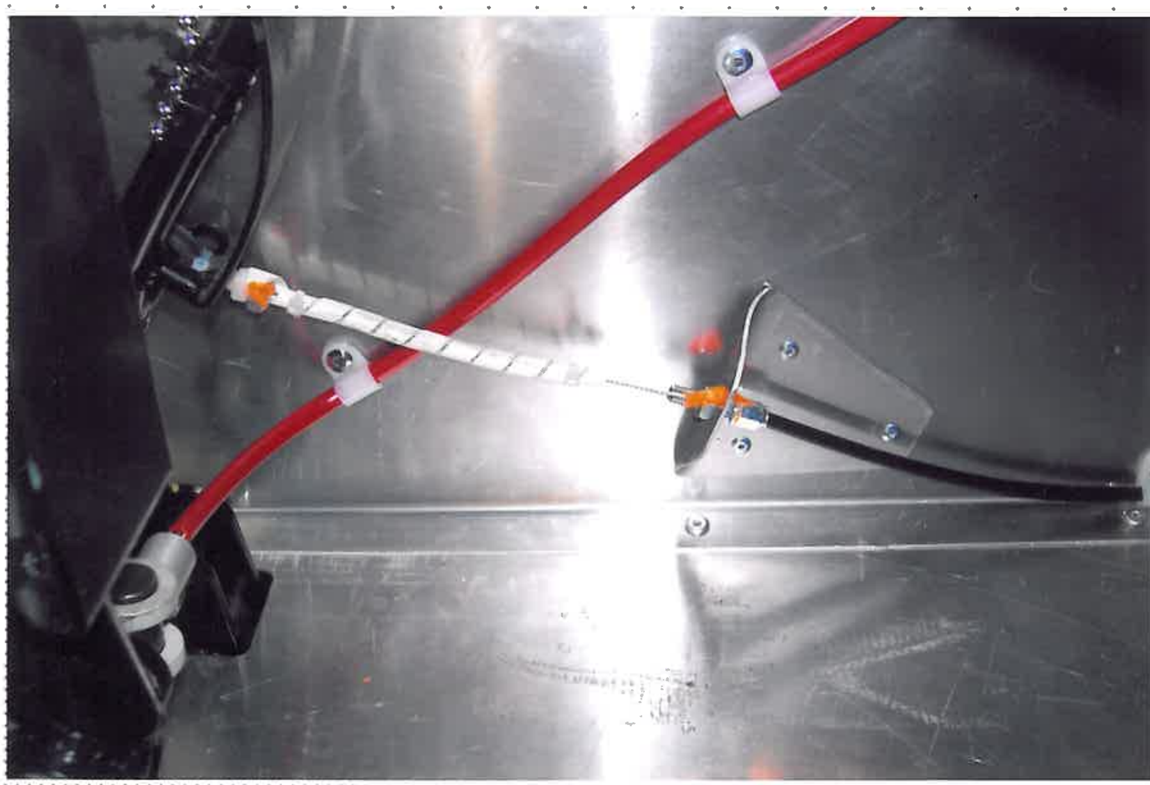


NOTE: AFT DIAGONAL "L" 376.00 M/M
INSTALL DOUBLE LOCKNUTS AS REQUIRED.

BEARING TO FLANGE MOUNTING BOLT (6 ONLY EA)
D. 8.00 M/M GRIP 45.00 M/M L. TOTAL 53.00 M/M
BOLT ALLENHEAD.

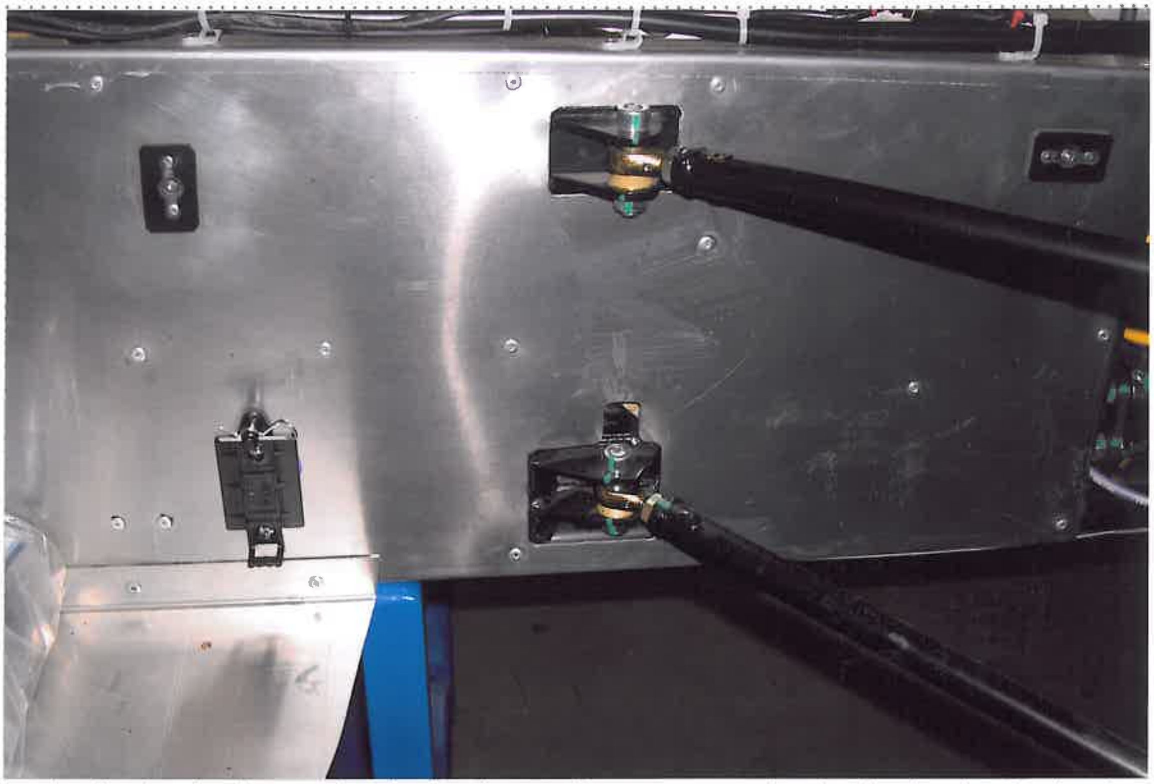

sparco





From the workbench of:
Date:

TRANSPONDER BRACKET INSTALLATION



FOR LOCATION DIMENSIONS CHECK DRAWINGS

SPA DESIGN LTD

New regulations for bottle refills and servicing

National and international requirements for pressurized equipment.

14/2/08

Due to SPA DESIGN'S ongoing product and safety reviews, it has been brought to our attention by authorities and insurance companies that we must comply with both national and international requirements for pressurized equipment.

This will mean that our current fire system service and refill procedure will have to change.

Under **FIA/MSA** Regulations, hand held and plumbed – in systems must be serviced every 2 years.

We regret that **SPA DESIGN** can only maintain **SPA DESIGN** bottles and other makes of cylinders should be returned to the original manufacturer. (Lifeline, **FEV**, etc)

Alloy and steel bottles will have a life span of 10 years from date of manufacturer. **ALL** carbon fiber bottles will have a life span of 2 years.

Bottles that have not adhered to the 2 year service schedule will not be serviced.

Cylinders that have been modified or not serviced by **SPA DESIGN**, or its authorized service dealers and units that have tampered or modified labels will not be accepted for service.

SPA DESIGN LTD reserve the right on the grounds of safety to reject a cylinder for service if it is felt that a bottle has sustained external damage and can not be safely repaired.

We are sorry for any inconvenience that this may cause, but this issue should be seen as a real safety concern to all parties.

Should you require any further information, please do not hesitate to contact us.

SPA DESIGN LTD and its associated companies reserve the right to change specifications of parts, kits and dimensions without prior announcement.

DESIGN

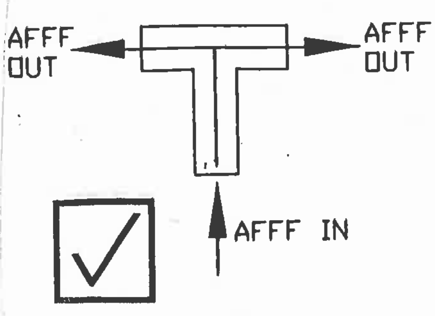
TEL: 01827 300150
FAX: 01827 300151
e-mail: sales@spa-uk.co.uk
WEB SITE: www.spa-uk.co.uk

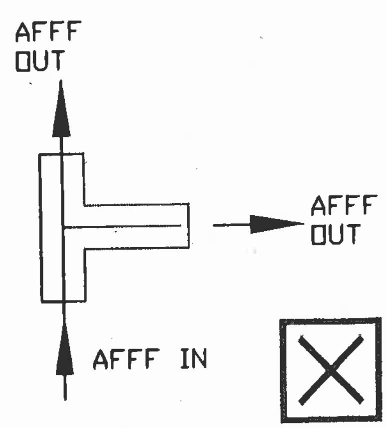
MECHANICAL SYSTEM INSTALLATION INSTRUCTIONS

This SPA 'FireSense-Response' Suppression system is a mechanically activated AFFF foam system; it uses two T-Handle pull cables, one 6 ft, and one 12ft in length

Fitting Instructions

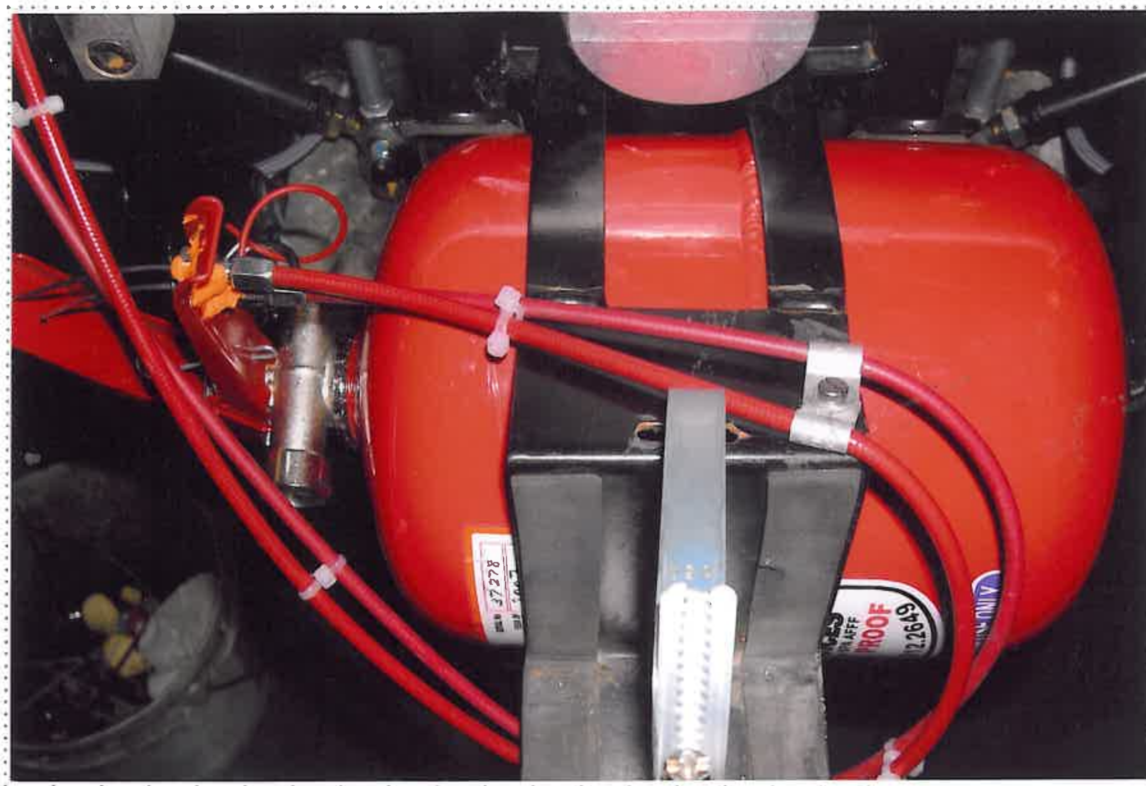
- Remove the system from its plinth by un-fastening the over-centre clips. Decide the best position for the system – IT IS RECOMMENED THAT THE BOTTLE SHOULD BE MOUNTED IN THE FORE AND AFT DIRECTION OF THE VEHICLE. The system label, detailing contents, etc and also the pressure gauge should be visible. Mount the plinth securely to the vehicle and put the bottle back into place.
- Insert the end of the decabon tube into the push-in fitting on the lever-valve and lay the length of the tube from the cylinder to the chosen location; plug the nozzles onto the free ends of the tube (depending on how many nozzles your system has). Orientate the nozzles to point onto anticipated fore source.
- Mount the 6ft 'Pull cable' in the cockpit within reach of the driver and/or co-driver when sitting in the normal driving position wearing seat belts. The other end of the cable is to be threaded through one of the adjusting screws on the handle of the lever-valve. Thread the adjusters through the holes on to the bottom handle of the lever-valve. Secure the clamp screw against the underside in such a way that movement of the red pull cable will close the handles of the lever-valve, but allowing 6mm of free play. **Remember to keep safety pin in place whilst using this assembling process; failure to do so may result in system being accidently dispersed.**
- Mount the 12 ft 'Pull cable' on the outside of the vehicle (on the front scuttle of a saloon car or by the roll hoop on a single seater). Lay the cable inside the vehicle and connect to the lever-valve as stated above.
- Pull cables should be fitted in a such a way that no links or 'S' bends are created, which could cause malfunction.
- **Make sure the safety pin on the lever handle is fully removed before an event/race; failure to do so will render the fire system <u>INOPERABLE.</u>**

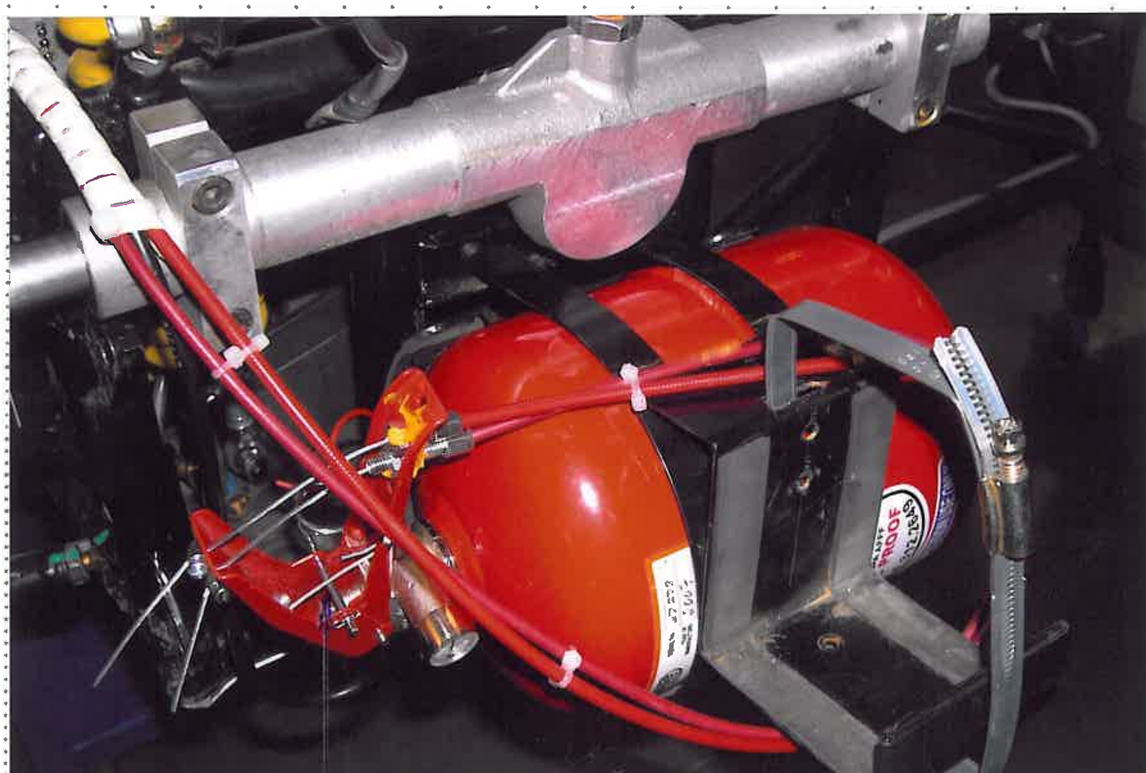




From the workbench of:
Date:

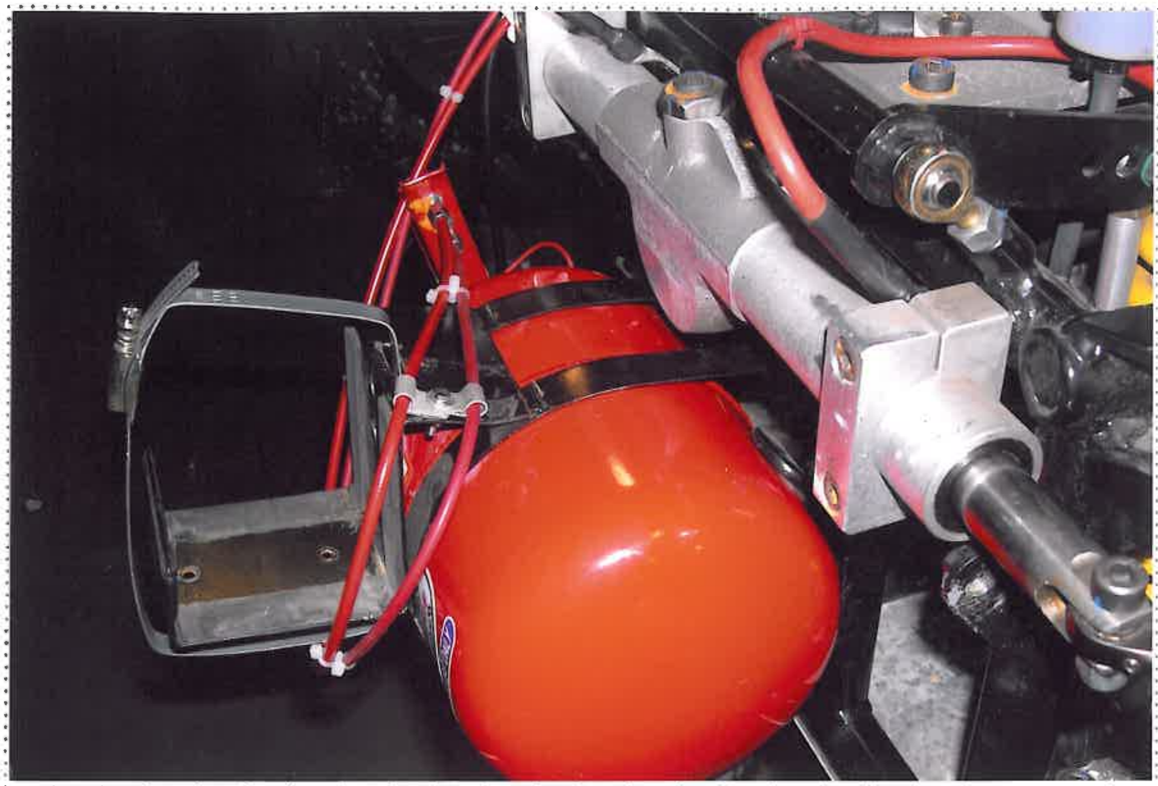
MANUAL RELEASE - FIREEXTINGUICHER BOTTLE INSTALLATION





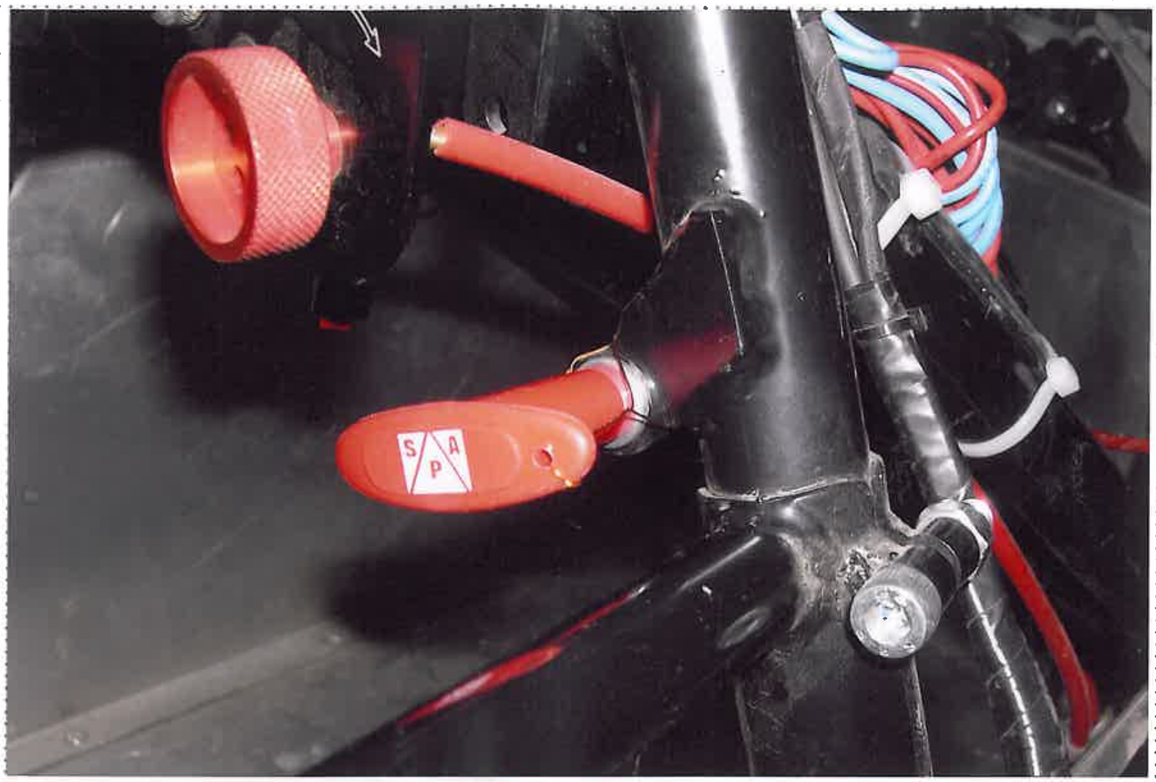
NOTE: LOCKPIN INSTALLED.

From the workbench of:
Date:



From the workbench of:
Date:

MANUAL RELEASE HANDLE — FWD.

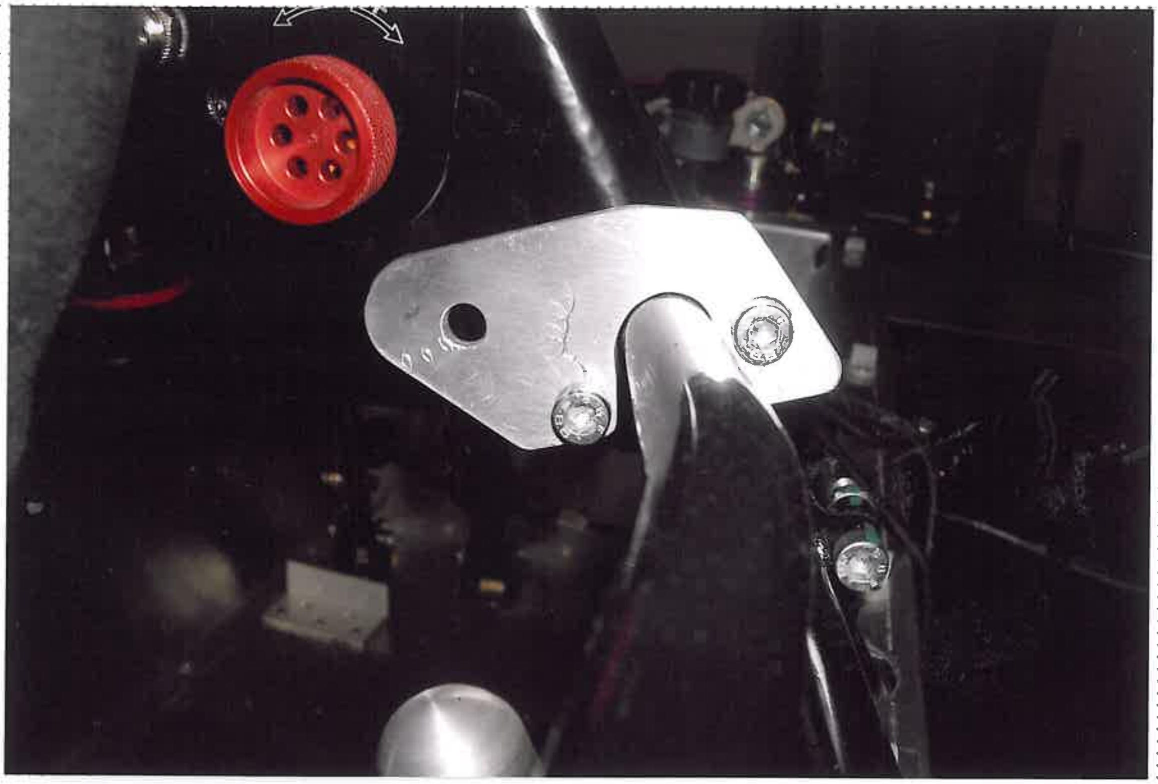


AFT — EXTERNAL

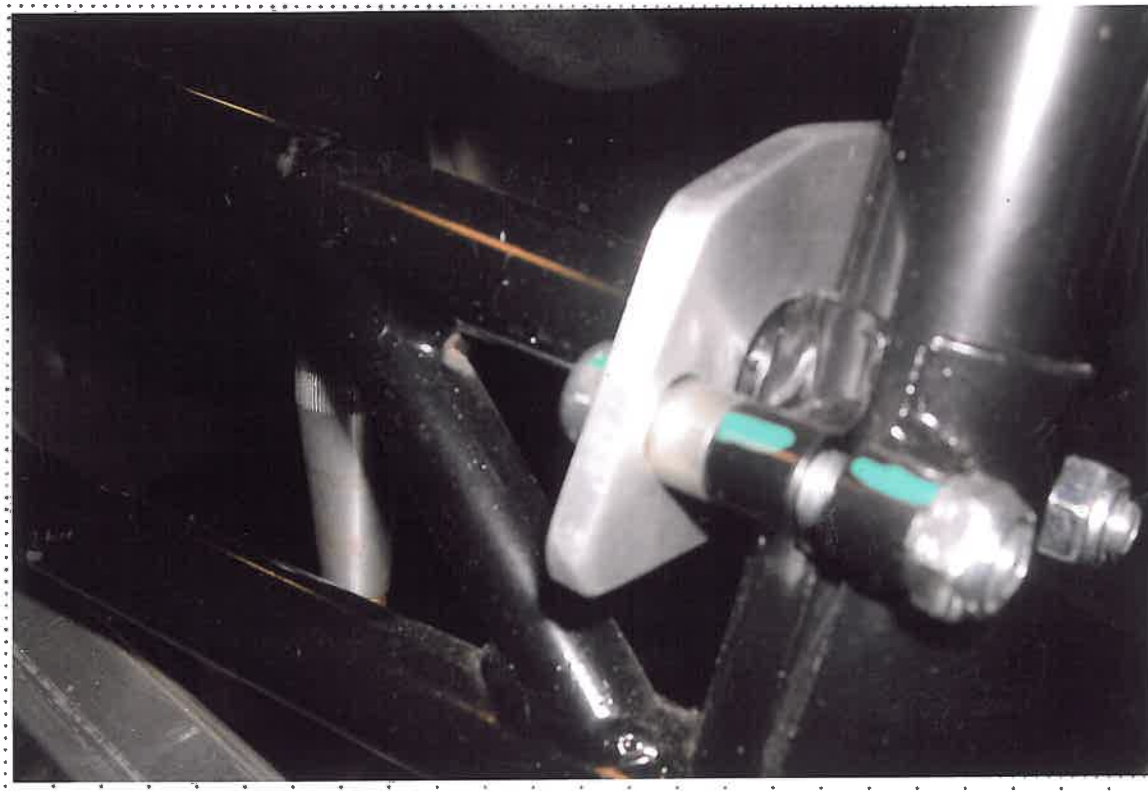
NOTE: BREAK-AWAY WIRE FOR INSPECTION — RELEASE INDICATION

From the workbench of:
Date:

FWD. RELEASE HANDLE MOUNTING PLATE



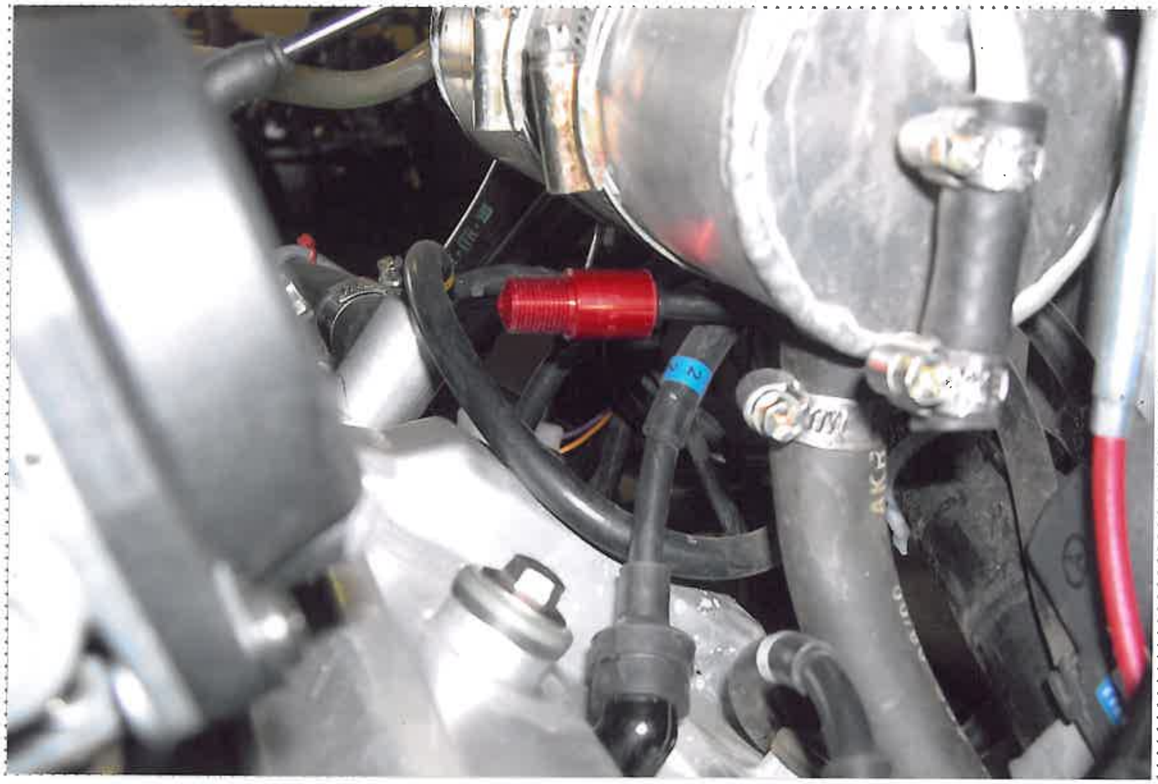
From the workbench of:
Date:

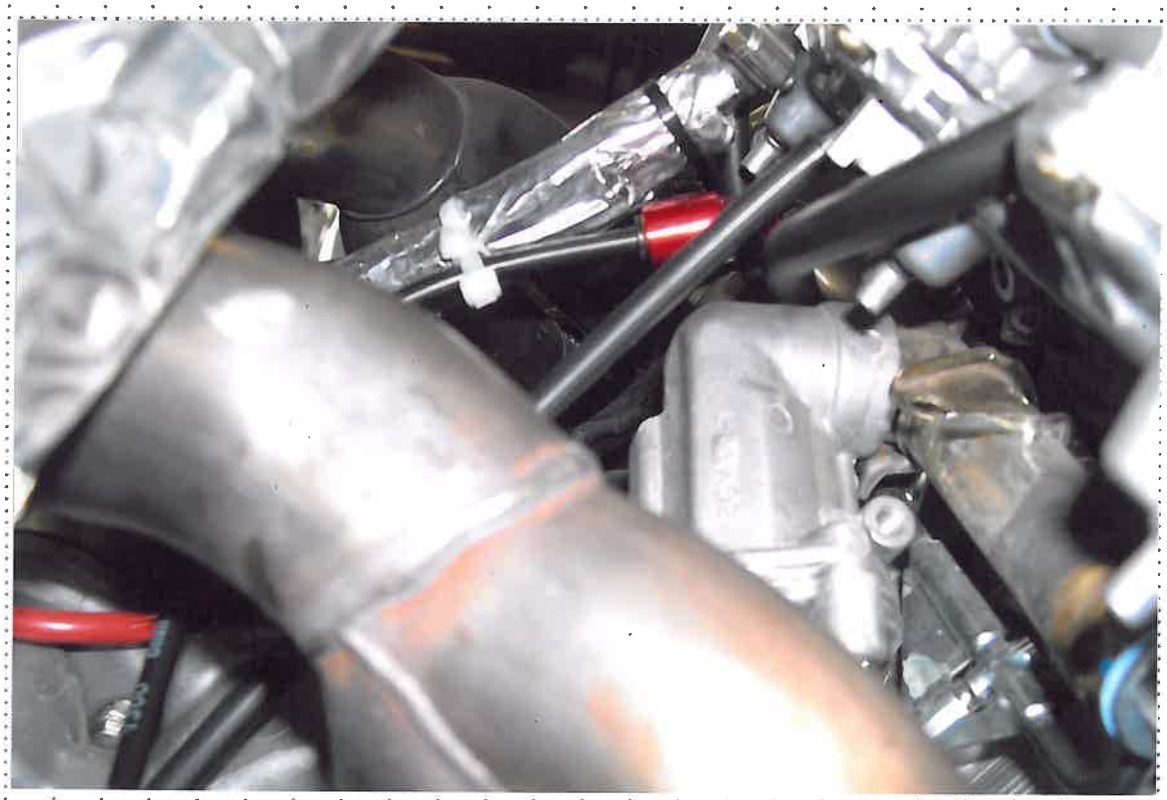


FOR DIMENSIONS AND MATERIAL SPECS SEE DRAWINGS.

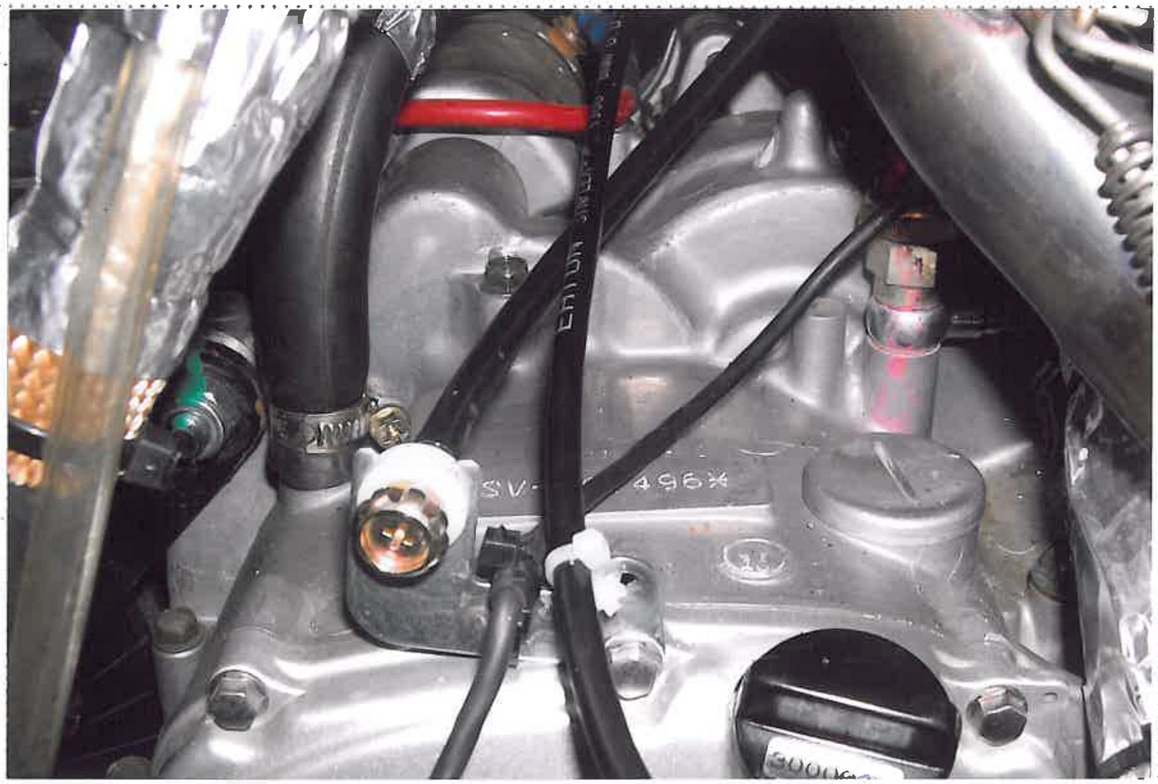
From the workbench of:
Date:

AFT DISCHARGE NOZZLES



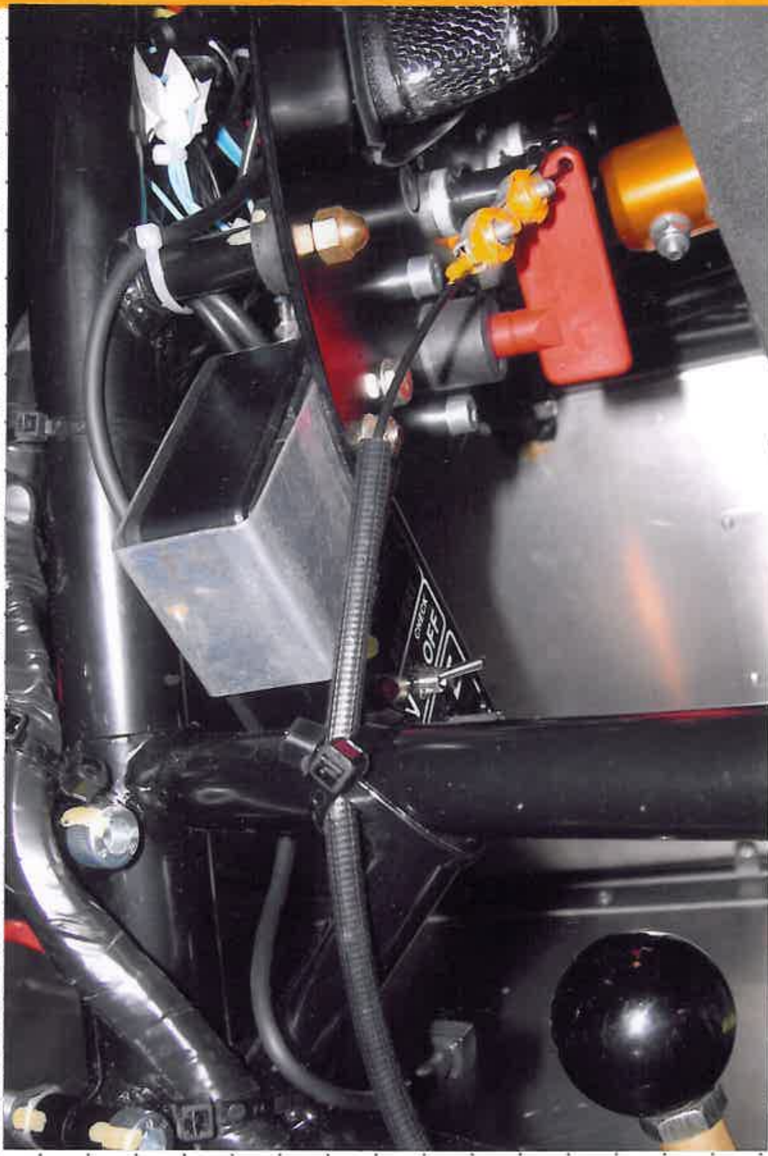


From the workbench of:
Date:



From the workbench of:
Date:

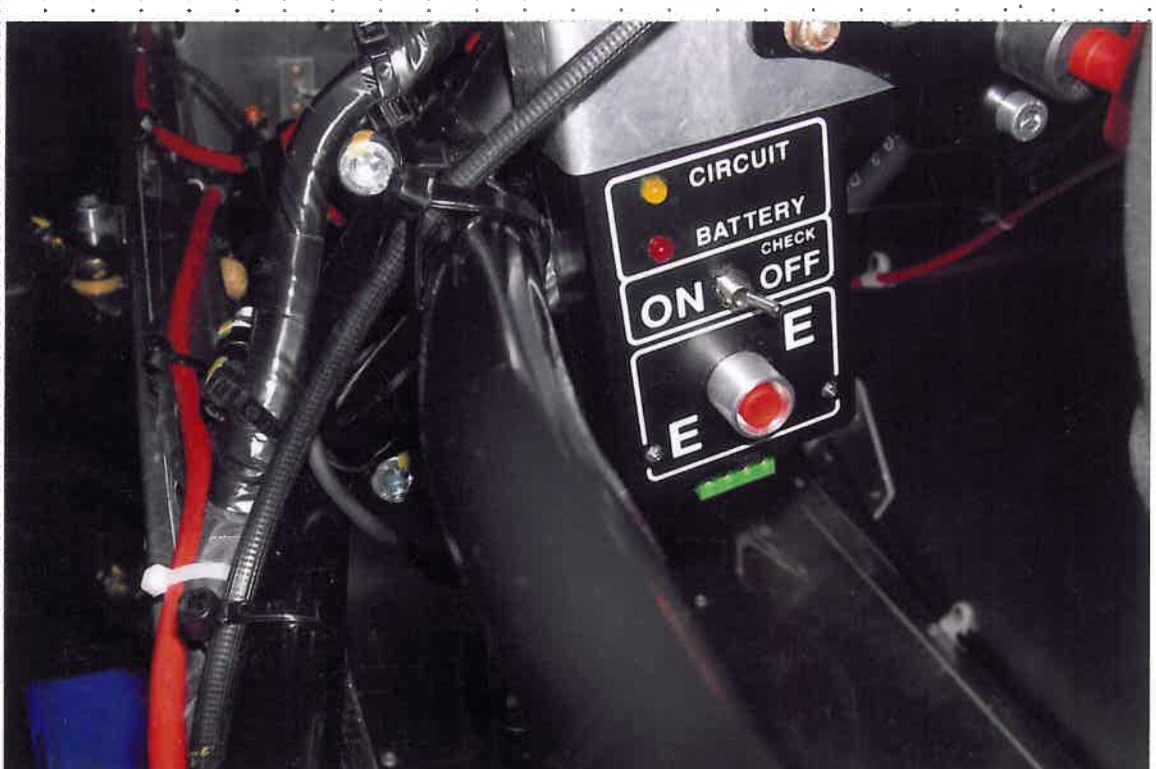
ELECTRICAL DISCHARGE FIREEXTINGUISHER CONTROL PANEL
VELCRO INSTALLATION.



EXTERNAL EMERGENCY ELECTRICAL CUT-OUT SWITCH AND SECTION OF CONTROL

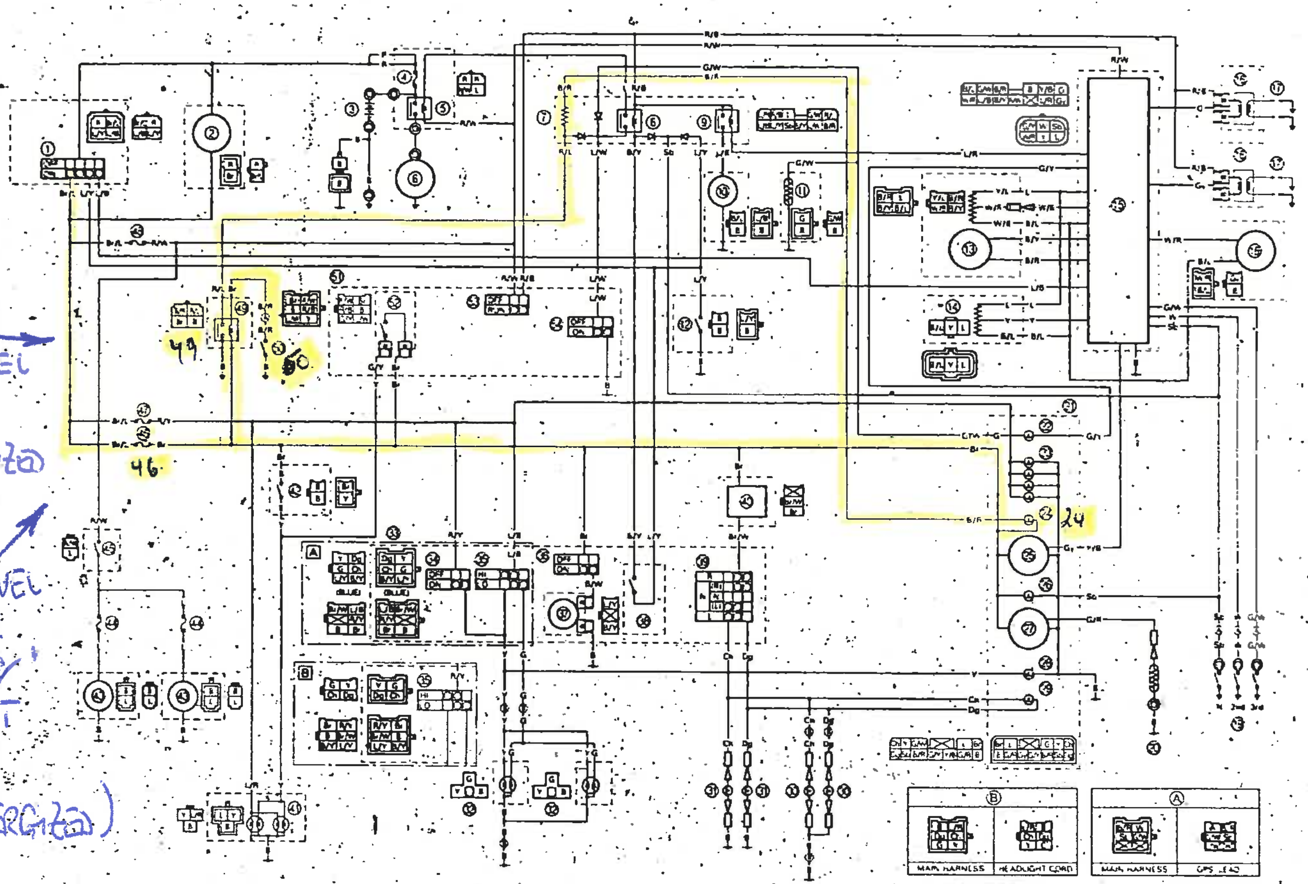
NOTE: INSTALL "T" HANDLE PRIOR TO INSTALLING HEADER TANK

FIRE EXTINGUISHER DISCHARGE PANEL



F-7

YZF1000R WIRING DIAGRAM (For CDN and AUS)



49 OIL LEVEL RELAY ENERGIZED "OPEN"

50 OIL LEVEL SENSOR "EMPTY" CIRCUIT "OPEN" (DE-ENERGIZED)

① Main switch
② AC generator
③ Battery
④ Main fuse
⑤ Starter relay
⑥ Starter motor
⑦ Relay unit
⑧ Starting circuit cut-off relay
⑨ Fuel pump relay
⑩ Fuel pump
⑪ Fuel sender
⑫ Sidestand switch
⑬ EXUP servo motor
⑭ Throttle position sensor (TPS)
⑮ Ignitor unit
⑯ Ignition coil
⑰ Spark plug
⑱ Pickup coil
⑲ GPS (gear position sensor)
⑳ Thermo unit
㉑ Meter assembly
㉒ Fuel level indicator light
㉓ Meter light
㉔ Oil level indicator light
㉕ Tachometer
㉖ Neutral indicator light
㉗ Temperature meter
㉘ High beam indicator light
㉙ Turn indicator light
㉚ Front flasher light
㉛ Rear flasher light
㉜ Headlight
㉝ Handlebar switch (left)
㉞ Pass switch
㉟ Dimmer switch
㊱ Horn switch
㊲ Horn
㊳ Clutch switch
㊴ Turn switch
㊵ Flasher relay
㊶ Tail/brake light
㊷ Rear brake switch
㊸ Fan motor
㊹ Radiator fan fuse
㊺ Thermo switch
㊻ Signal system fuse
㊼ Headlight fuse
㊽ Ignition fuse
㊾ Oil level relay
㊿ Oil level switch
51 Handlebar switch (right)
52 Front brake switch
53 Engine stop switch
54 Start switch

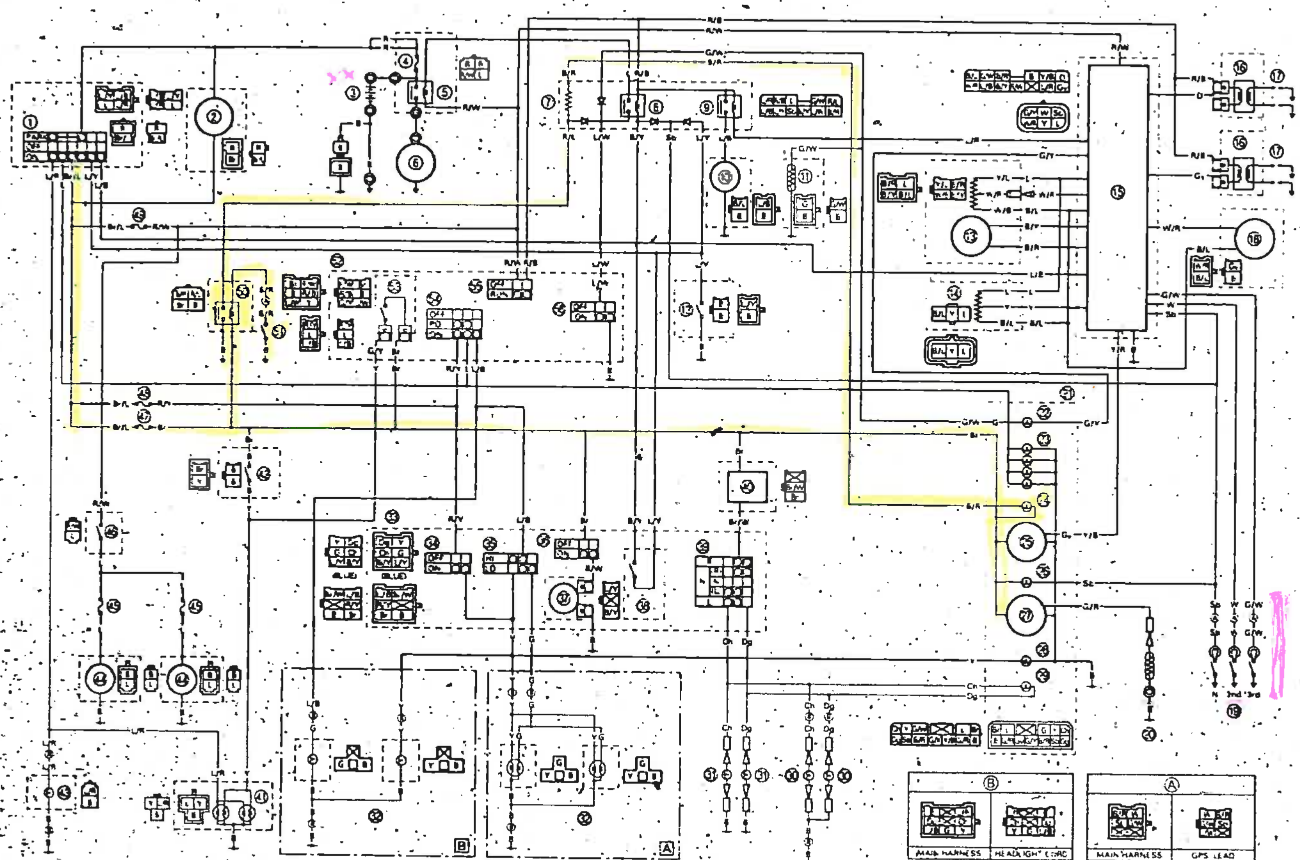
A For AUS
B For CDN

COLOR CODE

B .... Black	R .... Red	G/R .... Green/Red	R/L .... Red/Blue
Br .... Brown	Sb .... Sky blue	G/W .... Green/White	R/W .... Red/White
Ch .... Chocolate	W .... White	G/Y .... Green/Yellow	R/Y .... Red/Yellow
Dg .... Dark green	Y .... Yellow	L/B .... Blue/Black	W/B .... White/Black
G .... Green	B/L .... Black/Blue	L/R .... Blue/Red	W/R .... White/Red
Gy .... Gray	B/R .... Black/Red	L/W .... Blue/White	Y/B .... Yellow/Black
L .... Blue	B/Y .... Black/Yellow	L/Y .... Blue/Yellow	Y/L .... Yellow/Blue
O .... Orange	Br/L .... Brown/Blue	R/B .... Red/Black	

F-6

YFZ1000R WIRING DIAGRAM (For Europe)



1. Main switch
2. AC generator
3. Battery
4. Main fuse
5. Starter relay
6. Starter motor
7. Relay unit
8. Starting circuit cut-off relay
9. Fuel pump relay
10. Fuel pump
11. Fuel sender
12. Sidestand switch
13. EXUP servo motor
14. Throttle position sensor (TPS)
15. Ignitor unit
16. Ignition coil
17. Spark plug
18. Pickup coil
19. GPS (gear position sensor)
20. Thermo unit
21. Meter assembly
22. Fuel level indicator light
23. Meter light
24. Oil level indicator light
25. Tachometer
26. Neutral indicator light
27. Temperature meter
28. High beam indicator light
29. Turn indicator light
30. Front flasher light
31. Rear flasher light
32. Headlight
33. Handlebar switch (left)
34. Pass switch
35. Dimmer switch
36. Horn switch
37. Horn
38. Clutch switch
39. Turn switch
40. Flasher relay
41. Tail/brake light
42. Rear brake switch
43. Auxiliary light
44. Fan motor
45. Radiator fan fuse
46. Thermo switch
47. Signal system fuse
48. Headlight fuse
49. Ignition fuse
50. Oil level relay
51. Oil level switch
52. Handlebar switch (right)
53. Front brake switch
54. Lights switch
55. Engine stop switch
56. Start switch

A For GB
B Except for GB

COLOR CODE

B	Black	R	Red	G/R	Green/Red	R/L	Red/Blue
Br	Brown	Sb	Sky blue	G/W	Green/White	R/W	Red/White
Ch	Chocolate	W	White	G/Y	Green/Yellow	R/Y	Red/Yellow
Dg	Dark green	Y	Yellow	L/B	Blue/Black	W/B	White/Black
G	Green	B/L	Black/Blue	L/R	Blue/Red	W/R	White/Red
Gy	Gray	B/R	Black/Red	L/W	Blue/White	Y/B	Yellow/Black
L	Blue	B/Y	Black/Yellow	L/Y	Blue/Yellow	Y/L	Yellow/Blue
O	Orange	Br/L	Brown/Blue	R/B	Red/Black		

From the workbench of:
Date:

GEAR SELECTION CONNETOR

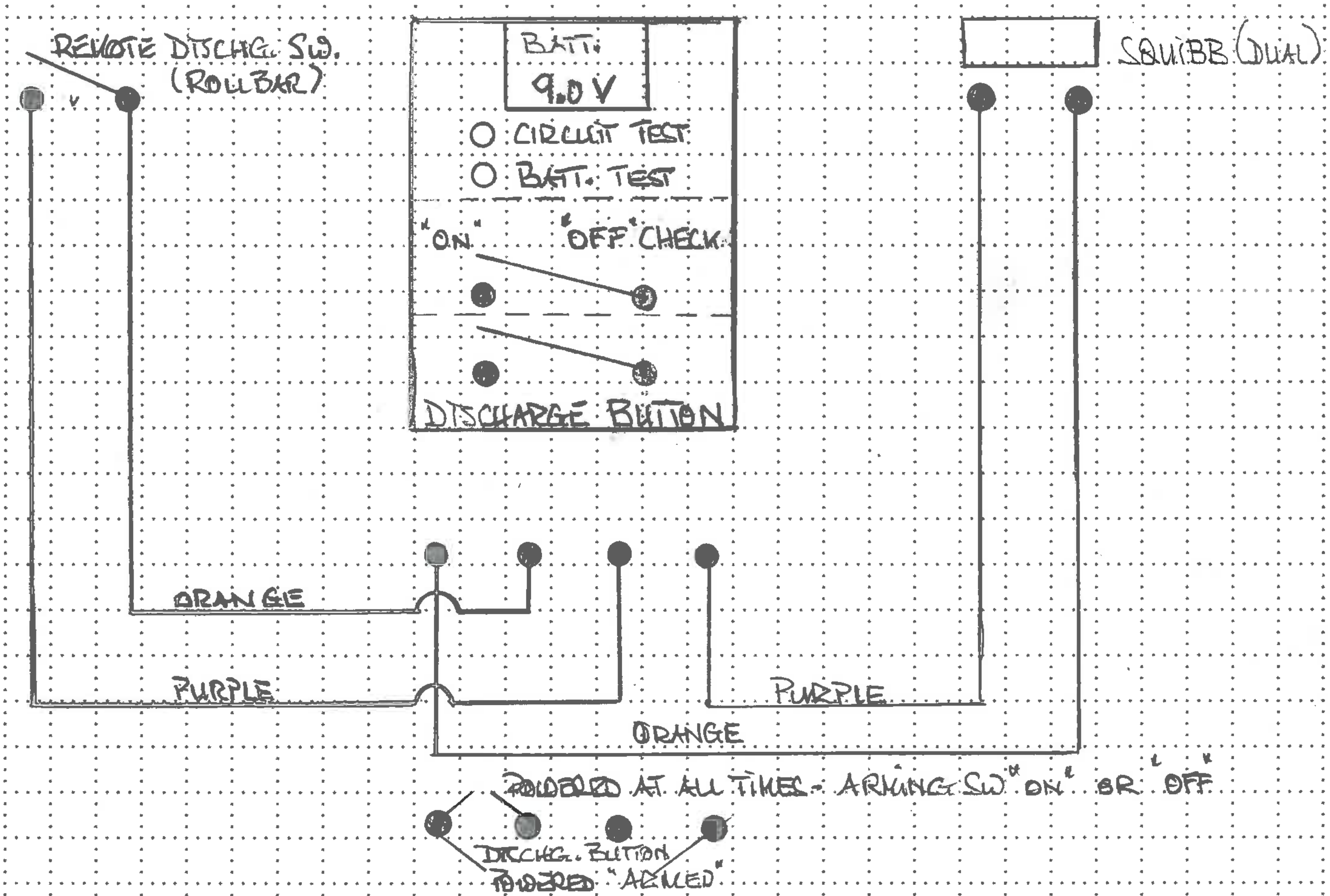
#1		WHITE
6	NEUTRAL	ORANGE
5		BROWN
2		GREY
3		RED
4		GREEN

ENGINE SHIFT CONNECTIONS

INACTIVE
NO. 1 WHITE
BROWN #5
N ORANGE
GREEN #4
#2 GREY
#3 RED

DASH CONNECTION YELLOW GEAR SELECT
GREEN NEUTRAL

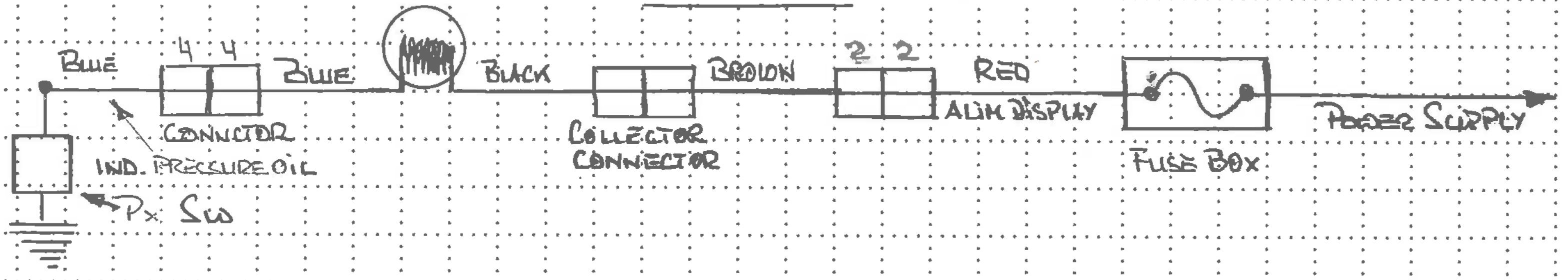
FIRE EXTINGUISHING SYSTEM



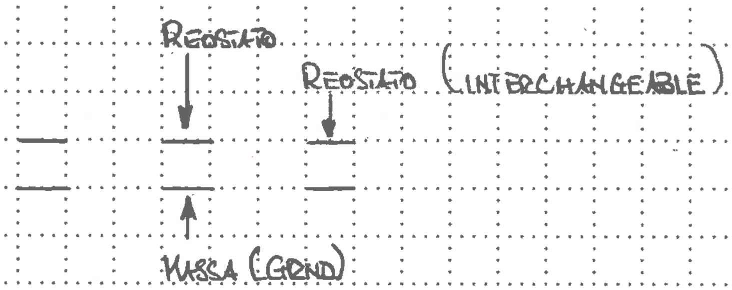
ARMING SW. "ON" (TOGGLE SW.) RED DISCHARGE BUTTON "ARMED"
ARMING SW TO "OFF/CHECK" - BATT. CHECK AND CIRCUIT CHECK AT REDUCED VOLTAGE TO PREVENT DISCHARGE - THE CURRENT BETWEEN EXTERNAL TERMINALS NOT TO EXCEED "1.0 ma"

From the workbench of:
Date:

OIL Px IND.



E.C.M.



SILICON PLUG AFTER ENGINE CHECK

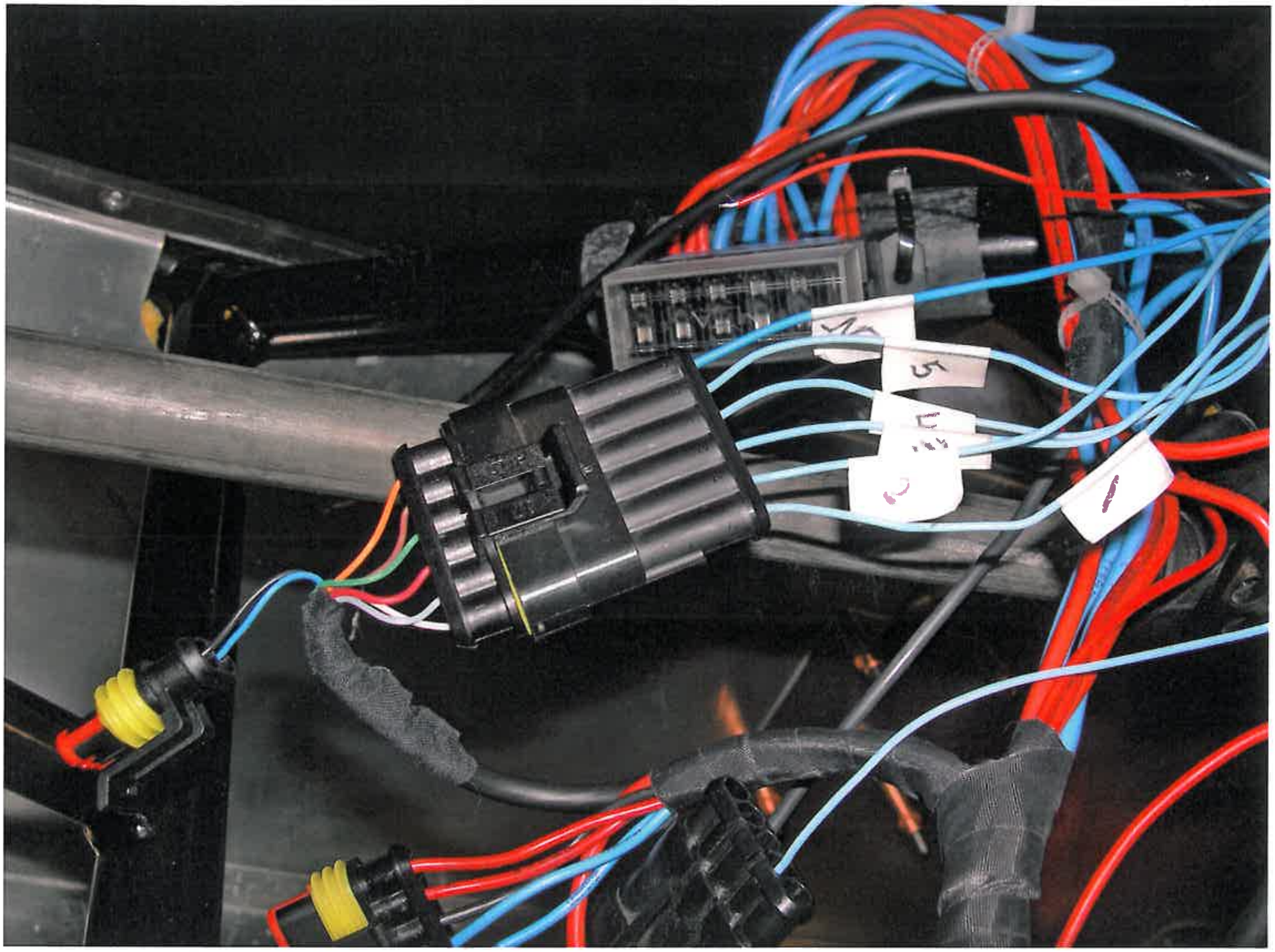
FUSE BOX

BOX SEQUENCE A – B – E – C – D

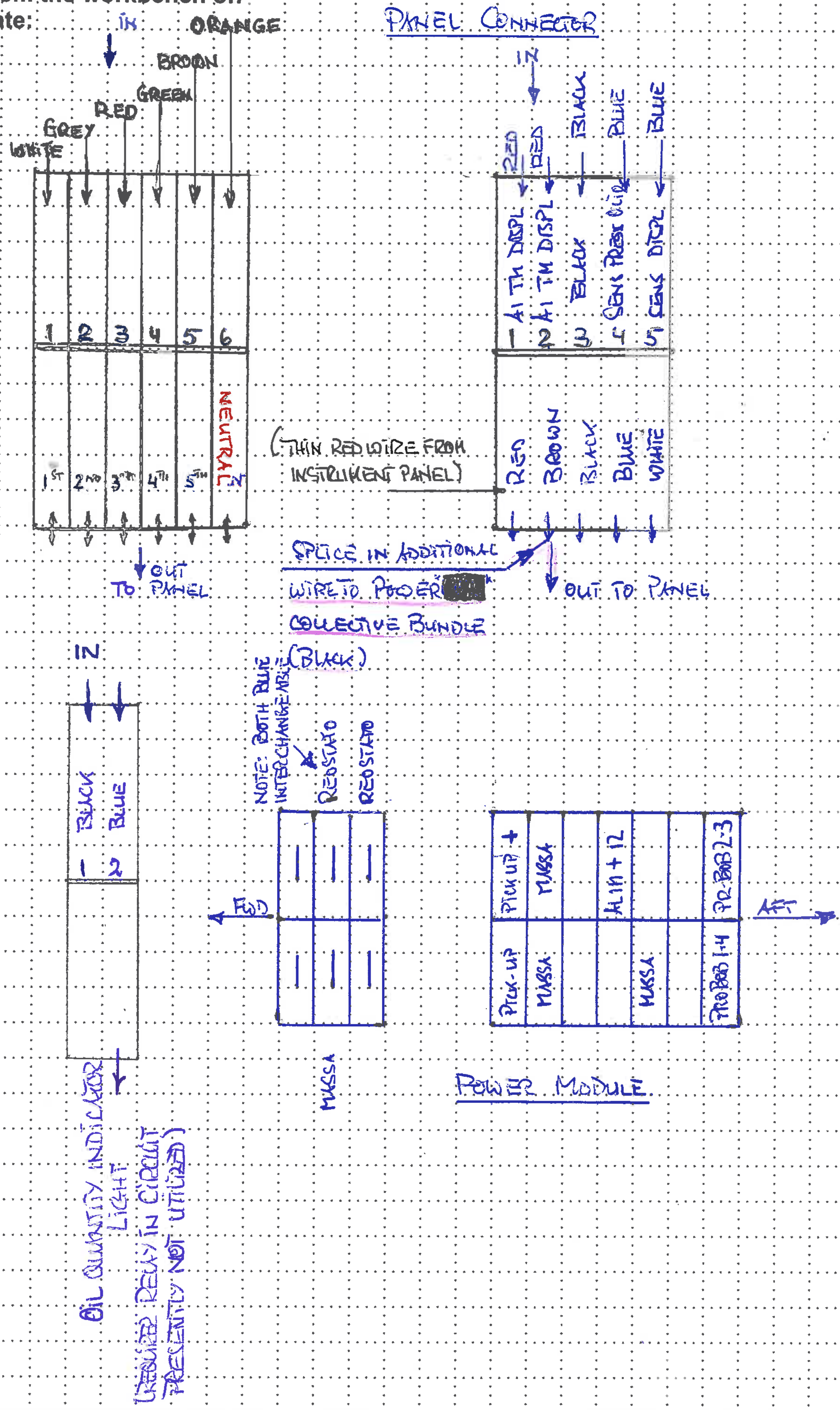
A GENERAL PROTECTION
B AFT RED LAMP
C RAD FAN
D FUEL PUMP
E DIODE COIL PROTECTION

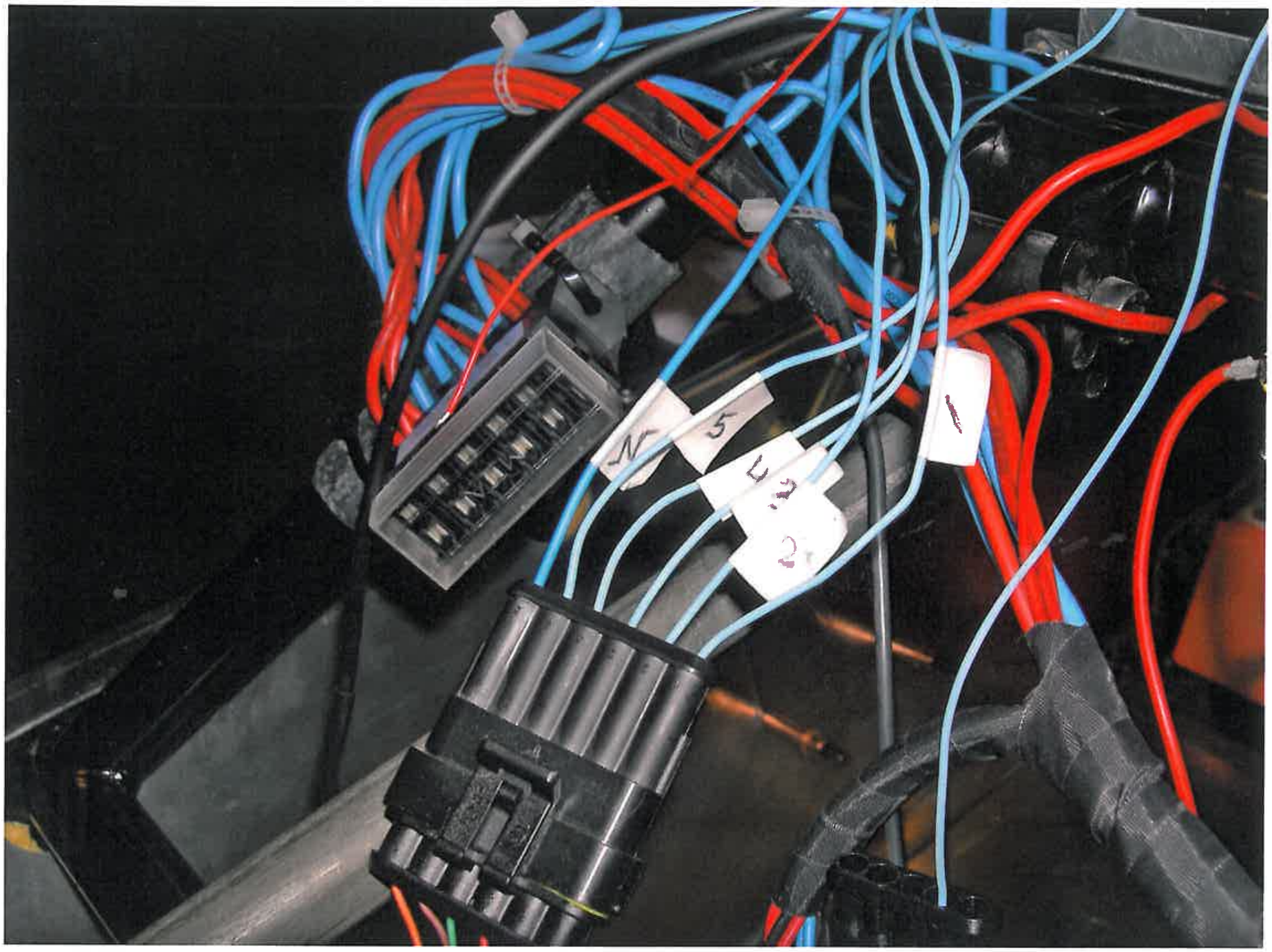
ARCO SEQUENCE MXL PISTA SYSTEM

A – B – MXL – C – E – D


5

From the workbench of:
Date:



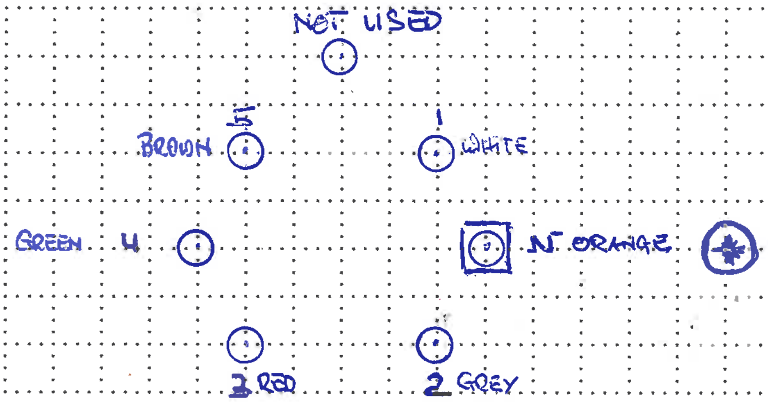

5
2

From the workbench of:
Date:

GEAR SELECTOR

1ST.	WHITE
2ND	GREY
3RD	RED
4TH	GREEN
5TH	BROWN
"N"	ORANGE

NOTE: ROUTE WIRE BUNDLE THROUGH BEHIND WATER PUMP (EXCEPT BLUE OIL QUANTITY WIRE) AND SECURE WITH TIE WRAP TO WATER PUMP.



OIL LEVEL BLUE WITH FEMALE CONNECTOR
(YELLOW AND BLACK ARE NOT USED

INSTRUMENT PANEL SWITCHES (MASTER - TAILLIGHT - RAD FAN)

MASTER

FACING AFT

INT GEN SUB (RED)

Ø

PF22 - INT GEN (RED)

TAIL LIGHT

PFE - INT FAR (BLUE)

Ø

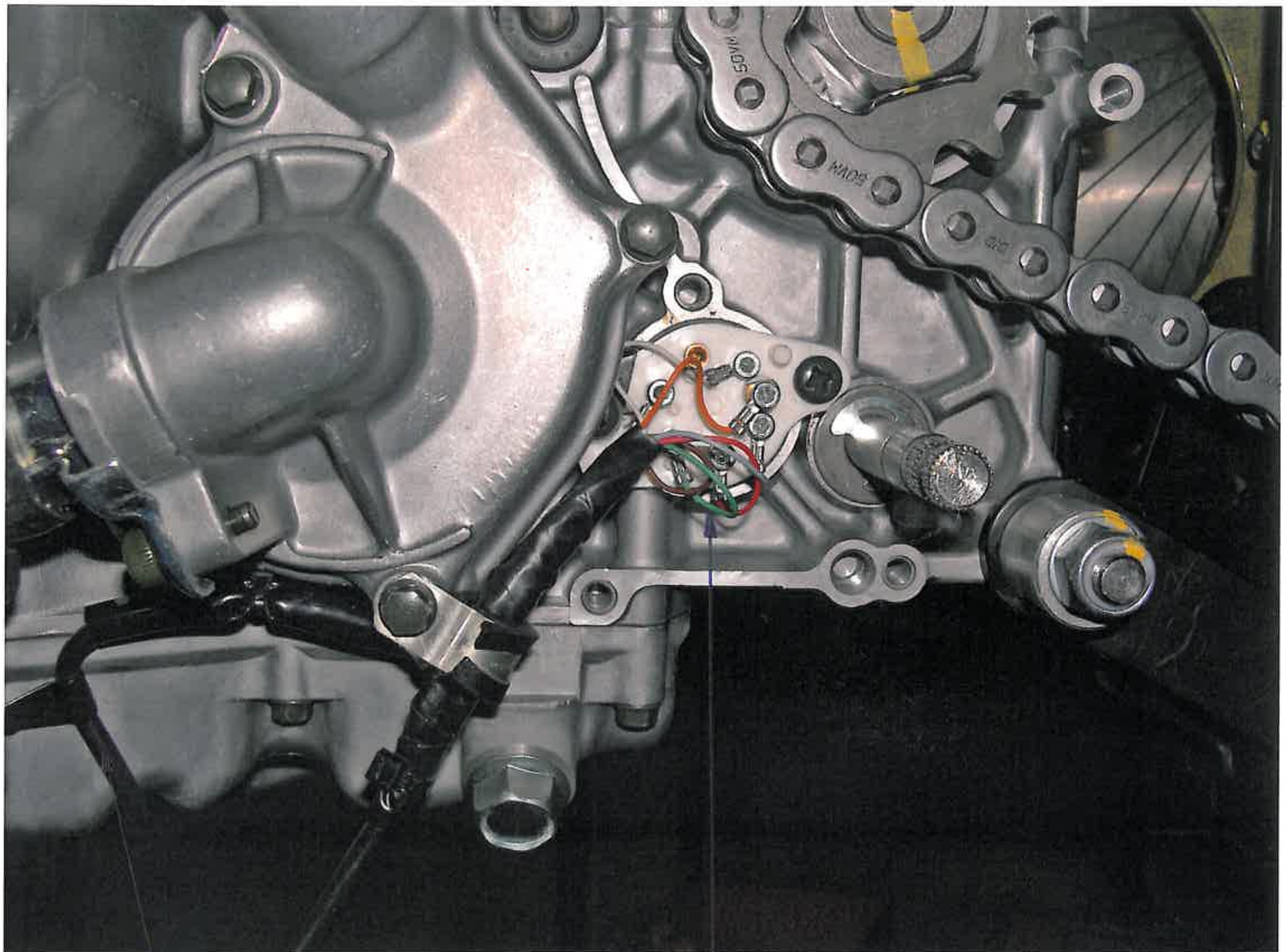
S.U.A. - INT FA POST (BLUE)

RAD FAN

BLUE

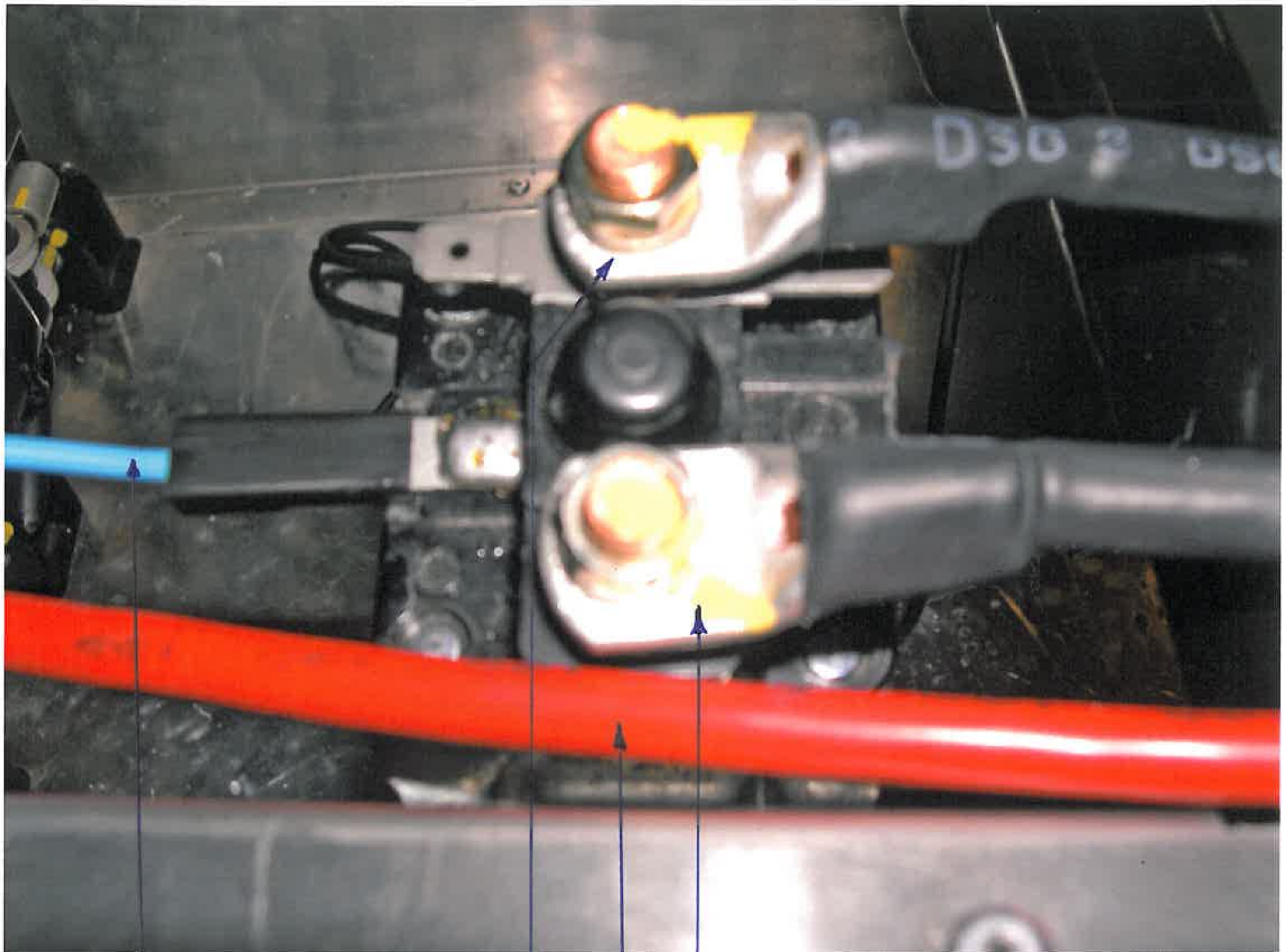
Ø

INT VENT (BLUE)



TO GEAR SHIFT POSITION INDICATING LIGHTS

OIL LEVEL



PULL AVV TELER
(BLUE)

TEL KEY B (RED)
TO INBD CONNECTION OF
EMERGENCY CUT-OUT

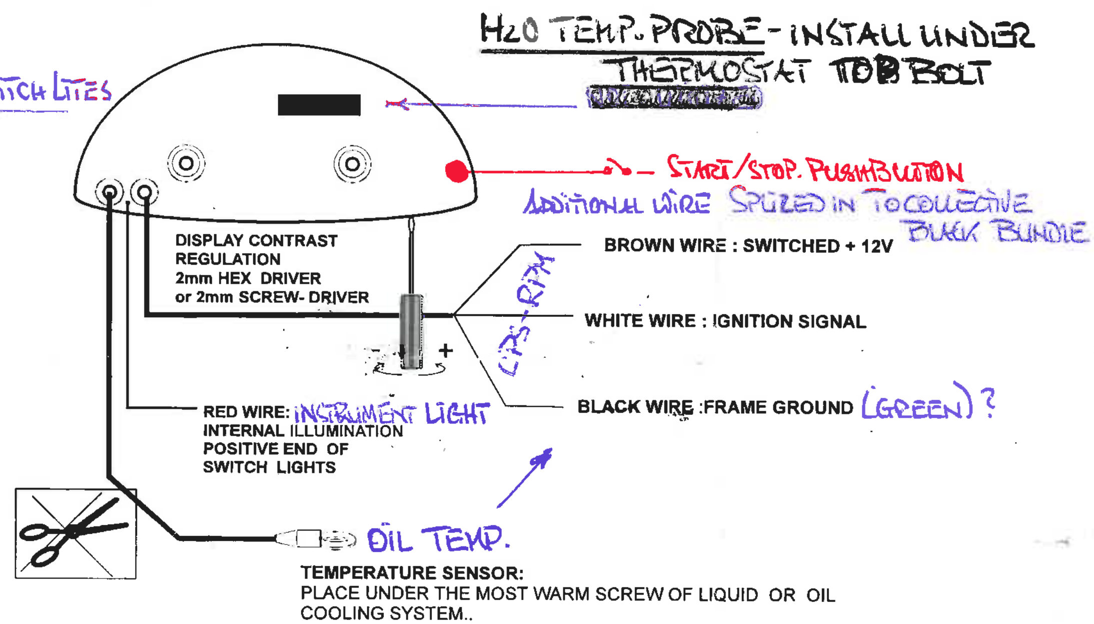
TEL MOT AV (RED)
TO STARTER

+12 KEY A (RED)
BATT. LEAD, TO OUTBD. CONNECTION
OF EMERGENCY CUT-OUT (DIODE SIDE)

AVIACOMPOSITI RACING
Via Lucrezia Romana 92 c
00043 Ciampino - Rome - Italy
tel. (+39) 06 79 17 711
fax. 06 79 8130 63
internet www.aviacompositi.com
E-mail aviacompositi@aviacompositi.com

DIGITAL TACHOMETER "F1 EVOLUZIONE "

INSTRUMENT PANEL SWITCH LITES
MASTER — GREEN
TAILLIGHT - RED
RAD-FAN — YELLOW



CLEANING::
Use non abrasive water based cleaner , don't use solvents.

5 PIN CONNECTOR

5 X — WHITE IGNITION SIGNAL (RPM)
4 X —— BLUE - OIL PRESSURE
3 X —— BLACK OR GREEN — GROUND
2 X —— BROWN +12 SPLICE IN ADDITIONAL WIRE TO COLLECTIVE BLACK BUNDLE
1 X —— RED - INSTRUMENT LIGHT

MODALITY SETTING:
The modality setting needs for right tuning of tachometer.
To set it, press the "MENU " button and choice "1" ,"2" o 0,5 press"MENU" to go to the next page.
ex.:
Modality " 1" : SUZUKI GSX-R till '01,YAMAHA FZR, DUCATI MONSTER, KAWASAKI ZXR 750 YAMAHA R1'99, SUZUKI SV650
Modality " 2" : YAMAHA R12000/R6, HONDA CBR, DUCATI996/916/748, KAWASAKI ZX6/9R
Modality " 0,5" : DUCATI 851 / 888 .

WATER 90°C
OIL 130°C

RESET FOR T. MAX OIL AND WATER
when in this page press the start/stop button

MAX RPM 12000

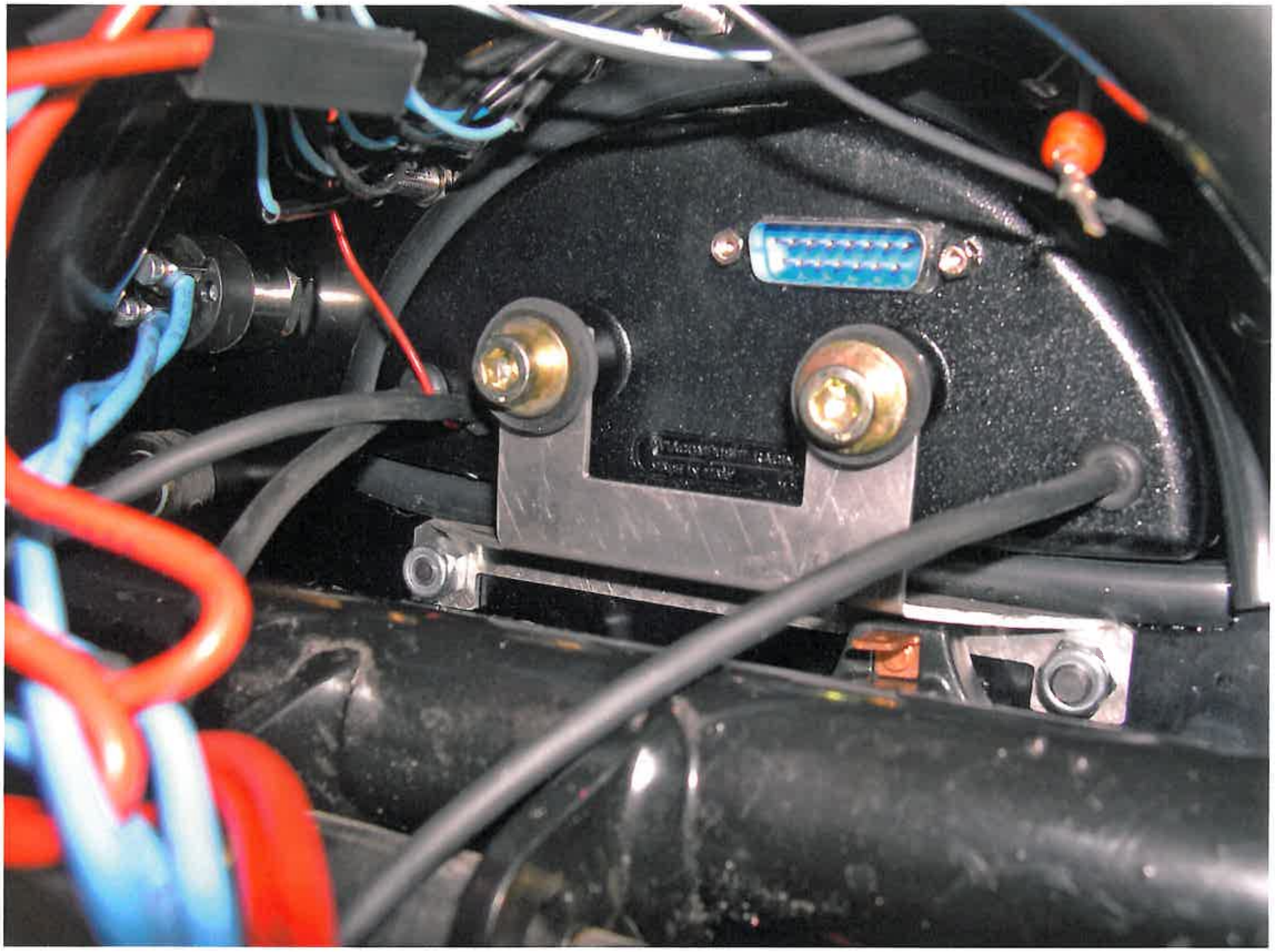
SHIFT-LITE SETTING : the shift-lite is settable from 5.000 RPM till 15.750 RPM.
for setting press the "UP" or "down" arrows and press "MENU"

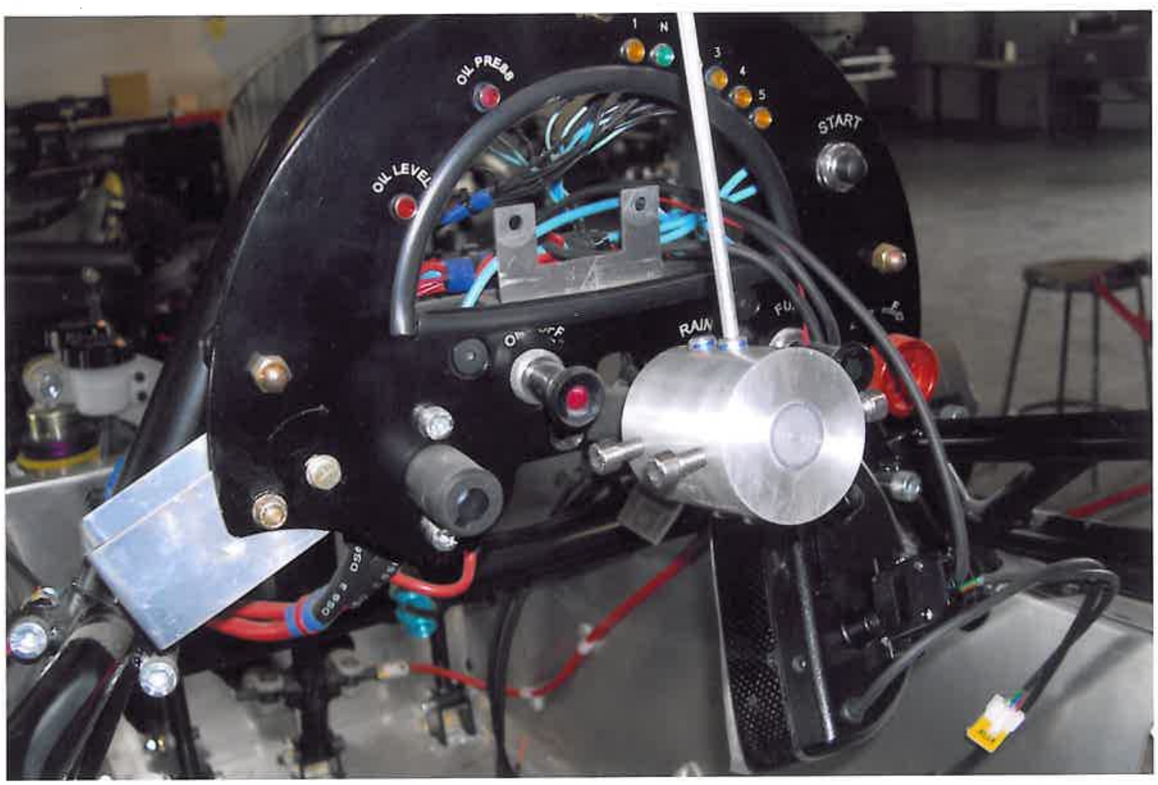
STOPWATCH-FUNCTION: the stopwatch function is activated when the tachometer is in the initial page only.To start the function press the red button, the next press capture the last lap and start the actual lap.
To stop the stopwatch hold down the start/stop button at least for 1.6 seconds.
NOTE: the memory stores 99 laps, the 00 address memory give the sum of total laps, when the memory is full it overwrites the laps starting from the memory address n.1
MEMORY CLEAR: to clear the memory press the start/stop button so the laps memory will clear an the display will show the initial page.

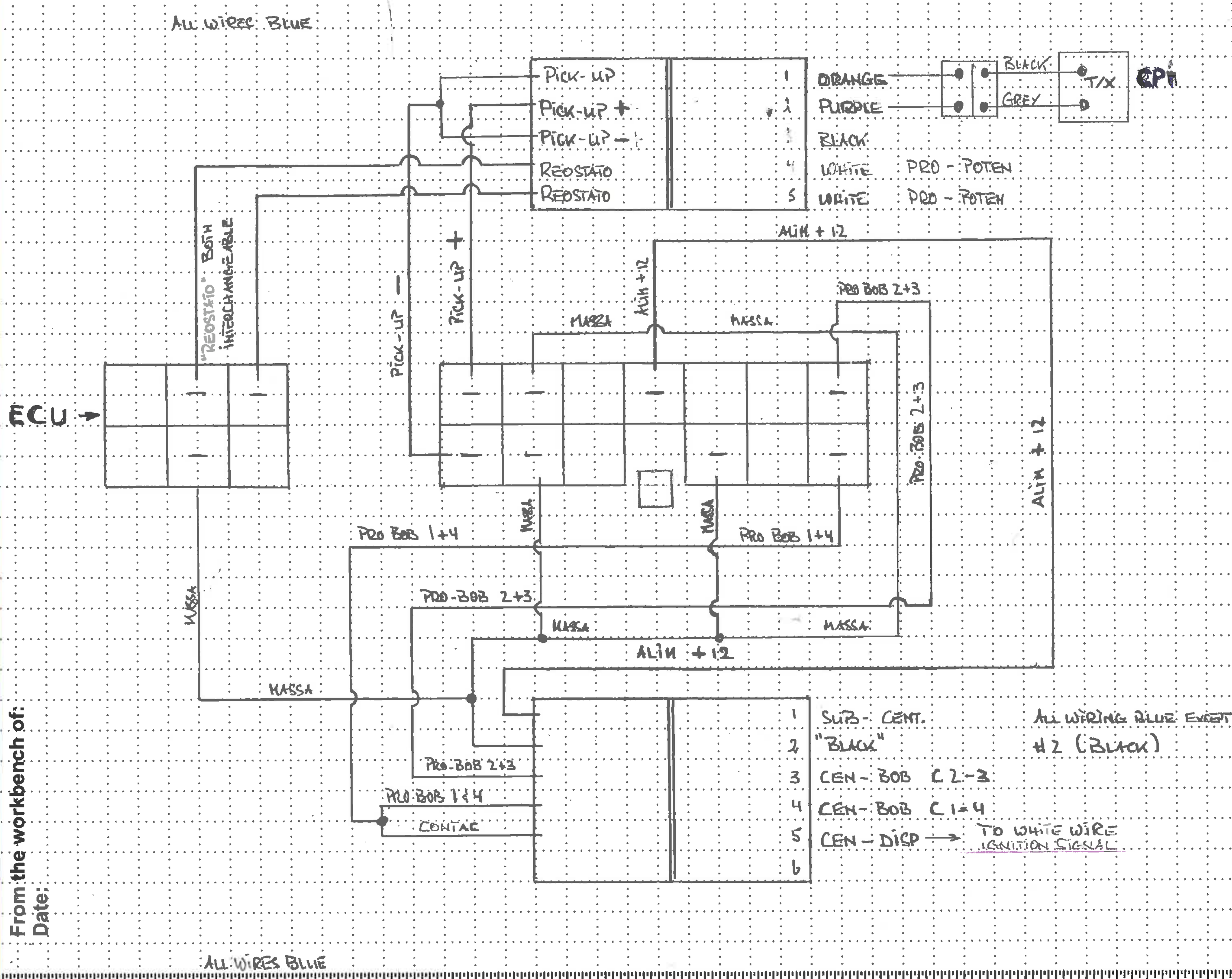
LANGUAGE SETTING: 1)switch off the tachometer
2) hold down the "MENU" button and switch on, holding down till the language page is shown on the display
3) choice the language with the "UP" or "DOWN" arrows
You can choice from ITALIAN, ENGLISH, GERMAN, FRENCH.
4) press the "MENU" button.

2.05 M/M ALLEN WRENCH

DISPLAY CONTRAST REGULATION:
cause of the ambient temperature (higher darken, lower clears) may be necessary to change the display contrast.
To adjust it,rotate the trimmer accessible from left bottom side.




1
N
OIL PRESS
3
4
5
START
OIL LEVEL

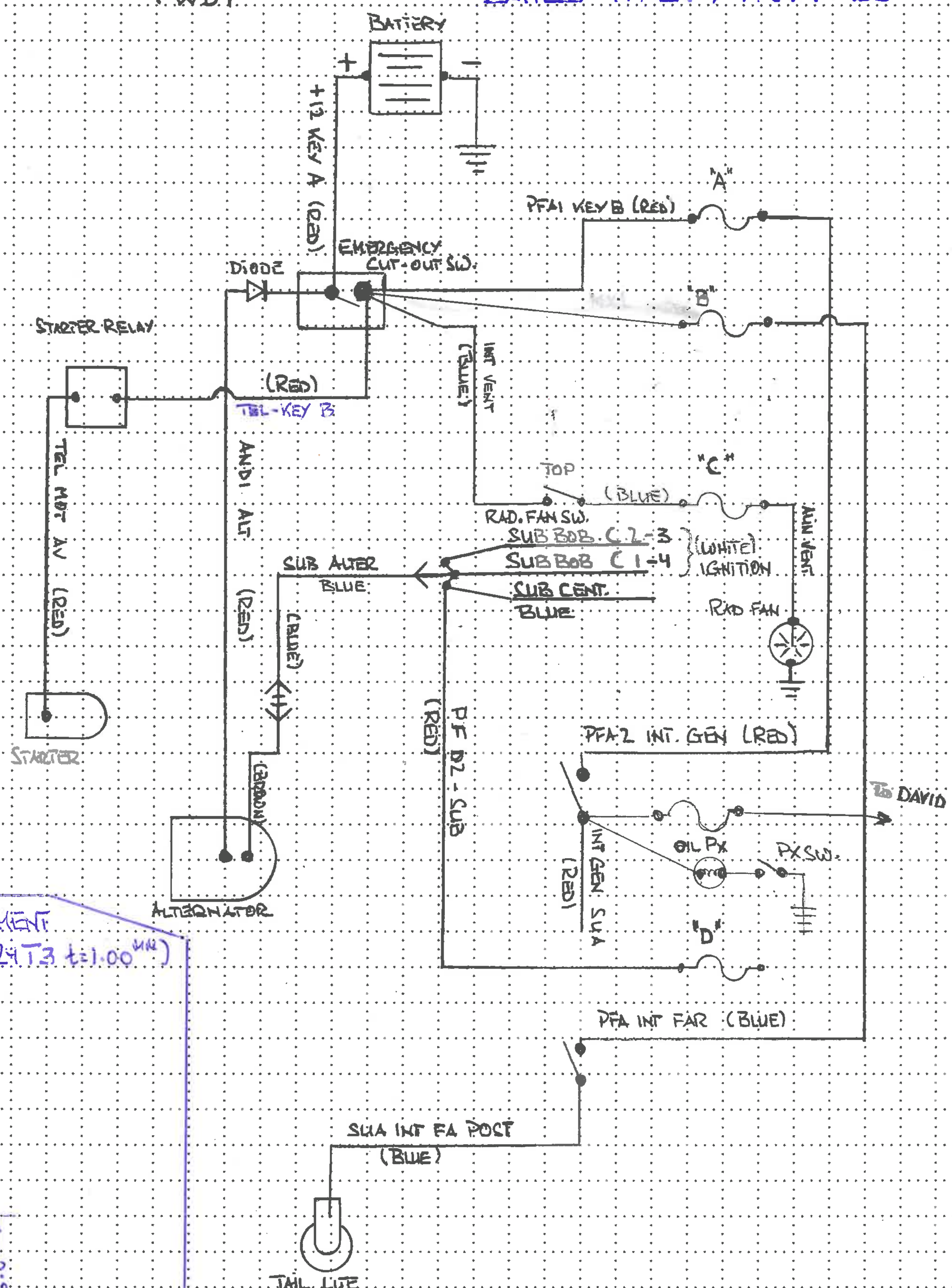


From the workbench of:
Date:

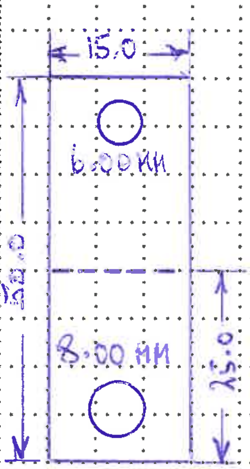
veritas® Made in Canada Innovation in tools®

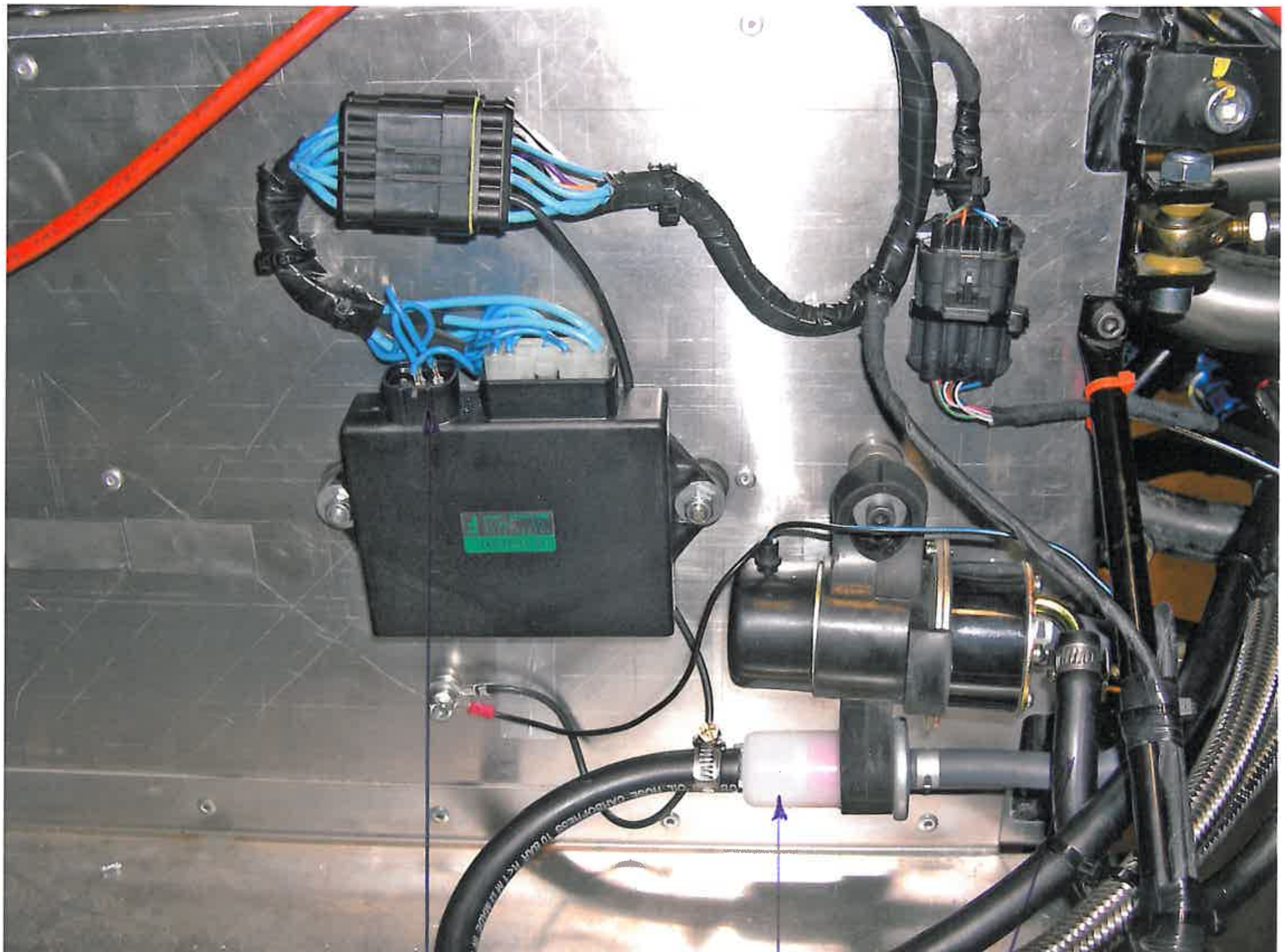
From the workbench of:
Date:

BATERY TYPE: YTX14-BS



DIODE ATTACHMENT BRACKET (2024T3 t=1.00 MM)



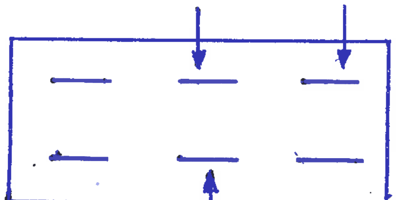


INLET - TANK TO PUMP

OUTLET PUMP TO CARB.

MODULE FEED CONNECTIONS.

REOSTATO REOSTATO (BOTH INTERCHANGEABLE)



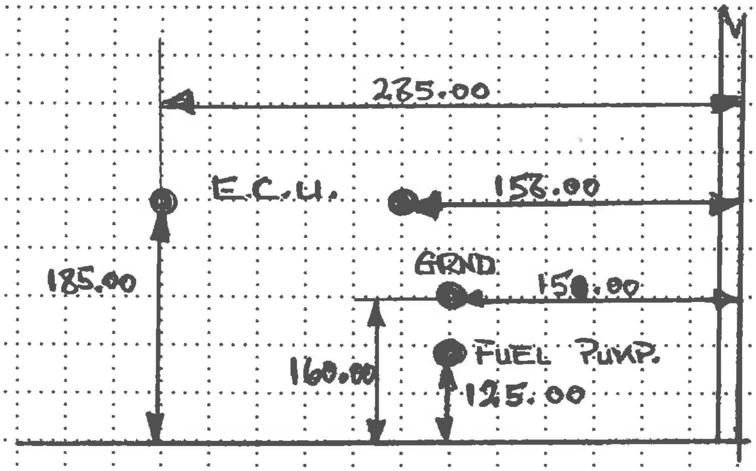
MASSA

INSTALLATION HOLE PATTERN →

From the workbench of:

Date:

ECU - FUEL PUMP - GRND. LEAD. ATTACHMENT
HOLE PATTERN



FOR RIVNUTS USE 9.00 m/m DRILL

IGNITION COIL CONNECTIONS FACING OUTBD.

WHITE FWD.

BLUE AFT (+)

NOTE: COIL FOR CYL. 2 & 3 INSTALL ON R.H. SIDE
(LONG PRIMARY LEAD)

BLUE AFT

WHITE FWD

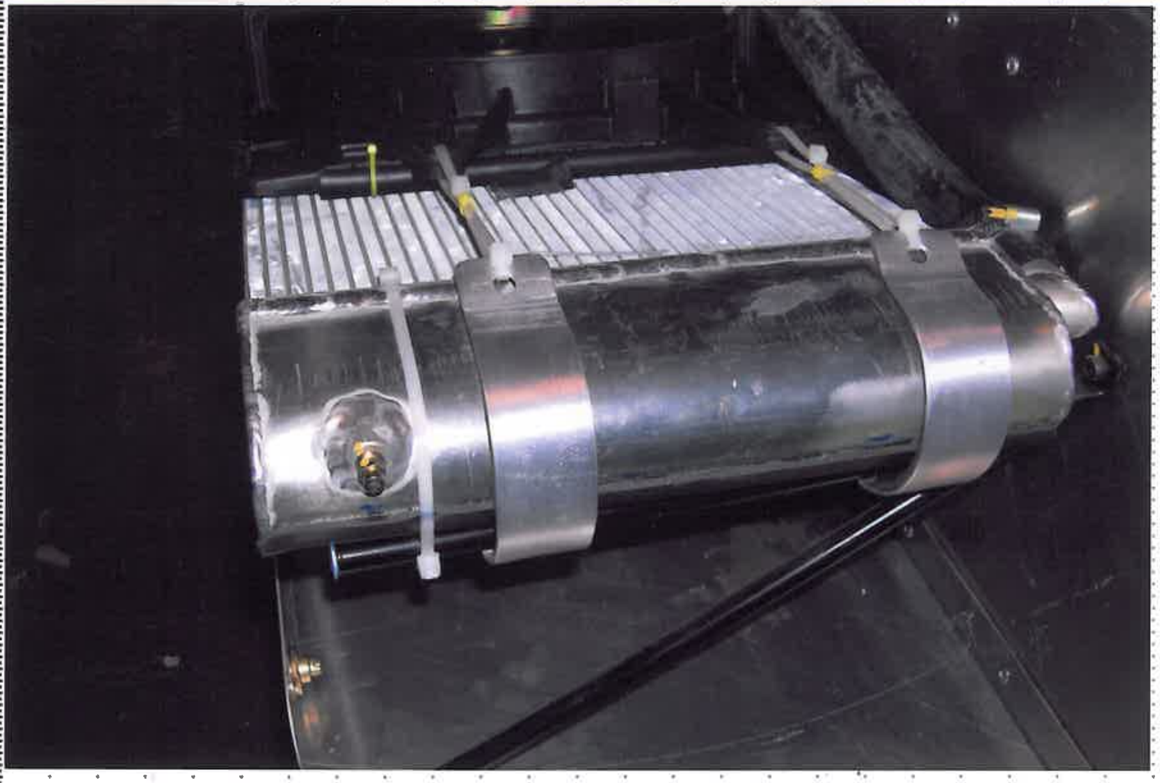
↑FWD
4 - 3 - 2 - 1
SPARKPLUG SOCKET 1800 MM

From the workbench of:
Date:

H2O "T" PROBE INSTALLATION

DISTANCE FROM WELD TO FIRE EXTINGUISHER EMERG.
RELEASE SWITCH HOLE CENTRE 60.00MM

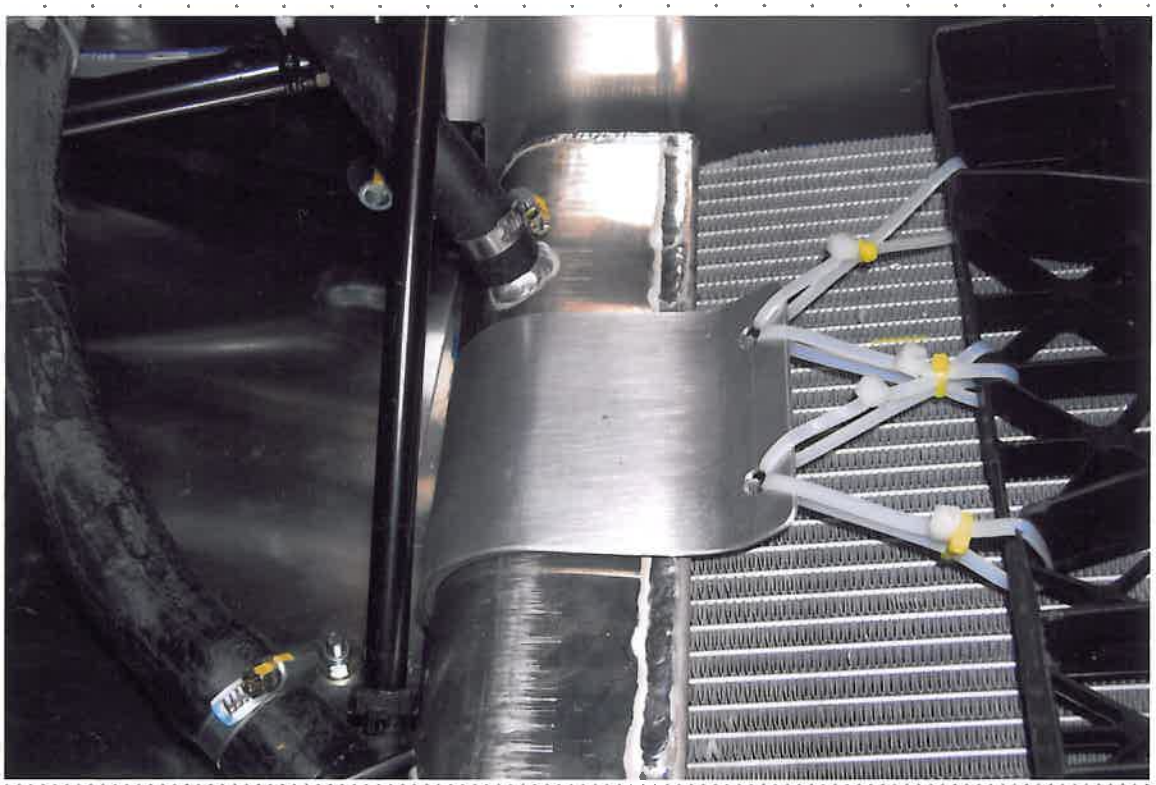
HOLE Ø 22.00MM

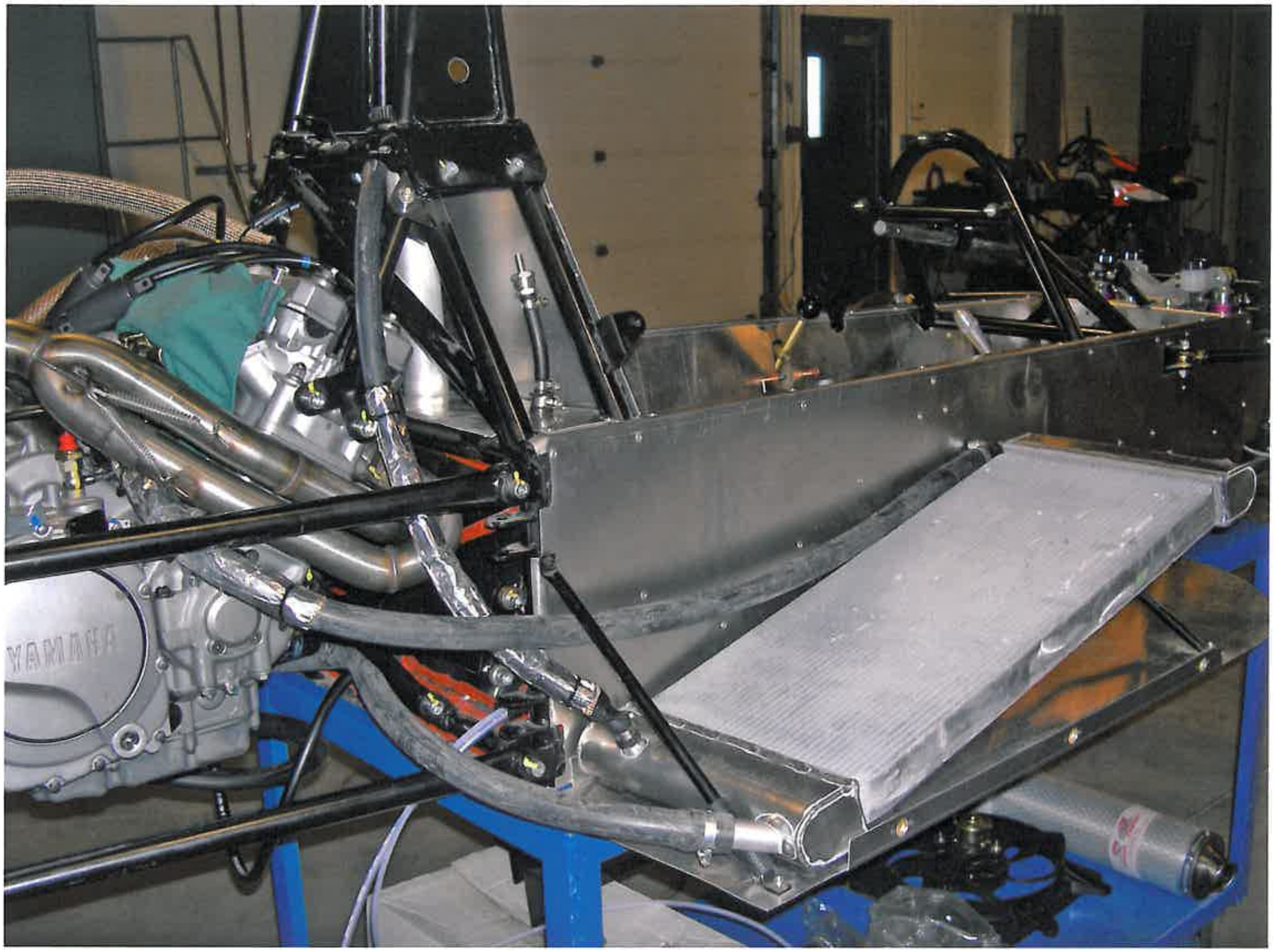


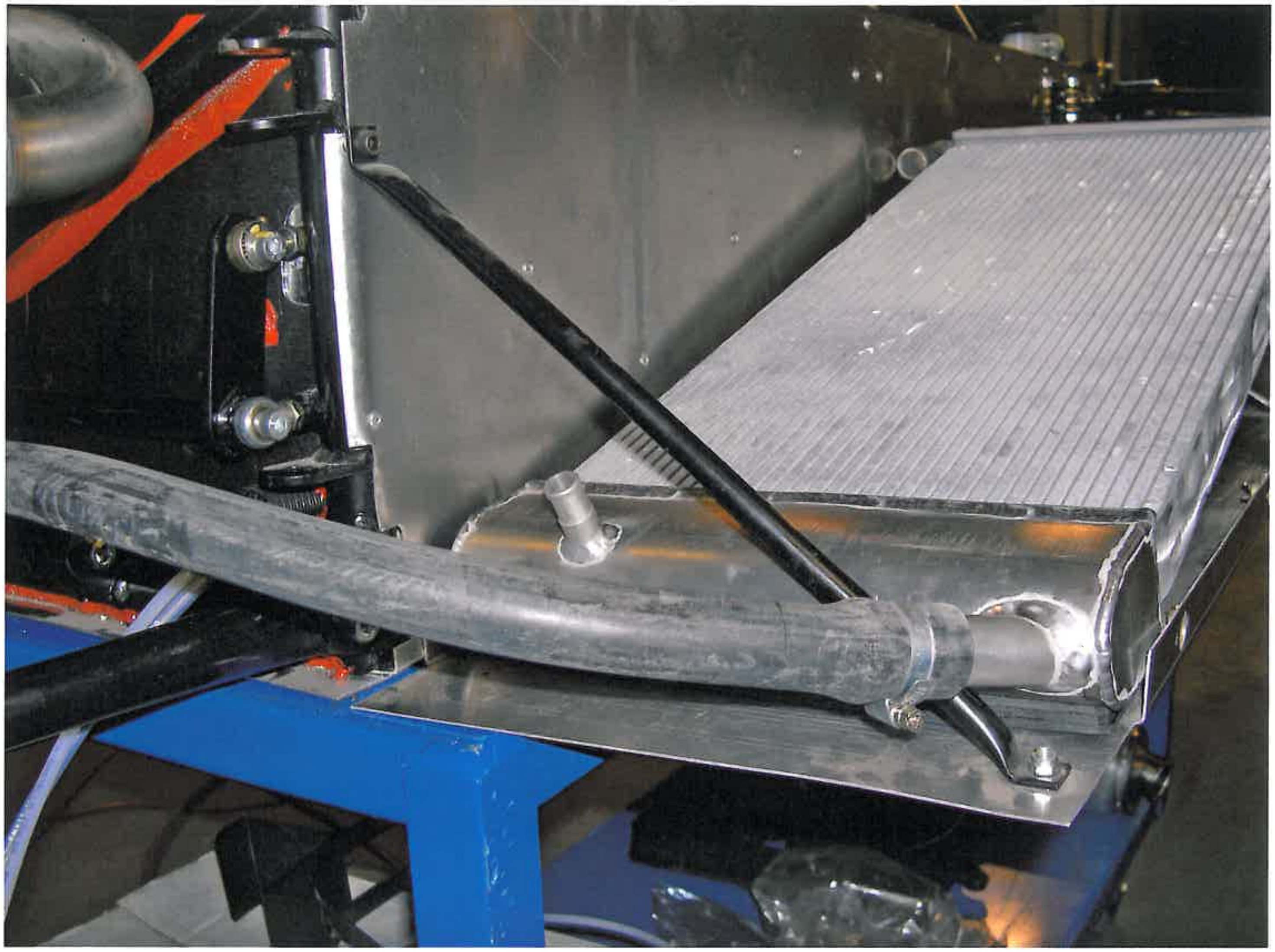
FWD

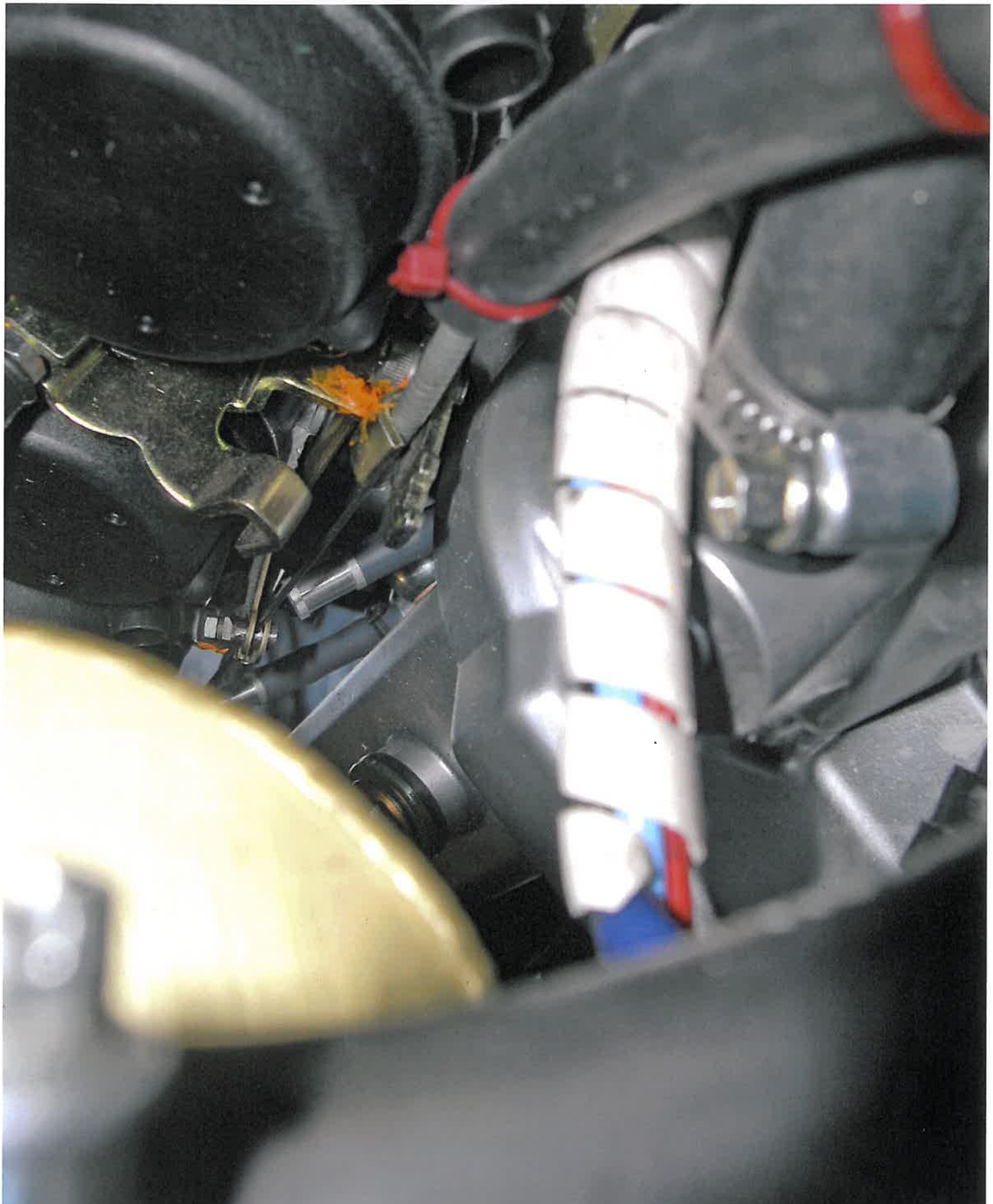
RADIATOR AND FAN INSTALLATION

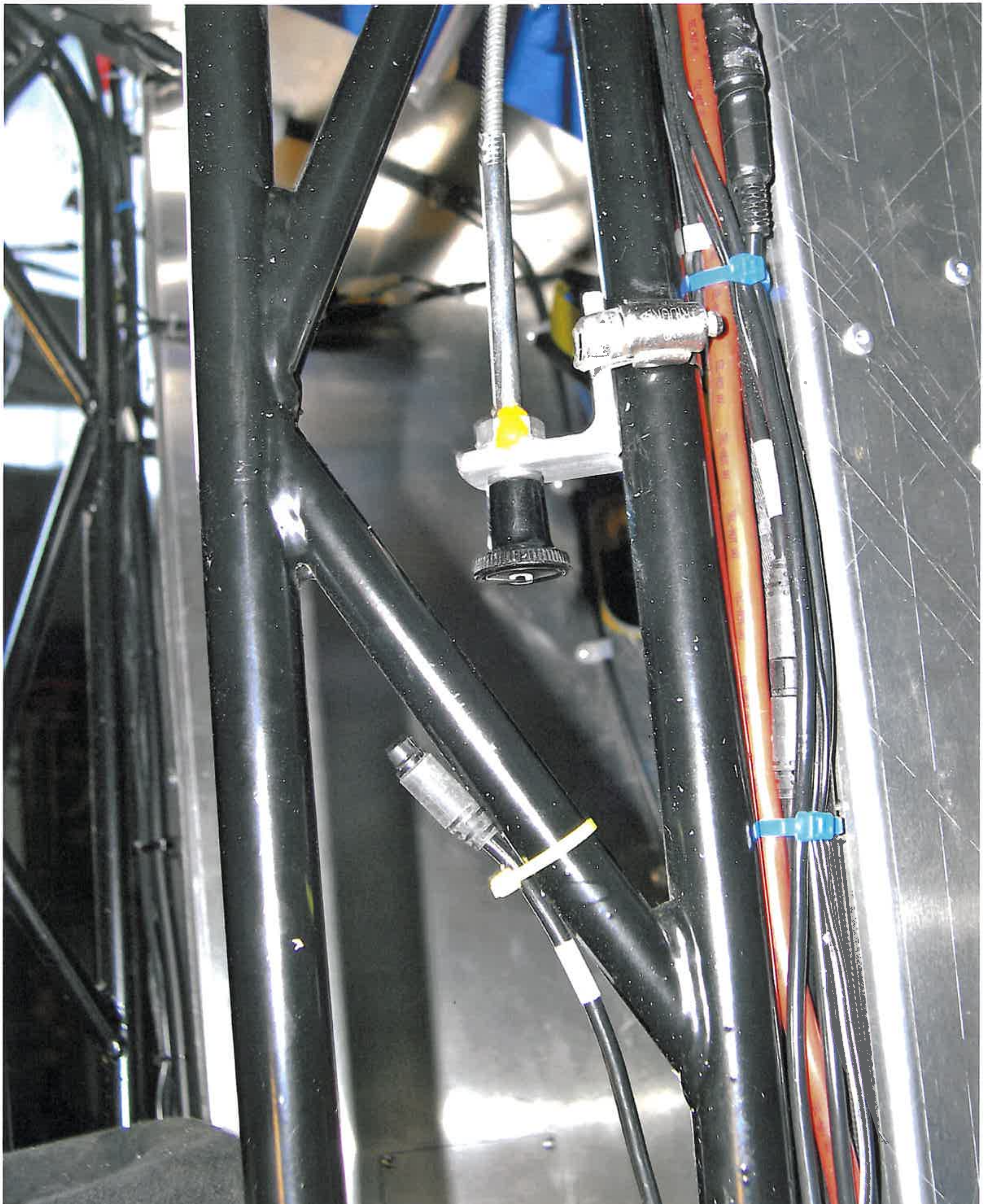
AFT.




YAMAHA

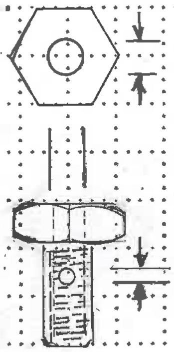






From the workbench of:
Date:

CHOKE CABLE RETENTION - CARBURETOR

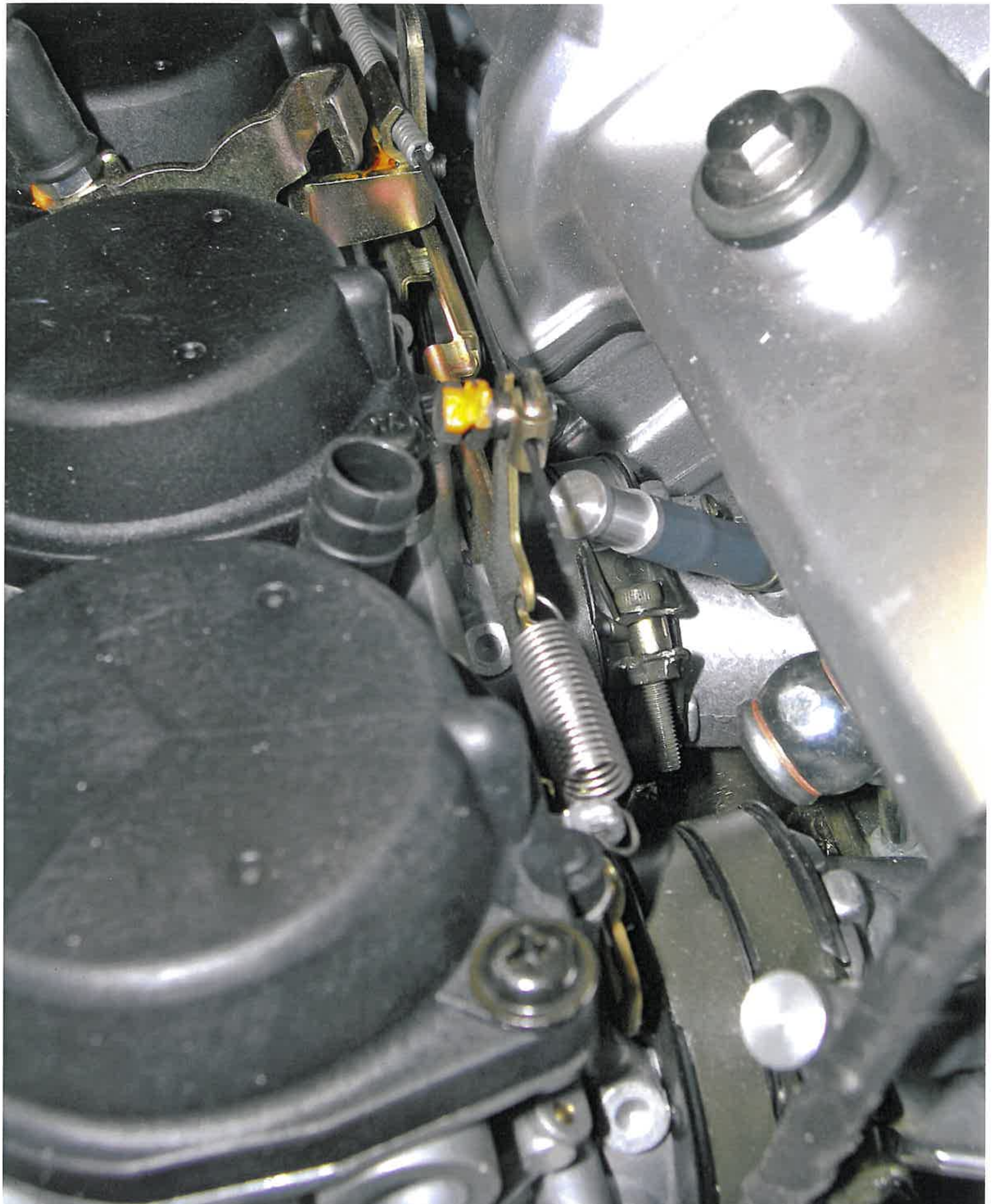


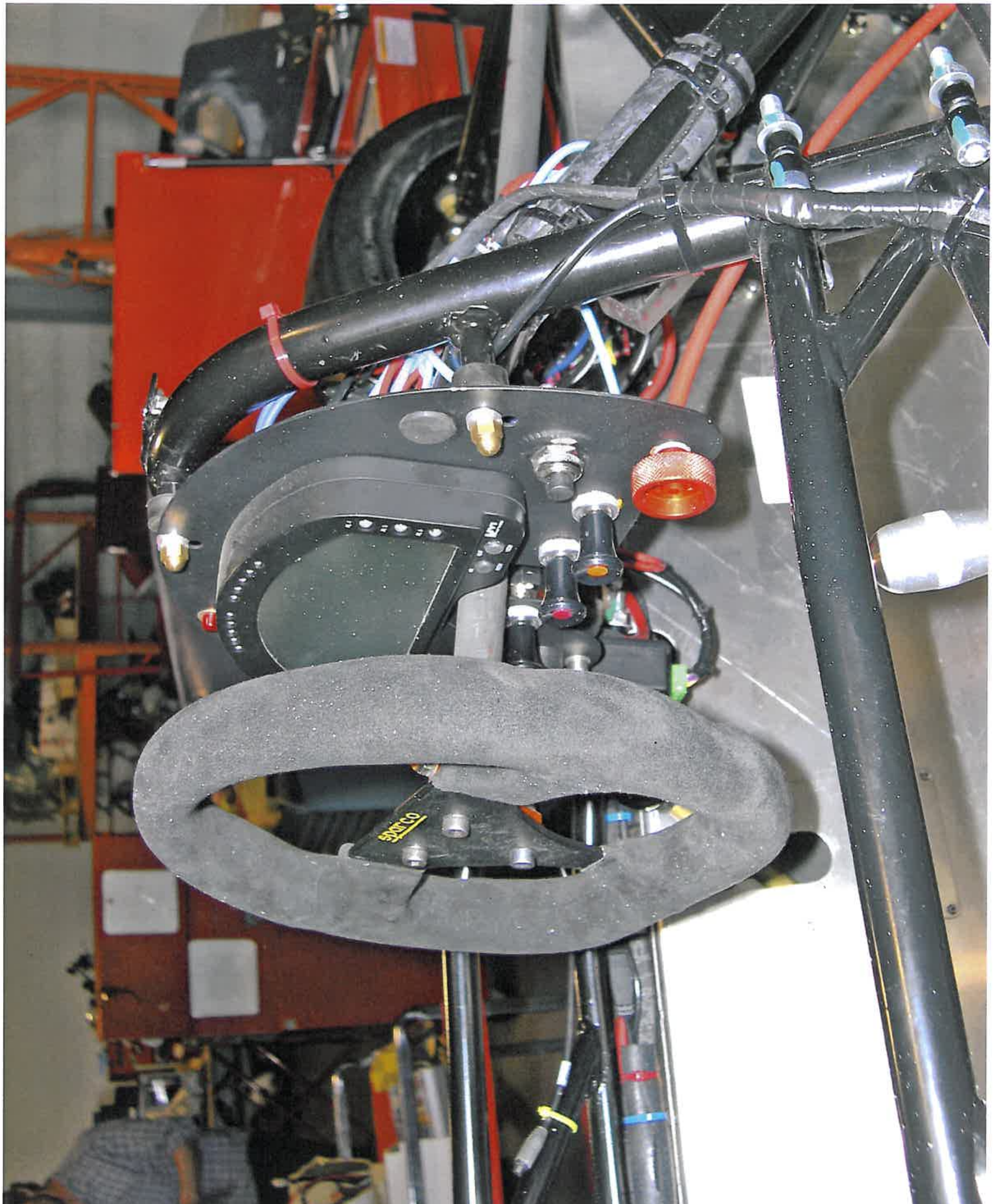
#38 DRILL FOR 4.00MM x 0.70MM THREAD.

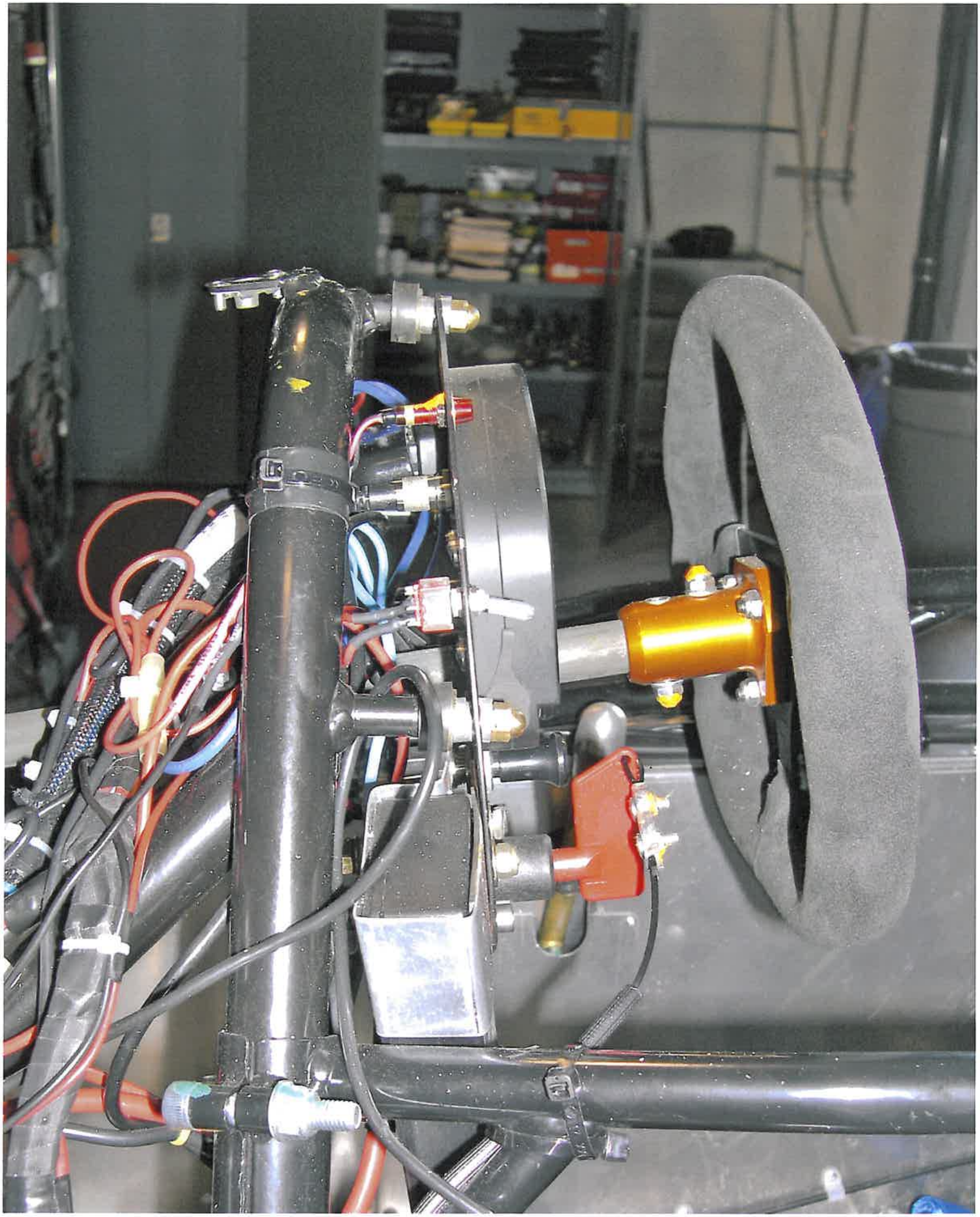
4 x .70MM SETSCREW OR ALLEN HEAD BOLT

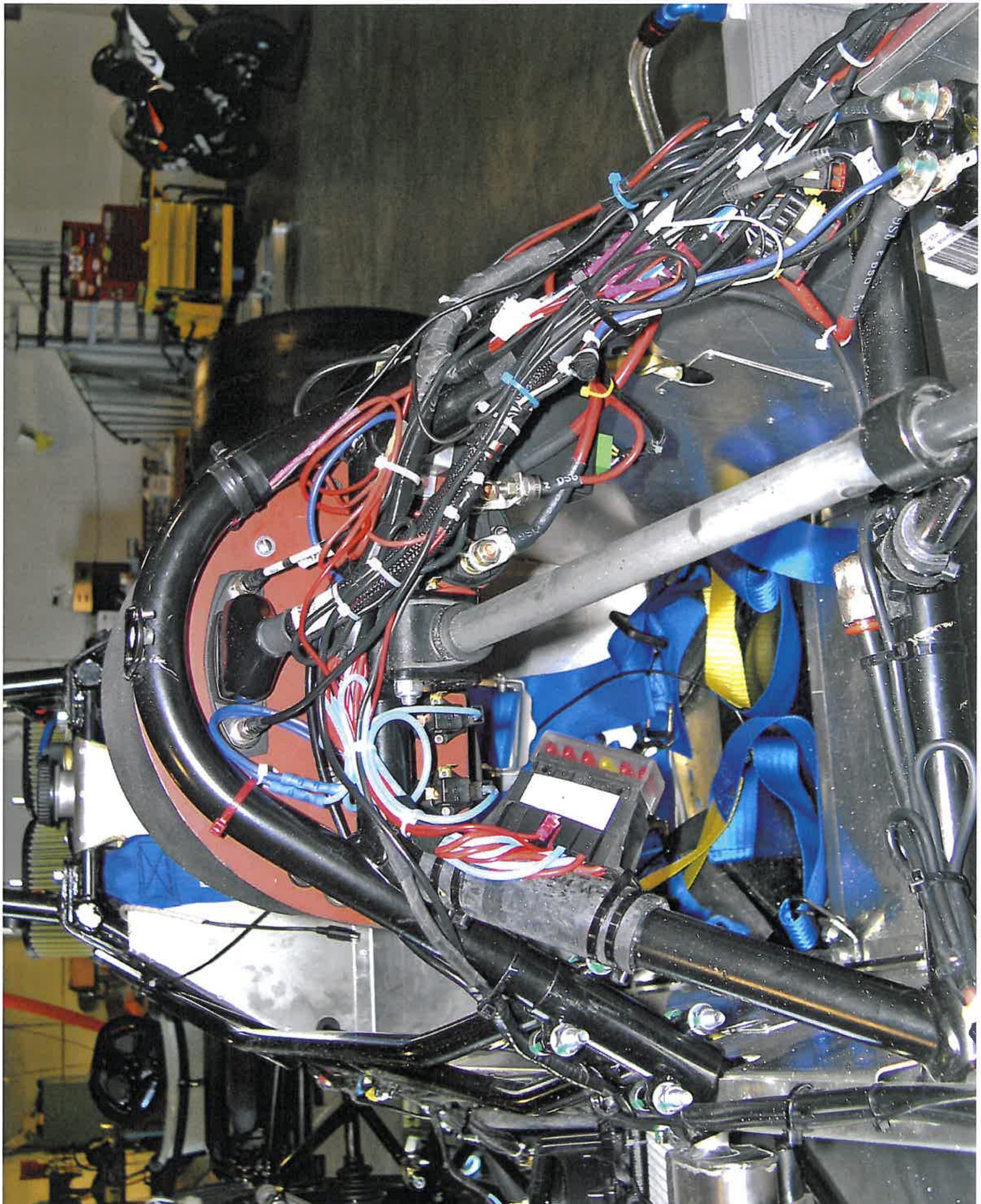
1/4 AN BOLT CUT TO LENGTH

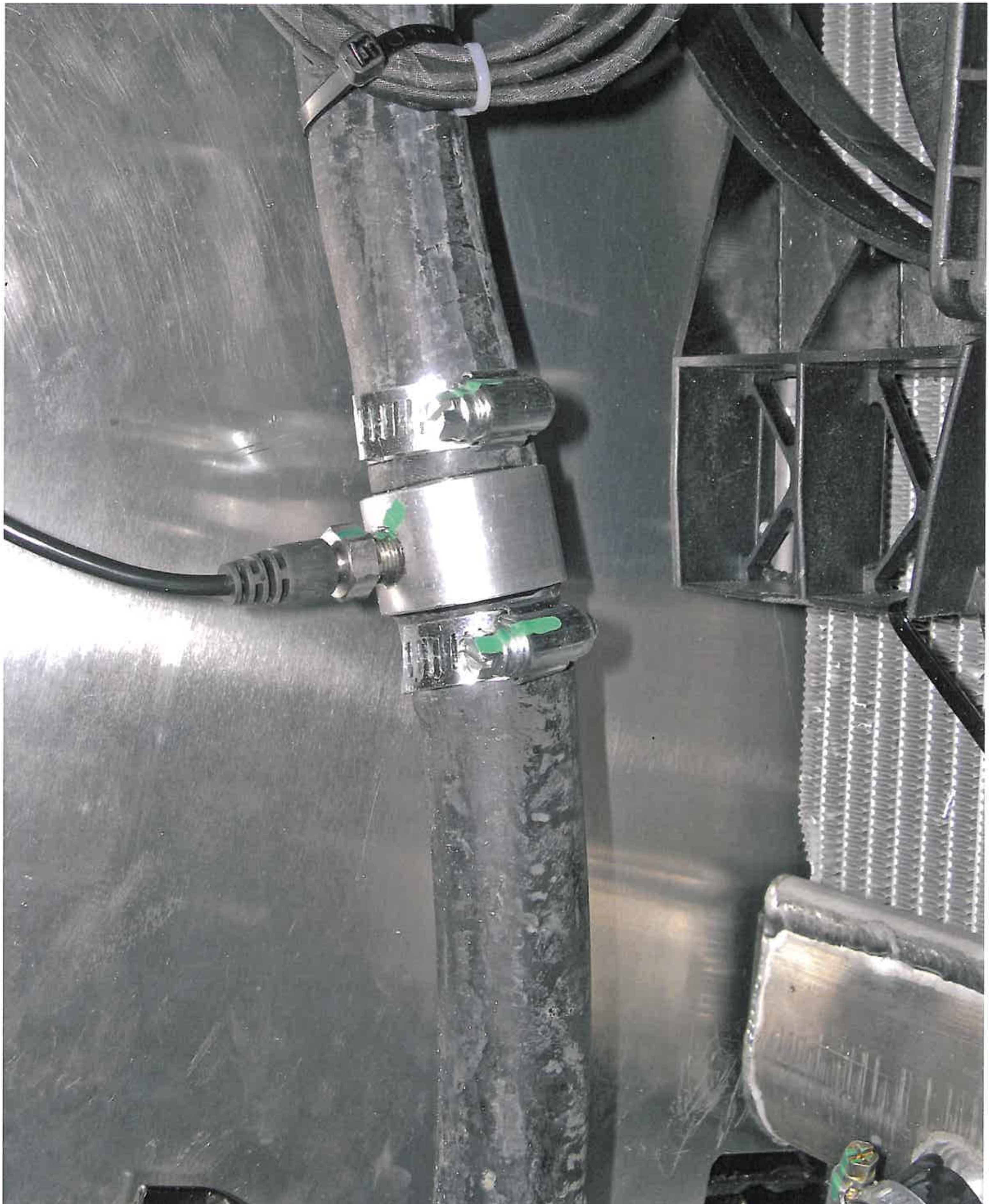
DRILL #50




sparco

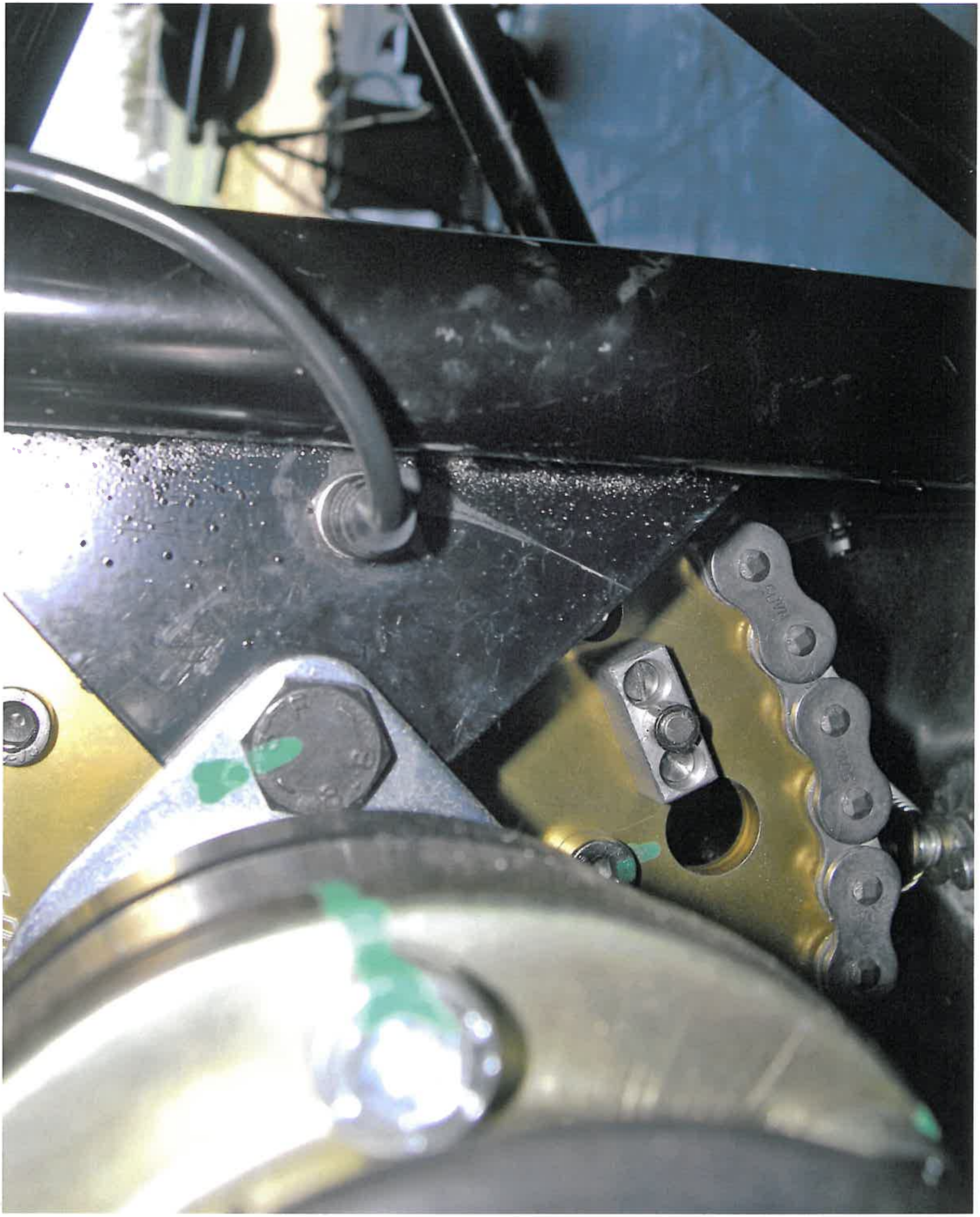


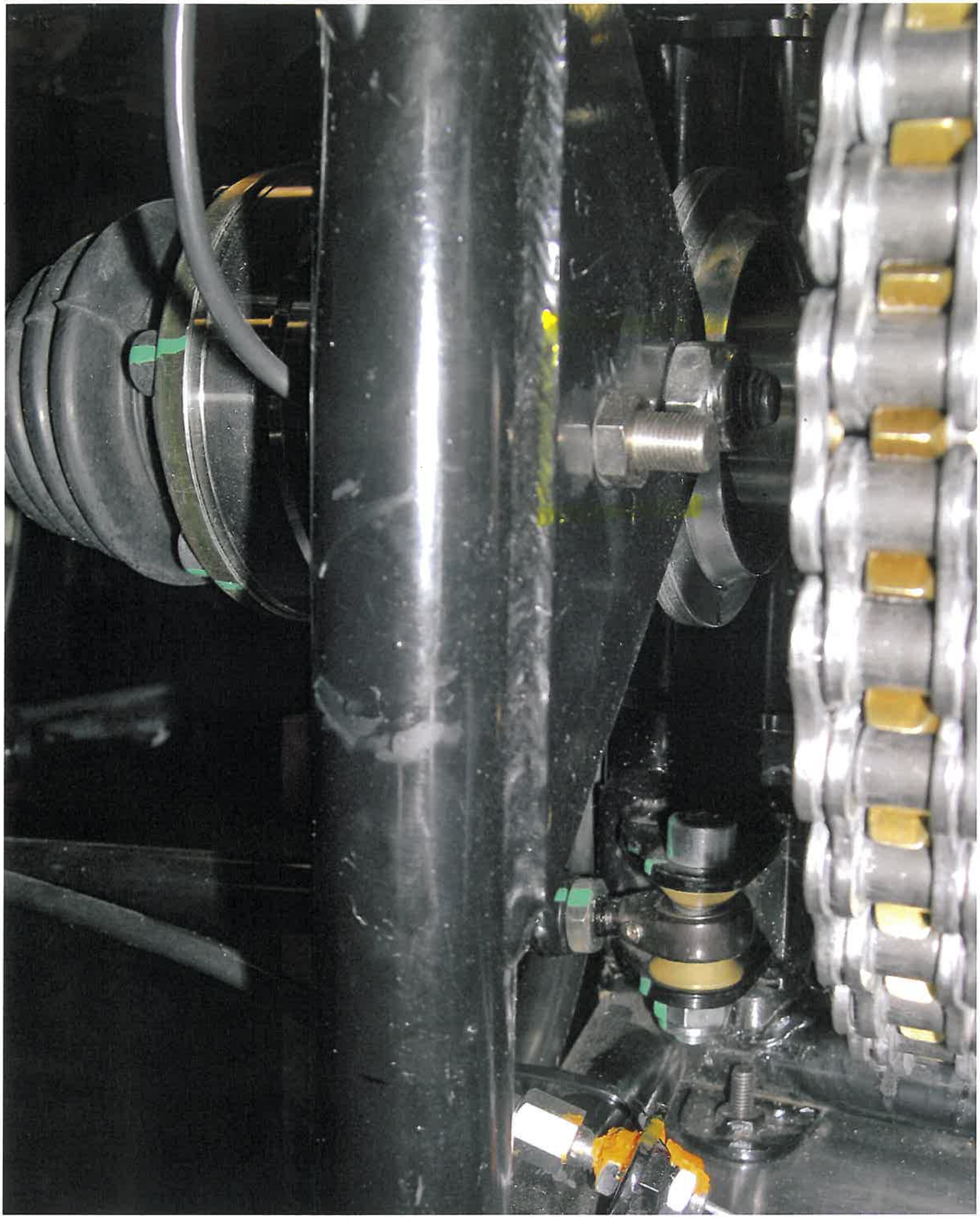


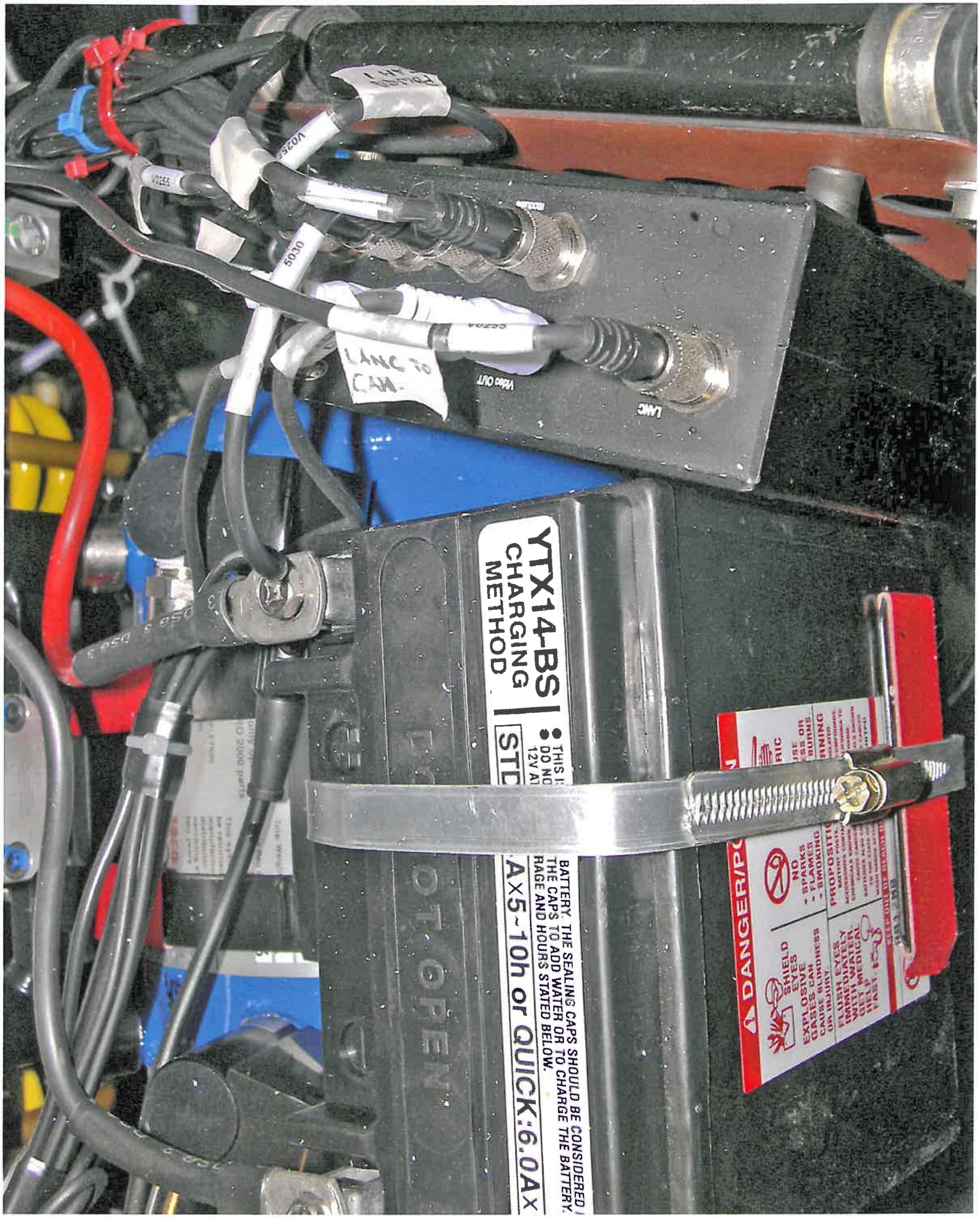


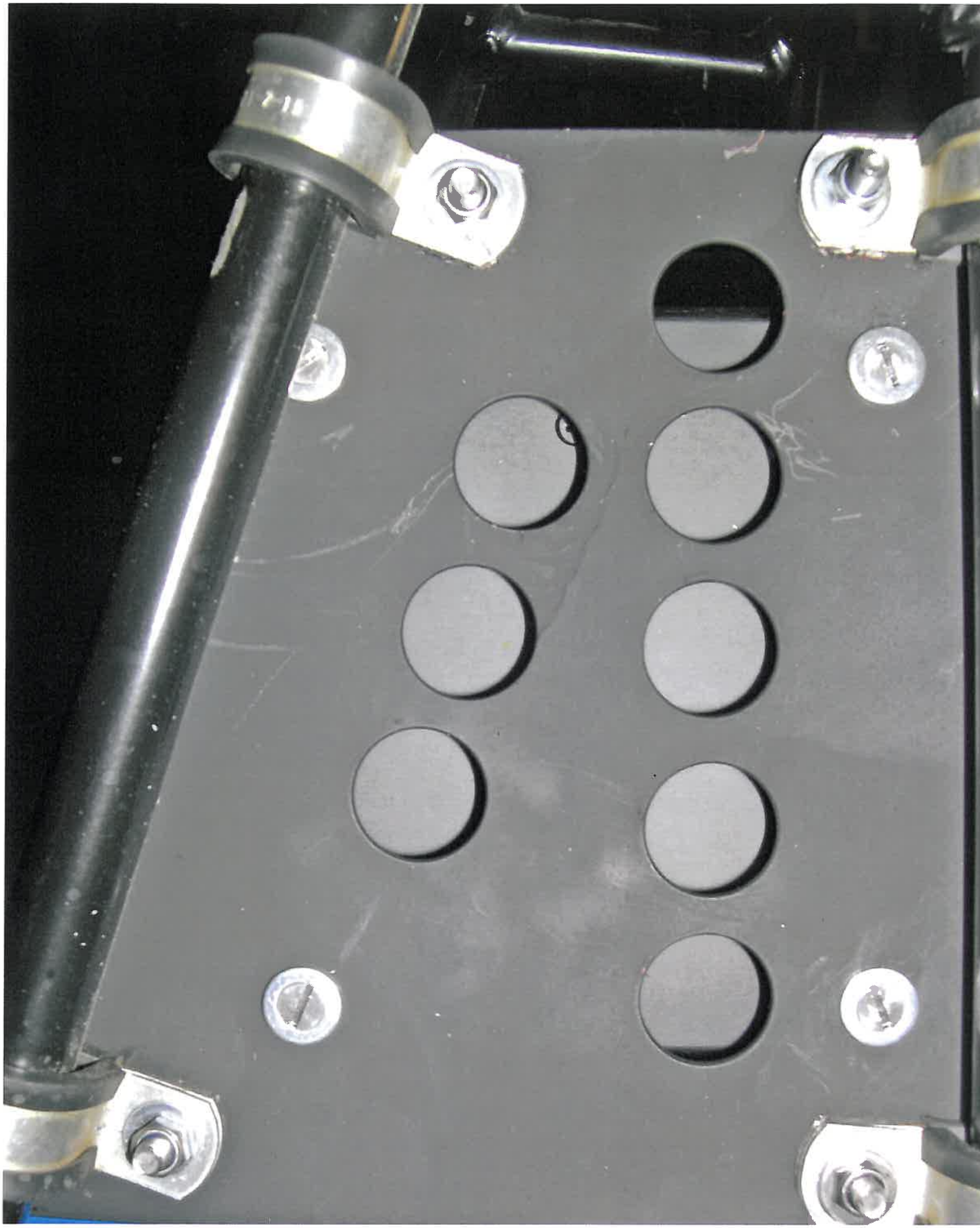

MADE IN JAPAN
5GH-13440-00
DENSO

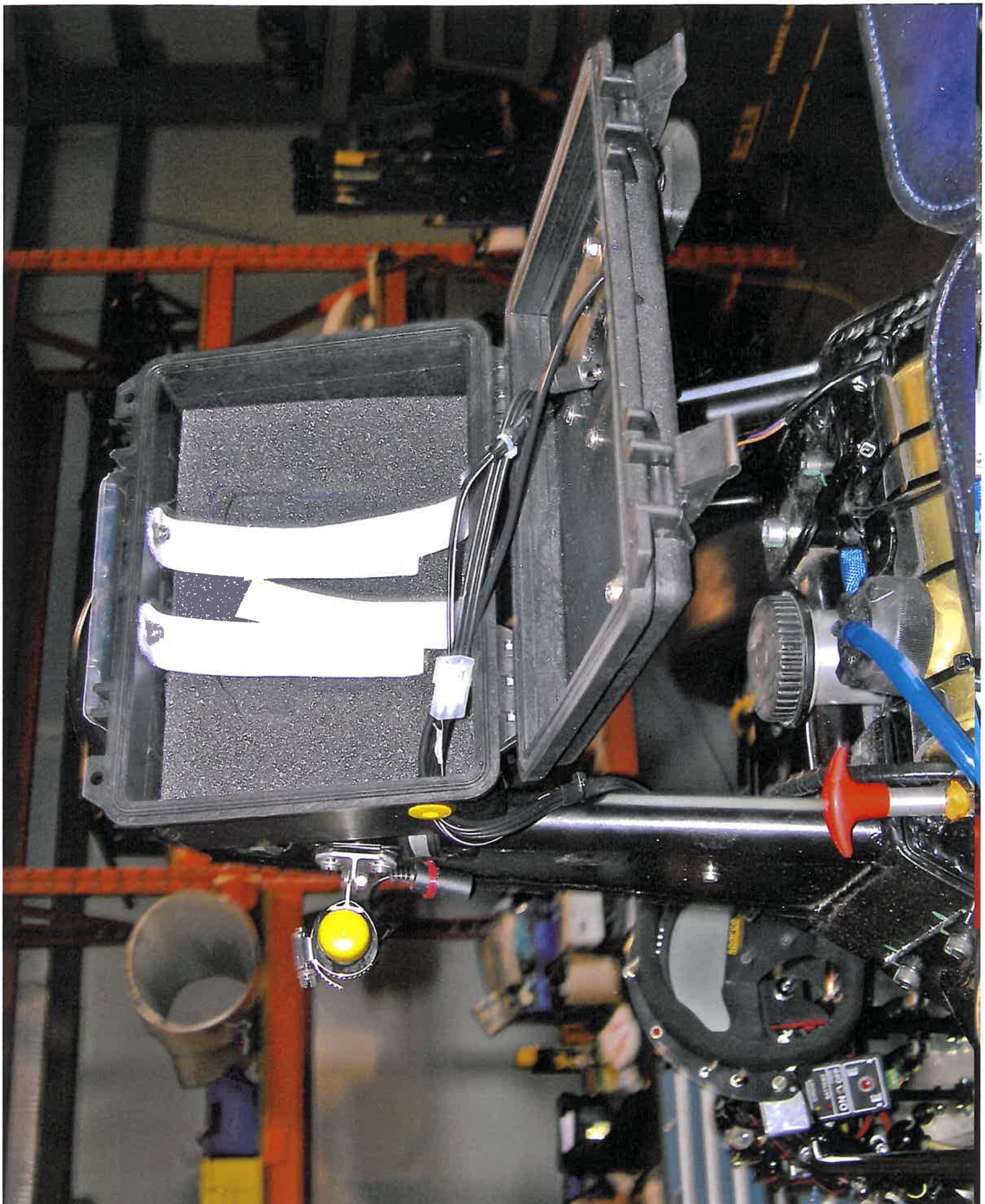

●DO NOT JACK UP
●NE PAS UTILISER COMME POINT DE LEVAGE
YAMAHA
5GH-13440-00

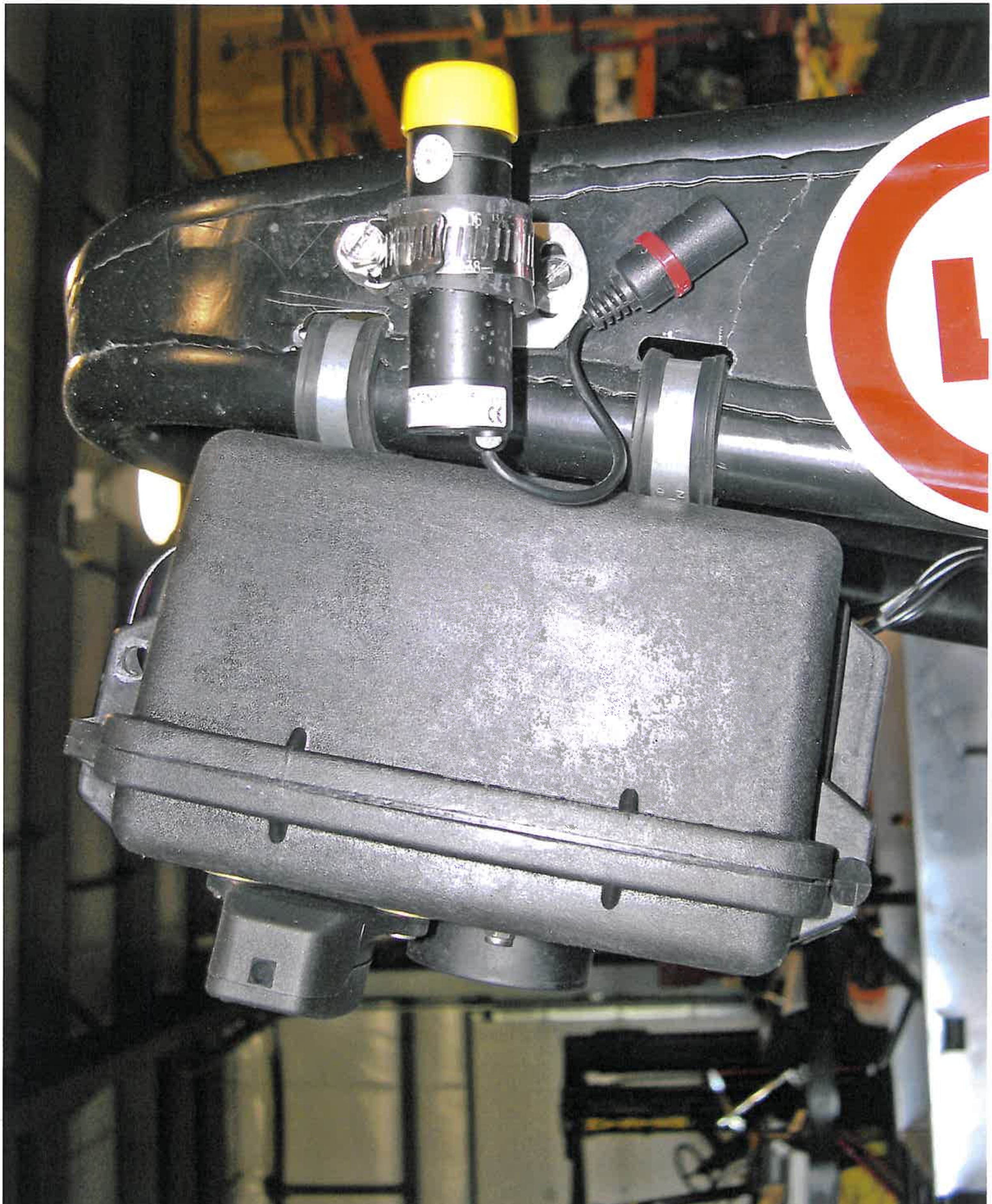


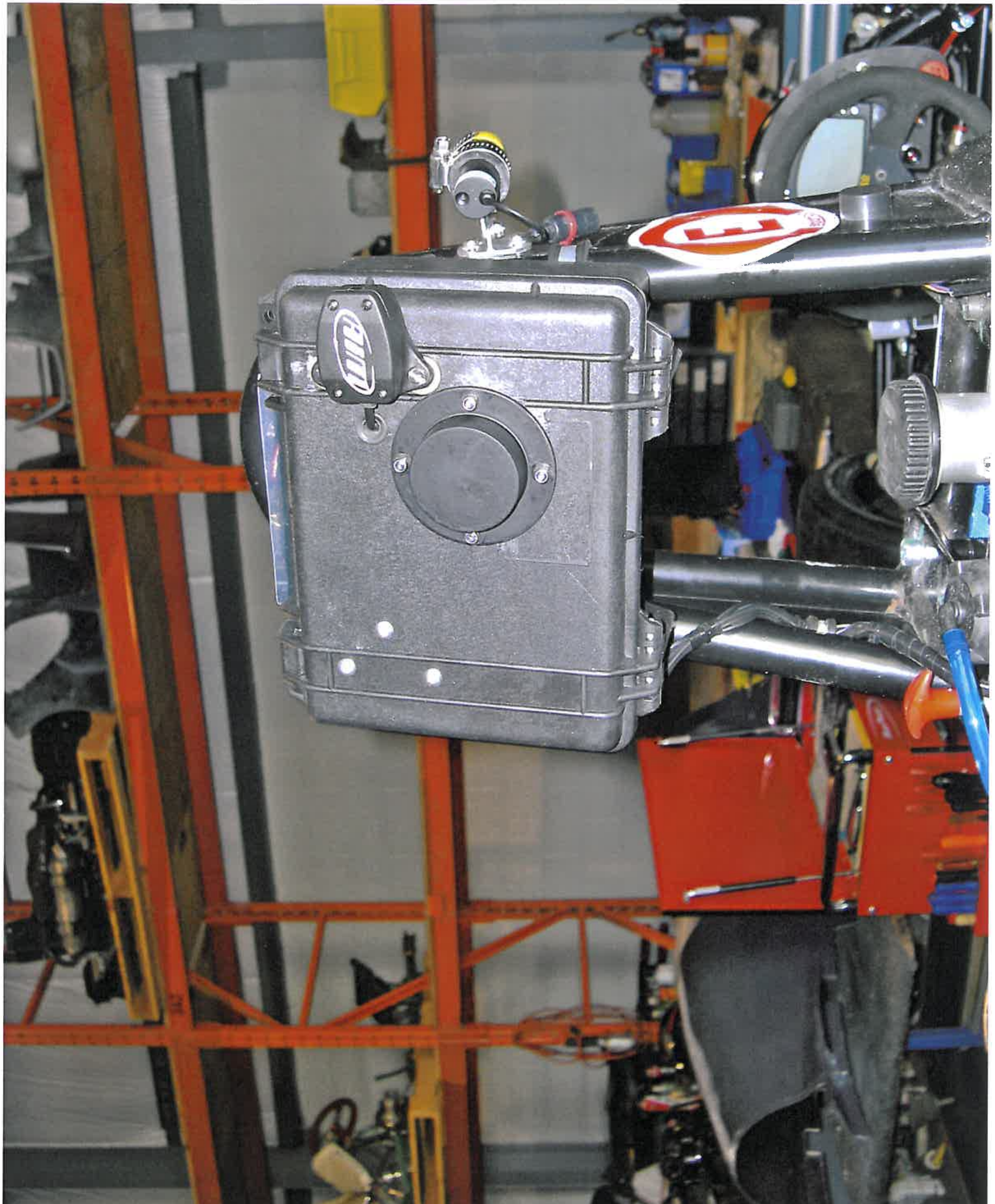


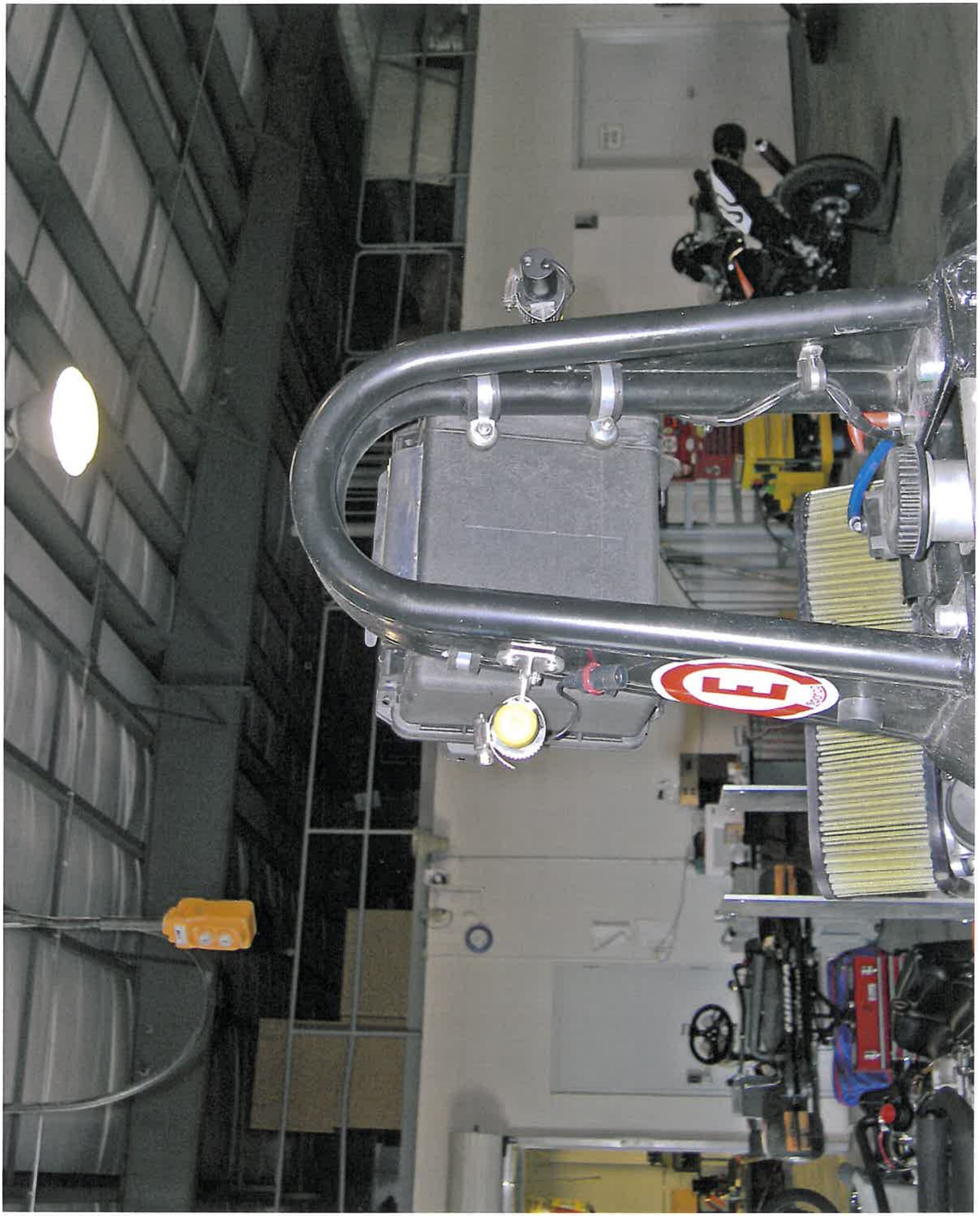

YTX14-BS
CHARGING
METHOD
BATTERY. THE SEALING CAPS SHOULD BE CONSIDERED
THE CAPS TO ADD WATER OR TO CHARGE THE BATTERY.
RAGE AND HOURS STATED BELOW.
A×5~10h or QUICK:6.0A×
LANC TO CAM.
LANC
Video OUT
5030
V0255
DANGER/PO











Cintura da competizione a bretelle con **5** o **6** punti di ancoraggio omologata secondo lo Standard FIA 8853-1998

*Suspender type racing seat-belt with **5** or **6** anchorage points type approved to standard FIA 8853-1998*

ISTRUZIONI PER L'USO DELLA CINTURA

1) Come indossare la cintura

Impugnare la fibbia, verificare che la leva di sgancio lingue sia in posizione di sicurezza, cioè chiusa (nel caso che non lo fosse le lingue non si aggancerebbero alla fibbia), e introdurre con l'altra mano una dopo l'altra tutte le lingue nelle apposite fenditure della fibbia fino a sentire gli scatti metallici che segnalano l'avvenuto aggancio delle lingue.
Nel caso che i cosciali siano di tipo "A" (vedi fig. 1) e quindi siano tenuti in posizione dalle lingue delle spalliere, curare di posizionare l'asola terminale dei cosciali in modo corretto (vedi fig. 1, montaggio corretto) e cioè tra la lingua della spalliera e la fibbia e non oltre la lingua, sul nastro della spalliera (vedi fig. 2, montaggio errato).
Accertarsi che i nastri non siano attorcigliati.

2) Come regolare la cintura

I dispositivi per regolare la lunghezza dei vari nastri che costituiscono la cintura sono detti regolatori e si usano come segue:

- per allungare un nastro: afferrare il regolatore corrispondente e tirare in modo da farvi scorrere il nastro;
- per accorciare un nastro: impugnare l'estremità libera del nastro uscente dal regolatore e tirare. Seguire la sequenza di regolazione sotto indicata.

a) *Regolazione dei rami addominali*
Agire sui regolatori oppure sui dispositivi di regolazione (facenti parte dell'ancoraggio sulla scocca) in modo che, a regolazione avvenuta, la fibbia sia centrata rispetto alle anche del pilota e che il nastro sia il più teso possibile senza tuttavia essere scomodo.

b) *Regolazione dei cosciali*
Agire sui regolatori o sui dispositivi di regolazione (facenti parte dell'ancoraggio sulla scocca) in modo che a cosciale agganciato il nastro sia teso senza dare impaccio al pilota.

c) *Regolazione delle spalliere*
Agire sui regolatori delle spalliere in modo da stringere senza rialzare i rami addominali. È importante, per la sicurezza del pilota, che i rami addominali siano nella giusta posizione che è la più bassa possibile sulle anche, come indicato nella fig. 3.

INSTRUCTIONS FOR USE

1) To fasten the seat belt

Take the buckle with one hand and make sure that the tongue release is in the safety position, i.e. closed (if it is not, the tongue will not hook into the buckle). With the other hand fit all the tongue one after the other into the respective slots of the buckles. Push them until you hear the clicks indicating that the tongues have snapped into place.
For "A" type leg pieces (see fig.1) which are kept in place by the shoulder piece tongues, position the end loops of the leg pieces correctly (see fig. 1, correct assembly), that is between the shoulder piece tongue and the buckle, not beyond the tongue, on the shoulder piece ribbon (see fig. 2, incorrect assembly).
Make sure the webbing is not twisted.

2) Adjusting the harness

The devices used to adjust the length of the different webbings are called adjusters and are used as follows:

- *to lengthen a ribbon, take the corresponding adjuster and pull so that the ribbon slides inside it;*
- *to shorten a ribbon, take the webbing out of the adjuster and pull. Follow the adjustment sequence described below.*

a) Adjusting the abdominal straps
Use the adjusters or the adjustment devices (in the anchorage bracket) to make sure that the buckle is centred relative to the driver's hips and that the ribbon is as tight as possible without being uncomfortable.

b) Adjusting the leg pieces
Use the adjusters or the adjustment devices (in the anchorage bracket) to make sure that the ribbon is tight but will not hamper the driver when the leg pieces are fastened.

c) Adjusting the shoulder pieces
By means of the adjusters tighten the shoulder straps without raising the abdominal straps. For the driver's safety, it is important that the abdominal straps be in the right position, i.e. as low as possible on the driver's hips, as shown in fig. 3.

Fig. 1 Esatto posizionamento dei cosciali di tipo A
Correct positioning of type A leg pieces

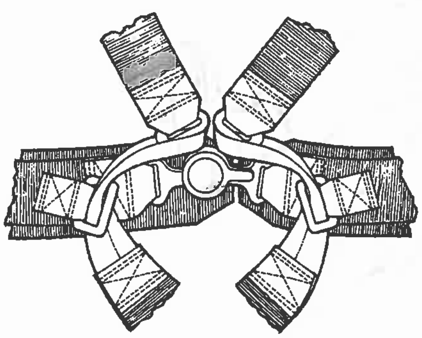
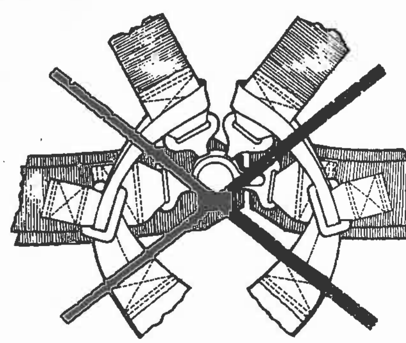


Fig. 2 Errato posizionamento dei cosciali di tipo A
Incorrect positioning of type A leg pieces



COD. 301076- 3b cascine vica

3) Come aprire la fibbia

Far ruotare la leva di sgancio finchè si senta uno scatto metallico e la leva giunga a fine corsa in posizione di apertura. Le lingue vengono espulse contemporaneamente, liberando così il pilota dalla cintura. La leva di sgancio resterà in posizione di apertura finchè il pilota non la farà ruotare in senso contrario.

4) Pulizia

Per pulire il tessuto della cintura basterà passarvi sopra, di tanto in tanto, una spugna imbevuta di acqua calda saponata. Si eviti di candeggiare o tingere la cintura in quanto ciò potrebbe pregiudicare le caratteristiche intrinseche del tessuto.

5) Note importanti

- Evitare che il tessuto sfreghi contro i punti vivi e taglienti del sedile o della scocca.
- Controllare periodicamente l'efficienza della cintura o dei suoi componenti.
- Le cinture che abbiano subito danni (tagli, sfilacciature) oppure siano state usate su vetture coinvolte in incidenti debbono essere immediatamente sostituite e nel caso di incidenti si consiglia pure di fare controllare che i punti di ancoraggio sulla vettura non abbiano riportato danni.
- Non introdurre varianti alla configurazione della cintura (es. aggiungere o eliminare un ramo della cintura).

3) Opening the buckle

Rotate the release lever until you hear a click and the lever reaches the fully open position. The tongues are ejected simultaneously and the driver is not buckled anymore. The release lever stays in the open position until it is rotated in the opposite direction by the driver.

4) Cleaning

To clean the harness, wipe the webbing with a sponge soaked in hot soapy water. Do not bleach or dye the seat-belt as this might reduce the fabric's intrinsic properties.

5) Important warnings

- *Make sure that the fabric does not rub against sharp corners or cutting edges of the seat or body work.*
- *Check at regular intervals the efficiency of the belt and its components.*
- *Seat-belts that have been damaged (cuts, fraying) or used in cars involved in an accident must be immediately replaced and, in the event of an accident, it is also recommended to make sure that the anchorage points in the cars are undamaged.*
- *Do not modify in any way the configuration of the seat-belt (i.e., add or remove a strap, etc.).*

Vettura monoposto
Single-seater car

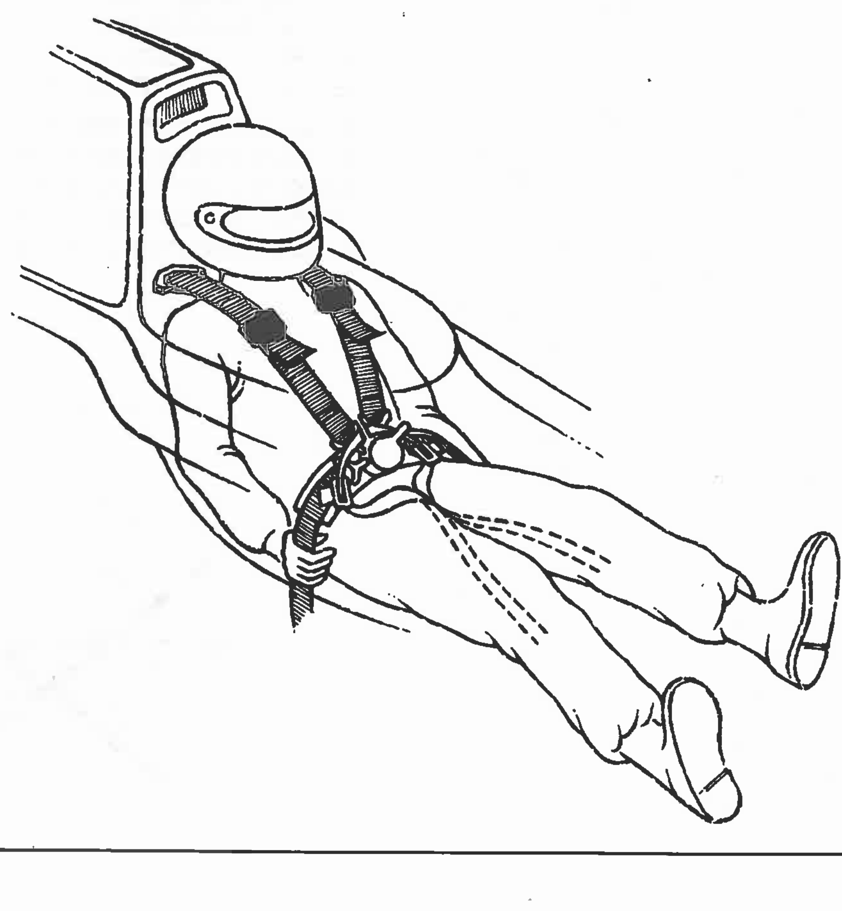


Fig. 3

ISTRUZIONI PER IL MONTAGGIO DELLA CINTURA

SEAT-BELT ASSEMBLY INSTRUCTIONS

USARE GLI ANCORAGGI PREVISTI DAL COSTRUTTORE DEL VEICOLO.

1) Fissaggio dei rami cintura ai relativi ancoraggi del veicolo

A seconda del modello di cintura ci sono vari tipi possibili di sistemi di fissaggio rappresentati ad esempio nelle fig. 4-5-6-7. Nel montaggio di tipo 5 occorre verificare che a fissaggio avvenuto la staffetta "A" possa ruotare agevolmente attorno alla vite in modo da autoposizionarsi correttamente.
In ogni caso i sistemi di fissaggio dei vari modelli di cinture sono conformi allo standard FIA 8853-1998.

2) Nota

Per il montaggio della cintura sulla vettura utilizzare solo i punti di ancoraggio previsti dalla casa costruttrice del veicolo **(consultare il libretto di uso e manutenzione)**. La società Belt & Buckle declina ogni responsabilità nel caso di un montaggio non conforme.

USE THE BRACKETS PROVIDED BY THE CAR MANUFACTURER.

1) Fastening the seat-belt straps to the relative fittings in the car

Depending on seat-belt model, there may be different fastening systems as shown for instance in figs. 4-5-6-7. When assembling type 5 make sure that the seat-belt straps fastened with bracket "A" can rotate freely around the screw into the correct position.
All fastening systems of the different models are conform to FIA 8853-1998 Std

2) Warning

*To assemble the seat-belt onto the car, use only the anchorage points specified by the car manufacturer **(see the use and the maintenance booklet)**. Belt & Buckle declines any liability in the event of erroneous assembly.*

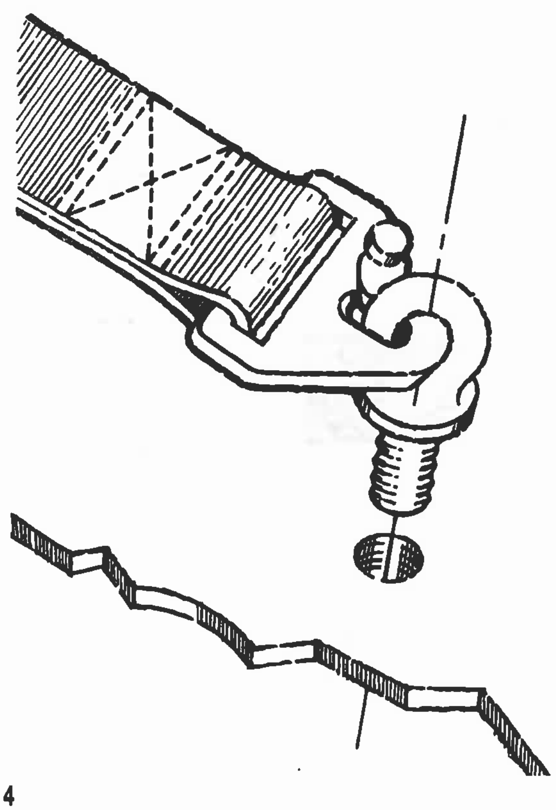


Fig. 4

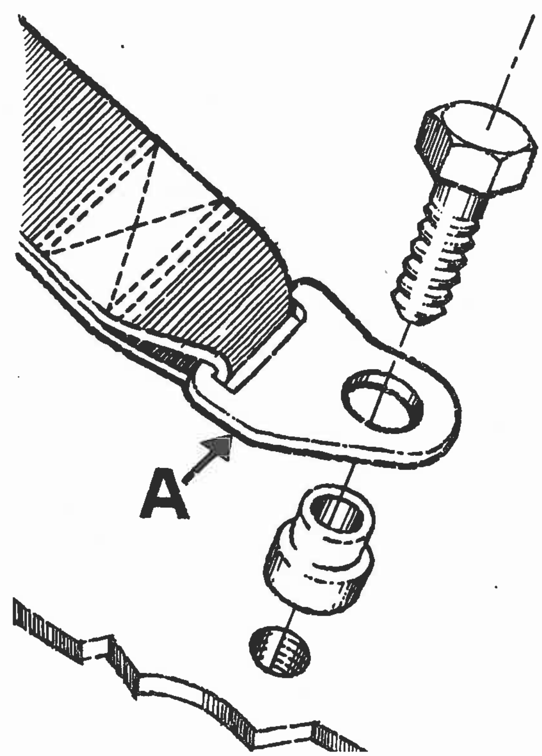


Fig. 5

Fig. 6

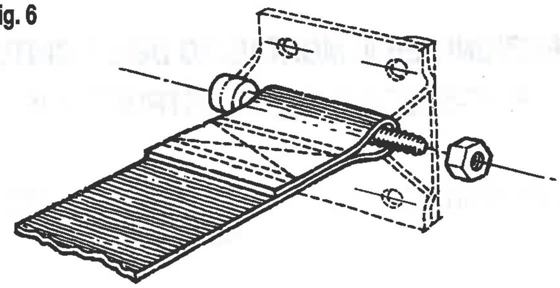
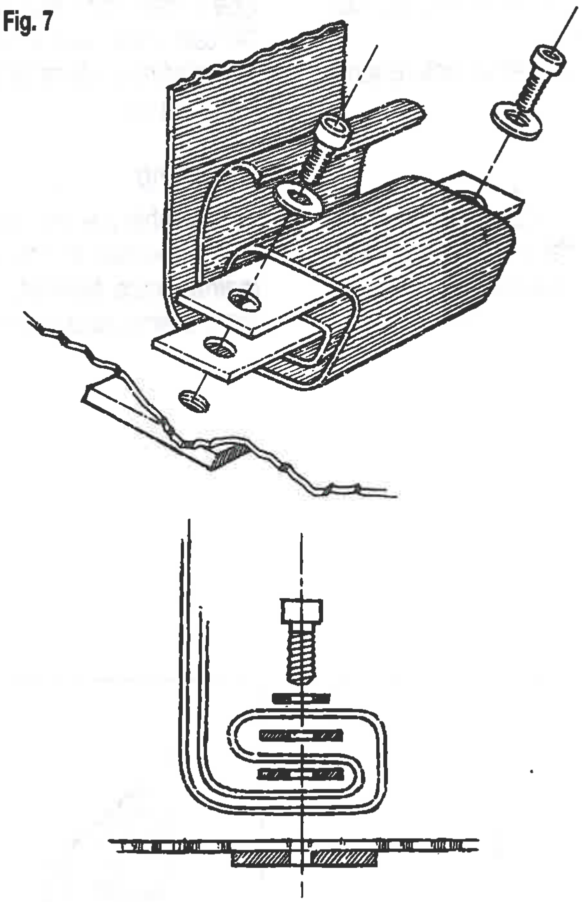


Fig. 7



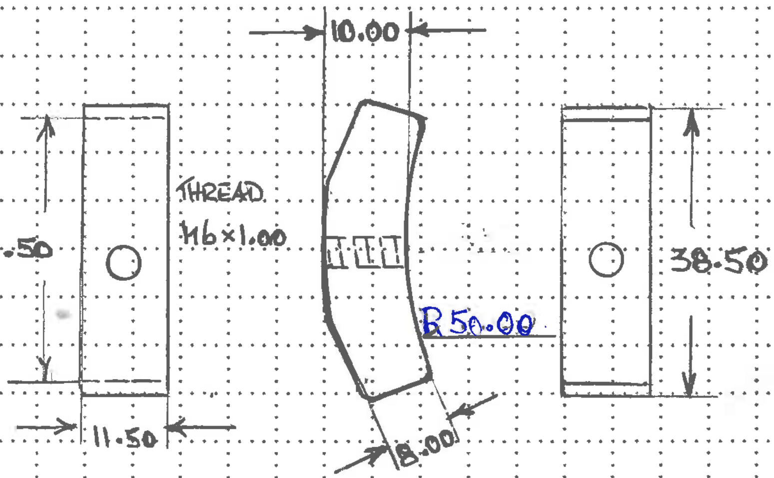
I dati di questo foglio istruzioni sono forniti a titolo indicativo.
La Belt & Buckle potrà apportare in qualunque momento modifiche ai modelli descritti in questo foglio istruzioni per ragioni di natura tecnica o commerciale.

*The data contained in this instruction sheet are purely indicative.
Betl & Buckle reserves the right to make any changes at any time to the models described herein for technical or commercial reasons.*

Belt & Buckle S.r.l.
Via G. La Pira, 11
10028 Trofarello - Torino (Italy)
Tel. +39-011-6804033
+39-011-6804204
Fax +39-011-6804020

From the workbench of:
Date:

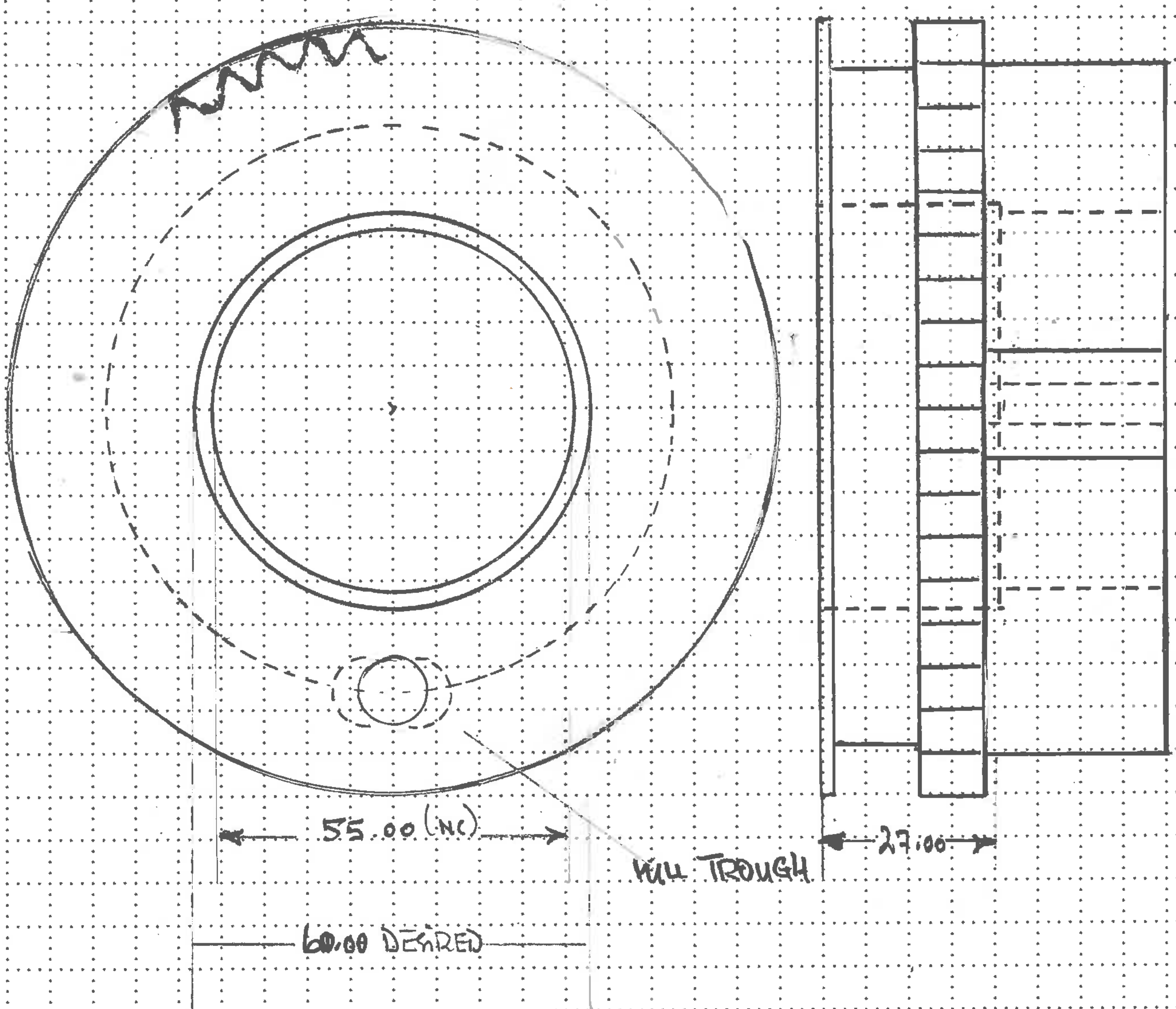
REVERSE- SLIP-RING SHOE (BRASS)



TAP DRILL 5.00 M/M

From the workbench of: SPIDER
Date:

DISSASSEMBLE - REMOVE GEAR RETAINER PLATE - REMOVE THREE (3) EQUIDISTANT GEAR STUDS - RETAIN 3 GEARS AND STUDS TO ACCOMODATE LOCKING TO SHAFT - CUT RETAINER PLATE INTO 3 SECTIONS FOR REMAINING 3 GEARS RETENTION.

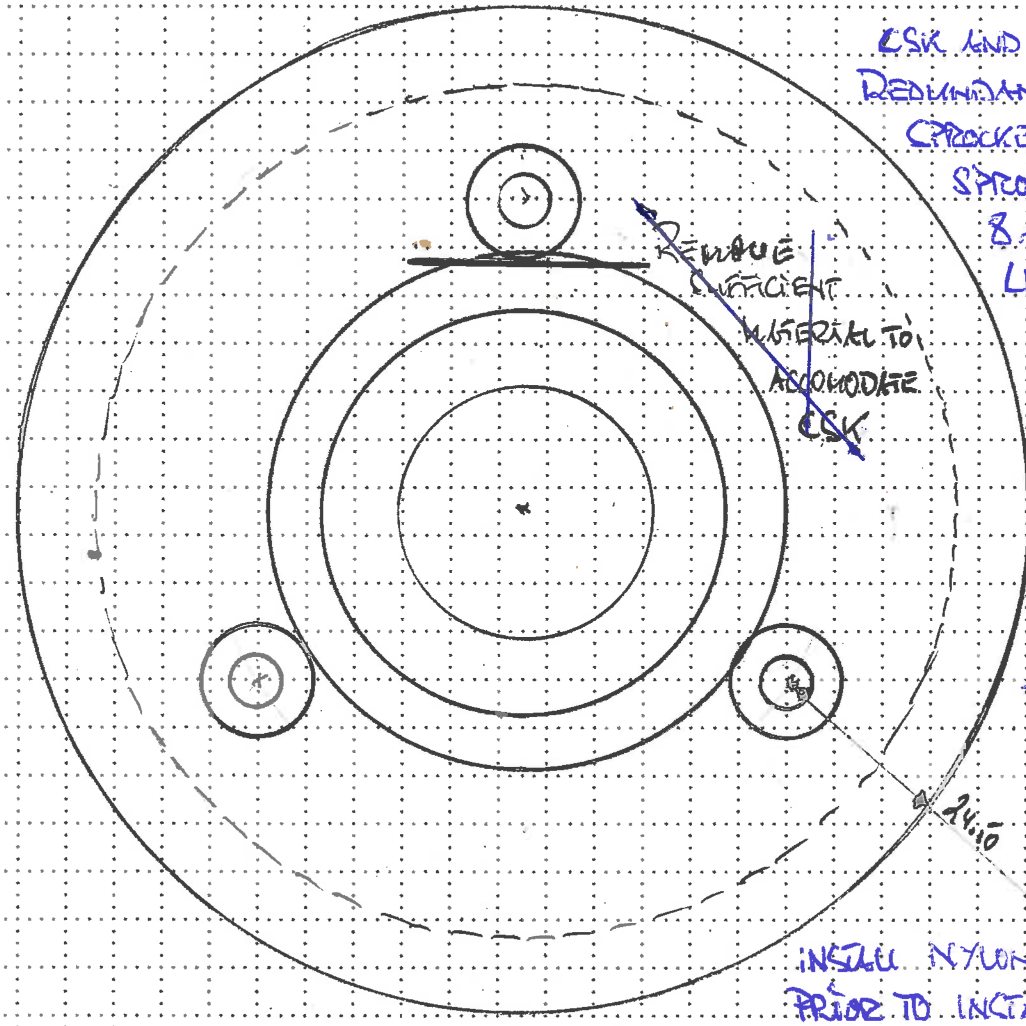


MACHINING - REMOVE OUTER GEAR RING AND OUTER SLIPRING RETAINING WALL
REMOVE EXPOSED REDUNDANT STUDS FLUSH
UNDERCUT I.D TO DEPTH OF 27.00MM - DESIRED I.D. 60.00 TO CLEAR SHAFT RETAINING LIP - ELONGATE THE THREE (3) SHAFTHOLES 6° (SIX°) IN BOTH DIRECTIONS OF ROTATION TO ALLOW FOR RUBBER COMPRESSION BEFORE STUD CONTACT TO REDUCE SHEAR/BENDING LOAD ON STUD.

From the workbench of:
Date: BELL HOUSING

NOTE: DESIGN CHANGE

CSK AND MATERIAL REMOVAL
REDUNDANT - 8 m/m DRILL THRU INCL.
SPROCKET - ENLARGE HOLE IN
SPROCKET TO ACCOMODATE
8.00 M/M HEX SOCKET CAP SCREW
(INTERNAL WRENCHING)
13.50 M/M ENLARGEMENT

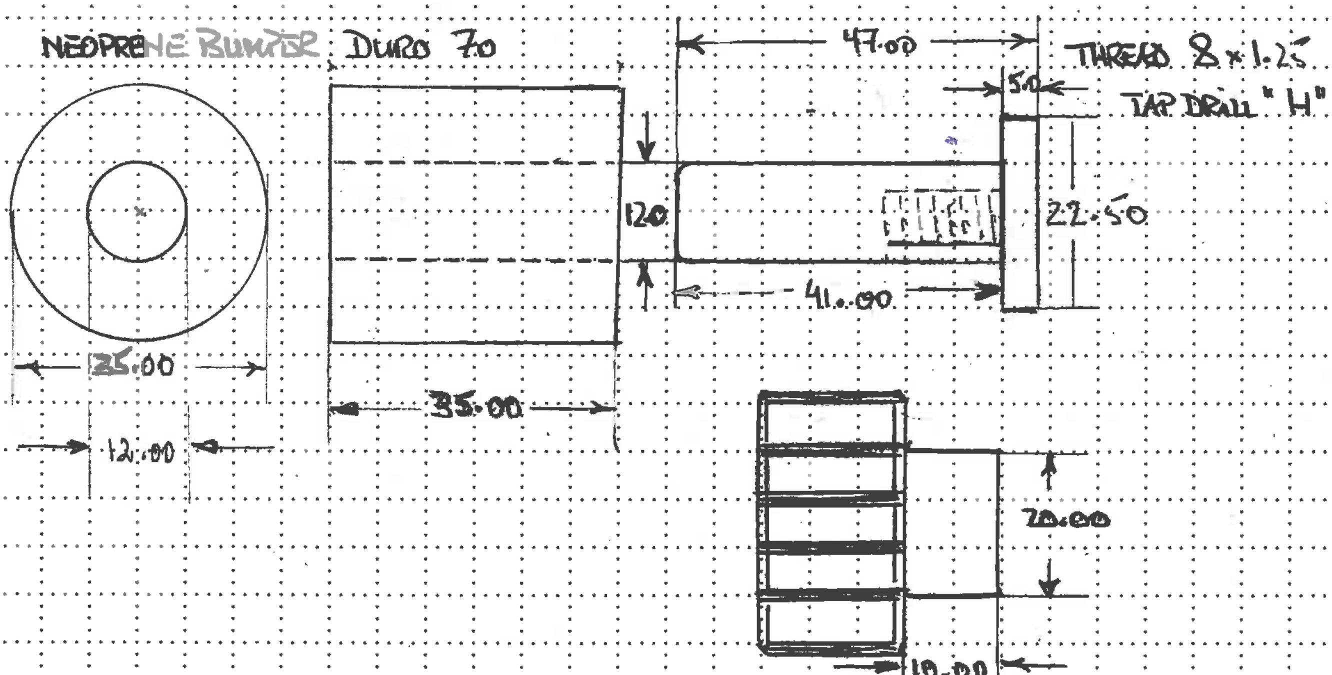


~~DRILL 8.00~~
~~CSK. 45°~~

INSTALL NYLON WASHER ON PIN
PRIOR TO INSTALLING BUMPER

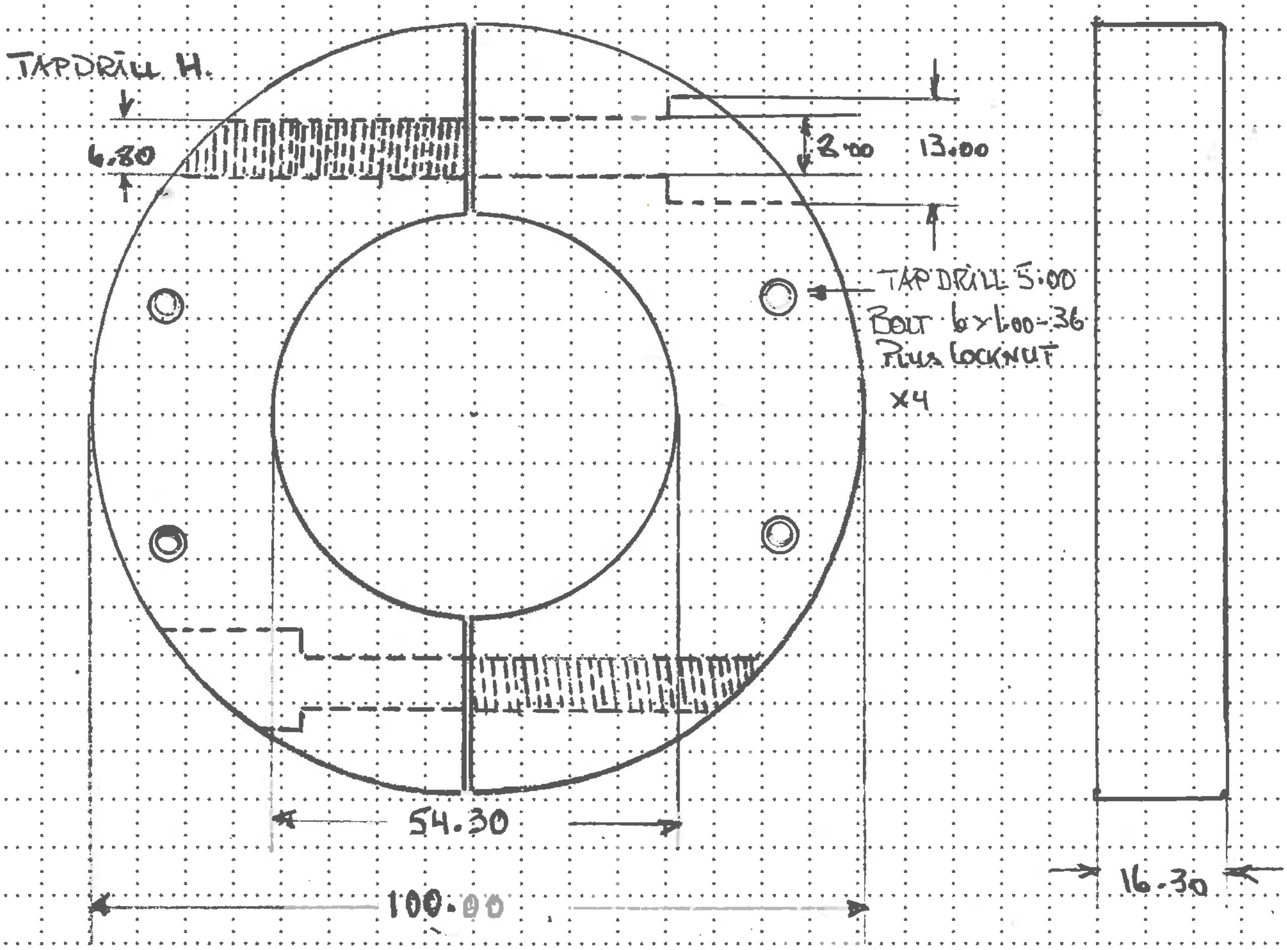
STUD

NEOPRENE BUMPER DURO 70



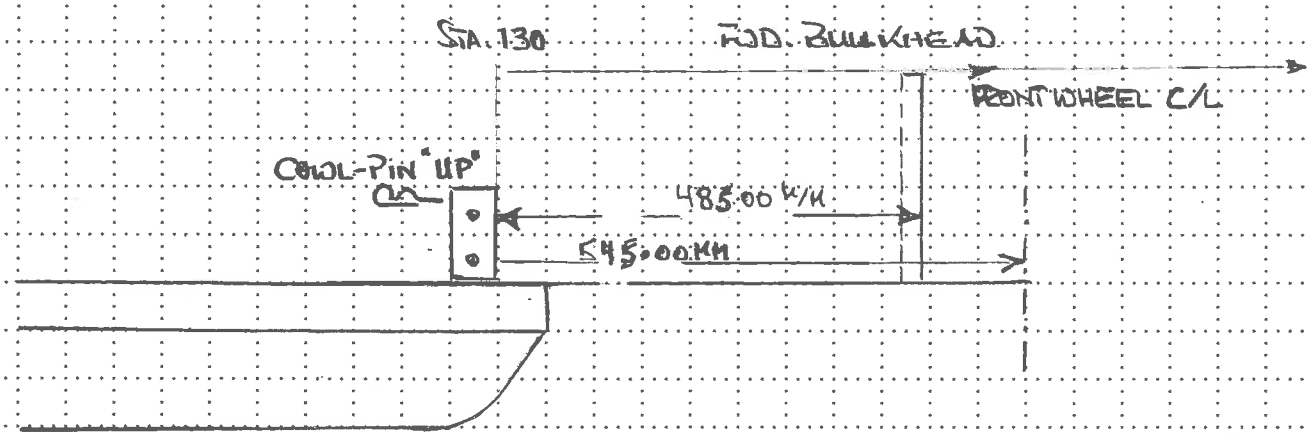
From the workbench of:
Date:

BOLT 8 x 1.25 x 55 TAPDRILL H x2



From the workbench of:
Date:

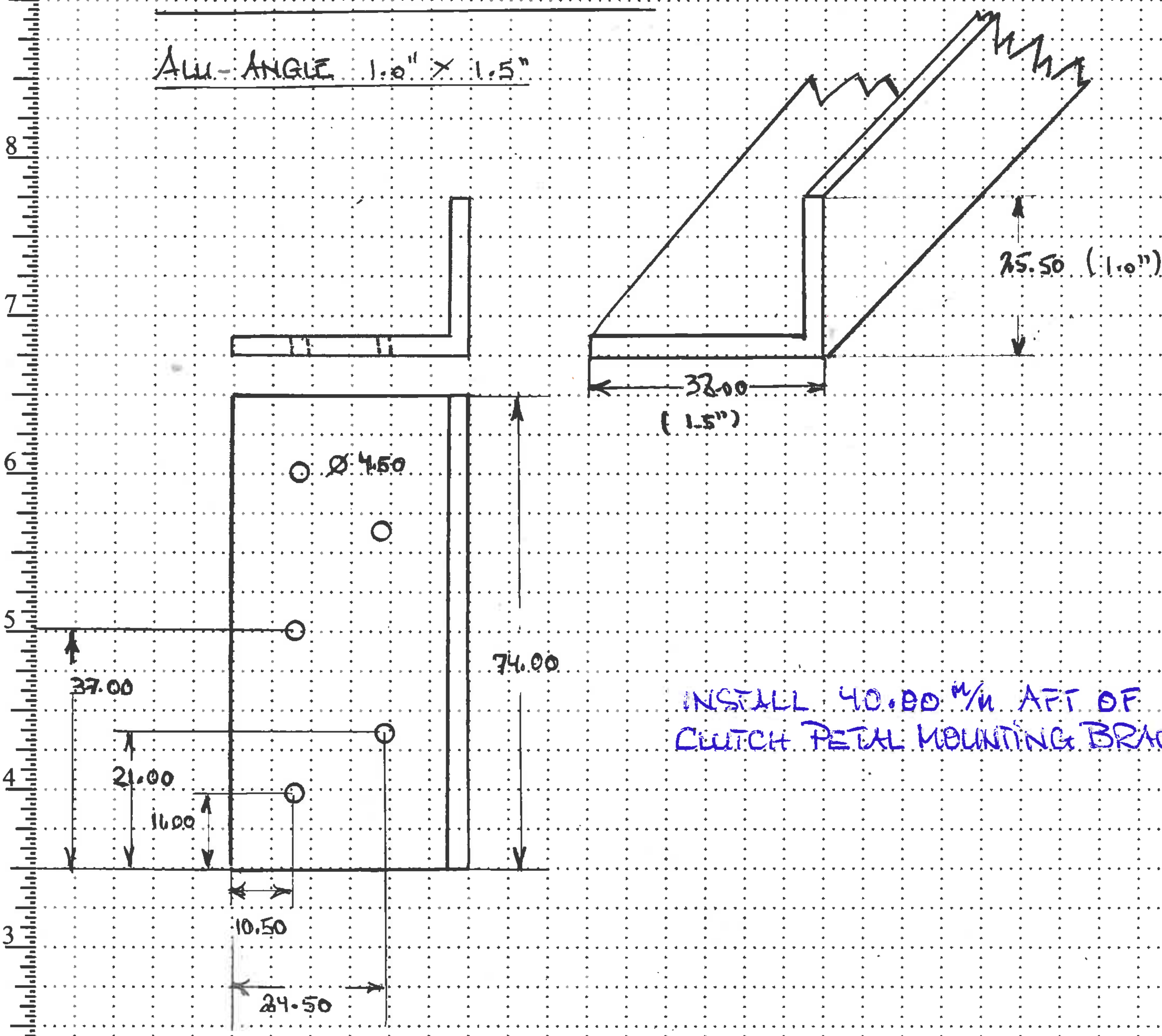
INSP. BRACKET INST. R.H. SIDE



From the workbench of:
Date:

HEEL STOP – CLUTCH ONLY

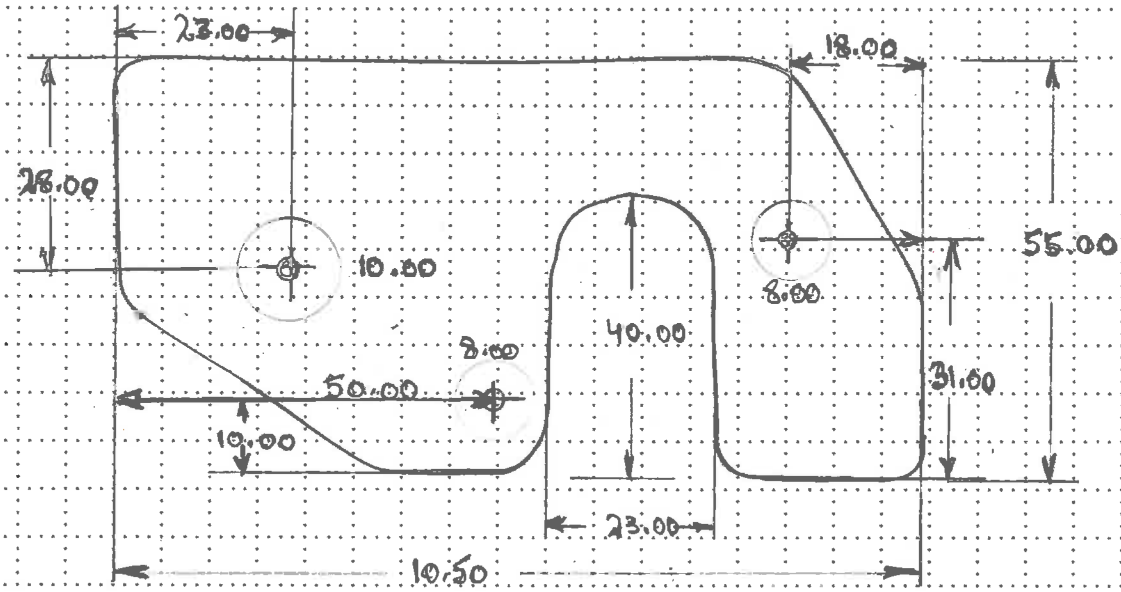
ALU- ANGLE 1.0" × 1.5"



INSTALL 40.00 M/M AFT OF
CLUTCH PETAL MOUNTING BRACKET

From the workbench of:
Date:

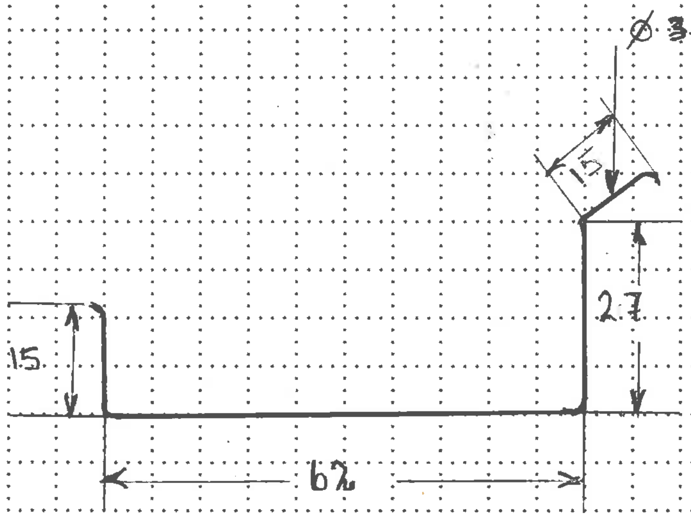
FIRE EXTINGUISHER DISCHARGE HANDLE ATTACH BRACKET



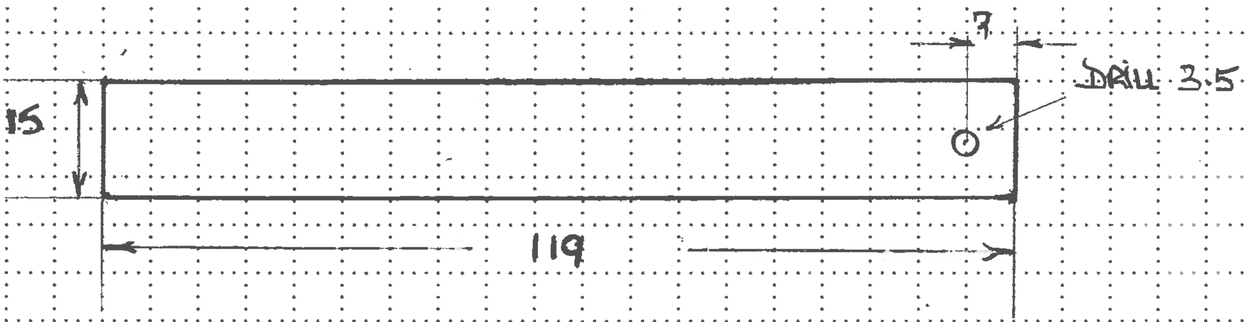
MATERIAL 2024 T3 0.250

From the workbench of:
Date:

FIRE EXTINGUISHER DISCHARGE PANEL SAFETY WIRE INSTALLATION

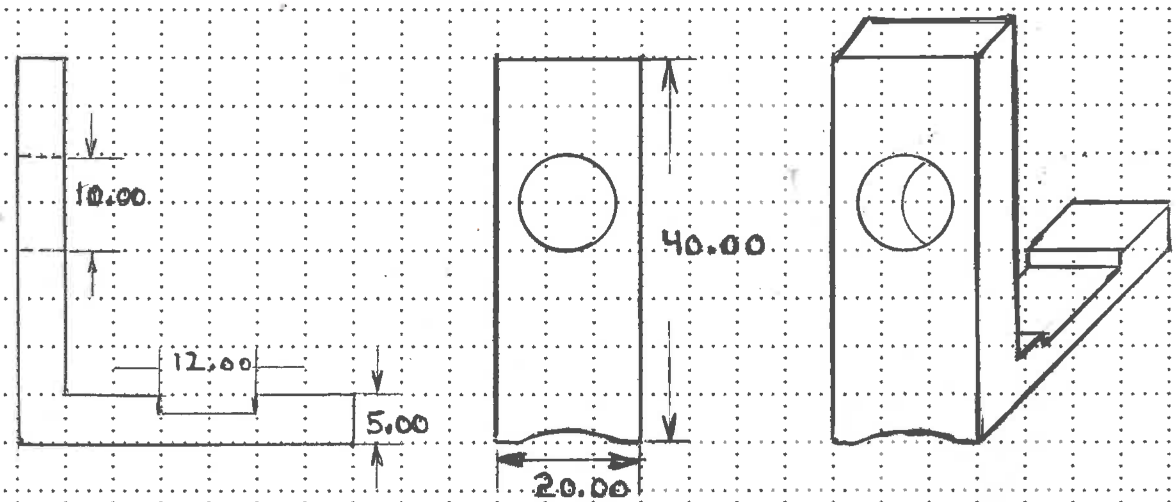


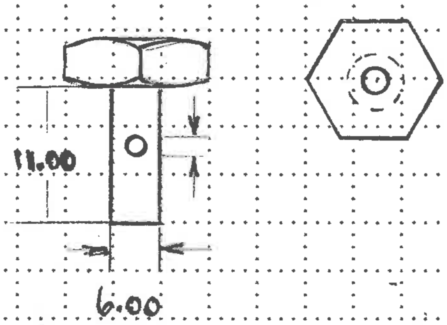
WRAP TOGGLE UPWARD TO PREVENT BREAKAWAY COPPER WIRE FROM SLIPPING



From the workbench of:
Date:

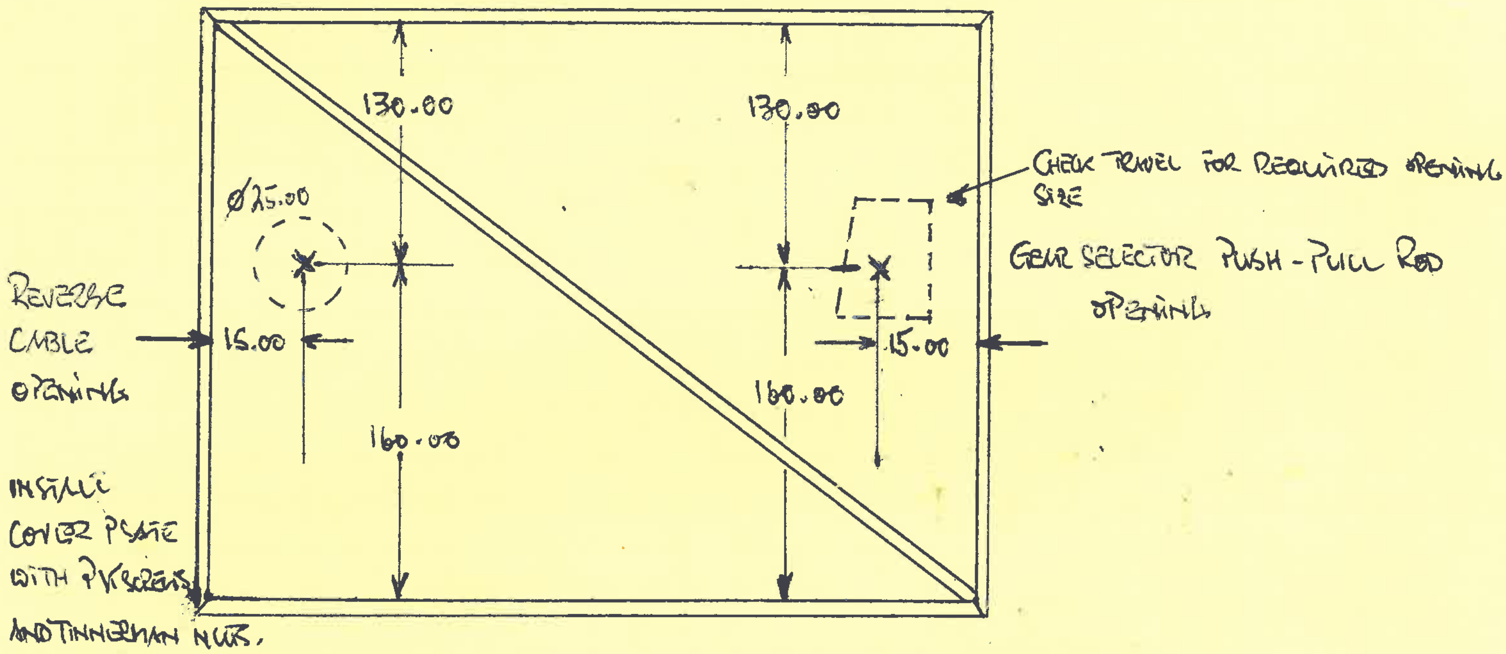
MANUAL CHOKE – ATTACH BRACKET – PIN





TAP-DRILL : #30
SET SCREW : M4 × 8 MM (482-005)
TAP : 4.00 × .70 MM

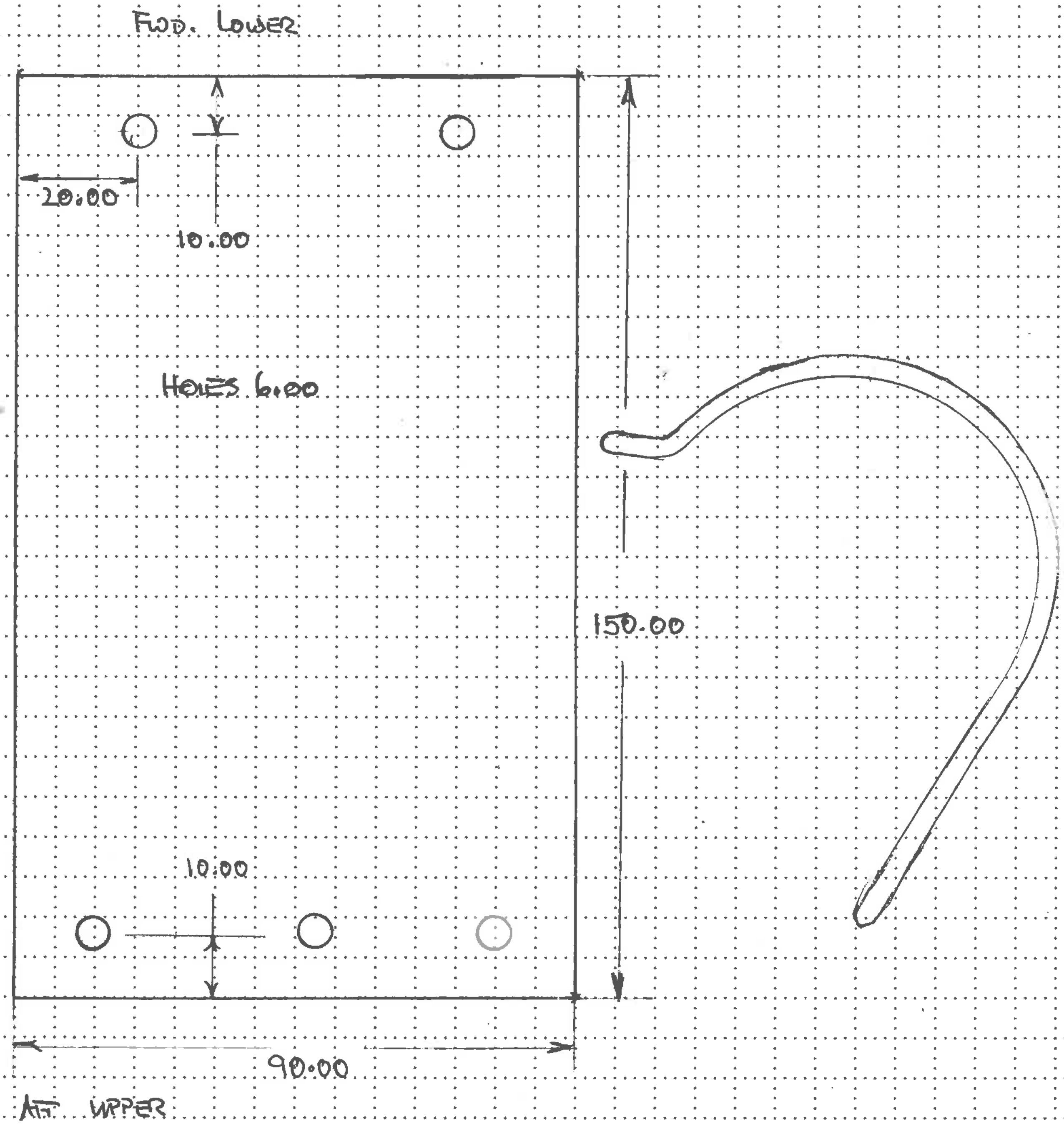
FIREWALL



130.00
130.00
Ø25.00
CHECK TRAVEL FOR REQUIRED OPENING SIZE
GEAR SELECTOR PUSH-PULL ROD OPENING
REVERSE CABLE OPENING
15.00
15.00
160.00
160.00
INSTALL COVER PLATE WITH PK SCREWS AND TINNERMAN NUTS.

From the workbench of:
Date:

AFT RADIATOR HOLD-DOWN BRACKET - ATTACHED TO SIDE POD FLOORPANEL



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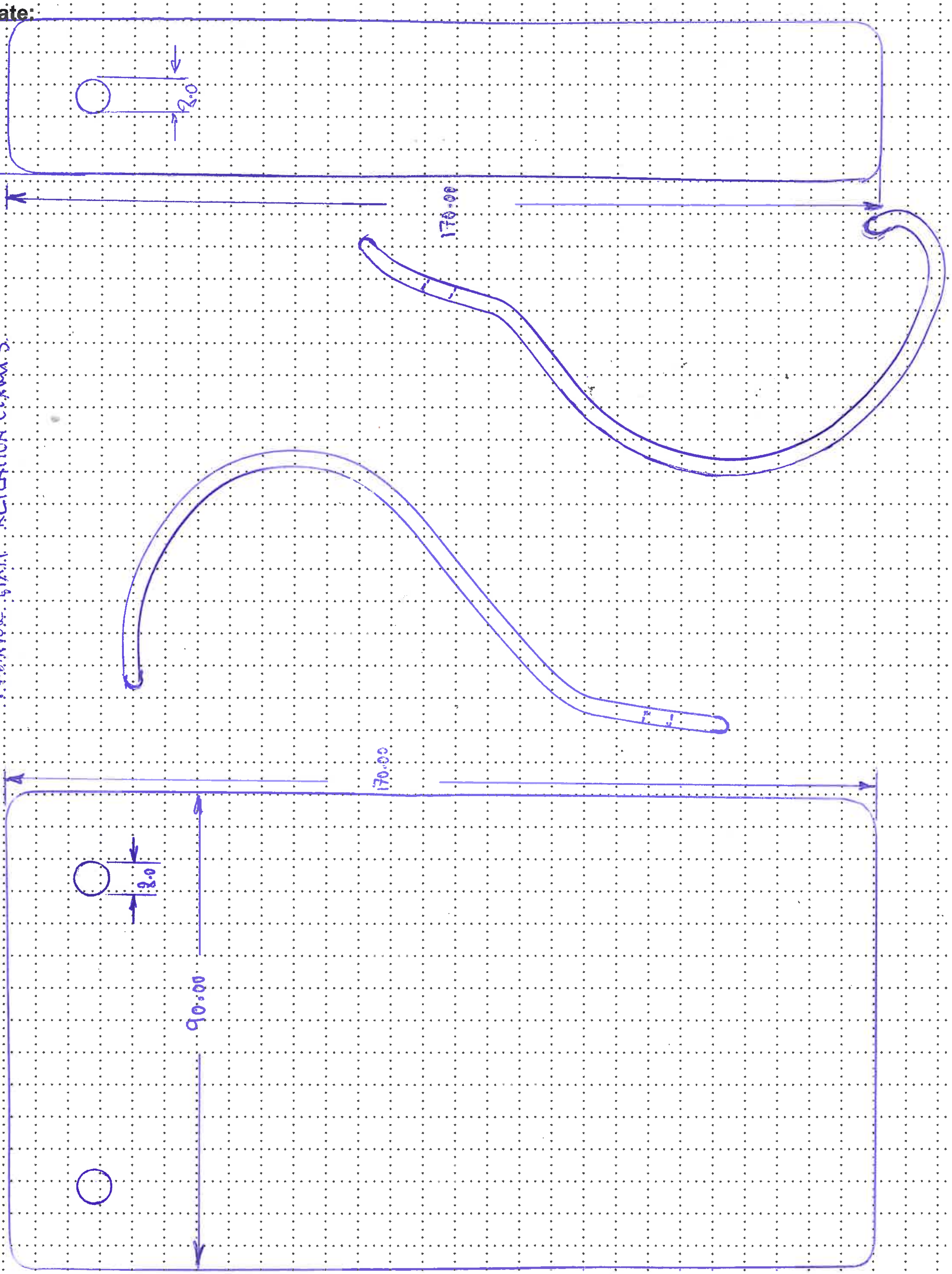
From the workbench of:

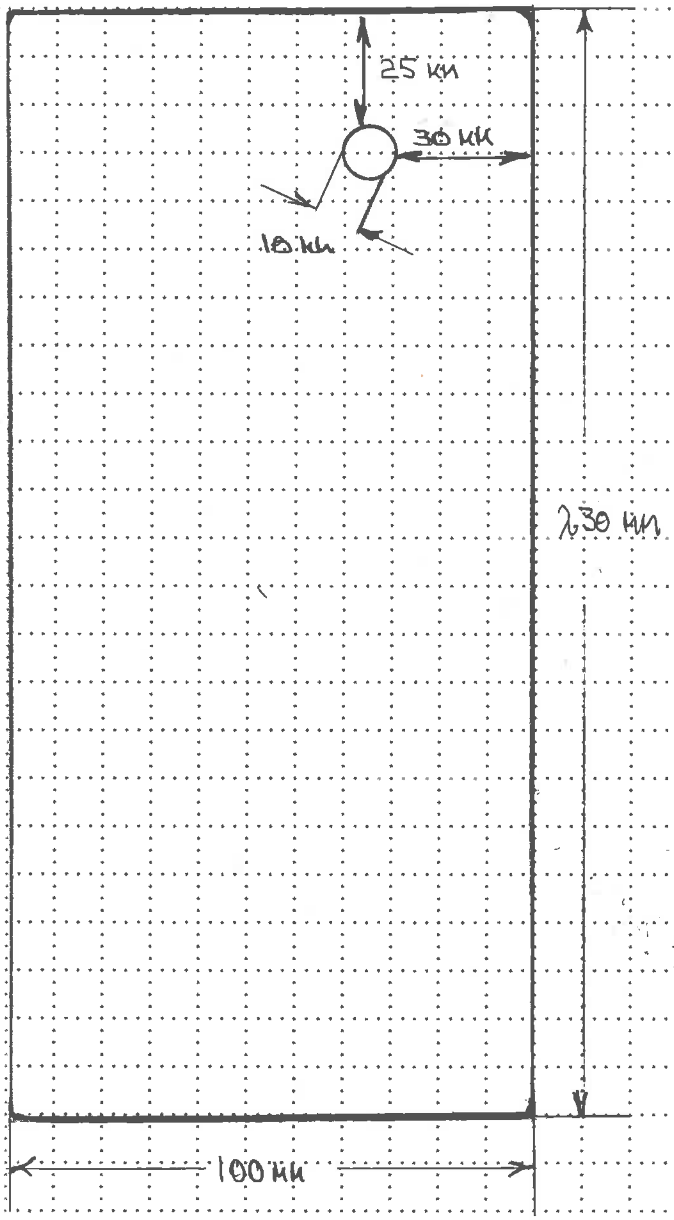
Date:

RADIATOR STAY RETENTION CLAMPS



From the workbench of:
Date:

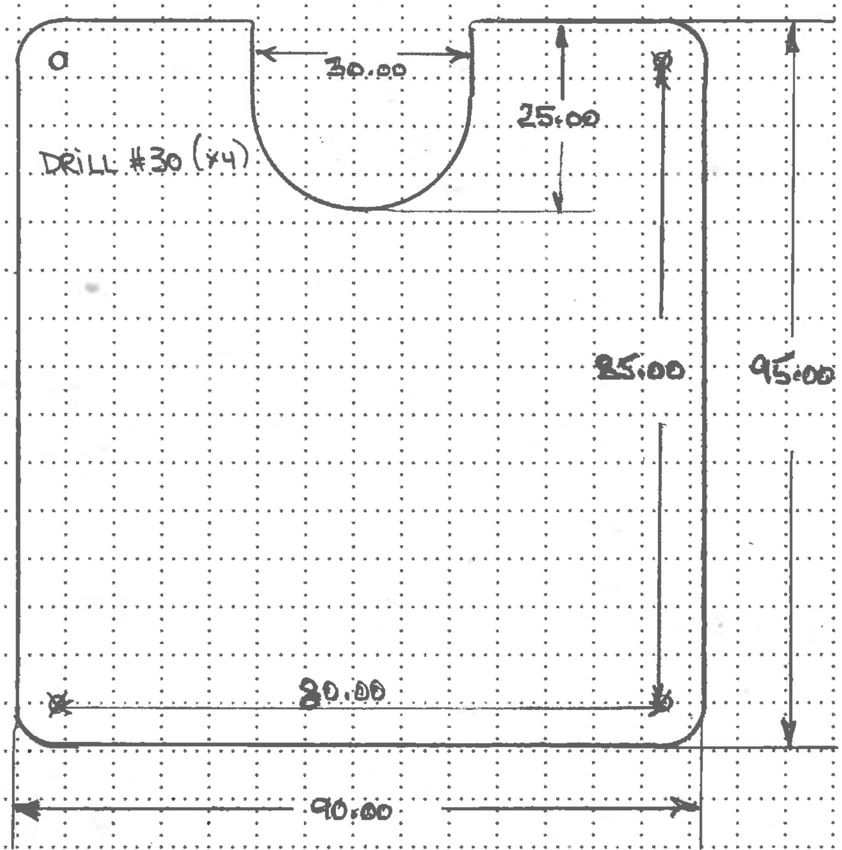
HEAT DEFLECTOR (PORT)   SHAPE AS REQUIRED
2024 T3   .025



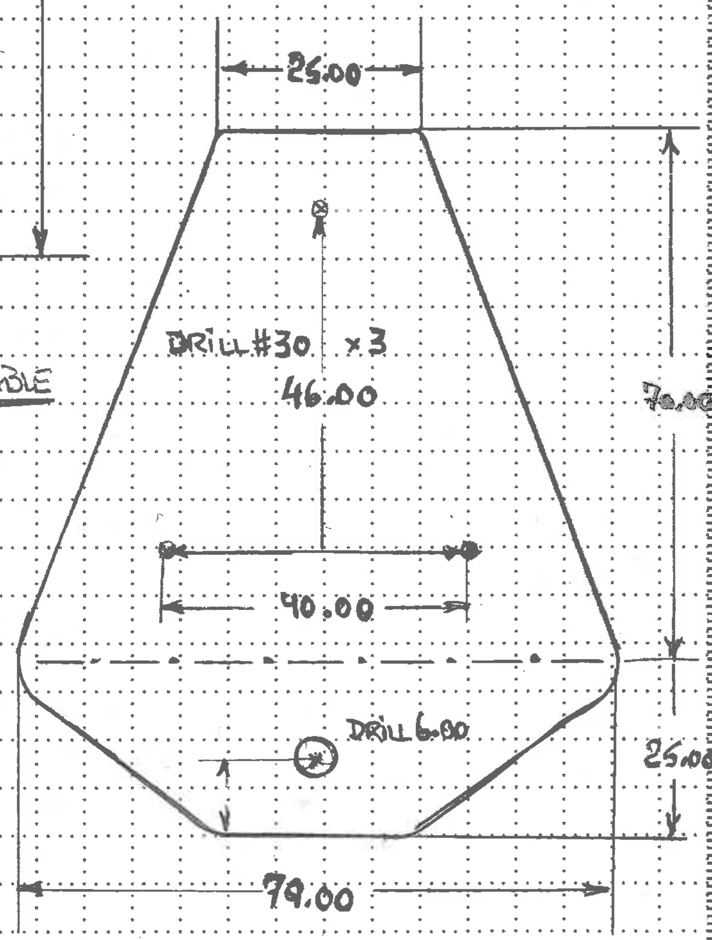
From the workbench of:
Date:

GEARSHIFT COVER PLATE - ACTUAL SIZE

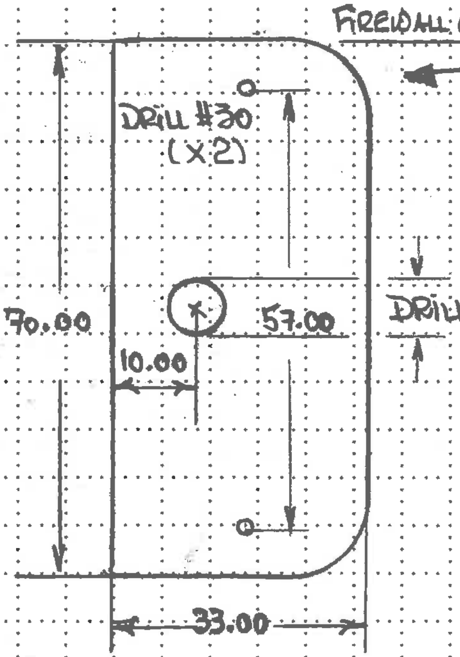
T 0.75 ALU. FOR ALL



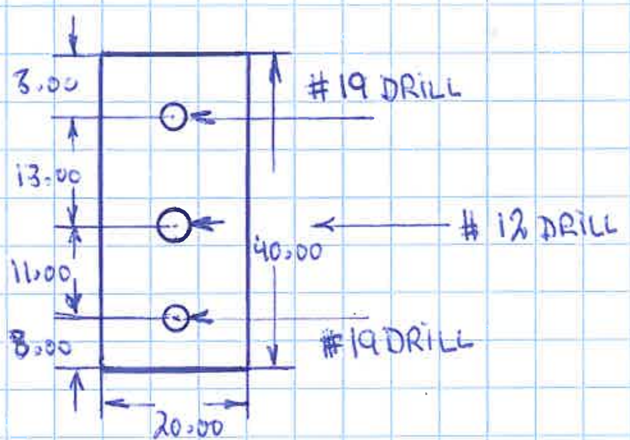
THROTTLE CABLE ATTACH BRACKET



FIREWALL COVERPLATE - REVERSEABLE



PEDAL TRAVEL LIMIT CHAIN RETAINER PLATE

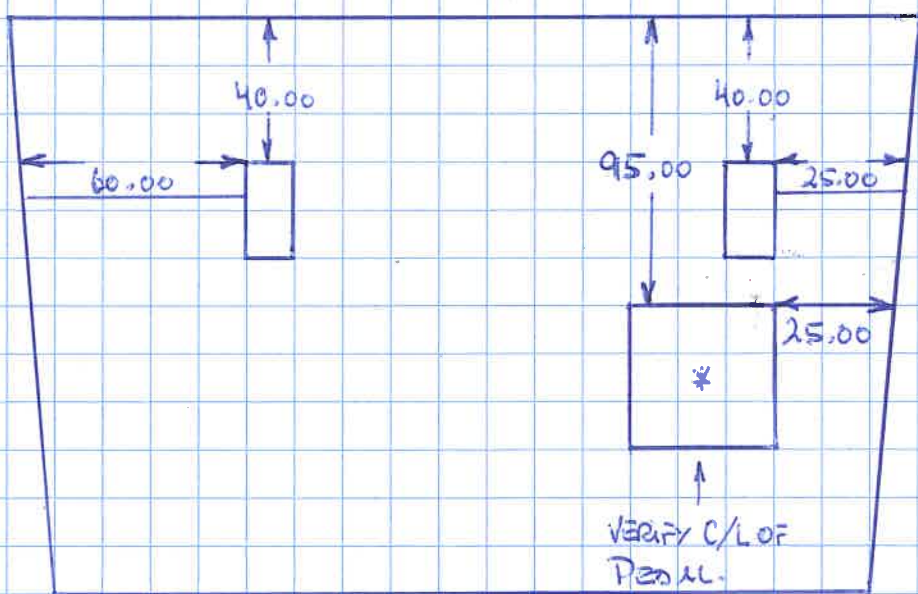


SCREW AN 525-832 R6 (2)

LOCKNUT MS 21083 N08

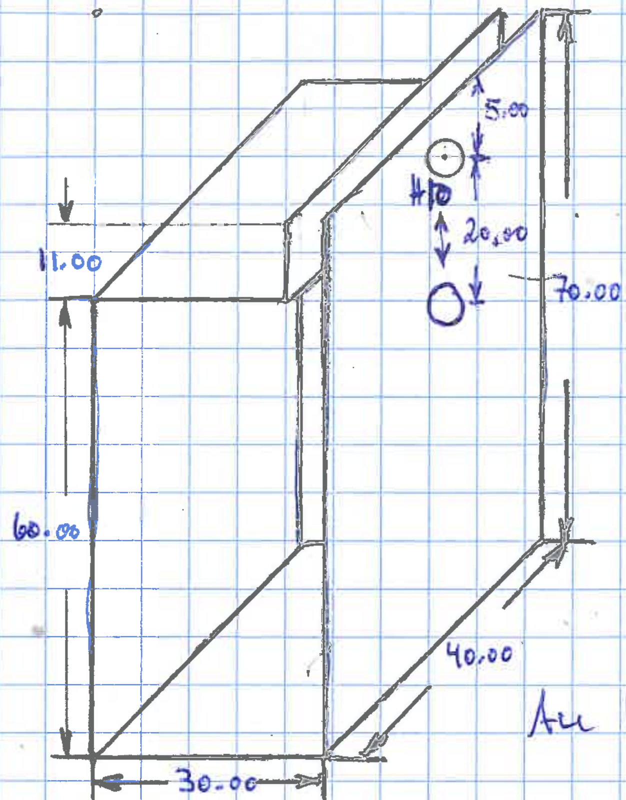
MATERIAL 2024 T3 .035

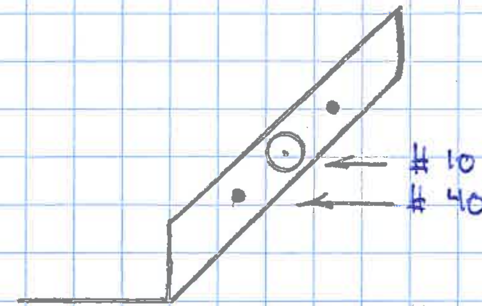
PEDAL TRAVEL ADJUSTMENT PLATE INSTALLATION



CHAIN LENGTH 200.00 MM

FIRE EMERGENCY CONTROL PANEL CLAMP.





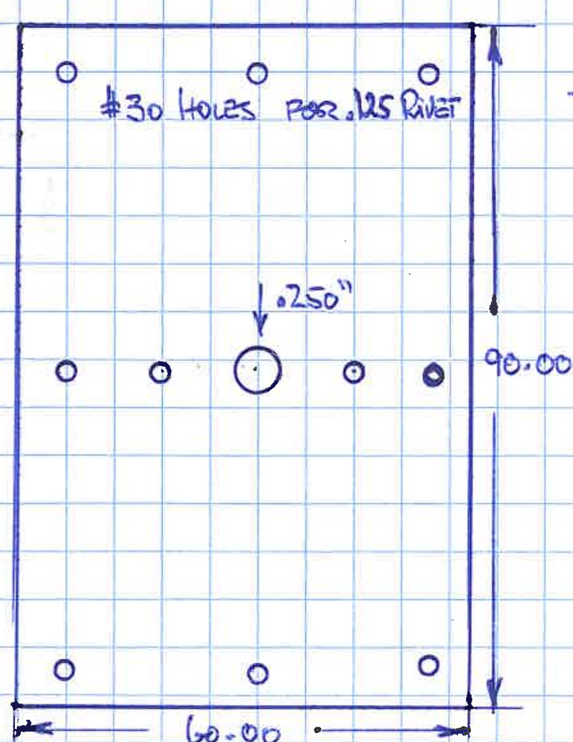
CUT STRIP TO 40MM × 202MM

ANCHOR NUT : AN366F-1032
BOLT : AN3-6A
SCREW : AN525-10R6

ALL HOLES TEMPLATE DRILLED (#30)

MATERIAL 2024 T3 (.032)
NEOPRENE INLAY.

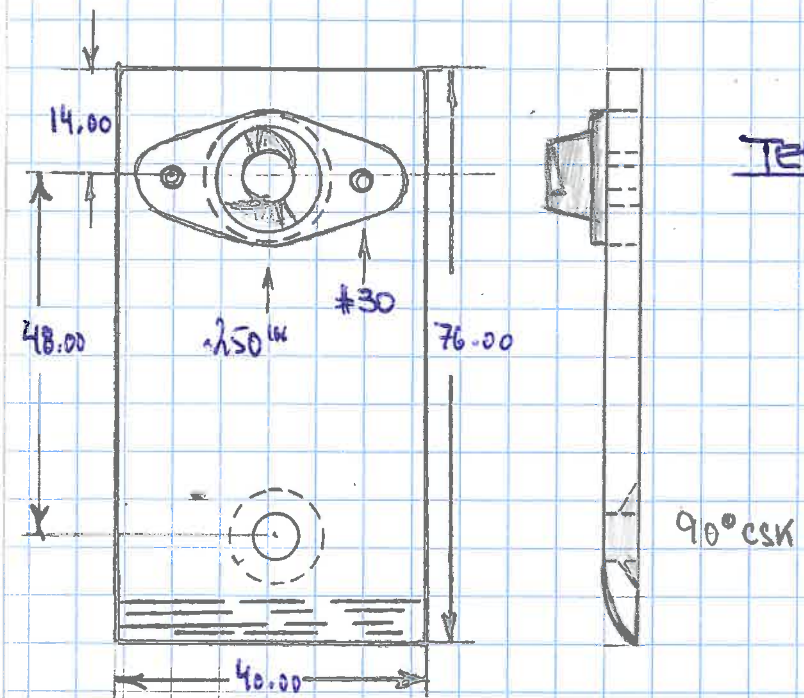
THROTTLE FWD TRAVEL LIMIT ADJUSTABLE STOP



TEMPLATE DRILLED.

MATERIAL 2024T3 (.125)
ANCHOR NUT AN366F-428
BOLT AN4-10

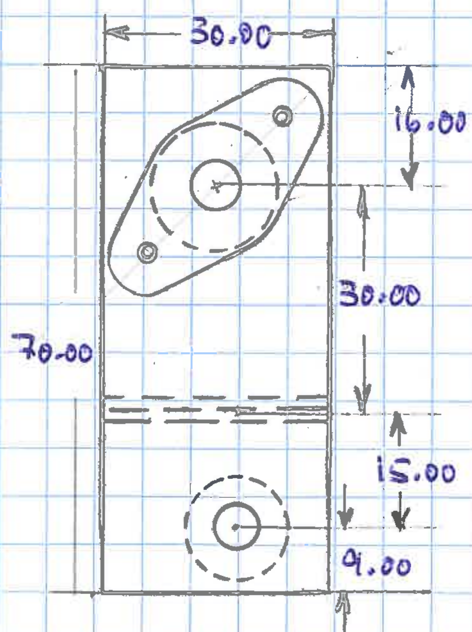
ENGINE MOUNT FWD. COWLING SUPPORT (1)



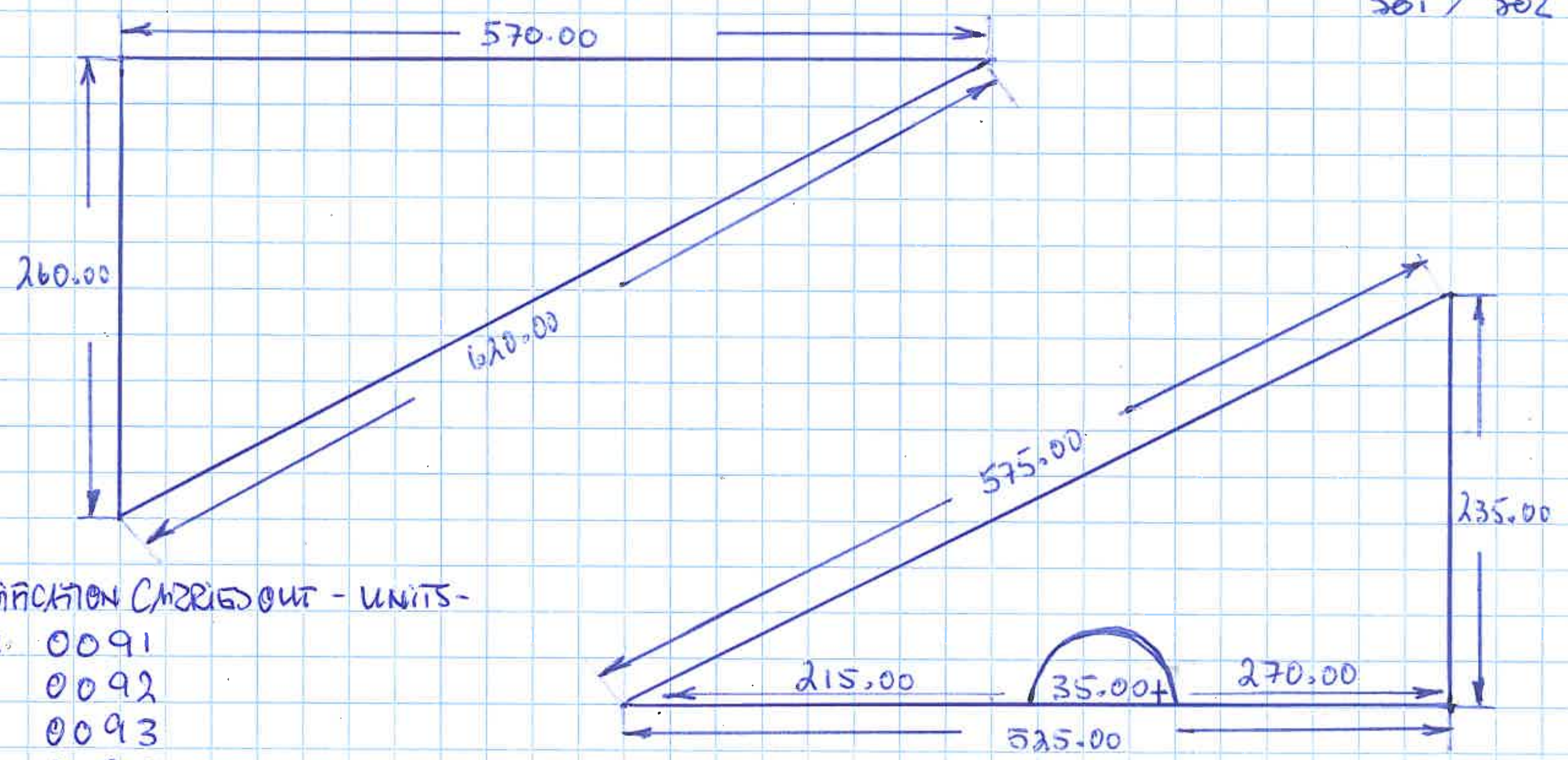
TEMPLATE DRILLED.

MATERIAL: 2024 T3 (.125)
RECEPTACLE: 214-16 (MDN 1142700)
SCREW DIN 7991 M6 x 20

ENGINE MOUNT AFT COWLING SUPPORT (2)



FUEL TANK PROTECTIVE FIREWALL
DOUBLER SST 18-8 OR 17-7 .025
301 / 302

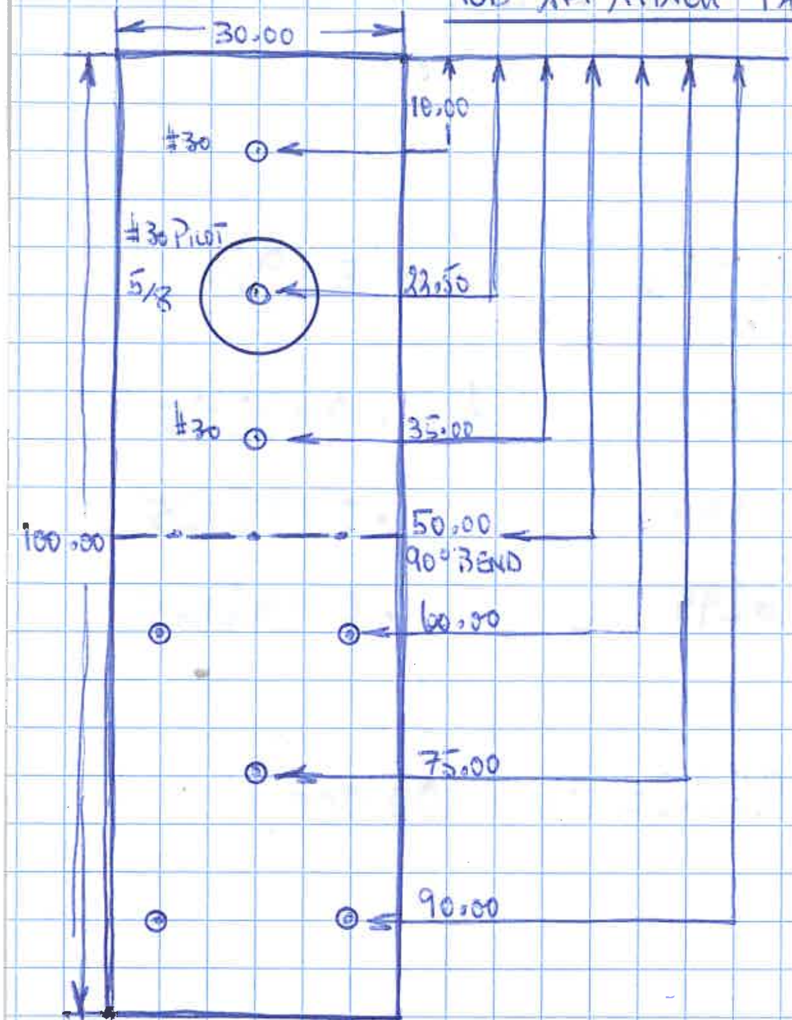


MODIFICATION CARRIED OUT - UNITS -
S/N 0091
0092
0093
0098
0100
0102
0103

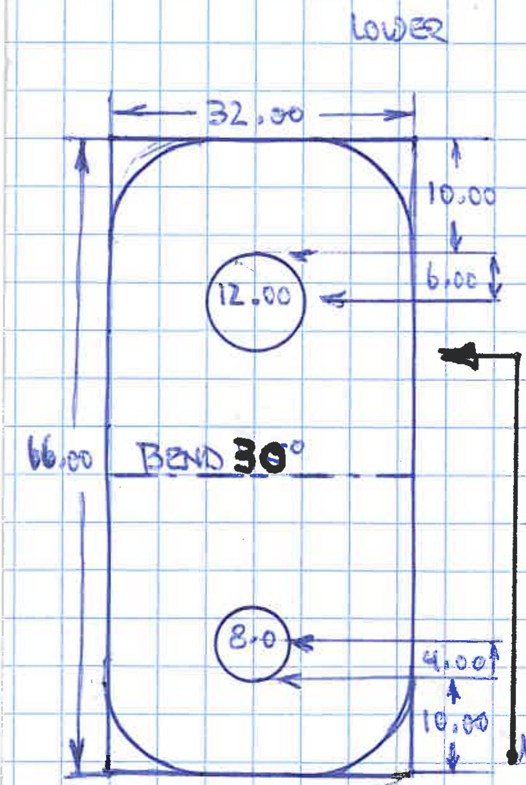
"NOT" COMPLETED DUE ENGINES INSTALLED
0088 - 0090 - 0097 - 0104 - 0105

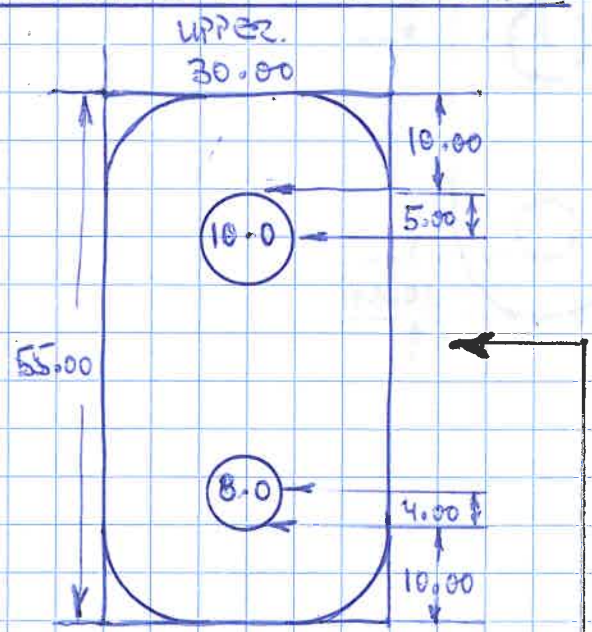
PR 1422 B COMPOUND FOR BONDING.
(5 CARS PER KIT)

POD AFT ATTACH BRACKET 2024T3 .040



SEAT BELT ATTACH LUGS 4130 t .125 IN





ATTACH LUGS - WAISTBELT BEND 30° AT CENTER
" " ANTI-SUB BELTS " 45° " "
" " SHOULDER HARNESS NO BEND

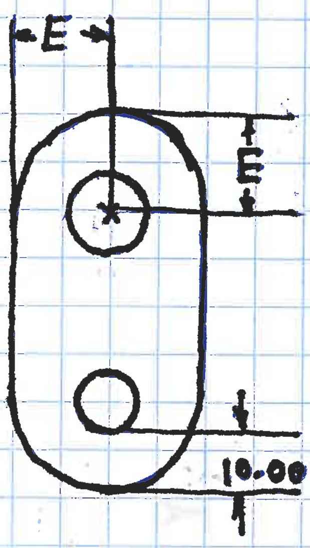
MAT. SPEC. EF 4130 HR COND. "N" MIL-S-18729C HT 118227
F_s 100 000 PSI t .125 in

TEAR THROUGH LBS (P_e)

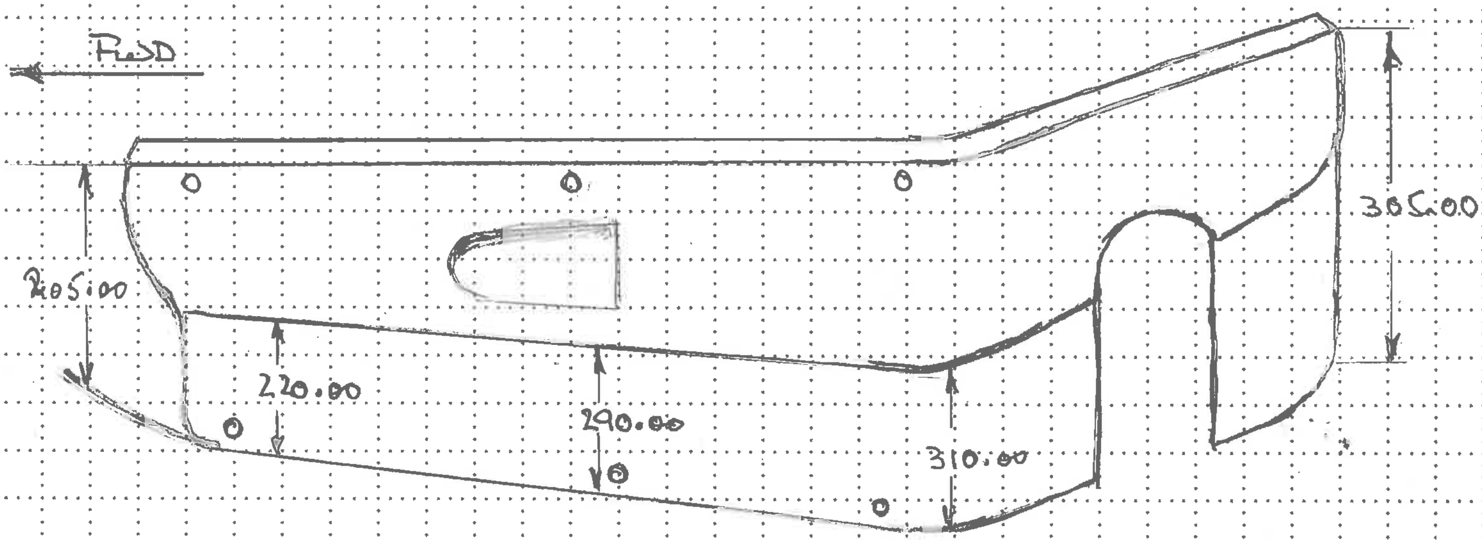
$P_e = AF_s$ $P_e = (E-d)tF_s$ $A = (E - \frac{d}{2})t$

HOLE Ø	8.00 m/m	(.3150 in)	E = .5512	A = .0492125
	10.00	(.3937)	.5906	.0492125
	12.00	(.4724)	.6299	.0492125

P_e = 4921.25 PSI (100 000)



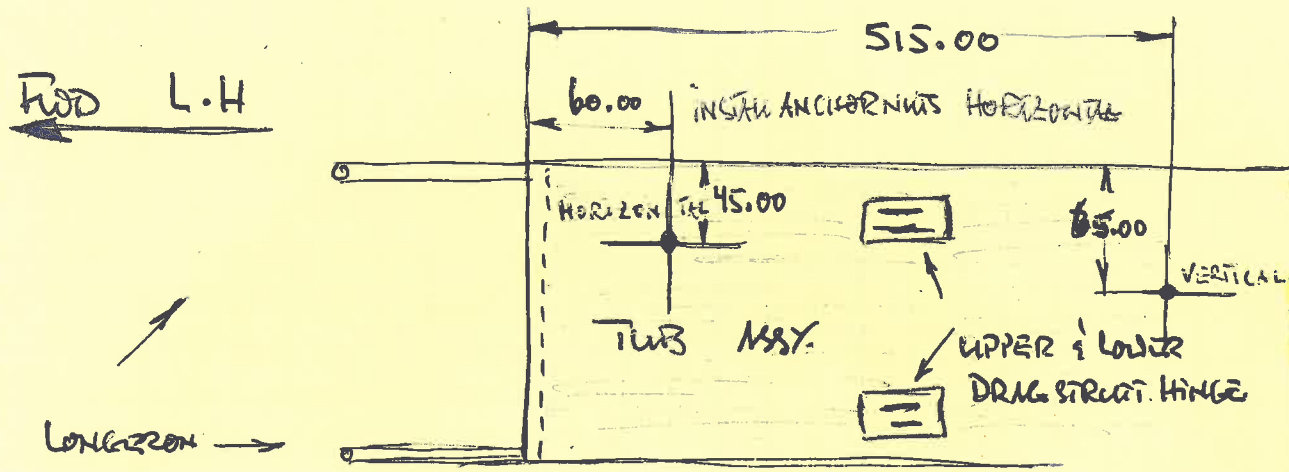
SIDE POD (x2) FASTENER LOCATION



TEMPLATE

WHEN DRILLING FOR RECEPTACLE ATTACHMENT – COCKPIT FAIRING SECURED IN SITU – C/L OF PILOT HOLES 25.00 M/M FROM COCKPIT FAIRING OUTER WALL – MARK HOLE POSITION WITH SIDEPOD IN PLACE BUTTED TIGHT. HOLD TEMPLATE IN PLACE WITH CLECOS FOR FURTHER DRILLING OF BOTH COCKPIT FAIRING AND SIDEPOD.

From the workbench of:
Date:

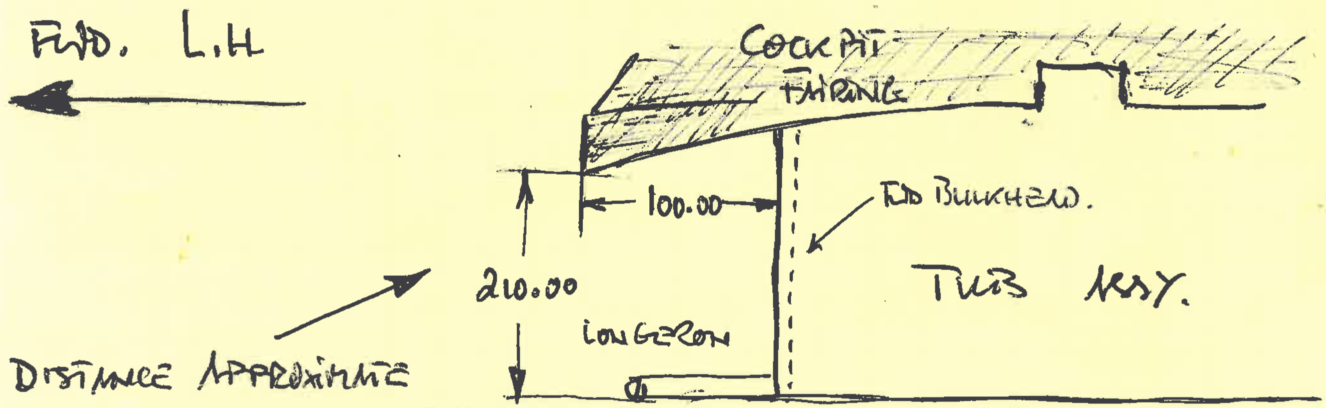


RIV NUT INSTALLATION

ANCHOR NUT P/N AN 366-F428
SCREW NAS 517-4-5 (1/4 28)

DRILL PILOT HOLES THROUGH COCKPIT FAIRING

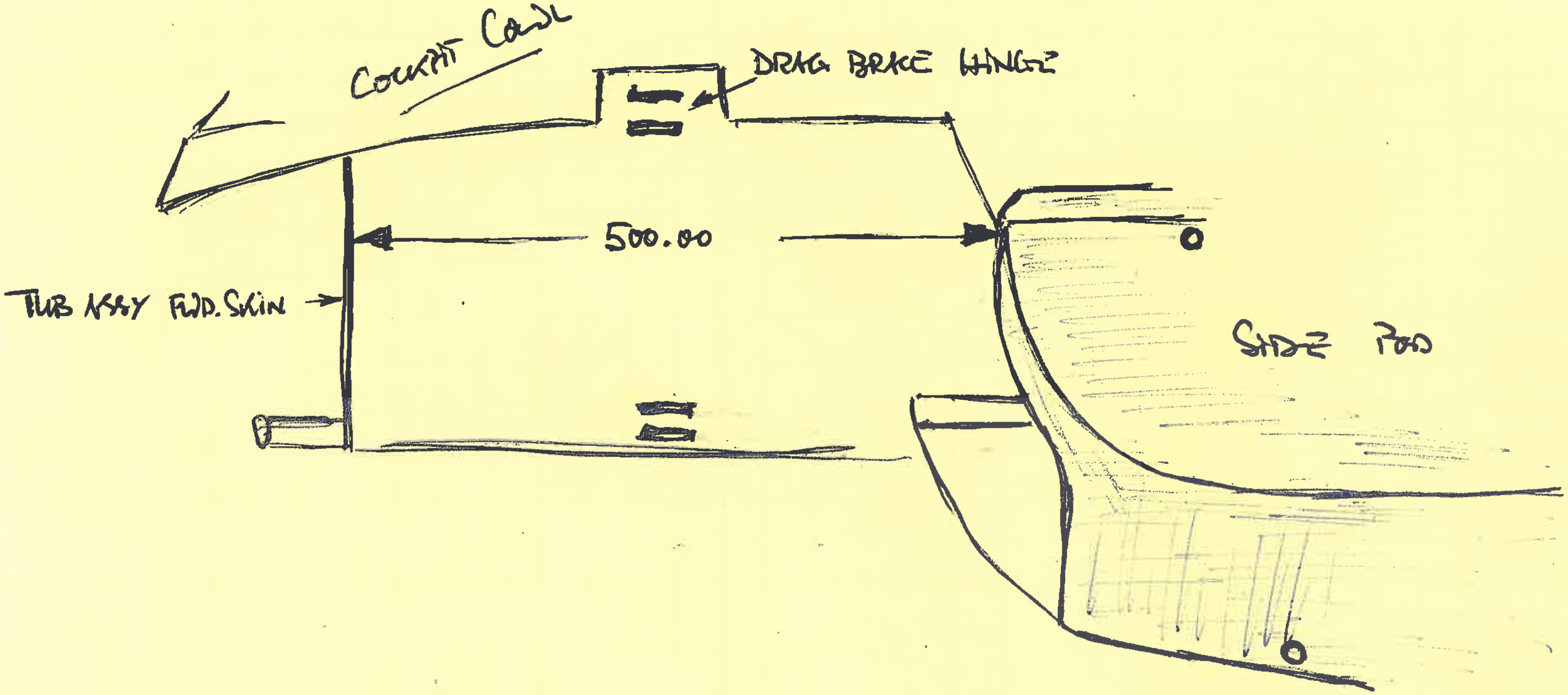
RIV-NUT INSTALLATION (4) COCKPIT FWD. INSTALL INTO TUB SKIN (6 x 1.25 RIV-NUT)
USE 9.00 MM DRILL NOTE: ANCHOR NUT PREFERABLE



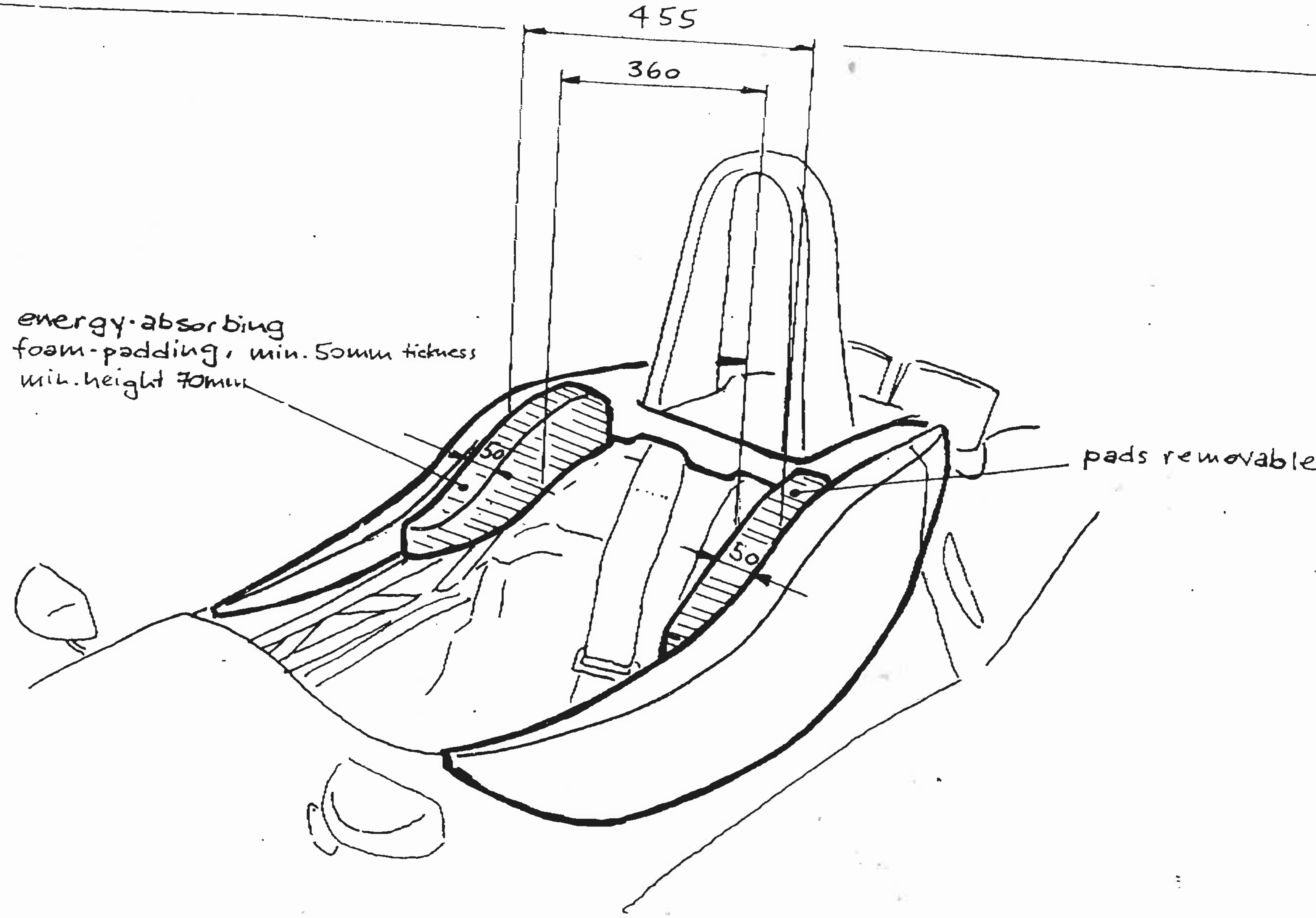
COCKPIT FAIRING
CENTERING FOR UPPER CENTRE
SCREW HOLE ALIGNMENT.

DISTANCE APPROXIMATE
ENSURE EQUAL DISTANCE
ON BOTH SIDES FOR
CENTERING OF COCKPIT
FAIRING

L.H. FWD DISTANCE FWD. TUB ASSY. TO SIDEPOD FWD. LIP (500.00MM)



Nose cone - engine cowl
adjust splay by application
of heat. - same for
sidepod attach legs / angulation
on cockpit cowl



all measurements in mm

lateral head-protection unit	1/1 5/2000 d.k.

ARCOBALENO COCKPIT SEAT FITTING PROCEDURE

2

Tape over all openings and seams

To prefabricated vacuum bag (made from vacuum release film) add quantity of expanded polystyrene pellets. Quantity for average Indy car 15 gallons – Dan 15 gallons – Chris 14 gallons – Doug 12 gallons.

Mix resin (blue) and hardener (amber) at a 1 to 1 ratio. Required quantity 100 ml of resin mix to 1 gallon of foam pellets. Working time (time to gel) 2 to 2 ½ hours, curing time 7 hours, 24 hours to complete cure.

Mix resin and foam beads manually in sealed bag, ensure complete wetting of all beads. Do "not" permit isolated pockets of resin concentration. On completion of kneading/wetting operation apply suction to bag and remove all excess air.

Distribute mixed material in bag evenly, even thickness throughout, double up bag longitudinally to verify even mixture distribution and to facilitate installation in cockpit.

Insert bag into cockpit, fit as close to structure as possible, allow for reserve above back area and extreme forward.

Install driver in seat dressed in driving attire, and fit material around lower body, upper torso, arms in driving position, material movement may be assisted by removing vacuum and allowing air to enter.

Vacuum attached to upper corner, adjust as required during fitting operation.
Complete initial fitting operation as close to perfect as possible. Prior to driver exit, measure dimension across hips in 2 – 3 places, mark with magic marker for future reference and record distances. Exit driver.

Smoothen all bumps, remove all uneven spots. Minimum thickness in back is 1 inch. Remove all folds by pulling out the excess bagging material, all excess will be trimmed after solidification.

Re-install driver in seat for final fitting. Vary the suction as required for material movement. After completion of final fitting exit driver. As on exiting some distortion may occur. Restore to original dimensions by means of previously taken measurements. During hand molding operation apply constant suction. To finish the molded seat, rub down with soft cloth. Remove all bumps, folds and crevices. Verify minimum thickness of backrest not less than 1 (one) inch at lowest point of seat area desirable as thin as possible.

Apply continuous suction for minimum 7 hours curing period prior to trimming off excess material. Install driver in seat for final trim fitting.

 3

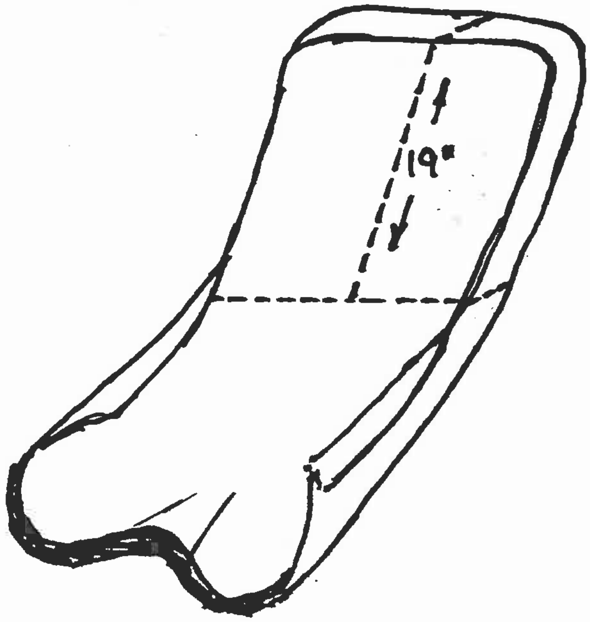
For seat removal, section off the seat in 3 (three) pieces. Make lateral cut in lower lumbar region (approximately 19 inches down from top). Vertical cut central, to upper portion only. Leave lower forward portion intact. Mark off cutlines with magic marker to ensure accurate cutting. Bias cut to allow sections to slide sideways for easier removal.

After removal, cut seatbelt holes. Ensure cuts follow the natural directions of the seat belt.

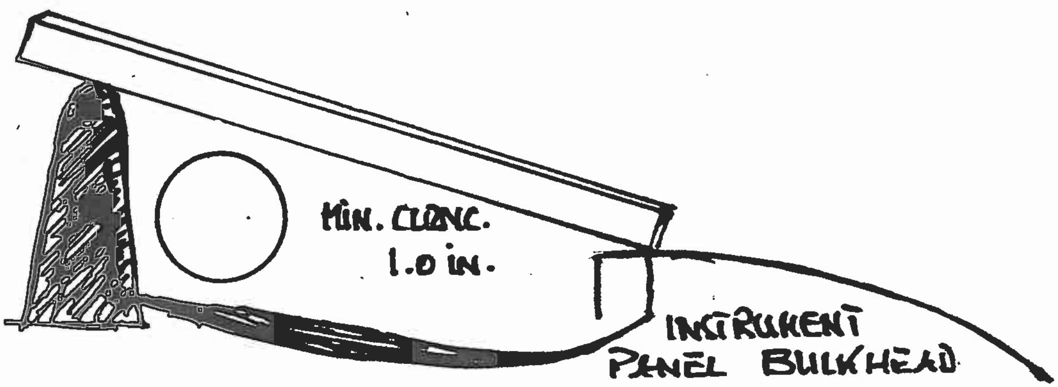
Smooth and blend sand (80 grit) individual sections. After sanding, tape the seat sections. (Gaffers tape, Shurtape, Hickory NC 28603 USA). Adhesive bond thin foam spacer (foam confore .1250 inches, adhesive 3M spray 909) to one side of seam. Trim for exact fit and retape surfaces.

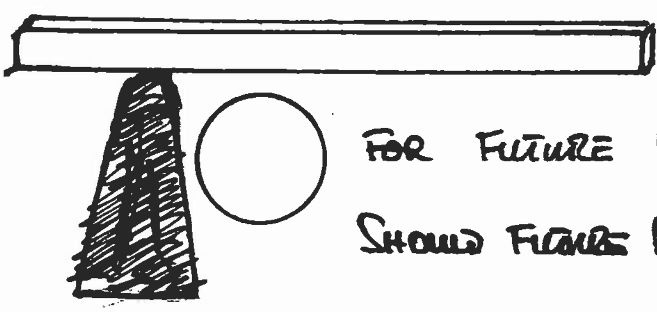
TO BOND NOMEX COVER USE 3M HI-STRENGTH 90 SPRAY ADHESIVE.

3M #80 RUBBER AND VINYL SPRAY ADHESIVE FOR FOAM SEAT WITH NEOPRENE 9009 SHARKSKIN (BLACK) COVERING



BIAS CUT.





FOR FUTURE HEIGHT REFERENCE MEASURE - RECORD
SHOULD FUTURE HEIGHT ADJUSTMENTS BE DESIRED.

Top Formula

Sabelt RACING

Cintura da competizione a bretelle con **5** o **6** punti di ancoraggio omologata secondo lo Standard FIA 8853-1998
*Suspender type racing seat-belt with **5** or **6** anchorage points type approved to standard FIA 8853-1998*

ISTRUZIONI PER L'USO DELLA CINTURA

1) Come indossare la cintura

Impugnare la fibbia, verificare che la leva di sgancio lingue sia in posizione di sicurezza, cioè chiusa (nel caso che non lo fosse le lingue non si aggancerebbero alla fibbia), e introdurre con l'altra mano una dopo l'altra tutte le lingue nelle apposite fenditure della fibbia fino a sentire gli scatti metallici che segnalano l'avvenuto aggancio delle lingue.
Nel caso che i cosciali siano di tipo "A" (vedi fig. 1) e quindi siano tenuti in posizione dalle lingue delle spalliere, curare di posizionare l'asola terminale dei cosciali in modo corretto (vedi fig. 1, montaggio corretto) e cioè tra la lingua della spalliera e la fibbia e non oltre la lingua, sul nastro della spalliera (vedi fig. 2, montaggio errato).
Accertarsi che i nastri non siano attorcigliati.

2) Come regolare la cintura

I dispositivi per regolare la lunghezza dei vari nastri che costituiscono la cintura sono detti regolatori e si usano come segue:
- per allungare un nastro: afferrare il regolatore corrispondente e tirare in modo da farvi scorrere il nastro;
- per accorciare un nastro: impugnare l'estremità libera del nastro uscente dal regolatore e tirare. Seguire la sequenza di regolazione sotto indicata.

a) *Regolazione dei rami addominali*
Agire sui regolatori oppure sui dispositivi di regolazione (facenti parte dell'ancoraggio sulla scocca) in modo che, a regolazione avvenuta, la fibbia sia centrata rispetto alle anche del pilota e che il nastro sia il più teso possibile senza tuttavia essere scomodo.

b) *Regolazione dei cosciali*
Agire sui regolatori o sui dispositivi di regolazione (facenti parte dell'ancoraggio sulla scocca) in modo che a cosciale agganciato il nastro sia teso senza dare impaccio al pilota.

c) *Regolazione delle spalliere*
Agire sui regolatori delle spalliere in modo da stringere senza rialzare i rami addominali. È importante, per la sicurezza del pilota, che i rami addominali siano nella giusta posizione che è la più bassa possibile sulle anche, come indicato nella fig. 3.

INSTRUCTIONS FOR USE

1) To fasten the seat belt

Take the buckle with one hand and make sure that the tongue release is in the safety position, i.e. closed (if it is not, the tongue will not hook into the buckle). With the other hand fit all the tongue one after the other into the respective slots of the buckles. Push them until you hear the clicks indicating that the tongues have snapped into place.
For "A" type leg pieces (see fig.1) which are kept in place by the shoulder piece tongues, position the end loops of the leg pieces correctly (see fig. 1, correct assembly), that is between the shoulder piece tongue and the buckle, not beyond the tongue, on the shoulder piece ribbon (see fig. 2, incorrect assembly).
Make sure the webbing is not twisted.

2) Adjusting the harness

The devices used to adjust the length of the different webbings are called adjusters and are used as follows:
- *to lengthen a ribbon, take the corresponding adjuster and pull so that the ribbon slides inside it;*
- *to shorten a ribbon, take the webbing out of the adjuster and pull. Follow the adjustment sequence described below.*

a) Adjusting the abdominal straps
Use the adjusters or the adjustment devices (in the anchorage bracket) to make sure that the buckle is centred relative to the driver's hips and that the ribbon is as tight as possible without being uncomfortable.

b) Adjusting the leg pieces
Use the adjusters or the adjustment devices (in the anchorage bracket) to make sure that the ribbon is tight but will not hamper the driver when the leg pieces are fastened.

c) Adjusting the shoulder pieces
By means of the adjusters tighten the shoulder straps without raising the abdominal straps. For the driver's safety, it is important that the abdominal straps be in the right position, i.e. as low as possible on the driver's hips, as shown in fig. 3.

Fig. 1 Esatto posizionamento dei cosciali di tipo A
Correct positioning of type A leg pieces

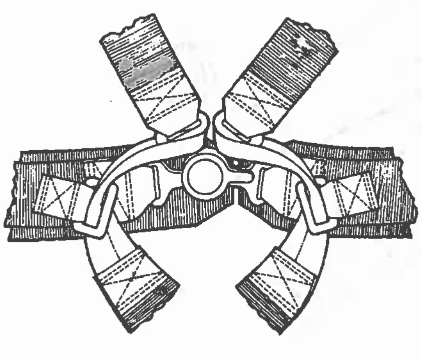
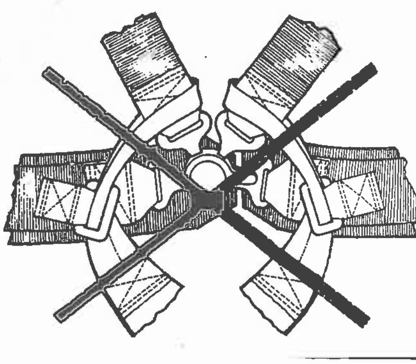


Fig. 2 Errato posizionamento dei cosciali di tipo A
Incorrect positioning of type A leg pieces



COD. 301076- 3b cascine vica

3) Come aprire la fibbia

Far ruotare la leva di sgancio finchè si senta uno scatto metallico e la leva giunga a fine corsa in posizione di apertura. Le lingue vengono espulse contemporaneamente, liberando così il pilota dalla cintura. La leva di sgancio resterà in posizione di apertura finchè il pilota non la farà ruotare in senso contrario.

4) Pulizia

Per pulire il tessuto della cintura basterà passarvi sopra, di tanto in tanto, una spugna imbevuta di acqua calda saponata. Si eviti di candeggiare o tingere la cintura in quanto ciò potrebbe pregiudicare le caratteristiche intrinseche del tessuto.

5) Note importanti

- Evitare che il tessuto sfreghi contro i punti vivi e taglienti del sedile o della scocca.
- Controllare periodicamente l'efficienza della cintura o dei suoi componenti.
- Le cinture che abbiano subito danni (tagli, sfilacciature) oppure siano state usate su vetture coinvolte in incidenti debbono essere immediatamente sostituite e nel caso di incidenti si consiglia pure di fare controllare che i punti di ancoraggio sulla vettura non abbiano riportato danni.
- Non introdurre varianti alla configurazione della cintura (es. aggiungere o eliminare un ramo della cintura).

3) Opening the buckle

Rotate the release lever until you hear a click and the lever reaches the fully open position. The tongues are ejected simultaneously and the driver is not buckled anymore. The release lever stays in the open position until it is rotated in the opposite direction by the driver.

4) Cleaning

To clean the harness, wipe the webbing with a sponge soaked in hot soapy water. Do not bleach or dye the seat-belt as this might reduce the fabric's intrinsic properties.

5) Important warnings

- *Make sure that the fabric does not rub against sharp corners or cutting edges of the seat or body work.*
- *Check at regular intervals the efficiency of the belt and its components.*
- *Seat-belts that have been damaged (cuts, fraying) or used in cars involved in an accident must be immediately replaced and, in the event of an accident, it is also recommended to make sure that the anchorage points in the cars are undamaged.*
- *Do not modify in any way the configuration of the seat-belt (i.e., add or remove a strap, etc.).*

Vettura monoposto
Single-seater car

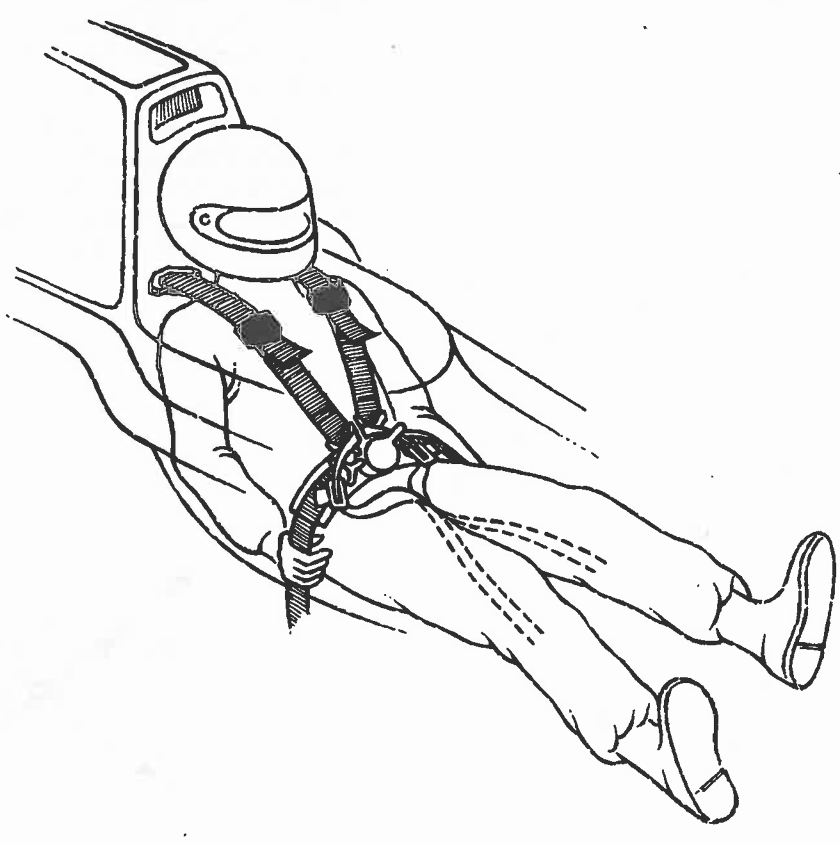


Fig. 3

ISTRUZIONI PER IL MONTAGGIO DELLA CINTURA
SEAT-BELT ASSEMBLY INSTRUCTIONS

USARE GLI ANCORAGGI PREVISTI DAL COSTRUTTORE DEL VEICOLO.

1) Fissaggio dei rami cintura ai relativi ancoraggi del veicolo

A seconda del modello di cintura ci sono vari tipi possibili di sistemi di fissaggio rappresentati ad esempio nelle fig. 4-5-6-7. Nel montaggio di tipo 5 occorre verificare che a fissaggio avvenuto la staffetta "A" possa ruotare agevolmente attorno alla vite in modo da autoposizionarsi correttamente.
In ogni caso i sistemi di fissaggio dei vari modelli di cinture sono conformi allo standard FIA 8853-1998.

2) Nota

Per il montaggio della cintura sulla vettura utilizzare solo i punti di ancoraggio previsti dalla casa costruttrice del veicolo **(consultare il libretto di uso e manutenzione)**. La società Belt & Buckle declina ogni responsabilità nel caso di un montaggio non conforme.

USE THE BRACKETS PROVIDED BY THE CAR MANUFACTURER.

1) Fastening the seat-belt straps to the relative fittings in the car

Depending on seat-belt model, there may be different fastening systems as shown for instance in figs. 4-5-6-7. When assembling type 5 make sure that the seat-belt straps fastened with bracket "A" can rotate freely around the screw into the correct position.
All fastening systems of the different models are conform to FIA 8853-1998 Std

2) Warning

*To assemble the seat-belt onto the car, use only the anchorage points specified by the car manufacturer **(see the use and the maintenance booklet)**. Belt & Buckle declines any liability in the event of erroneous assembly.*

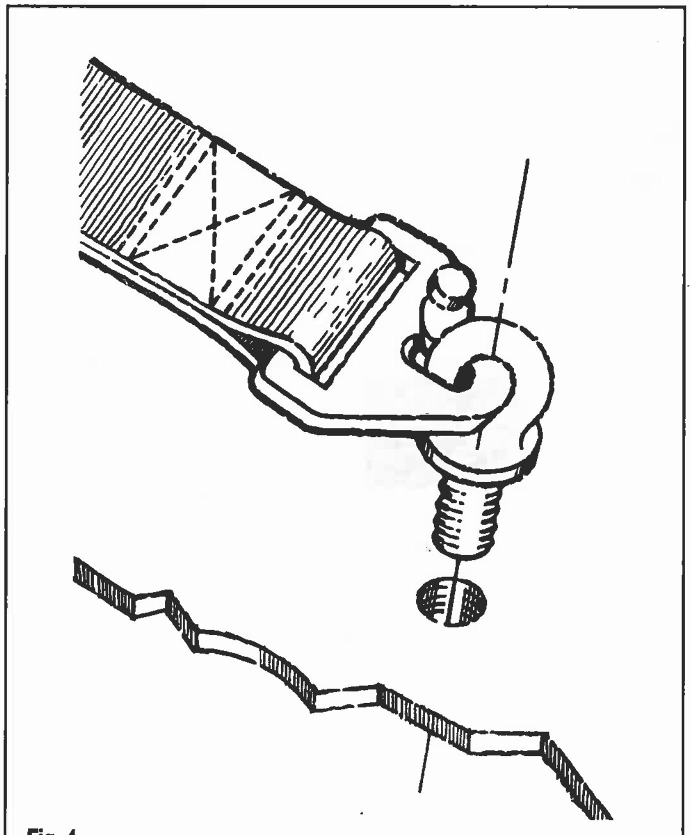


Fig. 4

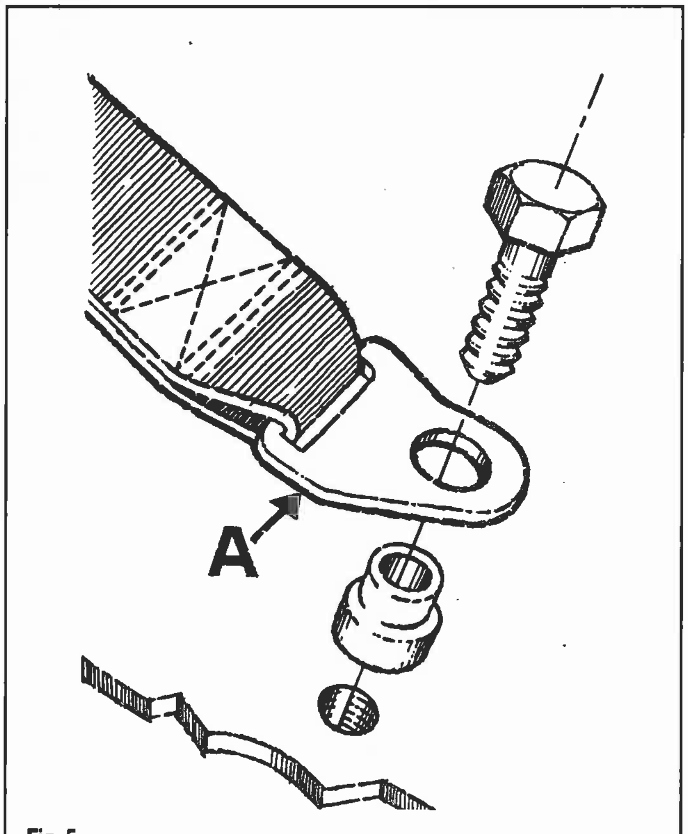


Fig. 5

Fig. 6

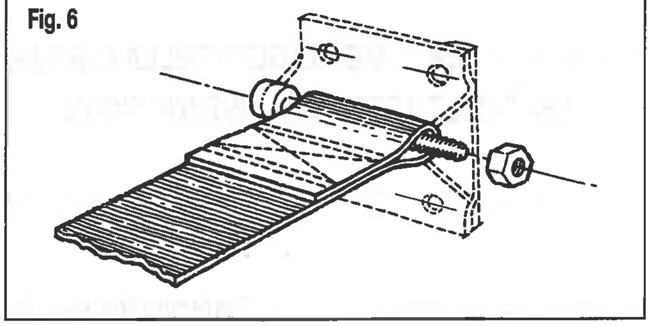
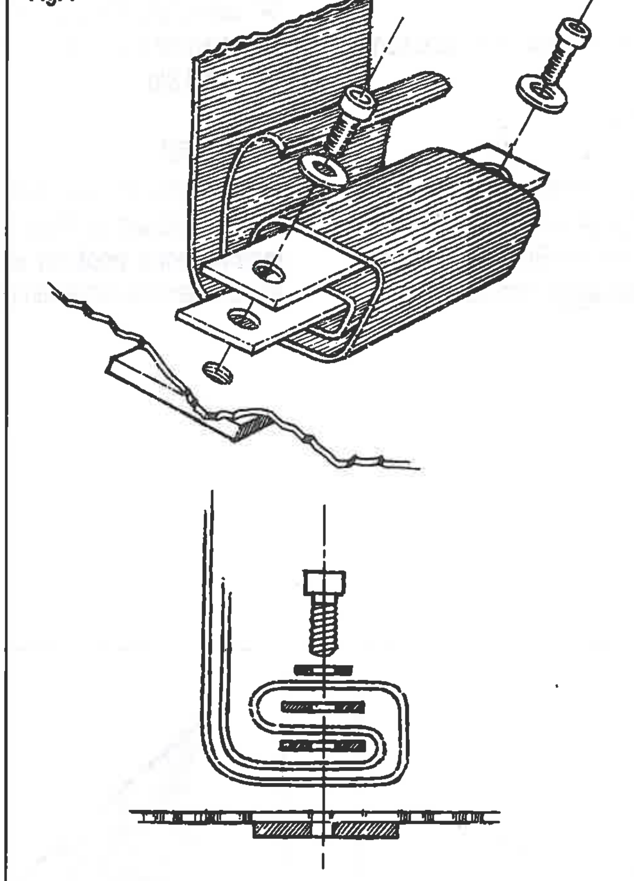


Fig. 7



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FITTING INSTRUCTIONS

Thank you for purchasing an FIA approved Sparco fire system. It is important that you read these instructions carefully before attempting to install you extinguisher system.
The system should in no way be modified or tampered with as by doing so, you could seriously affect its performance. If you need to replace parts, only genuine Sparco components should be used.
Should you experience any difficulties installing your system, please do not hesitate to contact Sparco on +39 011 4211911.
Important note: the purpose of any vehicle fire protection system is to provide a time envelope in which to control the fire in order to accomplish evacuation of the occupants. Ideally, the fire will be totally extinguished, but this cannot be guaranteed. Holding the intensity of an engine or a cockpit fire to enable the occupants to evacuate or allow outside assistance to be given, is the main purpose.

Unpack the kit carefully and check that all components are complete. Lay out the components so that each may be identified.
Remove the extinguisher from its mounting bracket by undoing the overcentre clips. Decide the bet position for the extinguisher to be mounted bearing in mind that the extinguisher label, showing its contents and pressure gauge should be clearly visible. Securely mount the extinguisher bracket to the vehicle and replace the bottle.

ELECTRICAL SYSTEM

Mount the power pack so that is clearly visible. Mount the switches to the vehicle, noting that the switch with the red plastic shroud is for the cockpit. The switch with the flexible push botton is for the outside of vehicle as it is waterproof. It should be fitted at the lower part of the windscreen mounting. The cockpit switch should be mounted so that it is within easy reach of the driver and co-driver when sitting in the normal driving position and wearing fully fastened seat belts.

- WIRING OF SYSTEM

All Sparco electrical extinguisher kits have a separate power pack unit to provide the current needed to operate the system. The power pack should be wired independently from the vehicle's electrics as failure to do this may result in the actuation of the system due to electric interference from the vehicle's power source. Before wiring up the extingusher use a voltmeter to check, when the switch is in the ON position and the button is pushed, there is a voltage of not less than 7 Volt through the external terminals. When the switch is in the OFF-CHECK position and the button is pushed, use a milliamperometer to check that the current between external terminals does not exceded 1mA. Make the electrical connections as shown in the diagram.
Once the system has been wired a test check should be carried out to ensure that the system will fire properly. Before you start the check procedure, ensure that the bottle and the power pack are connected.

- OPERATING

When the switch is in the ON position, the system is ready to be used: by pressing either the outside or inside pushbutton the extinguisher will be turned on. In all situation when it is not necessary to use the system (prolonged stopovers in the pits during races, transfer journeys, servicing and closed parks for rallies) you are advised to turn the switch to OFF-CHECK position to avoid accidental activation. When the switch is in the OFF-CHECK position, by pressing any of the start buttons, is possible to check the following:
1 Efficiency of pushbutton which has been pushed
2 Continuity of connections between the control unit and the extinguisher; the le CIRCUIT light up if there are no breaks
3 Battery efficiency: the BATTERY led will light up only if the charging status of the battery is sufficient to guarantee extinguisher operation.

IMPORTANT: given that the the battery suupLies a high level of current to simulate operating conditions when the switch is in the OFF-CHECK position, you are advised to limit the duration and frequency of controls. The use of 9 Volt transitor-type alkaline-manganese batteries (IEC 6LF22) is recommended.

MECHANICAL SYSTEM

These systems are operated using pull cables. Each kit is supplied with two cables, one being 6ft in lenght and the other, 12ft. Decide upon the best position for the pull cables to be mounted, bearing in mind that the cable mounted in the cockpit should be accessible to driver and co-driver when sitting in the normal driving position and wearing fully fastened seat belts. The external cable is normally mounted at the lower part of the windscreen mounting. When installing the pull cable on a saloon car, ensure that you leave sufficient clearance for the bonnet to fully open.
The pull cables should be rooted so that there are no sharp bends or S-shapes in the cable, this will ensure easy operation for the cables. The end of the cable should be passed through the levers of the extinguisher head and secured using the cable clamps attached to the end of the cables. It is advisable to leave a small amount of slack in the cable to prevent accidental firing of extinguisher. It is recommended that the cables are periodically lubricated and checked to prevent seizure.

- NOZZLES

It is important that the correct nozzles, supplied with the system, are used. The nozzles will produce an atomized foam spray. This foam spray, with its controlled particle size, has an exccellent fire known-down and fire-out capability. It covers the area being protected with a milky foam substance which has a cooling effect and also controls re-ignition. At the end of the discharge, as pressure drops, the solution will thicken to a stiffer foam consistency. The nozzles produce a 90° full cone spray pattern with an effective discharge range of 1 meter. This should be borne in mind when locating the nozzles.
Each kit is supplied with the correct number of nozzles and T-pieces to allow the correct number of nozzles to be plumbed to either the engine or the cockpit.

- Cockpit nozzle location for closed cars
Two nozzles should be mounted in the cockpit area. We recommend that these are mounted under the dashboard, spraying down into the foot well of both the driver and passenger compartment.
- Cockpit nozzle location for open car
One nozzle should be mounted in the cockpit area of an open car. The nozzle should be aimed at the driver's mid rif, in the normally seated position. Special care should be taken to ensure that the nozzle will not spray into the driver's face.
- Engine nozzle location for both open and closed cars
Two nozzles should be mounted in the engine compartment. These nozzles spray either side of the engine, ensuring full coverage. We recommend that the nozzles are mounted diagonally apart and approximately 200 mm below the bonnet shut line.
Sparco nozzles are designed so that they can be mounted through a bulkhead or to a specially made bracket. Nozzles should be machanically secured and not be simply supported by their own pipework.

- TUBING

Each extinguisher kit is supplied with a roll plastic coated aluminium tube. The system has been designed and homologated to use this type of tube. Under no circumstances should the tubing be changed for another type.

- TUBE CONNECTIONS

To enable a simple installation, the extinguisher and nozzles use push-in fittings for the tube. To attach the tube to the fitting, ensure that the end of the tube is cut at 90° and that the outside diameter has retained its circular shape. Insert the tube into the fitting, pushing firmly until it clicks. You should then be unable to pull the tubing back out of the fitting.
To remove the tubing, push the tube into the fitting and pull the black collar on the fitting in the same direction. Once this is done, pull the tube from the fitting.

TECHNICAL SPECIFICATION OF EXTINGUSHING PRODUCT

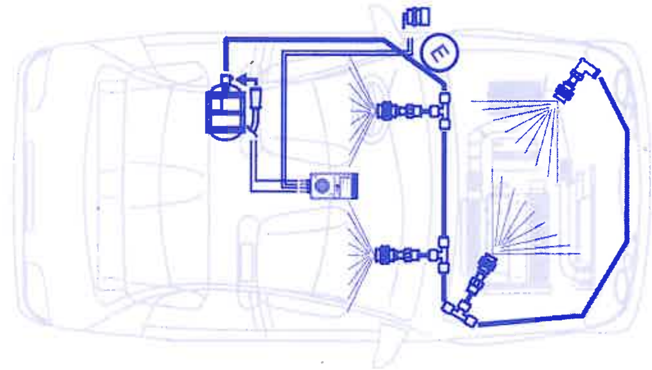
USAGE	Racing cars, including saloon, single seaters and other cars
CONTENTS	Foam solutions, 15% with de-ionised water
DISCHARGE AREAS	Engine compartment and driver's compartment
DISCHARGE TYPE	The product is stored in a container, and discharged through atomising nozzles as a very fine mist. Upon settling, it turns to milky white liquid.
COMPOSITION	Multi-purpose synthetic foam based solution, based on salts of alkyl ether sulphates, together with solvents and foam stabilisers
APPEARANCE	Clear amber liquid in solution
SPECIFIC GRAVITY	Typically within the range of 1016 +/- 0.01
ODP (Ozone Depletion Potential)	None
pH	8.0 +/- 0.5
CLOUD POINT	None
FREEZING POINT	-10° Centigrade
FLASH POINT	>100° Centigrade
SUSPENDED SEDIMENT	Less than 0.2%
MAX STORAGE TEMP	+49° Centigrade
PHYSIOLOGICAL PROPERTIES	Harmless, non-toxic liquid in solution

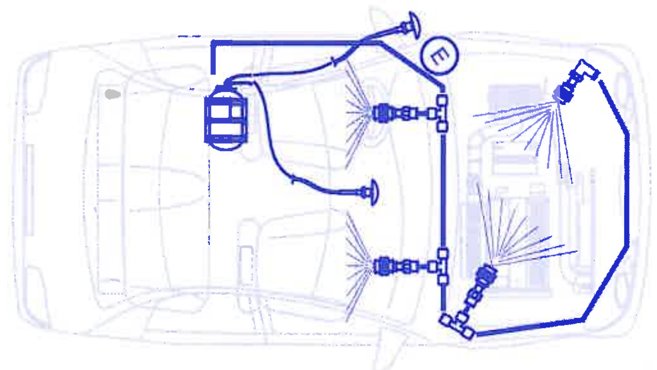
MAINTENANCE

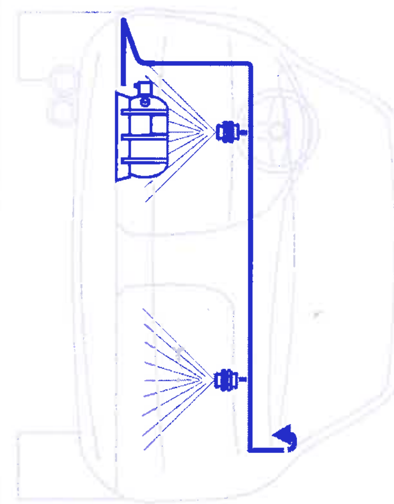
To ensure that you get the best possible performance from your fire system, the following checks and maintenance procedures should be carried out.
- Regularly check pressure gauge or gauges are in the green sector
- Regularly check the nozzles for obstructions and foreign bodies
- Regularly check the integrity of the pipework and the fittings
- Regularly inspect the cylinder for damage

- Your system should be serviced every two years. A service date is written on extinguisher label. It is up to you to ensure that the service is carried out at the correct intervals. Servicing of the extinguisher must only be carried out by Sparco or one of its official agents. You will need to send the cylinder, along with nozzles to be serviced
- If your system is discharged, it must be returned only to Sparco or one of its agents for refilling

Your Sparco fire system will be rejected from scrutineering if:
- The gauge reads in the red sector
- The tamper-proof label is not intact
- Non-genuine Sparco parts have been used
- The contents are below the specified weight
- The extinguisher label is worn or damaged
- The extinguisher is not within service date
- The system is in poor condictions







KINGDRAGON WASHABLE

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Congratulazioni!
Avete scelto quanto di meglio esiste nel campo dei filtri aria per autoveicoli ! I filtri KINGDRAGON LONG LIFE sono prodotti coi
nel nostro laboratorio su banco di prova secondo le norme SAE J 726. Queste sofisticate attrezzature di produzione e controllo sc
tennale nella progettazione e produzione di filtri per ogni tipo di veicolo. I filtri KINGDRAGON LONG LIFE , grazie al loro particola
gnato con una speciale miscela di olii e resine, garantiscono un elevato potere di filtrazione e un flusso d' aria molto superiore ai r
riori sono assicurate per lunghe percorrenze anche su strade polverose e consentono di disporre sempre della massima potenza
quindi con notevole risparmio.
Leggere attentamente le istruzioni di manutenzione. I filtri KINGDRAGON sono applicabili su qualunque tipo di autoveicolo.
ATTENZIONE! Il filtro é già oliato e pronto all' uso.

Congratulations!
You have chosen the best vehicle air filters on the market. Kingdragon long life air filters are manufactured by the most advance
our labs to SAE J 726 standards. This sophisticated manufacturing and control equipment is managed by a team technicians wi
tion of filters for every type of vehicle. With their special filtering element, made up of several layers of pure cotton with a particul
guarantee a high filtering power and an air flow well above that of normal paper or sponge filters. This superior performance is gu
sure maximum power from your engine with minimum fuel consumption and therefore considerable savings.
Read the maintenance instructions carefully. The Kingdragon filters can be applied on all types of vehicle.
ATTENTION! The filter is already oiled and ready for use.

Félicitations!
Vous avez choisi ce qui se fait de mieux dans le domaine des filtres à air pour véhicules.Les filtres à air KINGDRAGON LONG LIFI
matériaux les plus avancés. Par ailleurs, ils sont testés dans notre laboratoire sur un banc d' essai conforme aux normes SAE J 7
contrôle sont gérés par une équipe de techniciens qui ont acquis une expérience de trois décennies dans le domaine de l' étude e
cules. Les filtres KINGDRAGON LONG LIFE, grâce à leur élément filtrant multicouches en pur coton imprégné d' un mélange spé
cité de filtrage et un débit d' air nettement supérieur aux filtres traditionnels en papier ou éponge. Ces performances de haut nive
sur des parcours poussiéreux, et permettent de disposer toujours de la puissance maximale du moteur, au bénéfice de la consom
Lire attentivement le mode d' emploi. Les filtres KINGDRAGON LONG LIFE peuvent être installés sur n' importe quel type de véhic
ATTENTION! Le filtre est déjà lubrifié et prêt à l' usage.

Herzlichen glückwunsch!
Sie haben sich für das beste Produkt entschieden, das es im Bereich der Luftfilter für Fahrzeuge gibt ! Bei den Luftfiltern KINGDR
unter Einsatz modernster Verfahren und bester Materialien gefertigt und auf den Versuchsständen in unseren Laboratorien gemäl
ten Produktions- und Kontrollausrüslungen werden von einem Technikerteam überwacht, dasüber eine dreißigjährige Erfahrung
Fahrzeugtypen verfügt. Dank ihrem mehrschichtigen Filtrationselement aus reiner, mit einer speziellen Öl- und Harzmischung im
LONG LIFE-Filter ein hohes Filtrationsvermögen und einen weit höheren Luftstrom, als es bei herkömmlichen Papier- oder Schw
schaften bleiben über viele Fahrkilometer erhalten und werden auch auf staubigen Straßen gewährleistel, so daß stets die maxima
len Kraftstoffverbrauch und damit eine erheblichen Ersparnis sichergestelt ist. Lesen Sie die Wartungsanleitungen aufmerksam
beliebiger Bauart verwendet werden.
ACHTUNG! Der Filter ist bereits geölt und gebrauchsfertig.

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SERVICE D'ENTRETIEN TOUS LES 20.000 KM.

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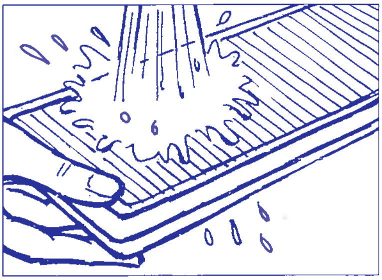

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CAREFULLY RINSE THE TWO SIDES OF THE FILTER UNDER RUNNIN
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RINCER SOIGNEUSEMENT À GRANDE EAU LES DEUX CÔTÉS DU FIL
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DIE BEIDEN SEITEN DES FILTERS SORGFÄLTIG UND BIS ZUR VOLLST
FLIEßENDEM WASSER SPÜLEN.

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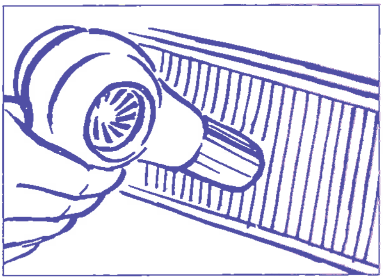

ASCIUGARE CON UN PHON CALDO PER CIRCA 15 MINUTI. LA FIBI
ROBUSTA E NON VIENE DANNEGGIATA DAL GETTO D' ARIA CALDA.

DRY UNDER HOT AIR FOR ABOUT 15 MINUTES. THE FIBRE USED B
DAMAGED BY JET OF HOT AIR.

SÉCHER AU MOYEN D' UN SÈCHE-CHEVEUX CHAUD PENDANT ENVII
DRAGON EST TRÈS ROBUSTE ET N' EST PAS DETERIORÉE PAR LE JE

MIT EINEM WARMLUFTFÖN ETWA 15 MINUTEN LANG TROCKNEN. D
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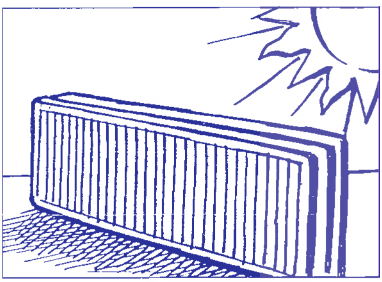
ドライヤーで15分ほど乾燥させます。当社のフィルター
え得る丈夫なものです。



NATURALMENTE É POSSIBILE ASCIUGARE IL FILTRO ALL' ARIA APER
RE PER GARANTIRE UNA PERFETTA ASCIUGATURA.

IT IS OF COURSE POSSIBLE TO DRY THE FILTER IN THE OPEN AIR BU

NATURELLEMENT, ON PEUT SÉCHER LE FILTRE À L' AIR. IL FAUDR
OBTENIR UN SÉCHAGE PARFAIT.

NATÜRLICH KANN DER FILTER AUCH AN DER LUFT GETROCKNE
TAUFWAND BIS ZUR VOLLSTÄNDIGEN TROCKNUNG ERFORDERLICH.

もちろん、フィルターは自然乾燥させることも可能です
を要します。

SPRUZZARE L' OLIO KINGDRAGON SUI DUE LATI DEL FILTRO FINO AD O
SENZA ECCEDERE NELLA QUANTITÀ. NON UTILIZZARE ALTRI TIPI DI OLIO

SPRAY KINGDRAGON OIL ON THE TWO SIDES OF THE FILTER UNTIL IT
USING AN EXCESSIVE AMOUNT OF OIL. DO NOT USE OTHER TYPES OF OI

VAPORISER L' HUILE KINGDRAGON SUR LES DEUX CÔTÉS DU FILTRE, JU
ME, SANS EXAGERER. NE PAS UTILISER D' AUTRES TYPES D' HUILES.

DAS KINGDRAGON-ÖL AUF BEIDE SEITEN DES FILTERS SPRÜHEN, BIS
FARBTON ERREICHT IST, DIE QUANTITÄT DABEI JEDOCH NICHT ÜBERSCH

フィルターの両面に、キングドラゴン・オイルを、全体
なお、ほかのオイルはご使用にならないでください。

PULIRE BENE LA SEDE D' APPOGGIO NEL CONTENITORE, RIMONTAR
ETICHETTA DI RICONOSCIMENTO DEI FILTRI LAVABILI KINGDRAGON.

CAREFULLY CLEAN THE FILTER SEAT IN THE CONTAINER, REASSEMB
WASHABLE FILTER LABEL ON THE LID.

NETTOYER SOIGNEUSEMENT LE SUPPORT DU BOTTIER, MONTER LE
ÉTIQUETTE D' IDENTIFICATION DES FILTRES LAVABLES KINGDRAGON

DEN AUFLAGESITZ IM BEHÄLTNIS GUT REINIGEN, DEN FILTER WIEDE
DER WASCHBAREN KINGDRAGON-FILTER AUF DEM DECKEL ANBRIN

フィルターの外枠容器をていねいに掃除してから、フィ
ドラゴン洗浄可能フィルターのシールを貼ります。

Arcobaleno Parts Kit (Rev #1 07/30/01)

CODE NUM.	QTY	ENGLISH DESCRIPTION	ITALIAN DESCRIPTION
ACS10001	1	RIGHT MIRROR	SPECCHIETTO DX
ACS10002	1	LEFT MIRROR	SPECCHIETTO SX
ACS10003	1	SAFETY BELT	CINTURE DI SICUREZZA
ACS10004	1	STOP CABLE	CAVO STOP
ACS10005	4	MOTOR OIL	OLIO MOTORE (L./kg)
ALM10001	1	FUEL TANK	SERBATOIO
ALM10002	1	FILLING TANK TUBE	TUBO RIEMPIMENTO SERBATOIO
ALM10003	3	SILENT BLOCK	SILENT BLOCK
ALM10004	1	FILLING TANK CAP	TAPPO DEL SERBATOIO
ALM10005	1	RUBBER TUBE (FUEL PIPE d:7mm)	TUBO SFIATO RILSAN d:7 L=1900mm
ALM10006	1	SAFETY VALVE	VALVOLA DI SICUREZZA
ALM10007	1	FUEL PUMP	POMPA BENZINA
ALM10011	2	AIR FILTER	FILTRO ARIA
ALM10020	1	PIPE FITTING FOR FUEL TANK D:13,5 mm d:5,5mm	RIDUZIONE SERBATOIO D:13.5 d:5.5
ALM10021	1	PIPE FITTING FOR FUEL TANK D:9 mm d:5,5mm	RIDUZIONE SERBATOIO D:9 d:5.5
ALM10025	4,5	FUEL PIPE d:7mm	TUBO TELATO BENZINA d:(L./M)
BLA20001	2	FRONT SUSPENSION ROD	BIELLA DI RINVIO ANTERIORE
BLP20001	2	REAR SUSPENSION ROD	BIELLA DI RINVIO POSTERIORE
BRC20001	2	FRONT LOWER WISHBONE	BRACCIO INFERIORE ANTERIORE
BRC20002	1	FRONT LEFT UPPER WISHBONE	BRACCIO SUPERIORE ANTERIORE SX
BRC20003	1	FRONT RIGHT UPPER WISHBONE	BRACCIO SUPERIORE ANTERIORE DX
BRC20004	2	FRONT PULL ROD	TIRANTE PULL-ROD ANTERIORE
BRC20005	1	FRONT ANTI ROLL BAR	BARRA STABILIZZATRICE ANTERIORE
BRC10006	1	UPPER SUPPORT FOR FRONT SHOCK ABSORBER	GABBIANO
BRC10007	4	DOUBLE THREAD PIN	PERNO DOPPIOFILETTO
BRC10008	32	TAPERED SPACER 10x22 L. 5 mm	DIST.CONICO SOSP. 10X22 L5 ACC.
BRC20009	2	REAR UPPER WISHBONE	BRACCIO SUPERIORE POSTERIORE
BRC20010	1	REAR LEFT LOWER WISHBONE	BRACCIO INFERIORE POSTERIORE SX
BRC20011	1	REAR RIGHT LOWER WISHBONE	BRACCIO INFERIORE POSTERIORE DX
BRC20012	2	REAR PUSH ROD	PUNTONE PUSH-ROD POSTERIORE
BRC20013	2	REAR TOE-IN ROD	TIRANT CONVERGENZA POSTERIORE
BRC20014	1	REAR ANTI ROLL BAR	BARRO STABILIZZATRICE POSTERIORE
BRC10015	4	SPACER(TAPE ROD) UNDER BEARING SUPPORT REAR	DIST. CONICO MOZZI 12X32 L8 ALL

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BRC10016	4	REAR PUSH-ROD	DISTANZIALE CONICO 12X32 L4 ALL
CMB10002	1	GEAR LEVER KNOB	POMELLO
CMB10003	1	DOUBLE THREAD GEAR LEVER	PRIGIONIREO TIRANTE CAMBIO
CMB10004	1	INTERNAL GEAR SHIFT ROD	TIRANTE INTERNO
CMB10006	1	EXTERNAL GEAR SHIFT ROD	TIRANTE ESTERNO
CMB 10007	1	GEAR BOX SHIFT ROD	BIELLETTA SCANALATA
CMB10008	1	BOLT TO CLOSE SHIFT LEVER (CLAMPING)	BULLONE PER BIELLETTA YAMAHA
CMB10010	2	INTERNAL BUSH FOR GEAR SHIFT LEVER	BOCCOLA INTERNA LEVA DEL CAMBIO
CMB10011	2	GEAR SHIFT LEVER	LEVA CAMBIO ALLUMINIO
CMB 20003	1	GEAR LEVER TRANSVERSE RETURN	RINVIO TRASVERSALE DEL LEVERAGGIO
CPN10005	2	FRONT RIM 6,5"x13"	CERCHIONE ANT. 6.5X13
CPN10006	2	REAR RIM 8"x13"	CERCHIONE POST. 8X13
CTR10001	7	NON-NYLOC 6MM NUT	DADO ESAG. 5589 P/G M6 6S
CTR10002	14	NON-NYLOC 8MM NUT	DADO ESAG. 5589 P/G M8
CTR10003	16	NON- NYLOC 10MM NUT	DADO ESAG. 5589 P/G CL. 8 M10
CTR10004	4	NON-NYLOC 12MM NUT	DADO ESAG. 5589 P/G M12 6S
CTR10005	6	NON-NYLOC 8MM NUT (PG SX)	DADO ESAG. 5589 SX P/G M8
CTR10006	2	NON-NYLOC	DADO ESAG. 10X1 H.6 SX
CTR10008	8	NON-NYLOC 12MMX1.5MM NUT	DADO ESAG 5589 P/F CL.8 12X1.5
CTR10009	2	NON-NYLOC 14MMX1.5	DADO ESAG. 5589 M14X1.5 6S
CTR10010	4	NON-NYLOC 12MM NUT	DADO ESAG. 5589 P/G M12X1.75SX
CTR10011	2	NON-NYLOC 10MM NUT	DADO ESAG. 5589 M10X16S ZB SX
CTR10012	2	NON-NYLOC 8MM NUT	DADO ESAG. 5589 P/G M8X16S
CTR10013	2	NON-NYLOC 8MM SX NUT	DADO ESAG. 5589 P/G M8X16S SX
CTR10014	1	NON-NYLOC 16MM NUT	DADO ESAG. 5589 M16X2
CTR10015	14	NON-NYLOC 6MM NUT	DADO ESAG. 5587 M6 PG 6S ALTO
CRZ10006	1	FRONT WING	ALETTONE ANTERIORE
CRZ10007	1	REAR WING	ALETTONE POSTERIORE
CRZ10012	2	FRONT WING VERTICAL FLANGE	FLANGIA VERTICALE ALA ANT.
CRZ10013	2	REAR WING VERTICAL FLANGE	FLANGIA VERTICALE ALA POST.
DAU10001	8	NYLON 3MM NUT	DADO AUTOBL. B M3
DAU10003	6	NYLON 5MM NUT	DADO AUTOBL. B M5 6S
DAU10004	36	NYLON 6MM NUT	DADO AUTOBL. B M6 6S
DAU10005	63	NYLON 8MM NUT	DADO AUTOBL. B M8 6S
DAU10006	50	NYLON 10MM NUT	DADO AUTOBL. B M10 6S
DAU10007	16	NYLON 12MM NUT	DADO AUTOBL. B M12 6S
DAU10008	4	SELF LOCKING NUT FOR WHEELS	DADO AUTOBL. A M16X1.5 6S FISSAGGIO RUOTA

DAU10009	2	NUT FOR REAR SHOCK ABSORBER(REAR STUD)	DADO AUTOBL. B M12X1.5 6S
DAV10001	3	DASHBOARD PANEL NUT	DADO CIECO IN OTTONE M6
DAV10002	2	REAR AXLE OVAL NUT	DADO AUTOBL. B M12X1.5 6S
DAV10003	8	EXHAUST MANIFOLD NUT	DADO DEL COLLETTORE SCARICO M8
DAV10004	1	NUT	ESAG. UNI5587 CL8 PG ALTO M6
DAV10005	10	NUT	DADO ESAG. 5587 M8 6S ALTO
ELT10001	1	YAMAHA ELECTRONIC CONTROL UNIT	CENTTRALINA ELETTRONICA
ELT10004	2	WIRE HARNESS	
ELT10005	6	REAR RED LIGHT	
ELT10007	20	WIRE HARNESS ANCHOR PLATE	
ELT10011	2	IGNITION COIL FOR CYL. 1-4	BOBINA 1-4 4FM-82310-01
ELT10012	2	IGNITION COIL FOR CYL. 2-3	BOBINA 2-3 4FM-82320-01
ELT10014	12	PLUG CLAP	PIPETTE
ELT10016	3	START RELAY	RELAIS AVVIAMENTO(solenoide)
ELT10017	4	BATTERY	BATTERIA
ELT10027	2	COOLING FAN	
ELT10028	2	FAN WIRING	
EST10001	1	FIRE EXTINGUISHER TANK	IMPIANTO ESTINZIONE COMPLETO
EST10002	*	FIRE EXTINGUISHER PIPES	
EST10003	*	FIRE EXTINGUISHER ELECTRC STARTING SYSTEM	
FFT10003	1	FRONT BRAKE PIPE	TUBO FRENO ANTERIORE
FFT10005	1	REAR BRAKE PIPE	TUBO FRENO POSTERIORE
FFT10006	2	BRAKE PUMP	POMPA FRENI
FFT10007	1	CLUTCH PUMP	POMPA FRIZIONE
FFT10008	3	BRAKE/CLUTCH FILLING PIPES	TUBO RIEMP. OLIO FRENI/FRIZIONE(L.4m)
FFT10009	3	BRAKE/CLUTCH OIL TANK	VASCHETTA OLIO FRENI/FRIZIONE
FFT10010	6	BRAKE/CLUTCH OIL TANK SPACER	DIST. VASCHETTE OLIO 5.2X8 L20 ALL.
FFT10011	2	FITTING FOR CLUTCH PUMP	RACCORDO POMPA FRIZIONE
FFT10013	1	FITTING FOR ALLUMINIUM PIPE	RACCORDO PORTA TUBO ALLUM.
FML10001	10	METAL CLAMP mm 20-32	FASCETTA METALLICA A VITE 20-32
FML10002	1	METAL CLAMP WATER TANK	FASCETTA METALLICA A VITE 78-98
FML10003	4	METAL CLAMP mm 8-12	FASCEATTA METALLICA A VITE 8-12
FML10004	1	METAL CLAMP mm 50-70	FASCETTA METALLICA A VITE 50-70
FML10006	2	METAL CLAMP mm 16-27	FASCETTA METALLICA A VITE 16-27
FML10007	1	METAL CLAMP mm 32-50	FASCETTA METALLICA A VITE 32-50
FML10008	1	METAL CLAMP mm 140-160 (FOR FIRE EXTINGUISHER TANK)	FASCETTA METALLICA A VITE 140-160 LAVORATA
FML10009	8	METAL CLAMP mm 10-16	FASCETTA METALLICA A VITE 10-16

FML10010		2	METAL CLAMP mm 80-100	FASCETTA METALLICA A VITE 80-100
FPL10001	*		PLASTIC CLAMP 1620.26	
FPL10002	*		PLASTIC CLAMP 1620.36	
FPL10003	*		PLASTIC CLAMP 1629.36	
FPL10004	*		PLASTIC CLAMP 1618.48	
FPL10005	*		PLASTIC CLAMP 1630.78	
FPL10006	*		PLASTIC CLAMP 1636.78	
FRN10001		1	FRONT RIGHT BRAKE DISK	DISCO MONOLITICO ANT. COMPLETO DX
FRN10003		1	FRONT LEFT BRAKE PLIER	PINZA FRENO ANTERIORE SX
FRN10004		6	BRAKE PAD	PASTIGLIA FRENO
FRN10005		4	FRONT BRAKE SPACER	DIST. FRENO ANT. 12X19 L 11 ALL.
FRN10006		1	REAR DISK	DISCO AUTOVENTILANTE POST.
FRN10008		1	REAR PLIER	PINZA FRENI POSTERIORE
FRN10009		1	REAR BRAKE SPACER L. 26mm	DIST. FRENO POST. LUNGO 12.5X25 L 26 ALL.
FRN10010		1	REAR BRAKE SPACER L. 14 mm	DIST. FRENO POST. CORTO 12.5X25 L 14 ALL.
FRN10011		1	REAR BRAKE DISK HUB	MOZZETTO IN ACC. SUPP. DISCO POST.
FRN10012		1	FRONT LEFT BRAKE DISK	DISCO MONOLITICO ANT. COMPLETO SX
FRN10013		1	FRONT RIGHT BRAKE PLIER	PINZA FRENI ANTERIORE DX
FRN 10016	*		FRONT BRAKE PLIERS PIPES	
FRN 10017	*		REAR BRAKE PLIERS PIPES	
GRZ10001		4	COPPER WASHER TO CLOSE BRAKE TUBE ON PUMP	GRZ. IN RAME d:10 D:14
GRZ10002		2	COPPER WASHER TO CLOSE BRAKE TUBE ON OIL TANK	GRZ. IN RAME d:12,5 D:18
GRZ10005	*		GASKET FOR OIL PIPE	
LMR10001		1	EXTERNAL PLATE BOTTOM	FONDO PIATTO
LMR10002		1	RIGHT EXTERNAL	LATO ESTERNO DESTRO
LMR10003		1	LEFT EXTERNAL. ALUMINUM PANELS ON CHASSIS	LATO ESTERNO SINISTRO
LMR10004		1	LEFT INTERNAL	LATO ESTERNO SINISTRO
LMR10005		1	RIGHT INTERNAL	LATO ESTERNO DESTRO
LMR10006		1	BACK PLATE (LOWER)	SCHIENALE
LMR10007		1	INTERNAL BASE PAN	FONDO INTERNO
LMR10008		1	UPPER BACK PLATE(INSIDE COCKPIT BEHIND DRIVER)	FONDO SCHIENALE
LMR10009		1	ENGINE PLATE BOTTOM	FONDO MOTORE
LMR10010		1	RIGHT SIDE OF GAS TANK(UPPER)	COPERCHIO SERBATOIO
LMR10011		1	FRONT PANEL	PARATIA ANTERIORE
LMR10012		1	BACK SIDE INBETWEEN FUEL TANK AND SIDE	PANNELLO RETRO SERBATOIO
LMR10013		1	RIGHT SIDE IN BETWEEN FUEL TANK	LATERALE DESTRO SERBATOIO
LMR10014		1	LEFT SIDE INBETWEEN FUEL TANK	LATERALE SINISTRO SERBATOIO

LMR10017	1	LEFT AIR INTAKE BOTTOM	FONDO PANCIA SINISTRA
LMR10018	1	RIGHT AIR INTAKE BOTTOM	FONDO PANCIA DESTRA
LMR10020	1	ACCELERATOR SUPPORT	SUPPORTO CAVO ACCELERATORE
LMR10022	3	AIR INTAKE BOTTOM SUPPORT	TIRANTE PANCE
LMR10023	2	WATER RADIATOR SUPPORT	FLANGE MONTANTI PER ALETTONE POST.
LMR10024	2	REAR WING SUPPORT	COPERCHIO LEVA CAMBIO
LMR10028	1	REMOVABLE PLATE ON GAS TANK(INSPECTION PLATE)	COPERCHIO SERBATOIO AMOVIBILE
LMR10029	2	FLEXIBLE TUBING EXITING BACK OF COCKPIT	TUBO CORRUGATO d:18X20 (L./m)
LMR10030	1	LITTLE PANEL FOR REVERSE GEAR(BACK OF COCKPIT)	PIASTRINA ALL. FISSAGGIO CAVO RETRO
PDL20002	1	ACCELERATOR PEDAL	PEDALE ACCELERATORE
PDL20003	1	BRAKE PEDAL	PEDALE FRENO
PDL10003	1	BRAKE COMPENSATOR	BILANCIERE+ PUNTALINI
PDL10004	*	CABLE FOR BRAKE COMPENSATOR	
PDL10006	1	CLUTCH PUMP ROD	PUNTALINO FRIZIONE
PDL10007	2	ELASTIC RING FOR BRAKE PORTS	SEEGER PER SNODO BILANCIERE
PDL10008	1	SET SCREW (4MM)	PERNO PER CAVO COMANDO BILANCIERE
PDL10012	1	RUBBER RING AROUND ACCEL CABLE IN FRONT OF COCKPIT	PASSACAVI IN GOMMA
PDL10016	1	GAS CABLE	KIT CAVO ACCELERATORE
PDL20004	1	CLUTCH PEDAL	PEDALE FRIZIONE
PDL10016	1	ACCELERATOR CABLE KIT	KIT CAVO ACCELERATORE
PMZ10003	4	FIXED IN HOLE(WHEEL BEARING) CER CLIP	SEEGER 60 UNI7437-75
PMZ10004	4	HUB WHEEL BEARING	CUSCINETTO MOZZO
PMZ10005	8	HUB WHEEL FLANGE	FLANGIA ANODIZZATA
PMZ10006	2	HUB WHEEL PERFORATED FLANGE	FLANGIA FORATA ANODIZZATA
PMZ10007	2	BRAKE PLIERS SUPPORT	STAFFA REGGIPINZA
PMZ10010	2	FRONT HUB WHEEL SUPPORT SPACER 12x16 L. 28 mm	DIST. PORTAMOZZI ANTERIORI 12X16 L 28 ALL.
PMZ10011	2	FRONT HUB WHEEL SUPPORT SPACER 12x16 L. 27 mm	DIST. PORTAMOZZI ANTERIORI 12X16 L 27 ALL.
PMZ10016	4	SAFETY COTTER PIN	SPINA DI SICUREZZA
PMZ10016	16	PARALLEL PIN	SPINA CILINDRICA TRASS. MOTO D:14 L 32
PMZ10017	9	REAR HUB WHEEL SUPPORT SPACER 8x12 L. 27 mm	DIST. PORTAMOZZI POSTERIORE 8X12 L 27 ALL
PMZ10018	2	REAR HUB WHEEL SUPPORT SPACER 12x17 L. 74 mm	DIST. PORTAMOZZI POSTERIORE 12X17 L 74 ALL
PMZ10019	2	REAR HUB WHEEL SUPPORT SPACER 12x17 L. 27 mm	DIST. PORTAMOZZI POSTERIORE 12X17 L 27 ALL
PMZ10025	4	BREAK RIM (DISC)	BLOCCO FERMACERCHIO
PMZ 20003	4	HUB WHEEL	MOZZO LAVORATO
PMZ20004	1	RIGHT SPINDLE STEERING ROD ATTACHMENT	BISCOTTO DESTRO
PMZ20005	1	LEFT SPINDLE STEERING ROD ATTACHMENT	BISCOTTO SINISTRO
PMZ20006	4	THREAD PIN FOR FRONT RIM	PROLUNGA ATTACCO CENTRALE CERCHIO

PMZ20007	*	THREAD PIN FOR REAR RIM	
PMZ20008	2	RIM CENTRAL PIN	PERNO CENTRALE
PMZ20014	4	HUB SUPPORT	PORTAMOZZO MONOLITICO ANODIZZATO
RDT10001	1	WATER RADIATOR	RADIATORE ACQUA
RDT10002	1	WATER TANK	VASCHETTA ESPANSIONE
RDT10004	1	OIL RADIATOR	RADIATORE OLIO
RDT10005	1	OIL FILTER FLANGE	FLANGIA FILTRO OLIO
RDT10006	2	CONNECTS OIL FILTER+OIL REGULATOR(FIXED HOSE)	RACCORDO AUTO-FIT DRITTO
RDT10007	2	BLUE PIECE CONNECTED TO RED PIECE(FROM ABOVE PART)	RACCORDO AUTO-FIT 90 DEGREES
RDT10008	2	TO CONNECT HOSE TO	NIPPLO 1/2" CILINDRICO
RDT10010	1	OIL FILTER	FILTRO OLIO
RDT10011	*	ALLUMINIUM PIPE	TUBO ALUMINIO
RDT10012	1	RADIATORE SUPPORT	SUPPORTO RADIATORE ACQUA
RDT10017	2,5	HIGH-PRESS PIPE	TUBO HIGH-PRESS GOMMA(L./m)
RDT10026	1	WATER TANK CAP	TAPPO VASCHETTA ESPANSIONE
RDT10027	2,1	RUBBER PIPE D:25 mm	TUBO GOMMA d:25(L./m)
RDT10030	2,1	HEAT RESISTANT SHEATH OVER HOSE	GUAINA TERMICA d:25 (L./m)
RDT10031	2,2	RUBBER PIPE D:14 mm	TUBO GOMMA d:14 (L./M)
RDT10032	0,8	HEAT RESISTANT SHEATH OVER HOSE	GUAINA TERMICA d:20 (L./m)
RDT10033	1	ALLUMINIUM CAP FOR ENGINE CRANKCASE	TAPPO IN ALL. USCITA MONOBLOCCO D:13.5
RDT10035	1	STRAIGHT FITTING	RACCORDO DRITTO IN ACCIALO NS. DISEGNO
RDT10040	2	OIL RADIATOR SILENT BLOCK M/F	SILENT BLOCK RADIATORE OLIO M/F
RDT10045	0,7	HEAT RESISTANT SHEATH OVER HOSE	GUAINA TERMICA d:10 (L./m)
RDT20002	1	OIL FILTER SUPPORT DISC	PIASTRA CIRCOLARE DI SUPPORTO
RND10005	38	FITTED WASHER FOR BODY WORK (TAPERED ANODIZED)	RONDELLE SVASATE IN ALL. PER CARROZZ
RND10006	4	FITTED WASHER 5MM	RONDELLA PER M5 5.5X15 UNI6593-69
RND10007	20	FITTED WASHER 6MM	RONDELLA PER M6 6.4X12.5 UNI6592-69
RND10008	2	FITTED WASHER 6MM	RONDELLA PER M6 6.6X18 UNI6593-69
RND10009	34	FITTED WASHER 8MM	RONDELLA PER M8 8.4X17 UNI6592-69
RND10010	4	FITTED WASHER 10MM	RONDELLA PER M10 10.5X21 UNI6592-69
RND10011	4	FITTED WASHER 8MM	RONDELLA PER M8 8.4X32
RND10012	4	FITTED WASHER 5MM	RONDELLE PER M5
RVT10002	164	ALUMINUM RIVET 4X12	RIVETTO ALLUMINIO D:4X12
RVT10003	50	ALUMINUM RIVET 4X16	RIVETTO ALLUMINIO D:4X16
RVT10004	4	ALUMINUM RIVET 5X10	RIVETTO ALLUMINIO D:5X10
SCR10010	1	LEFT INT. PIPE EXHAUST	TUBO SCARICO INTER. SX. 1000
SCR10011	1	LEFT EXT. PIPE EXHAUST	TUBO SCARICO ESTER. SX 1000cc

SCR10012		1	RIGHT INT. PIPE EXHAUST	TUBO SCARICO INTER. DX 1000cc
SCR10013		1	RIGHT EXT. PIPE EXHAUST	TUBO SCARICO ESTER. DX 1000cc
SCR10014		1	RIGHT 2-IN-1 FITTING EXHAUST	TUBO DUE-IN-UNO DESTRO
SCR10015		1	LEFT 2-IN-1 FITTING EXHAUST	TUBO DUE-IN-UNO SINISTRO 1000cc
SCR10016		1	MUFFLER	TERMINALE DI SCARICO SILENZIATO 1000cc
SCR10019		1	MUFFLER SPACER	DIST. TERMINALE SCARICO 10.1X18 L 62 ALL.
SCR10026		6	PIPE EXHAUST SPRING	MOLLE SCARICO
SCR 10024	*		KIT FOR MUFFLER	
SNS10001		1	RADIAL JOINT GE 15C	SNODO RADIALE GE 15C
SNS10004		6	BALL JOINT IKO POSL 8	SNODO SFERICO IKO POSL 8
SNS10006		4	BALL JOINT SMG 12.40	SNODO SFERICO SMG 12.40
SNS10007		2	BALL JOINT SMGM 8.51	SNODO SFERICO SMGM 8.51
SNS10008		12	BALL JOINT SMG 10.40	SNODO SFERICO SMG 10.40
SNS10009		4	BALL JOINT SMGM 10.51	SNODO SFERICO SMGM 10.50
SNS10010		8	BALL JOINT SMGM 12.51	SNODO SFERICO SMGM 12.51
SNS10011		4	BALL JOINT SMGM 14.52	SNODO SFERICO SMGM 14.52
SNS10012		4	BALL JOINT SMLG 12.40	SNODO SFERICO SMLG 12.40
SNS10014		2	BALL JOINT SMLGM 10.51	SNODO SFERICO SMLGM 10.51
SNS10015		2	BALL JOINT SMLGM 8.51	SNODO SFERICO SMLGM 8.51
SNS10016		3	BALL JOINT SM 6.40	SNODO SFERICO SM 6.40
SNS10017		4	BALL JOINT SMG 8.40	SNODO SFERICO SMG 8.40
SNS10018		8	BALL JOINT SMG 8 ST	SNODO SSA 10 PER BILANCIERE FRENO
SNS10019		1	BEARING INSIDE OF BREAK PEDAL	SNODO SSA 10 PER BILANCIERE FRENO
SOS10011		4	SHOCK ABSORBER WITH SPRING SUSPENSION	AMMORTIZZATORI+ MOLLE
SOS10017		2	FRONT ANTI ROLL BAR ROD	TIRANTE BARRA STABILIZZATRICE ANTERIORE
SOS10018		2	PIVOT SPACER 12x17 L. 7 mm	DIST. DEL PIVOT 12X17 L 7 ACC.
SOS10019		2	TIRANTE BARRA STABILIZZATRICE POSTERIORE	TIRANTE BARRA STABILIZZATRICE POSTERIORE
SOS10020	*		DOUBLE THREAD PIN 8.5x15 L. 6 mm	
SOS10029		1	RIGHT PIVOT SUPPORT PLATE	PIASTRA SUPPORTO PIVOT DX
SOS10030		1	LEFT PIVOT SUPPORT PLATE	PIASTRA SUPPORTO PIVOT SX
SOS10031		1	RIGHT PIVOT PYRAMID	PIRAMIDE ALLEGG. PER PIVOT. DX
SOS10032		1	LEFT PIVOT PYRAMID	PIRAMIDE ALLEGG. PER PIVOT. SX
SOS10033		2	PIVOT	PIVOT
SOS10034		2	WASHER PIVOT	RONDELLA FUNGO PIVOT
SOS 10036	*		REAR ANTI ROLL BAR ROD	
SOS10038		8	PUSH AND PULL ROD SPACER 12x18 L.3 mm	DIST. PULL E PUSH-ROD 12X18 L 3 ALL
SOS 10041	*		BLACK SPRING (SUSPENSION SPRING)	

SOS 10042	*	WHITHE SPRING (SUSPENSION SPRING)	
STM10001	1	ALUMINUM DASH PANEL	PANNELLO CRUSCOTTO DIGITALE
STM10002	1	DASHBOARD	CRUSCOTTO DIGITALE COMPLETO
STM10004	1	ON-OFF SWITCH	INTERRUTTORE ON-OFF (rosso)
STM10005	1	RED LIGHT SWITCH	INTERRUTTORE FARO POST.(arancione)
STM10006	1	ENGINE STARTING SWITCH STATING	PULSANTE AVVIAMENTO
STM10008	1	SAFETY BATTERY SWITCH	STACCABATTERIA
STZ20001	1	STEERING BOX	SCATOLA GUIDA
STZ10003	4	TAPERED SPACER FOR STEERING 8.5x22 L. 6 mm	DIST. CONICO STERZO 8.5X22 L 6 ALL
STZ10004	1	CARDAN JOINT	SNODO CARDANICO
STZ10009	1	STEERING COLUMN TEFLON SUPPORT	SUPPORTO TEFLON PIANTONE STERZO
STZ10011	1	STEERING WHEEL HUB	MOZZO VOLANTE
STZ10013	1	CIRCLIP FOR STEERING COLUMN SUPPORT 15MM EXTERNAL	SEEGER FISSAGGIO PIANTONE AV 15
STZ10014	1	CIRCLIP FOR STEERING COLUMN SUPPORT 26MM INTERNAL	SEEGER FISSAGGIO PIANTONE JV 26
STZ10015	1	STEERING WHEEL	VOLANTE
STZ10016	1	ALUMINIUM CAP FOR STEERING COLUMN	TAPPO IN ALLUMINIO PIANTONE STERZO
STZ20001	1	SCATOLA GUIDA	SCATOLA GUIDA
STZ20002	2	STEERING ROD	TIRANTE DELLO STERZO
STZ20003	1	STEERING COLUMN	PIANTONE DELLO STERZO
SUP20004	2	ENGINE LOWER SUPPORT	SUPPORTO INFERIORE
SUP20005	1	RIGHT ENGINE UPPER SUPPORT	SUPPORTO SUPERIORE DX 1000cc
SUP20006	1	LEFT ENGINE UPPER SUPPORT	SUPPORTO SUPERIORE SX 1000cc
TEL20002	1	CHASSIS TUB (COCKPIT) WITHOUT ALUMINUM PANEL	TELAIO CENTRALE VERNICIATO
TEL20003	1	ENGINE CHASSIS	TELAIO MOTORE VERNICIATO
TEL20004	1	FRONT CHASSIS	TELAIO ANTERIORE VERNICIATO
TEL20005	1	ROLL BAR	ROLL-BAR VERNICIATO
TEL20006	1	BATTERY SUPPORT	SUPPORTO ESTINT-BATT. VERNICIATO
TEL20007	1	RIGHT SAFETY BAR	BARRA LATERALE DESTRA
TEL20008	1	LEFT SAFETY BAR	BARRA LATERALE SINISTRA
TPT10001	22	NUT INSERT	INSERTI FILETTATI
TRM10004	2	ADJUSTABLE BEARING	CUSCINETTI ORIENTABILI NTN M-ASPFL 206
TRM10006	2	CENTRAL HOMOKINETIC JOINT	GIUNTO OMOCINETICO CENTR.
TRM10007	2	CASING WITH METAL FLANGE	CUFFIA CON FLANGIA METALLICA
TRM10008	2	SHAFT	SEMIASSE
TRM10009	2	WHEEL HOMOKINETIC JOINT	GIUNTO OMOCINETICO RUOTA
TRM10010	2	CASING	CUFFIA CON FLANGIA METALLICA
TRM10011	2	HALF SHAFT INNER CV JOINT CIRCLIP	SEEGER

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TRM10014		1	CROWN Z:38	CORONA SMONTABILE Z=42
TRM10015	*		CROWN Z:39	
TRM10016	*		CROWN Z:40	
TRM10021		1	PINION Z:14	PIGNONE Z=13
TRM10022	*		PINION Z:16	
TRM10023	*		PINION Z:17	
TRM10027	*		REVERSE GEAR SPRING	
TRM10028		2	REACTION PLATE SPACER 8.5x15 L. 12 mm	DIST.PIASTRA REAZIONE 8.5X15 L 12 ALL
TRM10029		1	CHAIN L. 810 mm	CATENA L=845
TRM10036		4	CROWN PARALLEL PIN D:8 mm L. 18 mm	SPINE CILINDRICHE D:8 L:18 centraggio corona
TRM10039	*		CHAIN L. 845 mm	
TRM10047		1	REVERSE GEAR LEVER KNOB	POMELLO DELLA RETROMARCIA
TRM10048		1	REVERSE GEAR CABLE KIT	KIT CAVO RETRO
TRM10049		1	CHAIN JOINT	GIUNTO A RIBADIRE
TRM10050		4	ADJUSTABLE BEARING SHELL	GUSCIO PER CUSCINETTO ORIENTABILE
TRM20005		1	REVERSE GEAR	INVERTITORE COMPLETO
TRM20006		1	REACTION PLATE FOR REVERSE GEAR	PIASTRA DI REAZIONE ZINCATA
TRM20007		1	REVERSE GEAR SHIFT FORKED LEVER	FORCELLA DI COMANDO RETROMARCIA
VIT10001		1	12MMX45MM BOLT	VITE TE UNI5740 P/F 8.8 12X45
VIT10002		1	12MMX40MM BOLT	VITE TE UNI5740 P/F 8.8 12X40
VIT10003		2	10MMX50MM BOLT	VITE TECEI UNI7380 10.9 10X50
VIT10005		2	10MMX1.5MMX60MM BOLT	VITE TE UNI5740 P/F 8.8 10X1.5X60
VIT10006		4	6MMX20MM BOLT	VITE TE UNI5739 8.8 6X20
VIT10007		1	6MMX25MM BOLT	VITE TE UNI5739 8.8 6X25
VIT10008		4	5MMX20MM BOLT	VITE TESTA BOMBATA 5X20
VIT10009		4	3MMX12MM BOLT	VITE TAGLIO A CROCE 3X12
VIT10010		1	10MMX20MM BOLT	VITE TPSCE UNI5933 10.9 10X20
VIT10014		4	8MMX35MM BOLT	VITE TE UNI5739 8.8 8X35
VIT10015		4	10MMX25MM BOLT	VITE TE UNI5739 8.8 10X25
VIT10018		6	3MMX6MM BOLT	VITE TCEI 5931 3X6 8.8
VTB10001		4	12MMX45MM BOLT	VITE TCE UNI5931 8.8 12X45
VTB10002		2	12MMX40MM BOLT	VITE TCE UNI5931 8.8 12X40
VTB10003		2	12MMX50MM BOLT	VITE TCE UNI5931 8.8 12X50
VTB10004		2	12MMX60MM BOLT	VITE TCE UNI5931 8.8 12X60
VTB10005		2	12MMX100MM BOLT	VITE TCE UNI5931 8.8 12X100
VTB10006		2	12MMX170MM BOLT	VITE TCEI UNI5931 8.8 12X170
VTB10007		4	12MMX1.25MMX50MM BOLT	VITE TCEI UNI5932 8.8 12X1.25X50

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VTB10008	9	10MMX20MM BOLT	VITE TCE UNI5931 8.8 10X20
VTB10009	8	10MMX25MM BOLT	VITE TCE UNI5931 8.8 10X25
VTB10011	2	10MMX35MM BOLT	VITE TCE UNI5931 8.8 10X35
VTB10012	18	10MMX45MM BOLT	VITE TCE UNI5931 8.8 10X45
VTB10013	10	10MMX50MM BOLT	VITE TCE UNI5931 8.8 10X50
VTB10014	2	10MMX70MM BOLT	VITE TCE UNI5931 8.8 10X70
VTB10015	4	10MMX1.25MMX20MM BOLT	VITE TCE UNI5932 10X1.25X20
VTB10016	7	8MMX16MM BOLT	VITE TCE UNI5931 8.8 8X16
VTB10017	10	8MMX20MM BOLT	VITE TCE UNI5931 8.8 8X20
VTB10018	6	8MMX25MM BOLT	VITE TCE UNI5931 8X25
VTB10019	13	8MMX25MM BOLT	VITE TCE UNI5931 8.8 8X25
VTB10020	7	8MMX30MM BOLT	VITE TCE UNI5931 8.8 8X30
VTB10021	8	8MMX35MM BOLT	VITE TCE UNI5931 8.8 8X35
VTB10022	9	8MMX40MM BOLT	VITE TCE UNI5931 8.8 8X40
VTB10023	1	8MMX45MM BOLT	VITE TCE UNI5931 8.8 8X45
VTB10024	3	8MMX55MM BOLT	VITE TCE UNI5931 8.8 8X55
VTB10025	2	8MMX70MM BOLT	VITE TCE UNI5931 8.8 8X70
VTB10027	4	8MMX110MM BOLT	VITE TCE UNI5931 8.8 8X110
VTB10028	8	8MMX130MM BOLT	VITE TCE UNI5931 8.8 8X130
VTB10029	21	6MMX20MM BOLT	VITE TCE UNI5931 8.8 6X20
VTB10030	3	6MMX25MM BOLT	VITE TCE UNI5931 8.8 6X25
VTB10031	3	6MMX30MM BOLT	VITE TCE UNI5931 8.8 6X30
VTB10032	6	6MMX30MM BOLT(8.8)	VITE TCE UNI5931 8.8 6X35
VTB10033	6	6MMX35MM BOLT (12.9)	VITE TCE UNI5931 12.9 6X35
VTB10034	1	6MMX90MM BOLT	VITE TCE UNI5931 8.8 6X90
VTB10035	2	6MMX40MM BOLT	VITE TCE UNI5931 8.8 6X40
VTB10037	6	5MMX35MM BOLT	VITE TCE UNI5931 5X35
VTB10039	4	3MMX12MM BOLT	VITE TCE UNI5931 8.8 3X12
VTB10040	10	10MMX30MM BOLT	VITE TCE UNI5931 8.8 10X30
VTB10042	2	10MMX40MM BOLT	VITE TCE UNI5931 8.8 10X40
VTB10043	4	8MMX100MM BOLT	VITE TCE UNI5931 8X100
VTB10045	1	10MMX90MM BOLT	VITE TCE UNI5931 8.8 10X90
VTB10047	4	12MMX1.25MMX40MM BOLT	VITE TCE UNI5932 8.8 12X1.25X40
VTB10050	38	6MMX20MM BOLT TAPERED HEAD INTERNAL CAP	VITE TPSCE UNI5933 10.9 6X20 scocca
VTB10051	4	6MMX12MM BOLT	VITE TPSCE UNI5933 10.9 6X12
VTB10052	6	8MMX45MM BOLT	VITE TCE 5931 12.9 8X45
YZA10001	1	YZF 1000 YAMAHA ENGINE	MOTORE YZF R 1000 YAMAHA

YZA10006	1	OIL PRESSURE SENSOR	BULBO PRESSIONE OLIO
YZA10007	*	OIL TEMPERATURE SENSOR	
YZA10008	*	WATER TEMPERATURE SENSOR	
YZA10010	1	CLUTCH PISTON	CILINDRETTO FRIZIONE 1TV-16381-12
YZA10011	2	ENGINE UPPER SPACER 12.5x20 L. 9.2 mm	DIST. SUPERIORE MOTORE 12.5X20 L 9.2 ALL.
YZA10012	1	ENGINE LOWER SPACER 12.5x20 L. 6.5 mm	DIST. INFERIORE MOTORE 12.5X20 L 6.5 ALL.
YZA10013	1	BOLT STEM	GAMBO BULLONE LUNGO
YZA10014	1	OIL PRESSURE SENSOR TO ENGINE BLOCK COUPLING BOLT	SUPPORTOBULBO PRESS. OLIO 1000cc.
YZA10016	1	BOLT SPACER 11x24 L. 25	DIST. ESTERNO BULLONE LUNGO 11X24 L.25 ALL.
YZA10017	1	OIL BREATHER FITTING	RACCORDO MODIFICA SFIATO OLIO
YZA10018	*	RILSAN PIPE **DISCONTINUED**	***DISCONTINUED***
YZA10019	2	COPPER WASHER FOR OIL SUMP/ENGINE VALVE OUTLET	RONDELLA RAME PER RACCORDO COPPA
YZA10023	1	FITTING SUMP 14x1	RACCORDO COPPA 14X1
YZA10024	1	OIL/GAS SEPARATER BOTTLE NON YAMAHA	DECANTATORE OLIO
YZA10026	1	PINION COVER	COVER ASSY 3GM-Y1541-21
YZA10027	4	GASKET EXHAUST 3YF-14613-01	GASKET EXHAUST 3YF-14613-01
YZA10028	1	SPACER 90560-12191	SPACER 90560-12191
YZA10029	2	OIL SEAL 93109-12075	OIL SEAL 93109-12075
YZA10030	3	YAMAHA BOLT PINION GEAR COVER TO ENGINE(95024-06040)	BOLT FLG 95024-06040
YZA10031	2	YAMAHA BOLT PINION GEAR COVER TO ENGINE(95024-06050)	BOLT FLG 95024-06050
YZA10032	2	YAMAHA BOLT PINION GEAR COVER TO ENGINE(95027-06030)	BOLT FLG 95027-06030
YZA10033	1	YAMAHA BOLT PINION GEAR COVER TO ENGINE (95027-06090)	BOLT FLG 95027-06090
YZA10034	1	BOLT 95824-06020	BOLT 95824-06020
YZA10035	4	PIN DOWEL 99530-08012	PIN DOWEL 99530-08012
YZA10037	1,7	18MM RUBBER HOSE	TUBO GOMMA D:18 (m)

ARCO BALENO CODE LIST

ACS-	ACCESSORY
ALM-	FUEL SYSTEM
BLA-	FRONT COVER SUSPENSION ARM
BLP-	REAR SHOCK UPPER ARM TO PUSH ROD
BRC-	OUTSIDE CHASSIS SUSPENSION COMPONENTS
CMB-	GEAR BOX PARTS
CPN-	RIMS
CTR-	NON NYLOC NUTS
CRZ-	FRONT AND REAR SPOILERS
DAU-	NYLOC NUTS
DAV-	SPECIAL NUTS
ELT-	ELECTRIC COMPONENTS
EST-	EXTINGUISHER COMPONENTS
FFT-	COMPONENTS FOR HYDRAULIC SYSTEM (BRAKE AND CLUTCH)
FML-	HOSE CLAMPS (VARIOUS)
FPL-	TIE STRAPS
FRN-	BRAKE COMPONENTS (NON HYDRAULIC)
GRZ-	COPPER WASHERS
LMR-	ALUMINIUM PANELS
PDL-	PEDAL COMPONENTS
PMZ-	SPINDLE COMPONENTS
RDT-	WATER AND OIL COOLING COMPOUND
RND-	WASHERS

RVT-	RIVETS
SCR-	EXHAUST COMPONENTS
SNS-	BALL JOINTS
SOS-	INSIDE CHASSIS SUSPENSION COMPONENTS
STM-	INSTRUMENT PANEL
STZ-	STEERING COMPONENT
SUP-	ENGINE MOUNTS (SUPPORTS)
TEL-	MAIN CHASSIS COMPONENTS (NOSE, COCKPIT,ENGINE)
TPT-	NUT INSERT
TRM-	DRIVETRAIN-EXTERIOR
VIT-	BOLTS (EXTERNAL HEX)
VTB-	INTERNAL HEAD BOLTS
YZA-	ENGINE PARTS

BOX NUMBER ONE

2	FIRE EXTINGUISHRS	10	STEERING ROD SPACERS
4	STOP CABLES	2	STEERING WHEELS
3	SEATBELTS	15	REAR SPINDLE SPACERS
2	FUEL FILLER TUBES	7	TOE BARS
6	GAS CAPS	5	ENGINE SHIFTER ARMS
3	FUEL PUMPS	10	SPARK PLUGS
4	REVERSE KNOBS	3	SHIFT LEVERS
6	AIR FILTERS	4	IGNITION COILS
6	MIRRORS (SIDE)	3	SHIFTER KNOBS
2	STEERING WHEEL COLUMNS	6	TORSION BARS (REAR)
13	WHEEL PINS	2	SHIFTING RODS (SHORT)
25	WHEEL NUTS		VARIOUS COOLING HOSES
6	TORSION BARS (FRONT)		VARIOUS SPINDLE SPACERS

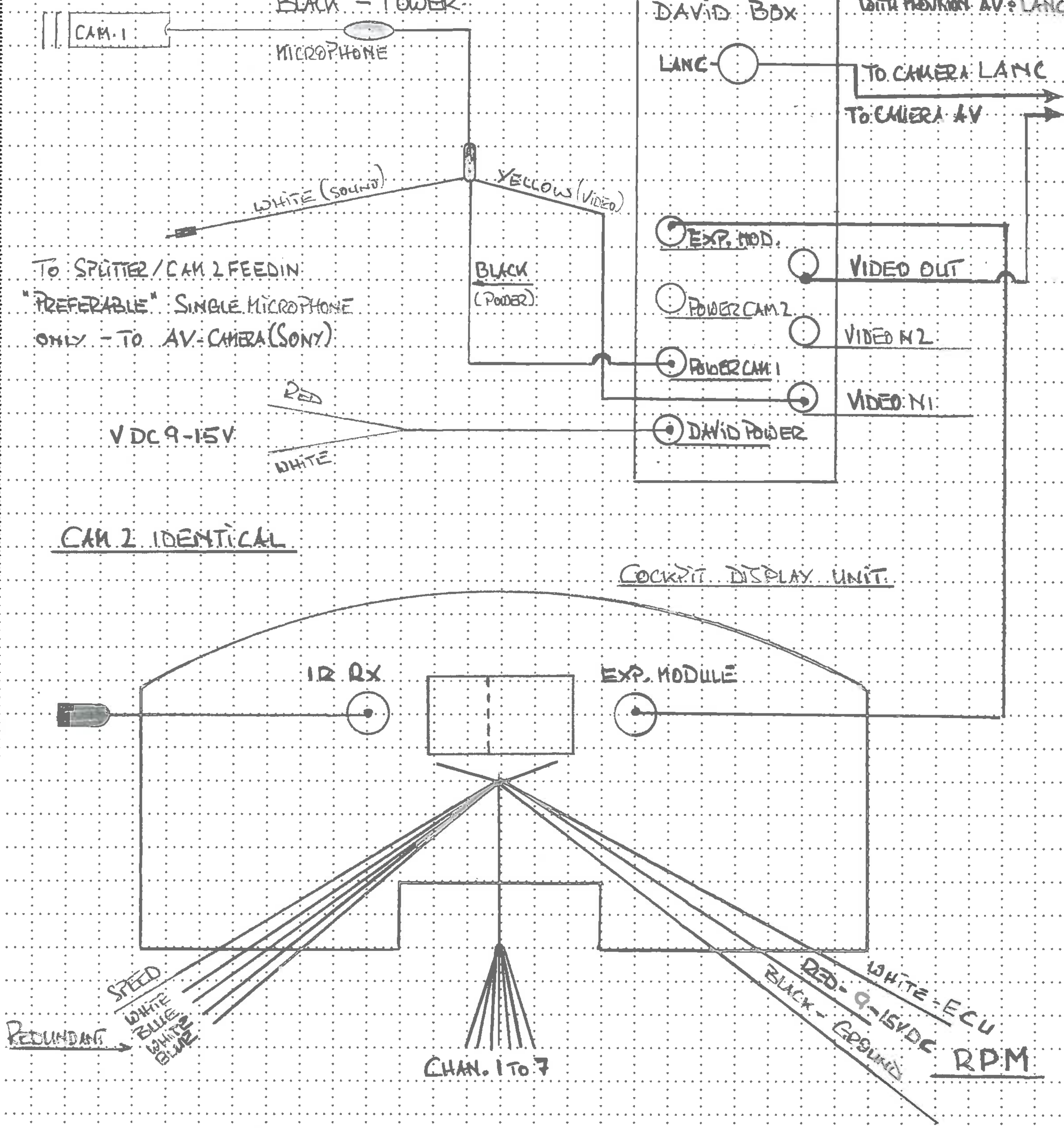
BOX NUMBER TWO

4	BATTERIES	BRAKE CYLINDERS
1	GAS TANK	STARTER SOLENOID
8	REAR SPOILER SUPPORTS	CLUTCH CYLINDER HOSE COUPLER
2	FIRE EXTINGUISHERS HOSES	SUSPENSION PUSH PULL ROD STUD
	REAR/FRONT DISC BRAKES	BRAKE CALIPER COUPLING TUBES
	SET OF PEDALS	RESEVOIR SPACERS
	WHEEL SPACERS	BRAKE CALIPER MOUNTS
	WHEEL HUBS	RESEVOIR TUBING
	IGNITION MODULES	CLUTCH CYLINDERS
	FRONT/REAR CALIPERS	WHEEL STUDS
	WHEEL SPINDLE STEERING BRACKET	SPINDLE PLATES
	WHEEL BEARINGS	

From the workbench of:
Date:

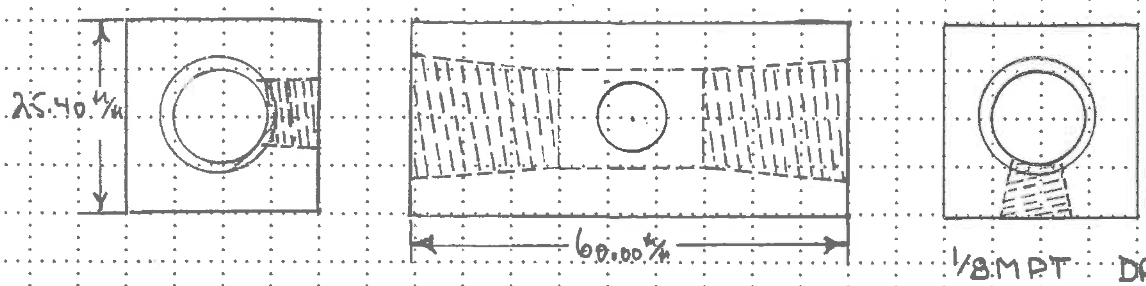
MXL "PISTA" ARCOBALENO

WHITE - SOUND
YELLOW - VIDEO
BLACK - POWER



From the workbench of:
Date:

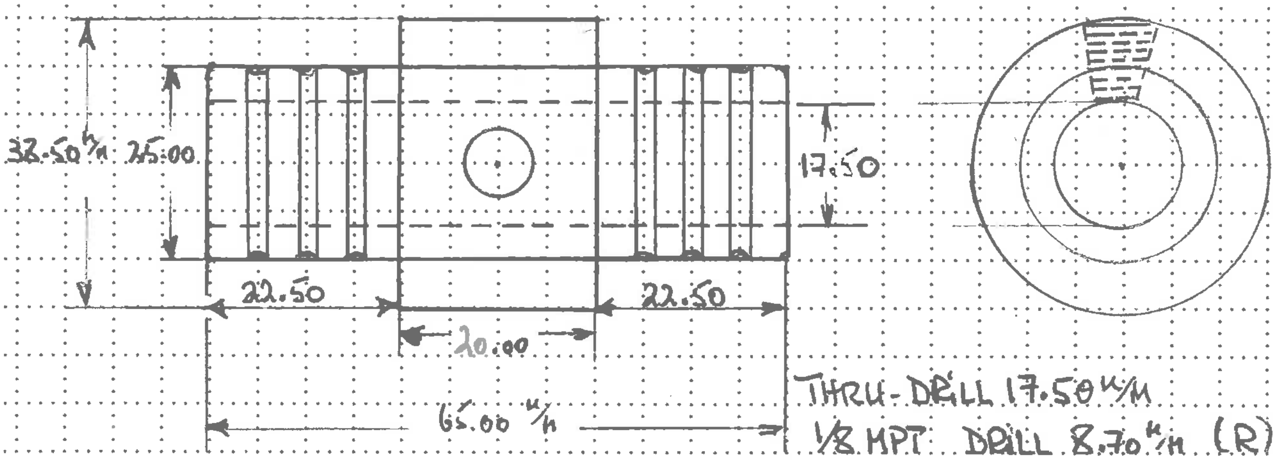
MXL SYST. OIL INLET TEMP. SENSOR ADAPTOR



1/8 MPT DRILL 8.70 m/m (R)

3/8 MPT DRILL 14.50 m/m FITTING CONNECTOR AN 816-8D (1)
REDUCER AN 912-4D (1)
NIPPLE AN 911-3D (1)

RADIATOR INLET WATER TEMP. SENSOR ADAPTOR



THRU-DRILL 17.50 M/M
1/8 MPT DRILL 8.70 m/m (R)

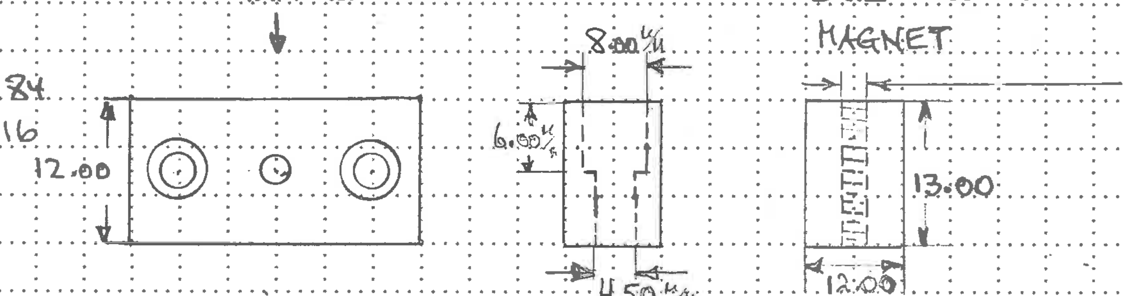
ENLARGED FOR CLARITY

THREAD 4.00 x .70 m/m
DRILL 3.30 m/m OR #30

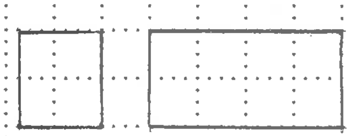
TAPPING REQUIRED

MAGNET

ATTACH SCREWS DIN 84
PHILLISTER HEAD M4 x 16



SPEED SENSOR MAGNET HOLDER

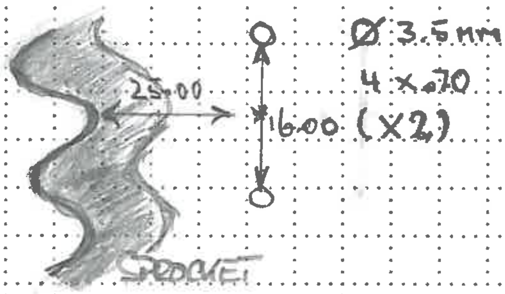


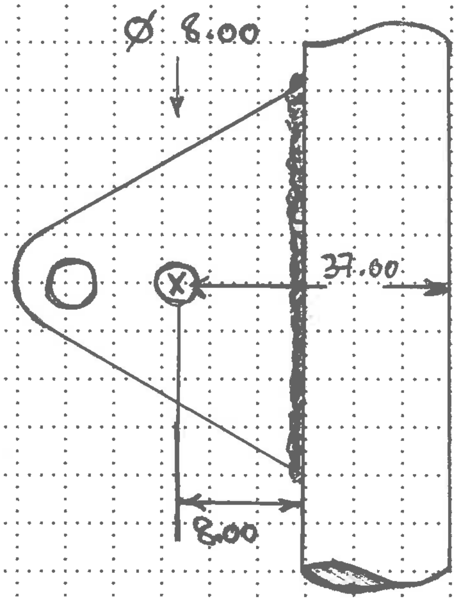
ACTUAL SIZE

From the workbench of:
Date:

INSTRUMENT PANEL MOUNTING STUDS. SHORTEN BY:
TOP: 20.00 M/M BOTTOM: 10.00 M/M

SPEED SENSOR ATTACHMENT





From the workbench of:
Date:

MXL PISTA CODE 04.554.15 TWO THERMOCOUPLES

CHANNEL 1 & 2 THERMOCOUPLE ONLY

3 VDO Px SENSORS ONLY, POTENTIOMETER, SENSORS "NOT" NEEDING + VB VOLTAGE

4 WATER TEMP. (RADIATOR INLET - ENGINE OUTLET)
O.I.T. 5 OIL TEMP. (RADIATOR OUTLET - ENGINE INLET)
6
7
SPEED TO SPEED MAGNETIC PICK-UP.

8 ON BOARD GEAR SENSOR ONLY

MXL PISTA CODE 04.554.08 ONE THERMOCOUPLE

CHANNEL

1 THERMOCOUPLE SENSOR ONLY

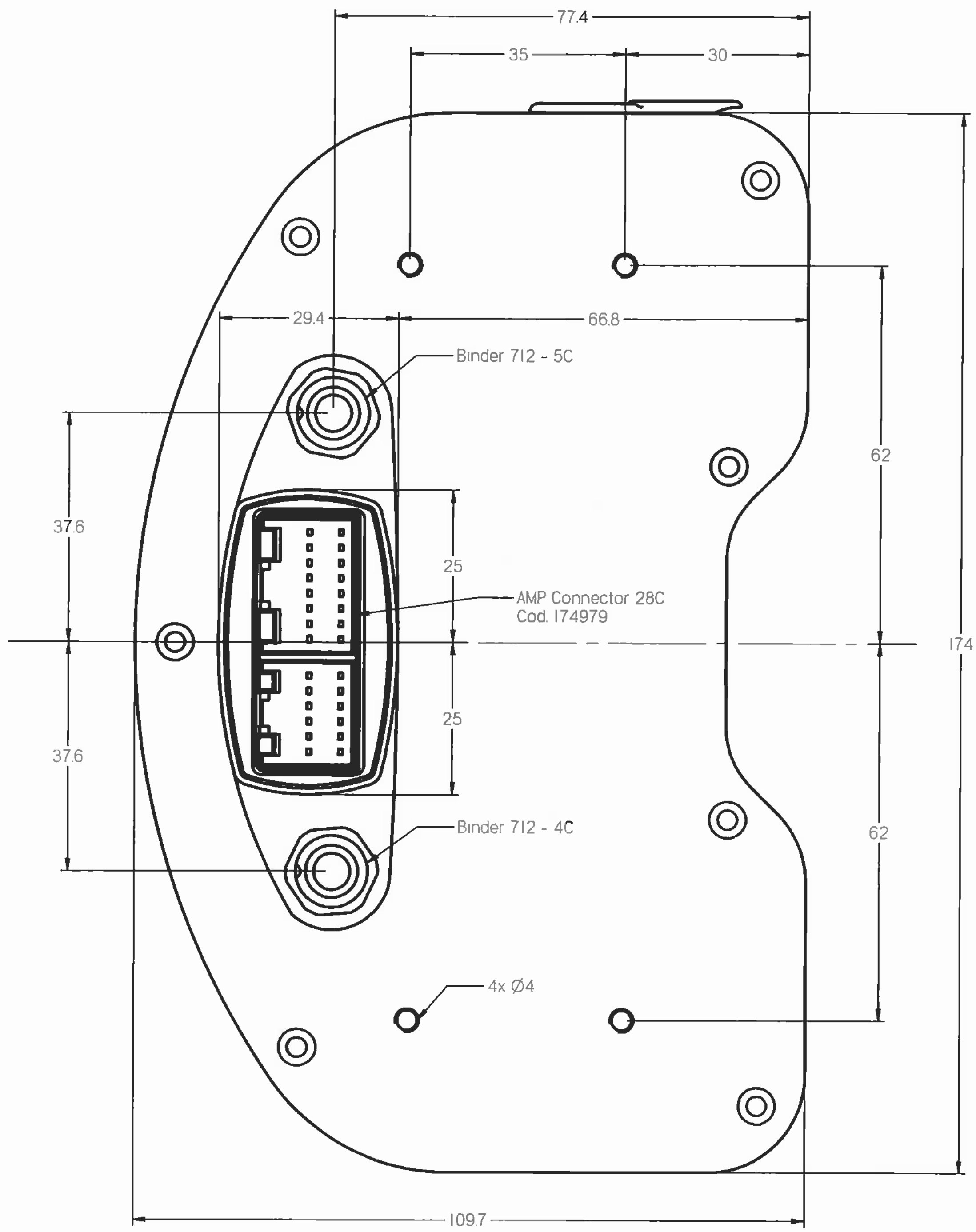
2 & 3 THERMORESISTOR, VDO PRESSURE SENSORS, POTENTIOMETERS AND ALL SENSORS THAT DO "NOT" NEED +VB OUTPUT
4 TO 8 ANY SENSOR EXCEPT FOR THERMOCOUPLE SENSORS THAT NEED COMPENSATED CABLE.
8 GEAR SENSOR OR ANY OTHER SENSOR THAT DO "NOT" NEED +VB VOLTAGE AS FOR 1 TO 3

MXL PISTA CODE 04.554.20 NO THERMOCOUPLES

CHANNEL 1 TO 3 THERMORESISTOR, VDO PRESSURE SENSORS, POTENTIOMETER AND ALL SENSORS "NOT" REQUIRING +VB OUTPUT
4 TO 8 ANY SENSOR EXCEPT THERMOCOUPLES THAT REQUIRE COMPENSATED CABLE
CHANNEL 8 ANY OTHER SENSOR NOT REQUIRING +VB VOLTAGE OUTPUT AS FOR 1 TO 3

MXL PISTA - STANDARD NO THERMOCOUPLE CODE 04.554.02 (04.554.20 - ABOVE)

N.rev	Nota sulla revisione	Data	Firma	Controllo

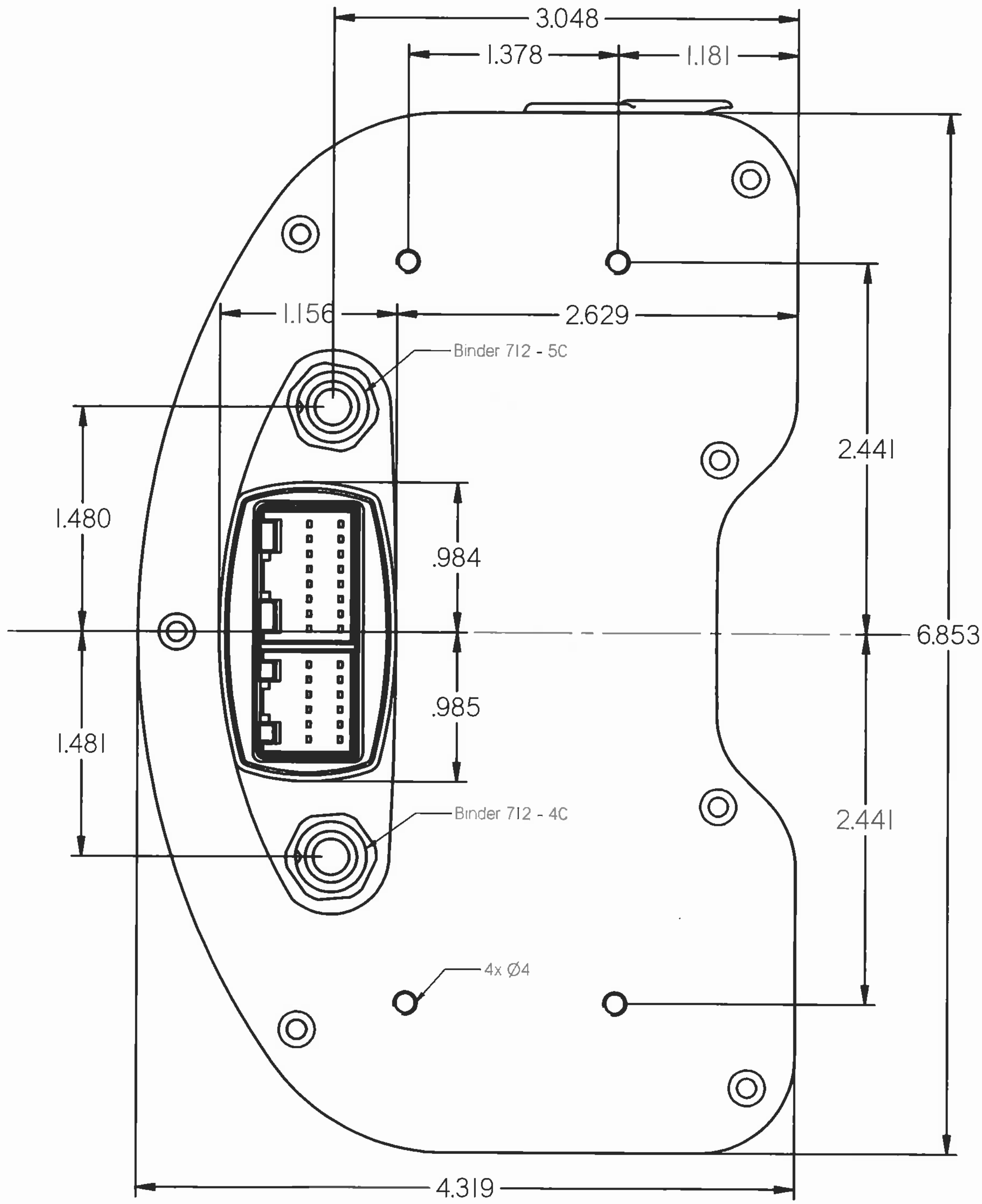


Quotes in millimeters [mm]

A4 paper size: 210 x 297 mm

Rif.	Quantità	Titolo/Nome, materiale		N. articolo/Riferimento	
Progettato da	Controllato da	Approvato da - Data	Nome file MXL_Pista_Strada Template_A4	Data 19/01/2005	Scala 1 : 1
AIM		Titolo / Nome MXL_Pista_Strada template: A4 paper size / Quotes in millimeters			
		Numero disegno		Modifica	Foglio

N.rev	Nota sulla revisione	Data	Firma	Controllo



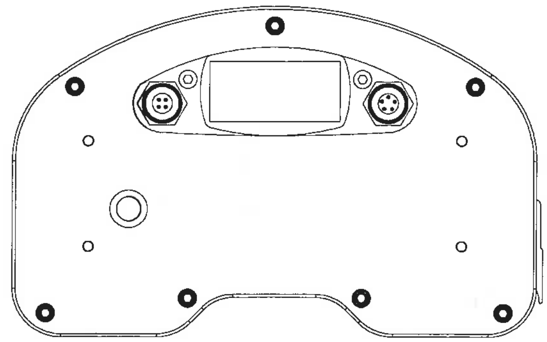
Quotes in inches ["]

Letter paper size: 8.5" x 11"

Rif.	Quantità	Titolo/Nome, materiale			N. articolo/Riferimento	
Progettato da	Controllato da	Approvato da - Data	Nome file MXL_Pista_Strada Template_Letter		Data 19/01/2005	Scala 1 : 1
	Titolo / Nome MXL_Pista_Strada template: Letter paper size / Quotes in inches					
	Numero disegno			Modifica	Foglio	

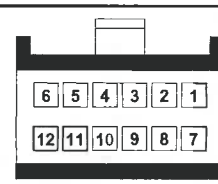
FIRMWARE VERSION 1454-0001-02309

WIRING FOR "MXL PISTA"

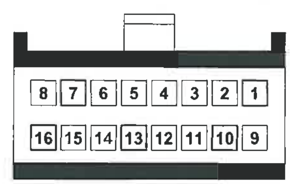


Logger's pinout: 12 + 16 pins AMP female connector

Pin	Signal	Pin	Signal
1A	GND	1B	Analog input 4
2A	9-15V Battery input	2B	V reference
3A	CAN 1- (ECU interface)	3B	Analog GND
4A	CAN 1+ (ECU interface)	4B	Analog input 3
5A	RS232 TX (ECU interface)	5B	Analog input 2
6A	RS232 RX (ECU interface)	6B	V reference
7A	USB D-	7B	Analog GND
8A	RPM 150-400V coil - RPM square wave >8V	8B	Analog input 1
9A	+ VB	9B	Analog input 8
10A	GND	10B	USB D+
11A	+ VB	11B	Analog GND
12A	Speed	12B	Analog input 7
		13B	Analog input 6
		14B	V reference
		15B	Analog GND
		16B	Analog input 5



12 Pins AMP female connector pinout (Labelled as "A") – Contacts insertion view



16 Pins AMP female connector pinout (Labelled as "B") – Contacts insertion view

CHANNEL
RPM
SPEED
CH1 H2O T.
CH2 O.i.T
CH3 TO 7 Ø
CH8 GEAR POTENTIOMETER
ACCELEROMETER
DATA LOGGER T.
BATT. Hi/LO

Connector details

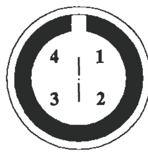
Beacon channel

Pin	Function	Pin	Function
1	Magnetic / Optic codified lap	3	+VB
2	GND	4	Optic not codified lap

CAN for Expansion Modules

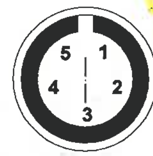
Pin	Function	Pin	Function
1	CAN 0+	4	CAN 0-
2	GND	5	9-15V Battery input
3	+ VB		

DAVID SYST.



1- WHITE
2- BLACK
3- RED (N/A)
4- BLUE.

4 Pins female Binder connector: outside view



5 Pins female Binder connector: outside view

NOTES:

- Pins labelled as "3B", "7B", "11B" and "15B" are the "GROUND" signals corresponding to the 8 analog inputs.
- The gauge must be powered by a 9 ÷ 15 V DC power source. **Do not exceed these limits**.
- The "V Reference" signals must be used for thermo resistances, VDO sensors and potentiometers.
- Pins labelled as "9A" and "11A" represent the battery voltage output signal. These pins must be used for those sensors which need to be powered by an external power source (Gyroscope, External accelerometer, speed sensor, lap receiver, etc...). Potentiometers, temperature sensors and pressure sensors must not be connected to these pins.

How to build your own "16+12 Pins AMP connector" harness

Please note: this part of the document is intended only for customers that wish to create their own harness.

How to power the gauge

The gauge must be powered by a **9 ÷ 15 V DC power source**. **Do not exceed these limits.**
We suggest to use 0.5 mm^2 unifilar wires.
See the following table in order to correctly connect the power wires.

Pin AMP connector	Signal	Cable colour
2A	9-15V Battery input	Red
1A	GND	Black

We strongly suggest to connect the "Power input" cable to the bike/car master switch.

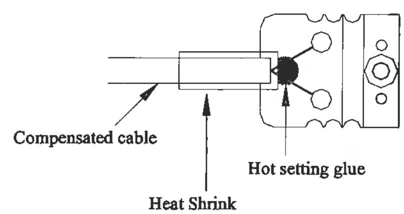
If you are not able to power the gauge using the master switch, please connect the red wire to the battery's positive (+) pole and the black one to the negative (-) pole. As the gauge automatically switches on when connected to an external 9-15 V power source, please install an ON/OFF switch along the power cable.

How to connect a thermocouple

Thermocouples may be connected on any one of the 8 analog inputs.
We remind You to use **compensated cable** to connect the **AMP connector** to the **Mignon** connector (shown in the following picture).

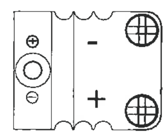
To make the Mignon connector wiring, we recommend you to screw the wirings in the connector and fix them with heat setting glue, as in the picture on the right.

Mignon Connector Wiring



See the following table in order to correctly connect a thermocouple (in this example the thermocouple has been installed on Channel 1).

Pin AMP	Signal	Pin Mignon	Cable colour
8B	Analog input 1	+	Yellow
7B	Analog GND	-	Red



Mignon connector pinout: top side view

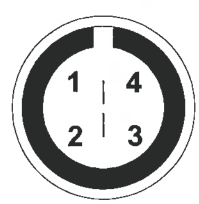
Please note: Thermocouple GND has to be connected to GND belonging to homogeneous channels (0-50mV – i.e. only thermocouples) and not to potentiometers, pressure sensors, Thermoresistor or similar sensors, so to avoid interferences and measurement errors.

How to connect a Thermoresistor

Thermoresistor may be connected on any one of the 8 analog inputs.
We suggest You to use a " 4 x 0.14 mm^2 " wire to connect the **AMP connectors** to the **Binder 719 connector** (shown in the following picture).

See the following table in order to correctly connect a Thermoresistor (in this example the Thermoresistor has been installed on Channel 2).

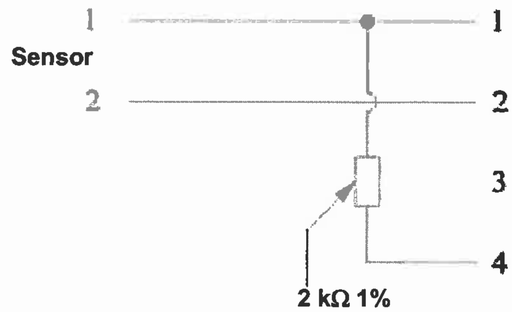
Pin AMP	Signal	Pin Binder	Cable colour
5B	Analog input 2	1	White
3B	Analog GND	2	Black
	Not connected	3	
6B	V reference	4	Blue

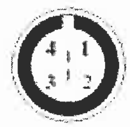


Binder 719 female pinout: solder termination view

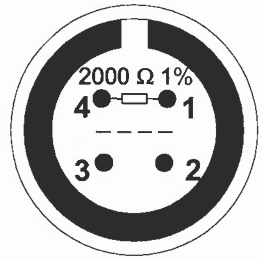
If you bought an AIM PT100 Thermoresistor for MXL, an SMD resistor is mounted inside the sensor's connector between pins number 1 and 4, as shown in the following pictures. The value of this resistor is **2 kΩ 1%**. If, on the contrary, you bought another Thermoresistor, you have to mount an SMD resistor between pins number 1 and 4.

H2O T WARNING LITE 95°C   O.I.T. WARNING LITE 110°C





4 pins male connector Solder termination view

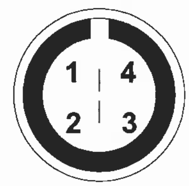


Binder 719 male: resistor installation

How to connect a VDO pressure sensor

VDO pressure sensors may be connected on any one of the 8 analog inputs.
We suggest you to use a " 4 x 0.14 mm^2 " wire to connect the **AMP connectors** to the **Binder 719 connector** (shown in the following picture).
See the following table in order to correctly connect a VDO pressure sensor (in this example the sensor has been installed on Channel 3).

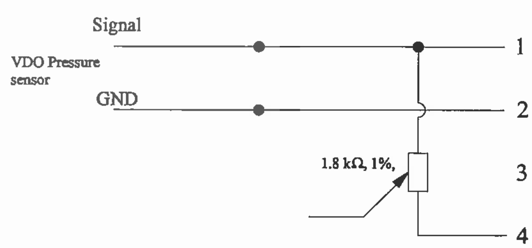
Pin AMP	Signal	Pin Binder	Cable colour
4B	Analog input 3	1	White
3B	Analog GND	2	Black
	Not connected	3	
6B	V reference	4	Blue



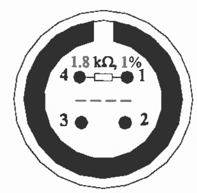
Binder 719 female pinout: solder termination view

If you bought an AIM VDO pressure sensor, an SMD resistor is mounted inside the sensor's connector between pins number 1 and 4. The value of this resistor is **1.8 kΩ 1%**.
Please do not tamper in anyway the SMD resistor or the sensor will not work properly. If, on the contrary, you bought a VDO sensor on your own, please **be sure it is a VDO sensor without warning contact, insulated return** and mount the resistor on your own between pin 1 (signal) and pin 4 (V reference) as specified in the figure below.
Please refer to the following table to see **VDO sensors compatibility with AIM instruments**:

VDO Pressure sensor: • **without warning contact** • **insulated return** **Compatibility: YES**	VDO Pressure sensors: • without Warning contact • common ground **Compatibility: NO**	VDO Pressure sensors: • with warning contact • common ground **Compatibility: NO**



Male solder termination view



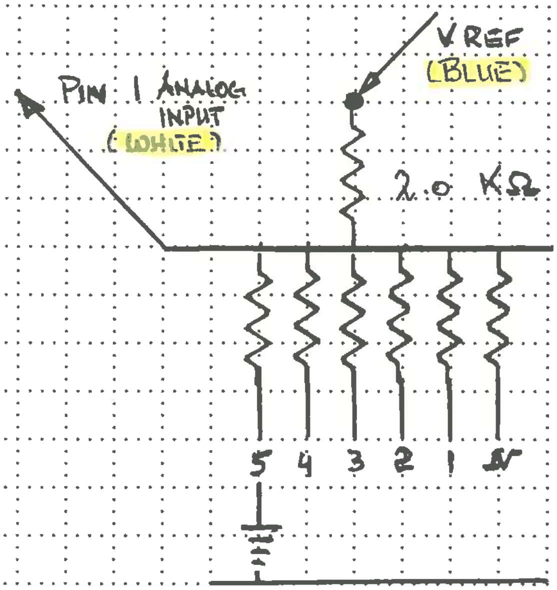
Binder 719 Male resistor installation

VDO pressure sensor with Binder 719 and resistor installation.

From the workbench of:
Date:

ON BOARD GEAR SENSOR

ENGINE GEAR POS. SENSOR SW.



N/A

15K 5 | 1 3K

12K 4 | N 2K

"V" REF 4.495

9K 3 | 2 6K

ACTUAL "V"

R KΩ				
N	2.0 K	WHITE	(2K QW220)	2.24
1	3.0 K	RED	(3K QW 230)	2.69
2	6.0 K	GREEN	(4.7K QW247)	3.15
3	9.0 K	BROWN	(6.2K QW262)	3.39
4	12.0 K	BLACK	(10.0K QW310)	3.74
5	15.0 K	BLUE OR WHITE/BROWN	(12.0K QW312)	3.83

FEMALE PLUG
VIEWED FROM REAR

WHITE — PIN 1 ANALOG INPUT 8
BLACK N/A PIN 2 ANALOG GRND
RED N/A PIN 3 + VB
BLUE V.REF PIN 4 V REF

UPSHIFT

1 - FWD
N
2 - AFT
3 - AFT
4 - AFT
5 - AFT

CIRCUIT BOARD 1593L (BPS)

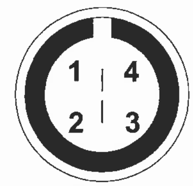
ENCLOSURE 1593 LBK (HAMMOND)

DOWN SHIFT REVERSE

How to connect a potentiometer

Potentiometers may be connected on any one of the 8 analog inputs.
See the following table in order to correctly connect a potentiometer (in this example the sensor has been installed on Channel 4).

Pin AMP	Signal	Pin Binder	Cable colour
1B	Analog input 4	1	White
3B	Analog GND	2	Black
	Not connected	3	
2B	V reference	4	Blue

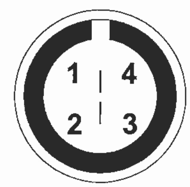


Binder 719 female pinout: solder termination view

How to connect the Speed sensor

See the following table in order to correctly install the speed sensor:

Pin AMP	Signal	Pin Binder	Cable colour
12A	Speed	1	White
10A	GND	2	Black
11A	+ VB	3	Red
	Not connected	4	



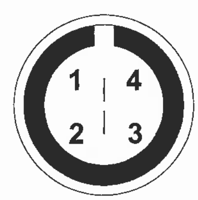
Binder 719 female pinout: solder termination view

How to connect the "on-board" Gear sensor

The gear sensor is usually an "on-board" sensor which is powered by the vehicle's battery: in order to correctly sample the engaged gear You only have to connect the gear signal on the right connector pin. See the following table in order to correctly measure the engaged gear.

Please note: the "on-board gear sensor MUST be connected on channel number 8.

Pin AMP	Signal	Pin Binder	Cable colour
9B	Analog input 8	1	White
	Not connected	2	
	Not connected	3	
	Not connected	4	→ Vref (4,5 V)

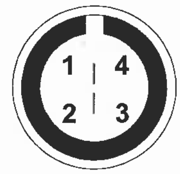


Binder 719 female pinout: solder termination view

How to connect the Gyroscope (Bikes) or the Ext. accelerometer (Cars)

The Gyroscope/External accelerometer may be connected on any one of the 8 analog inputs. See the following table in order to correctly connect a Gyroscope/External accelerometer (in this example the sensor has been installed on Channel 5).

Pin AMP	Signal	Pin Binder	Cable colour
16B	Analog input 5	1	White
15B	GND	2	Black
9A	+ VB	3	Red
	Not connected	4	

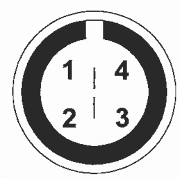


Binder 719 female pinout: solder termination view

How to connect the 100 PSI Pressure Sensor

This sensor can be connected only on channels 4 to 8 (those with + VB voltage output). See the table below to correctly connect it (in this example the sensor is installed on Channel 5).

Pin AMP	Signal	Pin Binder	Cable colour
16B	Analog Input 5	1	White
15B	Analog GND	2	Black
9A	+ VB	3	Red
2B	V reference	4	blue



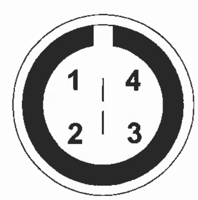
Binder 719 female pinout: solder termination view

Other sensors that need V Battery to be connected are: **100 Bar pressure sensor** for **Formula Renault 2000** and **Pitot Tube sensor**.

How to create the USB cable

See the following table in order to correctly create the USB data download cable.

Pin AMP	Signal	Pin Binder	Cable colour
10B	USB D+	1	White
10A	GND	2	Black
7A	USB D-	3	Red
	Not connected	4	



Binder 719 female pinout: solder termination view

How to connect the RPM sensor

The RPM signal may be sampled either from the ECU or from the coil.

- The RPM signal sampled from the ECU is, usually, a 12 Volts square wave signal. Your MXL is able to sample RPM square wave signals down to 8 V.
- The RPM signal sampled from the coil is, usually, a 150 - 400 V signal.

Your MXL is able to sample both RPM signals using a single RPM input. See the following table in order to correctly measure the RPM channel.

We suggest you to use 0.5 mm^2 unifilar wires.

Pin AMP	Signal	Cable colour
8A	RPM 150-400V coil - RPM square wave >8V	White

How to connect your MXL to the ECU – CAN protocol

Your MXL is able to sample data incoming from external ECUs (please refer to the user's manual or to **Race Studio 2** for the available ECUs list).
If your ECU is equipped with a CAN communication protocol and is included among the available ECUs list, here below you find the information you need to create the "ECU-CAN" communication cable.
We suggest You to use 0.5 mm^2 unifilar wires.

Pin AMP	Signal	Cable colour
4A	CAN 1+ (for ECU interface)	White
3A	CAN 1- (for ECU interface)	Blue

How to connect your MXL to the ECU – RS232 protocol

Your MXL is able to sample data incoming from external ECUs (please refer to the user's manual or to **Race Studio 2** for the available ECUs list).
If your ECU is equipped with an RS232 (serial) communication protocol and is included among the available ECUs list, here below you find the information you need to create the "ECU-RS232" communication cable.
We suggest You to use 0.5 mm^2 unifilar wires.

Pin AMP	Signal	Cable colour
6A	RS232 RX (for ECU interface)	White
5A	RS232 TX (for ECU interface)	Blue

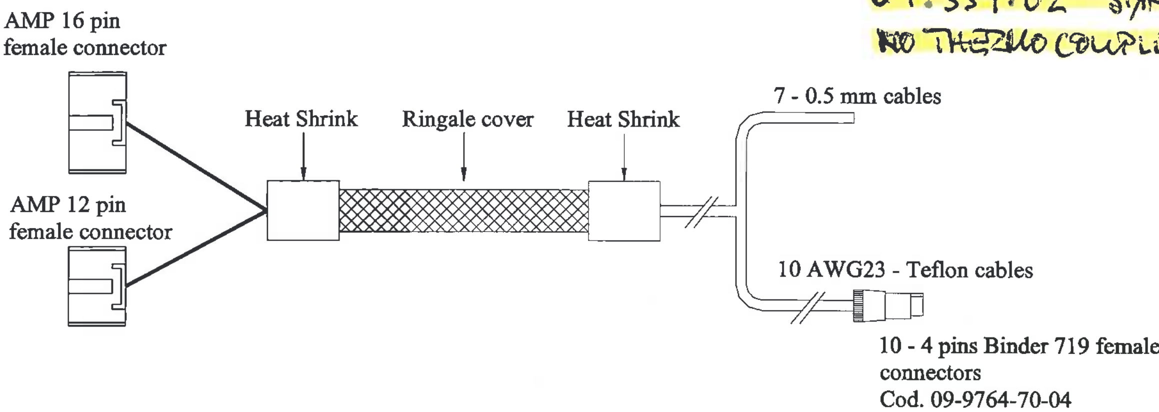
AIM harnesses for MXL Pista "16+12 pins AMP connector"

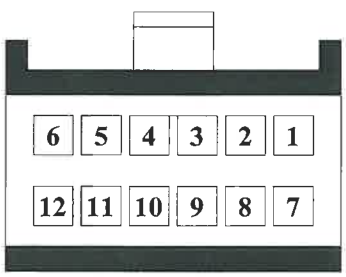
If you bought an AIM wiring for **MXL Pista**, here follows explanation of three different wirings for 16+12 AMP female connector on **MXL Pista**:

- **MXL Pista** standard (no thermocouples) – Code 04.554.02
- **MXL Pista** with one thermocouple – Code 04.554.08
- **MXL Pista** with two thermocouples – Code 04.554.15

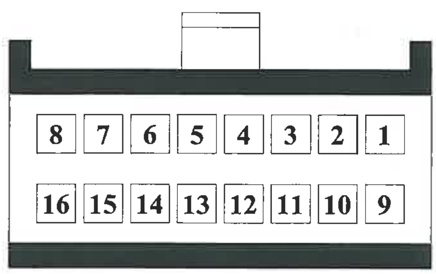
Wiring for MXL Pista: No thermocouple - Code 04.554.20

04.554.02 STANDARD -
NO THERMO COUPLES.

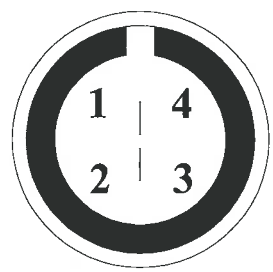




12 Pins AMP female connector pinout contact insertion view



16 Pins AMP female connector pinout contact insertion view



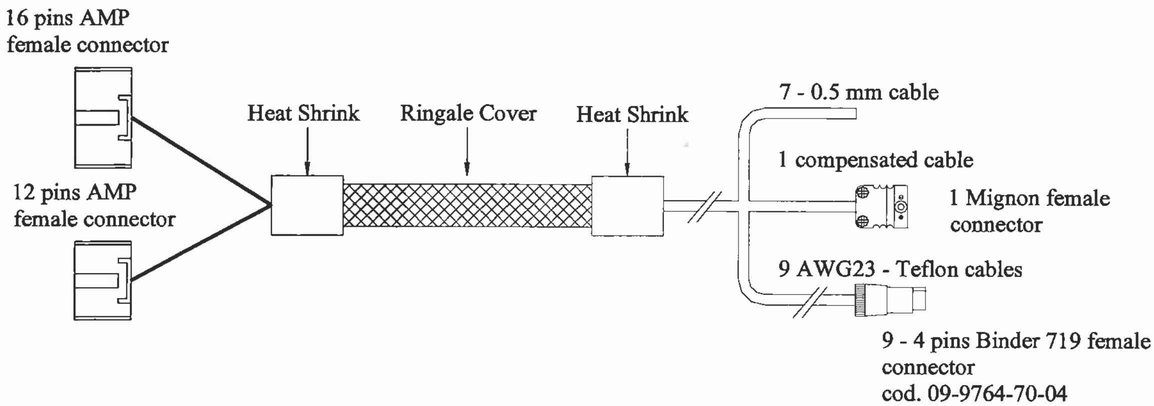
4 pins Binder 719 female connector pinout solder termination view

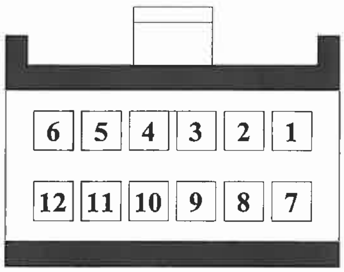
Notes:

- On **Channels 1 to 3 you can connect** Thermoresistor, VDO Pressure sensors, potentiometers and all sensors that do not need +VB voltage output; to say:
  - **no Gyroscope** for bike installations
  - **no external accelerometer** for car installations
  - **no Pitot tube**
  - **no 0-100 PSI Pressure Sensor**
  - **no 100 Bar Pressure Sensor for formula Renault 2000**.
- On **Channels 4 to 8 you can connect any sensor,** except for **thermocouples** sensors, that need compensated cable; see following pages - wirings codes 04.554.08 and 04.554.15.
- On **Channel 8 you can connect gear sensor or any other sensor that do not need +VB voltage output**, as for channels 1 to 3.

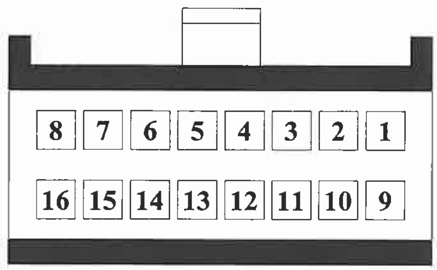
Channel name	Pin AMP 12 pins	Pin AMP 16 pins	Signal	Pin Binder	Cable colour
Ch. 1		8	Analog Input 1	1	White
		7	Analog GND	2	Black
				3	Red
		6	V Reference	4	Bleu
Ch. 2		5	Analog Input 2	1	White
		7	Analog GND	2	Black
				3	Red
		6	V Reference	4	Bleu
Ch. 3		4	Analog Input 3	1	White
		3	Analog GND	2	Black
				3	Red
		6	V Reference	4	Bleu
Ch. 4		1	Analog Input 4	1	White
		3	Analog GND	2	Black
	9		+ VB	3	Red
		2	V Reference	4	Bleu
Ch. 5		16	Analog Input 5	1	White
		15	Analog GND	2	Black
	9		+VB	3	Red
		2	V Reference	4	Bleu
Ch. 6		13	Analog Input 6	1	White
		15	Analog GND	2	Black
	9		+ VB	3	Red
		2	V Reference	4	Bleu
Ch. 7		12	Analog Input 7	1	White
		11	Analog GND	2	Black
	11		+ VB	3	Red
		14	V Reference	4	Bleu
Ch. 8		9	Analog Input 8	1	White
		11	Analog GND	2	Black
	11		+ VB	3	Red
		14	V Reference	4	Bleu
Speed	12		Speed	1	White
	10		GND	2	Black
	11		+ VB	3	Red
				4	Bleu
USB		10	USB D+	1	White
	10		GND	2	Black
	7		USB D-	3	Red
				4	n.c.

Wiring for MXL Pista: One thermocouple - Code 04.554.08

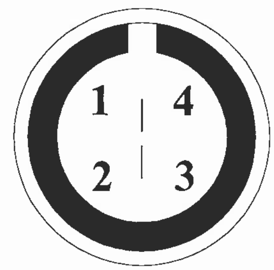




12 Pins AMP female connector pinout contact insertion view



16 Pins AMP female connector pinout contact insertion view



4 pins Binder 719 female connector pinout solder termination view

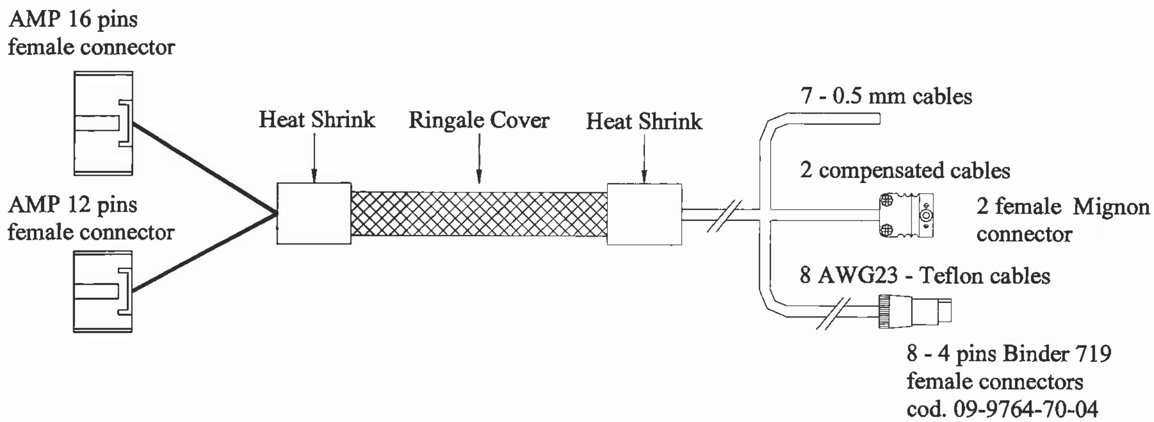
Notes:

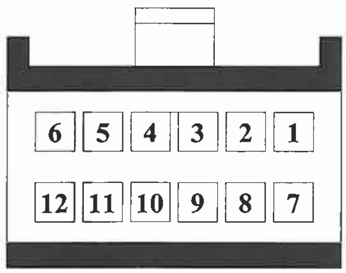
- On **Channel 1 you can connect only thermocouple sensors**.
- On **Channels 2 and 3 you can connect** Thermoresistor, VDO Pressure sensors, potentiometers and all sensors that do not need +VB voltage output; to say:
  - **no Gyroscope** for bike installations
  - **no external accelerometer** for car installations
  - **no Pitot tube**
  - **no 0-100 PSI Pressure Sensor**
  - **no 100 Bar Pressure Sensor for formula Renault 2000**.
- On **Channels 4 to 8 you can connect any sensor, except for thermocouples** sensors, that need compensated cable.
- On **Channel 8 you can connect gear sensor or any other sensor that do not need +VB voltage output**, as for channels 1 to 3.

Channel name	Pin AMP 12 pins	Pin AMP 16 pins	Signal	Pin Mignon	Cable colour
Ch. 1		8 7	Analog Input 1 Analog GND	+ -	Yellow Red

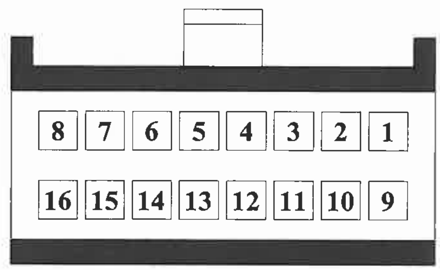
Channel name	Pin AMP 12 pins	Pin AMP 16 pins	Signal	Pin Binder	Cable colour
Ch. 2		5 7 6	Analog Input 2 Analog GND V Reference	1 2 3 4	White Black Red Bleu
Ch. 3		4 3 6	Analog Input 3 Analog GND V Reference	1 2 3 4	White Black Red Bleu
Ch. 4	9	1 3 2	Analog Input 4 Analog GND + VB V Reference	1 2 3 4	White Black Red Bleu
Ch. 5	9	16 15 2	Analog Input 5 Analog GND +VB V Reference	1 2 3 4	White Black Red Bleu
Ch. 6	9	13 15 2	Analog Input 6 Analog GND + VB V Reference	1 2 3 4	White Black Red Bleu
Ch. 7	11	12 11 14	Analog Input 7 Analog GND + VB V Reference	1 2 3 4	White Black Red Bleu
Ch. 8	11	9 11 14	Analog Input 8 Analog GND + VB V Reference	1 2 3 4	White Black Red Bleu
Speed	12 10 11		Speed GND + VB	1 2 3 4	White Black Red Bleu
USB	10 7	10	USB D+ GND USB D-	1 2 3 4	White Black Red n.c.

Wiring for MXL Pista: Two thermocouples - Code 04.554.15

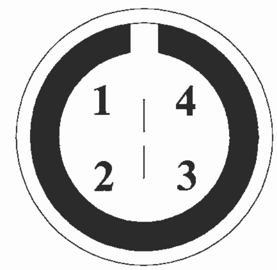




12 Pins AMP female connector pinout contact insertion view



16 Pins AMP female connector pinout contact insertion view



4 pins Binder 719 female connector pinout solder termination view

Notes:

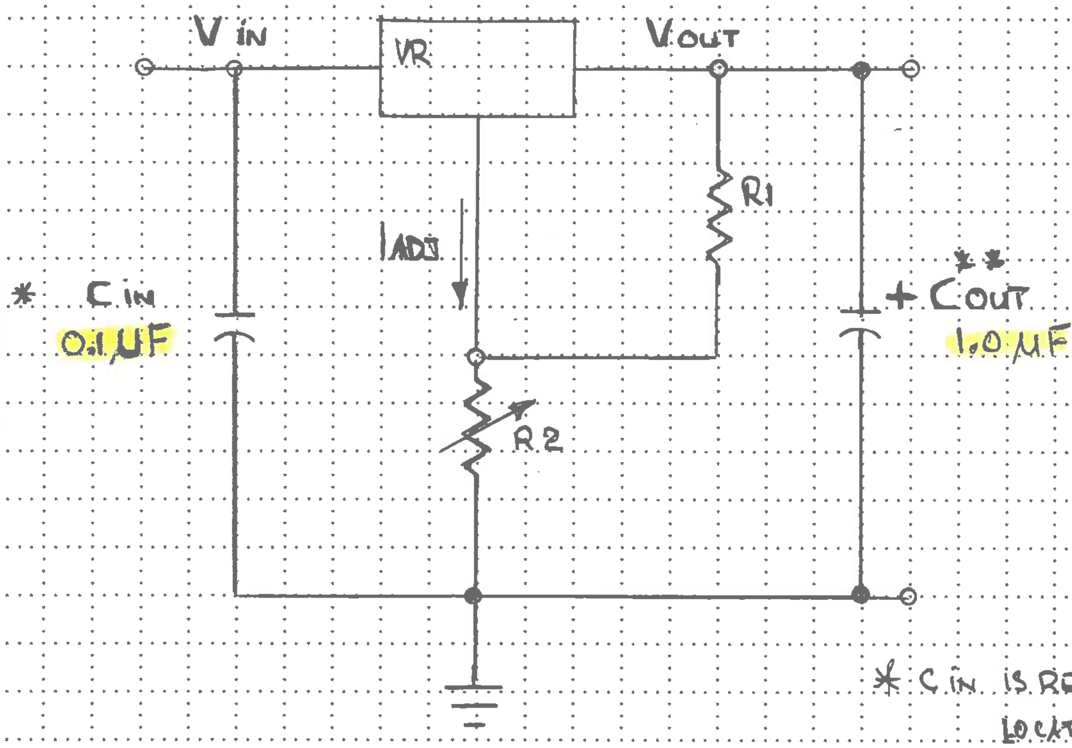
- On **Channels 1 and 2 you can connect only thermocouple sensors**.
- On **Channel 3 you can connect** Thermoresistor, VDO Pressure sensors, potentiometers and all sensors that do not need +VB voltage output; to say:
  - **no Gyroscope** for bike installations
  - **no external accelerometer** for car installations
  - **no Pitot tube**
  - **no 0-100 PSI Pressure Sensor**
  - **no 100 Bar Pressure Sensor for formula Renault 2000**.
- On **Channels 4 to 8 you can connect any sensor, except for thermocouples** sensors, that need compensated cable.
- On **Channel 8 you can connect gear sensor or any other sensor that do not need +VB voltage output**, as for channel 3.

Channel name	Pin AMP 12 pins	Pin AMP 16 pins	Signal	Pin Mignon	Cable colour
Ch. 1		8	Analog Input 1	+	Yellow
		7	Analog GND	-	Red
Ch. 2		5	Analog input 2	+	Yellow
		7	Analog GND	-	Red

Channel name	Pin AMP 12 pins	Pin AMP 16 pins	Signal	Pin Binder	Cable colour
Ch. 3		4	Analog Input 3	1	White
		3	Analog GND	2	Black
				3	Red
		6	V Reference	4	Bleu
Ch. 4		1	Analog Input 4	1	White
		3	Analog GND	2	Black
	9		+ VB	3	Red
		2	V Reference	4	Bleu
Ch. 5		16	Analog Input 5	1	White
		15	Analog GND	2	Black
	9		+VB	3	Red
		2	V Reference	4	Bleu
Ch. 6		13	Analog Input 6	1	White
		15	Analog GND	2	Black
	9		+ VB	3	Red
		2	V Reference	4	Bleu
Ch. 7		12	Analog Input 7	1	White
		11	Analog GND	2	Black
	11		+ VB	3	Red
		14	V Reference	4	Bleu
Ch. 8		9	Analog Input 8	1	White
		11	Analog GND	2	Black
	11		+ VB	3	Red
		14	V Reference	4	Bleu
Speed	12		Speed	1	White
	10		GND	2	Black
	11		+ VB	3	Red
				4	Bleu
USB		10	USB D+	1	White
	10		GND	2	Black
	7		USB D-	3	Red
				4	n.c.

From the workbench of:
Date:

VOLTAGE REGULATOR - SONY CAMERA POWER SUPPLY



VOLTAGE REGULATOR
THREE TERMINAL
ADJUSTABLE POSITIVE
(LM317)

* C IN IS REQUIRED IF REGULATOR IS LOCATED AN APPRECIABLE DISTANCE FROM POWER SUPPLY FILTER

$$V_{OUT} = 1.25V\left(1 + \frac{R2}{R1}\right) + i_{ADJ.}R2$$

* C OUT IS NOT NEEDET FOR STABILITY HOWEVER IT DOES IMPROVE TRANSIENT RESPONSE.

VOLTS (E) AMPS (I) × RESISTANCE (R)

$$I = \frac{E}{R} \qquad R = \frac{E}{I} \qquad E = R \times I$$

$$\text{WATT} = \text{AMP} \times \text{VOLT} \qquad \text{VOLT} = \frac{\text{WATT}}{\text{AMP}} \qquad \text{AMP} = \frac{\text{WATT}}{\text{VOLT}}$$

REQUIREMENTS VOLTAGE IN 12.0V TO 14.5V
VOUT 8.4V (DESIRED
POWER CONS. 3.6 W / 0.43 A

From the workbench of:
Date:

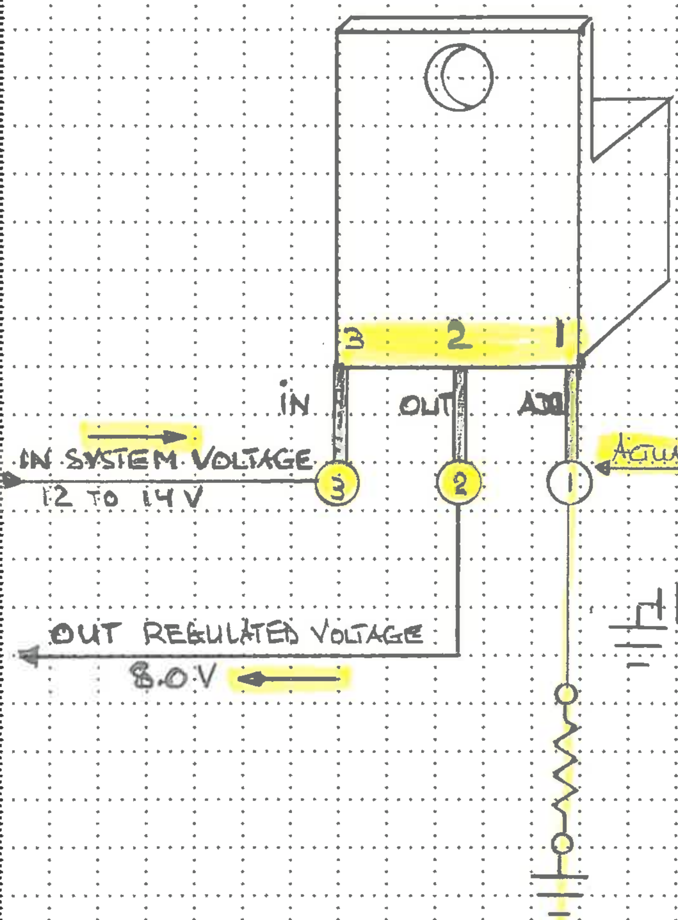
ARCO CAMERA POWER SYSTEM (INSTALLATION 0092)

THREE (3) TERMINAL POSITIVE ADJUSTABLE VOLTAGE REGULATOR P.N. LM 317T (AP 81679)

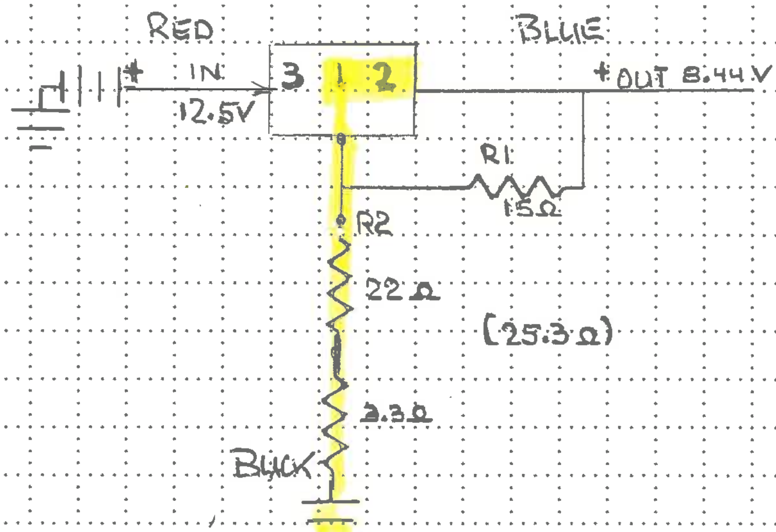
RESISTOR: 22 & 3.3 Ω ½ W PN HW022 / HW303

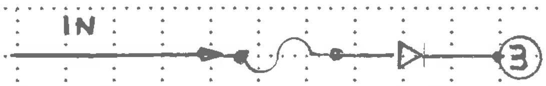
DIODE: PN IN4002 RSI. 100V, 1A

FUSE: NORMAL DUTY PN 20N 2000-AT 2A



ACTUAL TERMINAL POSITION





FUSE & DIODE NOT INSTALLED 0092

$$\text{OUT } V = 1.25V\left(1 + \frac{R2}{R1}\right) + I_{ADJ}\,R2$$

$$1.25 \times 1 + 0.59 = 1.59 = 1.99 + 6.45 = 8.44 \ (V\ OUT$$

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www.alldatasheet.com

1.5 A Adjustable Output, Positive Voltage Regulator

LM317

THREE–TERMINAL ADJUSTABLE POSITIVE VOLTAGE REGULATOR

SEMICONDUCTOR TECHNICAL DATA

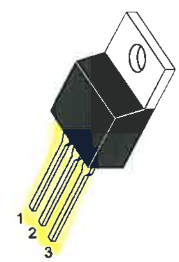
The LM317 is an adjustable 3–terminal positive voltage regulator capable of supplying in excess of 1.5 A over an output voltage range of 1.2 V to 37 V. This voltage regulator is exceptionally easy to use and requires only two external resistors to set the output voltage. Further, it employs internal current limiting, thermal shutdown and safe area compensation, making it essentially blow–out proof.

The LM317 serves a wide variety of applications including local, on card regulation. This device can also be used to make a programmable output regulator, or by connecting a fixed resistor between the adjustment and output, the LM317 can be used as a precision current regulator.

- Output Current in Excess of 1.5 A
- Output Adjustable between 1.2 V and 37 V
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting Constant with Temperature
- Output Transistor Safe–Area Compensation
- Floating Operation for High Voltage Applications
- Available in Surface Mount D^2PAK, and Standard 3–Lead Transistor Package
- Eliminates Stocking many Fixed Voltages

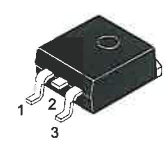
T SUFFIX
PLASTIC PACKAGE
CASE 221A

Heatsink surface connected to Pin 2.



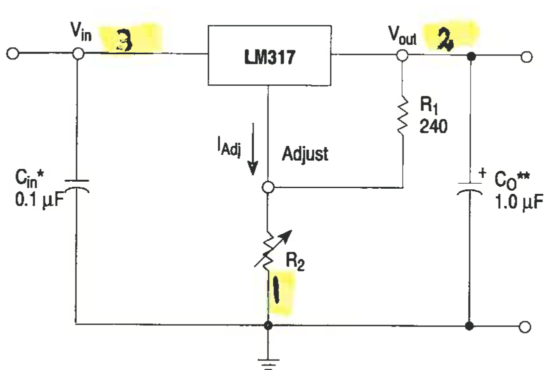
Pin 1. Adjust
2. V_{out}
3. V_{in}

D2T SUFFIX
PLASTIC PACKAGE
CASE 936
(D^2PAK)



Heatsink surface (shown as terminal 4 in case outline drawing) is connected to Pin 2.

Standard Application



* C_{in} is required if regulator is located an appreciable distance from power supply filter.
** C_O is not needed for stability, however, it does improve transient response.

$$V_{out} = 1.25\,V\left(1 + \frac{R_2}{R_1}\right) + I_{Adj}R_2$$

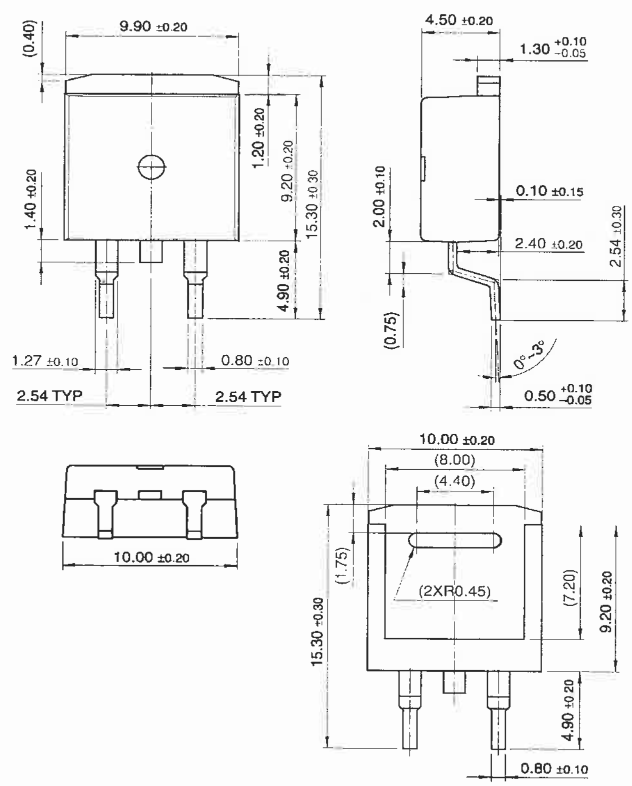
Since I_{Adj} is controlled to less than 100 µA, the error associated with this term is negligible in most applications.

ORDERING INFORMATION

Device	Operating Temperature Range	Package
LM317BD2T	T_J = –40° to +125°C	Surface Mount
LM317BT		Insertion Mount
LM317D2T	T_J = 0° to +125°C	Surface Mount
LM317T		Insertion Mount

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

D²-PAK



Dimensions in Millimeters

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1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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FAIRCHILD SEMICONDUCTOR®

March 2000
Revised June 2005

LM317
3-Terminal Positive Adjustable Regulator

General Description

This monolithic integrated circuit is an adjustable 3-terminal positive voltage regulator designed to supply more than 1.5A of load current with an output voltage adjustable over a 1.2 to 37V. It employs internal current limiting, thermal shut-down and safe area compensation.

Features

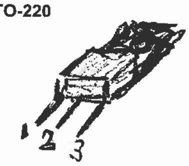
- Output Current In Excess of 1.5A
- Output Adjustable Between 1.2V and 37V
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe Operating Area Compensation
- TO-220 Package
- D2 PAK Package

Ordering Code:

Product Number	Package	Operating Temperature
LM317T	TO-220	0°C to +125°C
LM317D2TXM	D2 PAK	0°C to +125°C

Connection Diagrams

TO-220



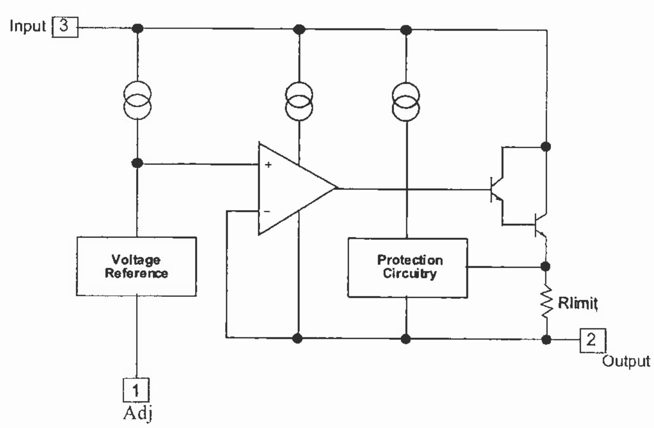
1. Adj 2. Output 3. Input

D2-PAK

1

1. Adj 2. Output 3. Input

Internal Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input-Output Voltage Differential	$V_I - V_O$	40	V
Lead Temperature	T_{LEAD}	230	°C
Power Dissipation	P_D	Internally limited	W
Operating Junction Temperature Range	T_j	0 ~ +125	°C
Storage Temperature Range	T_{STG}	-65 ~ +125	°C
Temperature Coefficient of Output Voltage	$\Delta V_O / \Delta T$	±0.02	% / °C

Note 1: Absolute Maximum Ratings: are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Electrical Characteristic

($V_I - V_O = 5V$, $I_O = 0.5A$, $0°C \le T_J \le +125°C$, $I_{MAX} = 1.5A$, $P_{DMAX} = 20W$, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Line Regulation (Note 2)	Rline	$T_A = +25°C$ $3V \le V_I - V_O \le 40V$	—	0.01	0.04	% / V
		$3V \le V_I - V_O \le 40V$	–	0.02	0.07	% / V
Load Regulation (Note 2)	Rload	$T_A = +25°C$, $10mA \le I_O \le I_{MAX}$ $V_O < 5V$ $V_O \ge 5V$	–	18.0 0.4	25.0 0.5	mV% / V_O
		$10mA \le I_O \le I_{MAX}$ $V_O < 5V$ $V_O \ge 5V$	–	40.0 0.8	70.0 1.5	mV% / V_O
Adjustable Pin Current	I_{ADJ}	–	–	46.0	100	μA
Adjustable Pin Current Change	ΔI_{ADJ}	$3V \le V_I - V_O \le 40V$ $10mA \le I_O \le I_{MAX}$ $P_D \le P_{MAX}$	–	2.0	5.0	μA
Reference Voltage	V_{REF}	$3V \le V_{IN} - V_O \le 40V$ $10mA \le I_O \le I_{MAX}$ $P_D \le P_{MAX}$	1.20	1.25	1.30	V
Temperature Stability	ST_T	–	–	0.7	–	% / V_O
Minimum Load Current to Maintain Regulation	$I_{L(MIN)}$	$V_I - V_O = 40V$	–	3.5	12.0	mA
Maximum Output Current	$I_{O(MAX)}$	$V_I - V_O \le 15V$, $P_D \le P_{MAX}$ $V_I - V_O \le 40V$, $P_D \le P_{MAX}$ $T_A = 25°C$	1.0	2.2 0.3	–	A
RMS Noise,% of V_{OUT}	eN	$T_A = +25°C$, $10Hz \le f \le 10KHz$	–	0.003	0.01	% / V_O
Ripple Rejection	RR	$V_O = 10V$, $f = 120Hz$ without C_{ADJ} $C_{ADJ} = 10\mu F$ (Note 3)	66.0	60.0 75.0	–	dB
Long-Term Stability, $T_J = T_{HIGH}$	ST	$T_A = +25°C$ for end point measurements, 1000HR	–	0.3	1.0	%
Thermal Resistance Junction to Case	$R_{\theta JC}$	–	–	5.0	–	°C / W

Note 2: Load and line regulation are specified at constant junction temperature. Change in V_D due to heating effects must be taken into account separately. Pulse testing with low duty is used. ($P_{MAX} = 20S$)

Note 3: CADJ, when used, is connected between the adjustment pin and ground.

Typical Performance Characteristics

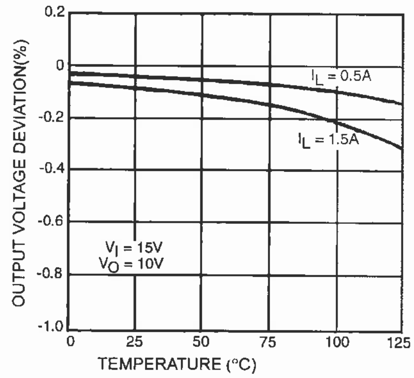


FIGURE 1. Load Regulation

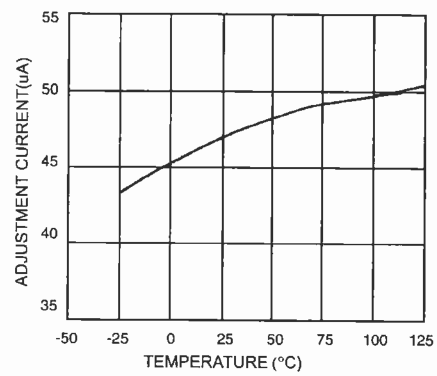


FIGURE 2. Adjustment Current

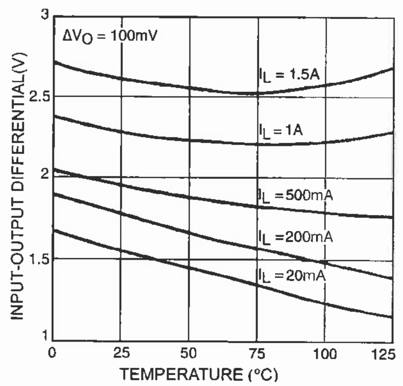


FIGURE 3. Dropout Voltage

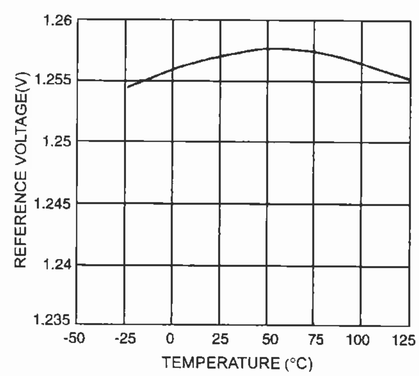
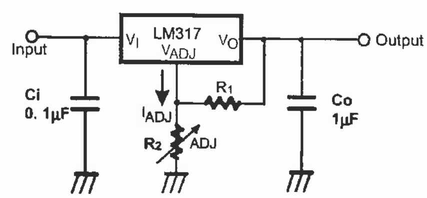


FIGURE 4. Reference Voltage

Typical Application



$$V_O = 1.25V\,(1 + R_2 / R_1) + I_{ADJ}\,R_2$$

Note: C_I is required when regulator is located an appreciable distance from power supply filter.

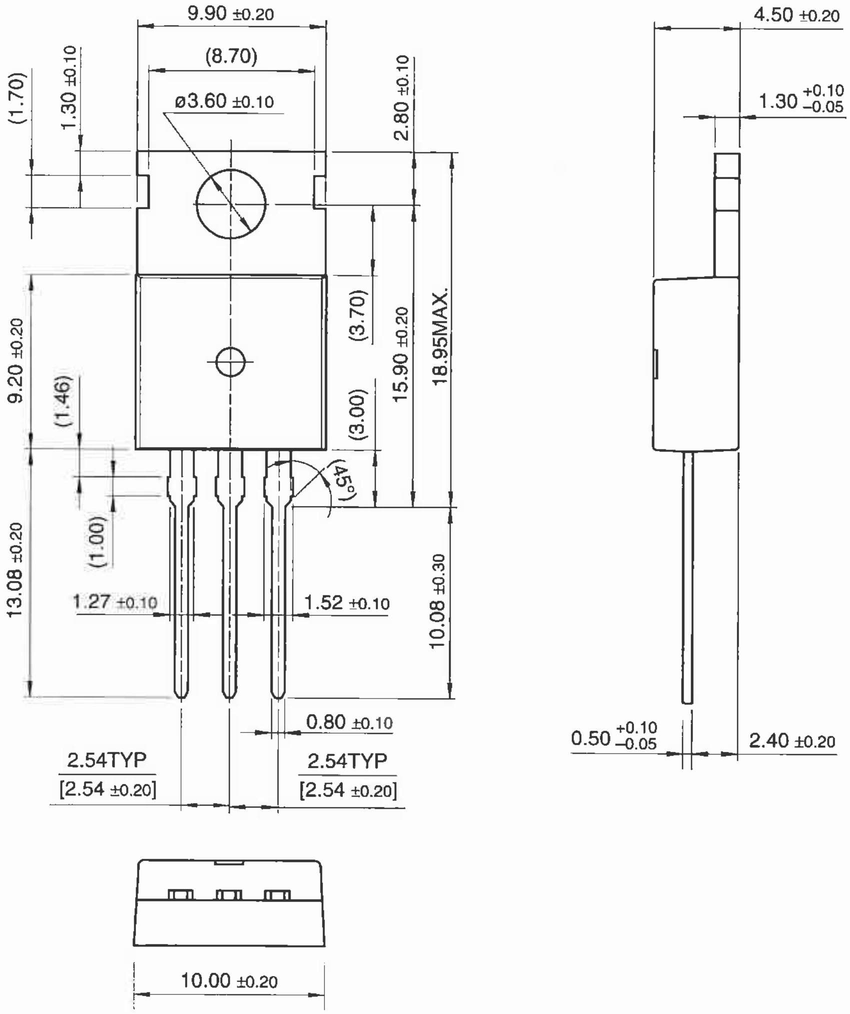
Note: C_o is not needed for stability, however, it does improve transient response.

Note: Since I_{ADJ} is controlled to less than 100μA, the error associated with this term is negligible in most applications.

FIGURE 5. Programmable Regulator

Physical Dimensions inches (millimeters) unless otherwise noted

TO-220



National Semiconductor

June 2006

LM117/LM317A/LM317
3-Terminal Adjustable Regulator

General Description

The LM117 series of adjustable 3-terminal positive voltage regulators is capable of supplying in excess of 1.5A over a 1.2V to 37V output range. They are exceptionally easy to use and require only two external resistors to set the output voltage. Further, both line and load regulation are better than standard fixed regulators. Also, the LM117 is packaged in standard transistor packages which are easily mounted and handled.

In addition to higher performance than fixed regulators, the LM117 series offers full overload protection available only in IC's. Included on the chip are current limit, thermal overload protection and safe area protection. All overload protection circuitry remains fully functional even if the adjustment terminal is disconnected.

Normally, no capacitors are needed unless the device is situated more than 6 inches from the input filter capacitors in which case an input bypass is needed. An optional output capacitor can be added to improve transient response. The adjustment terminal can be bypassed to achieve very high ripple rejection ratios which are difficult to achieve with standard 3-terminal regulators.

Besides replacing fixed regulators, the LM117 is useful in a wide variety of other applications. Since the regulator is "floating" and sees only the input-to-output differential voltage, supplies of several hundred volts can be regulated as long as the maximum input to output differential is not exceeded, i.e., avoid short-circuiting the output.

Also, it makes an especially simple adjustable switching regulator, a programmable output regulator, or by connecting a fixed resistor between the adjustment pin and output, the LM117 can be used as a precision current regulator. Supplies with electronic shutdown can be achieved by clamping the adjustment terminal to ground which programs the output to 1.2V where most loads draw little current.

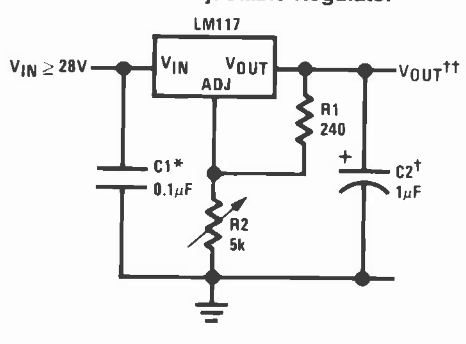
For applications requiring greater output current, see LM150 series (3A) and LM138 series (5A) data sheets. For the negative complement, see LM137 series data sheet.

Features

- Guaranteed 1% output voltage tolerance (LM317A)
- Guaranteed max. 0.01%/V line regulation (LM317A)
- Guaranteed max. 0.3% load regulation (LM117)
- Guaranteed 1.5A output current
- Adjustable output down to 1.2V
- Current limit constant with temperature
- P+ Product Enhancement tested
- 80 dB ripple rejection
- Output is short-circuit protected

Typical Applications

1.2V–25V Adjustable Regulator



Full output current not available at high input-output voltages

*Needed if device is more than 6 inches from filter capacitors.

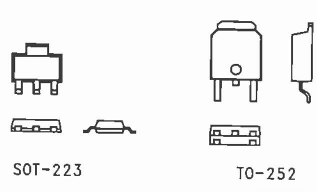
†Optional—improves transient response. Output capacitors in the range of 1μF to 1000μF of aluminum or tantalum electrolytic are commonly used to provide improved output impedance and rejection of transients.

$$††V_{OUT} = 1.25V\left(1+\frac{R2}{R1}\right) + I_{ADJ}(R_2)$$

LM117/LM317A/LM317 Package Options

Part Number	Suffix	Package	Output Current
LM117, LM317	K	TO-3	1.5A
LM317	T	TO-220	1.5A
LM317	S	TO-263	1.5A
LM317A, LM317	EMP	SOT-223	1.0A
LM117, LM317A, LM317	H	TO-39	0.5A
LM117	E	LCC	0.5A
LM317A, LM317	MDT	TO-252	0.5A

SOT-223 vs. TO-252 (D-Pak) Packages

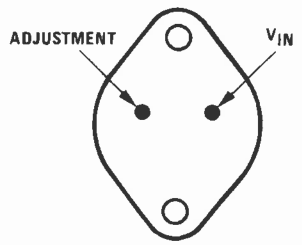


Scale 1:1

 DS009063

Connection Diagrams

TO-3 (K)
Metal Can Package

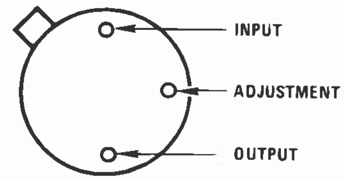


00906330

CASE IS OUTPUT

Bottom View
Steel Package
NS Package Number K02A or K02C

TO-39 (H)
Metal Can Package

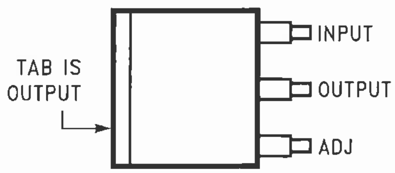


00906331

CASE IS OUTPUT

Bottom View
NS Package Number H03A

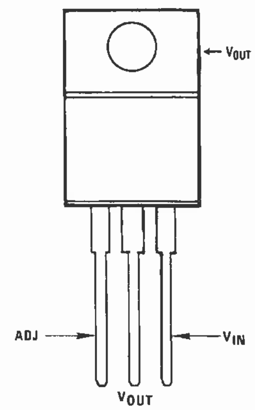
TO-263 (S)
Surface-Mount Package



00906335

Top View

TO-220 (T)
Plastic Package



00906332

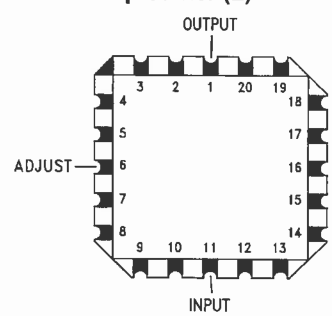
Front View
NS Package Number T03B

TO-263 (S)
Surface-Mount Package

00906336

Side View
NS Package Number TS3B

Ceramic Leadless
Chip Carrier (E)

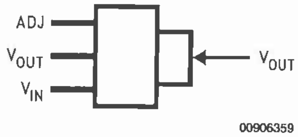


00906334

Top View
NS Package Number E20A

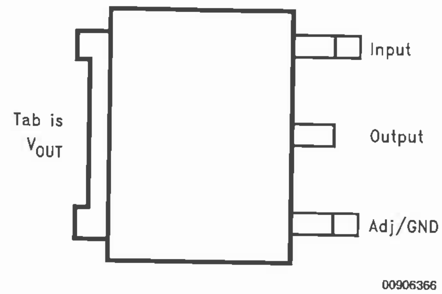
Connection Diagrams (Continued)

4-Lead SOT-223 (EMP)



Front View
NS Package Number MP04A

TO-252 (MDT)



Front View
NS Package Number TD03B

Ordering Information

Package	Temperature Range	Output Current	Order Number	Package Marking	Transport Media	NSC Drawing
TO-3 Metal Can (K)	$-55^\circ C \leq T_J \leq +150^\circ C$	1.5A	LM117K STEEL	LM117K STEEL P+	50 Per Bag	K02A
	$0^\circ C \leq T_J \leq +125^\circ C$	1.5A	LM317K STEEL	LM317K STEEL P+	50 Per Bag	
	$-55^\circ C \leq T_J \leq +150^\circ C$	1.5A	LM117K/883	LM117K/883	50 Per Bag	K02C
TO-220 3- Lead	$-40^\circ C \leq T_J \leq +125^\circ C$	1.5A	LM317AT	LM317AT P+	45 Units/Rail	T03B
	$0^\circ C \leq T_J \leq +125^\circ C$	1.5A	LM317T	LM317T P+	45 Units/Rail	
TO-263 3- Lead	$0^\circ C \leq T_J \leq +125^\circ C$	1.5A	LM317S	LM317S P+	45 Units/Rail	TS3B
			LM317SX		500 Units Tape and Reel	
SOT-223 4- Lead	$0^\circ C \leq T_J \leq +125^\circ C$	1.0A	LM317EMP	N01A	1k Units Tape and Reel	MP04A
			LM317EMPX		2k Units Tape and Reel	
	$-40^\circ C \leq T_J \leq +125^\circ C$	1.0A	LM317AEMP	N07A	1k Units Tape and Reel	
			LM317AEMPX		2k Units Tape and Reel	
TO-39 Metal Can (H)	$-55^\circ C \leq T_J \leq +150^\circ C$	0.5A	LM117H	LM117H P+	500 Per Box	H03A
	$-55^\circ C \leq T_J \leq +150^\circ C$	0.5A	LM117H/883	LM117H/883	20 Per Tray	
	$-40^\circ C \leq T_J \leq +125^\circ C$	0.5A	LM317AH	LM317AH P+	500 Per Box	
	$0^\circ C \leq T_J \leq +125^\circ C$	0.5A	LM317H	LM317H P+	500 Per Box	
LCC	$-55^\circ C \leq T_J \leq +150^\circ C$	0.5A	LM117E/883	LM117E/883	50 Units/Rail	E20A
TO-252 3- Lead D-Pack	$0^\circ C \leq T_J \leq +125^\circ C$	0.5A	LM317MDT	LM317MDT	75 Units/Rail	TD03B
			LM317MDTX		2.5k Units Tape and Reel	
	$-40^\circ C \leq T_J \leq +125^\circ C$	0.5A	LM317AMDT	LM317AMDT	75 Units/Rail	
			LM317AMDTX		2.5k Units Tape and Reel	

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

Power Dissipation	Internally Limited
Input-Output Voltage Differential	+40V, −0.3V
Storage Temperature	−65°C to +150°C
Lead Temperature	
Metal Package (Soldering, 10 seconds)	300°C
Plastic Package (Soldering, 4 seconds)	260°C
ESD Tolerance (Note 5)	3 kV

Operating Temperature Range

LM117	$-55°C \le T_J \le +150°C$
LM317A	$-40°C \le T_J \le +125°C$
LM317	$0°C \le T_J \le +125°C$

Preconditioning

Thermal Limit Burn-In	All Devices 100%

LM117 Electrical Characteristics(Note 3)

Specifications with standard type face are for $T_J = 25°C$, and those with **boldface type** apply over **full Operating Temperature Range**. Unless otherwise specified, $V_{IN} - V_{OUT} = 5V$, and $I_{OUT} = 10$ mA.

Parameter	Conditions	LM117 (Note 2) Min	Typ	Max	Units
Reference Voltage	$3V \le (V_{IN} - V_{OUT}) \le 40V$, $10 mA \le I_{OUT} \le I_{MAX}$	**1.20**	**1.25**	**1.30**	V
Line Regulation	$3V \le (V_{IN} - V_{OUT}) \le 40V$ (Note 4)		0.01 **0.02**	0.02 **0.05**	%/V
Load Regulation	$10 mA \le I_{OUT} \le I_{MAX}$ (Note 4)		0.1 **0.3**	0.3 **1**	%
Thermal Regulation	20 ms Pulse		0.03	0.07	%/W
Adjustment Pin Current			**50**	**100**	μA
Adjustment Pin Current Change	$10 mA \le I_{OUT} \le I_{MAX}$ $3V \le (V_{IN} - V_{OUT}) \le 40V$		**0.2**	**5**	μA
Temperature Stability	$T_{MIN} \le T_J \le T_{MAX}$		**1**		%
Minimum Load Current	$(V_{IN} - V_{OUT}) = 40V$		**3.5**	**5**	mA
Current Limit	$(V_{IN} - V_{OUT}) \le 15V$ K Package H, E Package	**1.5** **0.5**	**2.2** **0.8**	**3.4** **1.8**	A
	$(V_{IN} - V_{OUT}) = 40V$ K Package H, E Package	0.3 0.15	0.4 0.20		A
RMS Output Noise, % of V_{OUT}	$10 Hz \le f \le 10 kHz$		0.003		%
Ripple Rejection Ratio	$V_{OUT} = 10V$, f = 120 Hz, $C_{ADJ} = 0$ μF		65		dB
	$V_{OUT} = 10V$, f = 120 Hz, $C_{ADJ} = 10$ μF	**66**	80		dB
Long-Term Stability	$T_J = 125°C$, 1000 hrs		0.3	1	%
Thermal Resistance, θ_{JC} Junction-to-Case	K (TO-3) Package H (TO-39) Package E (LCC) Package		2 21 12		°C/W
Thermal Resistance, θ_{JA} Junction-to-Ambient (No Heat Sink)	K (TO-3) Package H (TO-39) Package E (LCC) Package		39 186 88		°C/W

FAIRCHILD SEMICONDUCTOR®

March 2000
Revised June 2005

LM317
3-Terminal Positive Adjustable Regulator

General Description

This monolithic integrated circuit is an adjustable 3-terminal positive voltage regulator designed to supply more than 1.5A of load current with an output voltage adjustable over a 1.2 to 37V. It employs internal current limiting, thermal shut-down and safe area compensation.

Features

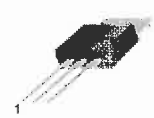
- Output Current In Excess of 1.5A
- Output Adjustable Between 1.2V and 37V
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe Operating Area Compensation
- TO-220 Package
- D2 PAK Package

Ordering Code:

Product Number	Package	Operating Temperature
LM317T	TO-220	0°C to +125°C
LM317D2TXM	D2 PAK	0°C to +125°C

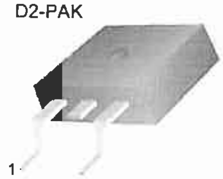
Connection Diagrams

TO-220



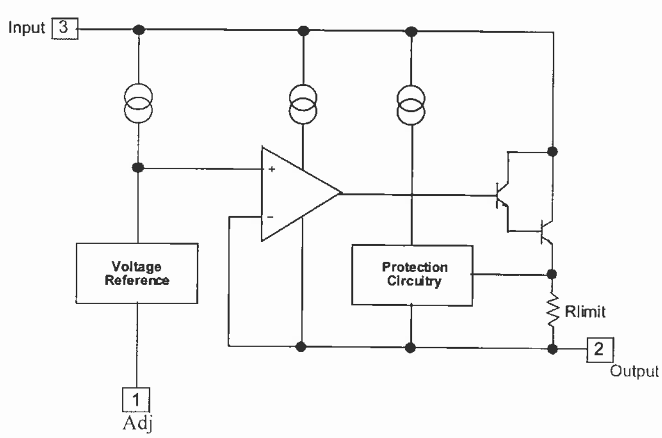
1. Adj 2. Output 3. Input

D2-PAK



1. Adj 2. Output 3. Input

Internal Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input-Output Voltage Differential	$V_I - V_O$	40	V
Lead Temperature	T_{LEAD}	230	°C
Power Dissipation	P_D	Internally limited	W
Operating Junction Temperature Range	T_j	0 ~ +125	°C
Storage Temperature Range	T_{STG}	−65 ~ +125	°C
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	±0.02	% / °C

Note 1: Absolute Maximum Ratings: are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Electrical Characteristic

($V_I - V_O = 5V$, $I_O = 0.5A$, $0°C \leq T_J \leq +125°C$, $I_{MAX} = 1.5A$, $P_{DMAX} = 20W$, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Line Regulation (Note 2)	Rline	$T_A = +25°C$ $3V < V_I - V_O < 40V$	–	0.01	0.04	% / V
		$3V < V_I - V_O < 40V$	–	0.02	0.07	% / V
Load Regulation (Note 2)	Rload	$T_A = +25°C$, $10mA < I_O < I_{MAX}$ $V_O < 5V$ $V_O \geq 5V$	–	18.0 0.4	25.0 0.5	mV% / V_O
		$10mA < I_O < I_{MAX}$ $V_O < 5V$ $V_O \geq 5V$	–	40.0 0.8	70.0 1.5	mV% / V_O
Adjustable Pin Current	I_{ADJ}	–	–	46.0	100	μA
Adjustable Pin Current Change	ΔI_{ADJ}	$3V < V_I - V_O < 40V$ $10mA < I_O < I_{MAX}$ $P_D < P_{MAX}$	–	2.0	5.0	μA
Reference Voltage	V_{REF}	$3V \leq V_{IN} - V_O \leq 40V$ $10mA \leq I_O \leq I_{MAX}$ $P_D \leq P_{MAX}$	1.20	1.25	1.30	V
Temperature Stability	ST_T	–	–	0.7	–	% / V_O
Minimum Load Current to Maintain Regulation	$I_{L(MIN)}$	$V_I - V_O = 40V$	–	3.5	12.0	mA
Maximum Output Current	$I_{O(MAX)}$	$V_I - V_O \leq 15V$, $P_D \leq P_{MAX}$ $V_I - V_O \leq 40V$, $P_D \leq P_{MAX}$ $T_A = 25°C$	1.0	2.2 0.3	–	A
RMS Noise,% of V_{OUT}	eN	$T_A = +25°C$, $10Hz \leq f \leq 10KHz$	–	0.003	0.01	% / V_O
Ripple Rejection	RR	$V_O = 10V$, $f = 120Hz$ without C_{ADJ} $C_{ADJ} = 10\mu F$ (Note 3)	66.0	60.0 75.0	–	dB
Long-Term Stability, $T_J = T_{HIGH}$	ST	$T_A = +25°C$ for end point measurements, 1000HR	–	0.3	1.0	%
Thermal Resistance Junction to Case	$R_{\theta JC}$	–	–	5.0	–	°C / W

Note 2: Load and line regulation are specified at constant junction temperature. Change in V_D due to heating effects must be taken into account separately. Pulse testing with low duty is used. ($P_{MAX} = 20S$)

Note 3: CADJ, when used, is connected between the adjustment pin and ground

Typical Performance Characteristics

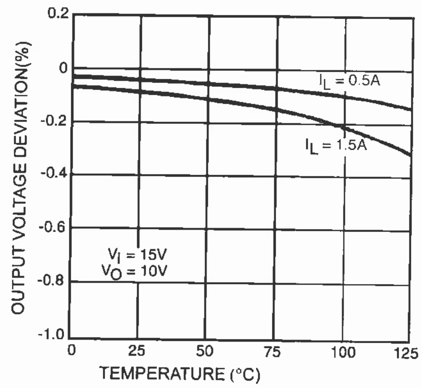


FIGURE 1. Load Regulation

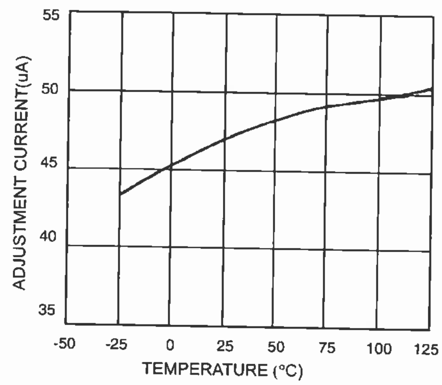


FIGURE 2. Adjustment Current

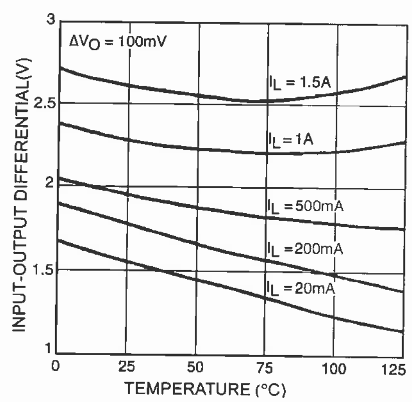


FIGURE 3. Dropout Voltage

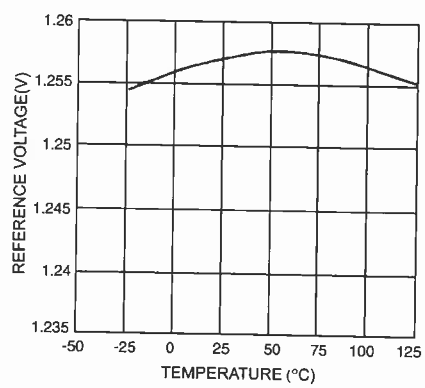
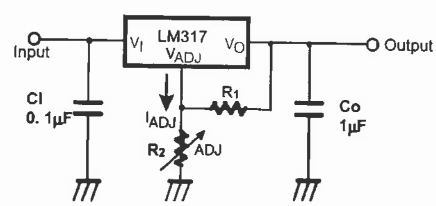


FIGURE 4. Reference Voltage

Typical Application



$$V_O = 1.25V\,(1 + R_2 / R_1) + I_{ADJ}\,R_2$$

Note: C_I is required when regulator is located an appreciable distance from power supply filter.

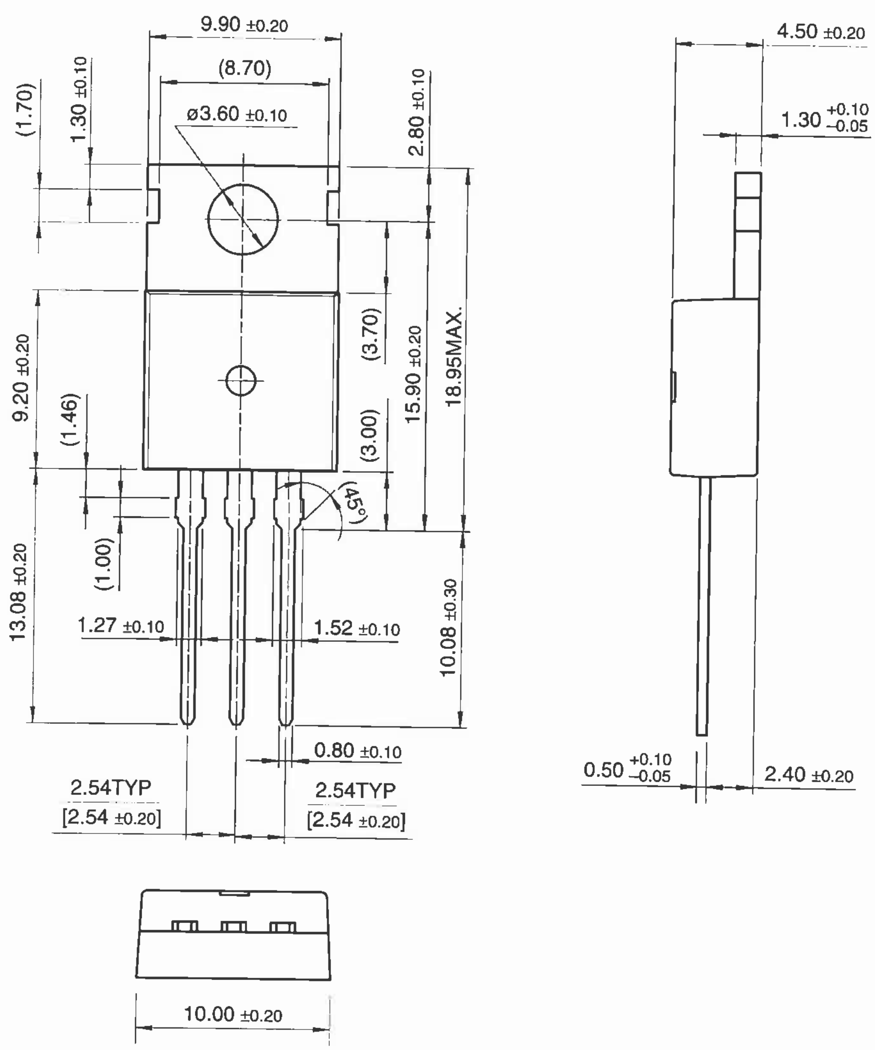
Note: C_O is not needed for stability, however, it does improve transient response.

Note: Since I_{ADJ} is controlled to less than 100μA, the error associated with this term is negligible in most applications.

FIGURE 5. Programmable Regulator

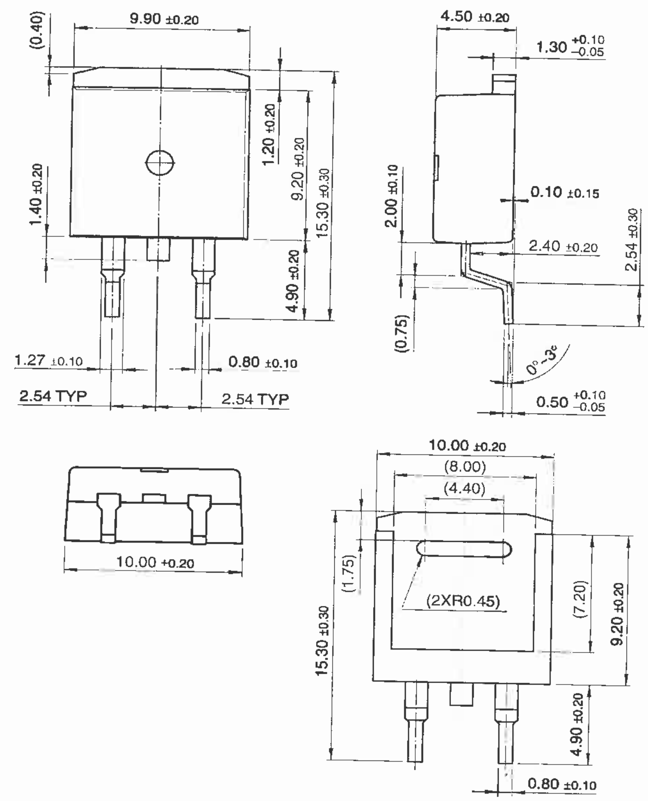
Physical Dimensions inches (millimeters) unless otherwise noted

TO-220



Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

D^2-PAK



Dimensions in Millimeters

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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Viosport Camera Systems

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wearable video technology

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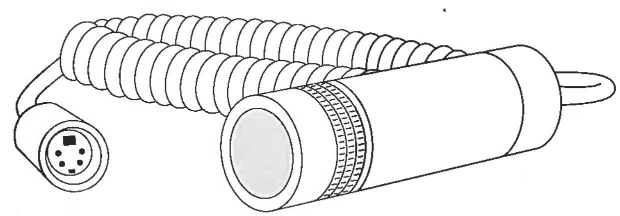
Owner's Manual

viotac



FC CE

Welcome: A note from our President

Thank you for choosing Viosport cameras and accessories; I am confident you will find our equipment to be of the highest quality in the industry. We are committed to the success of your video pursuits and take great pride in our products and professional level of customer service and support.

The art of capturing video is best achieved when you're familiar with your equipment; therefore, we ask that you read this manual in its entirety and retain for future reference.

Visit www.viosport.com regularly for new product releases, shooting techniques and industry news. Be sure to check out our video gallery – how do your videos compare?

Enjoy your new equipment.

David Ollila
President
Viosport Camera Systems

Welcome: Cam Care & Safety Precautions

PLEASE READ THE INFORMATION AND FOLLOW ALL INSTRUCTIONS BEFORE USING THIS PRODUCT.

Viosport Helmet Cam

CARE:
• Clean and inspect after every use. Be sure to use a non-abrasive cloth when cleaning the lens.
• Inspect all plug terminals to make sure that they are clean and in proper alignment.
• Never force a connection.
• Always hold the cable end to connect and disconnect.
• Store your equipment in a cool, dry place.
• Check all cables for cracks or exposed wires; if a cable is suspect, discard and replace.
• Cameras are not serviceable – do not attempt to open the case as this will void any possible warranty. The Adventure Cam 3 and S.C.O.U.T. Cam have replaceable lenses, removing the front lens cover will not cause damage and will not void your warranty.

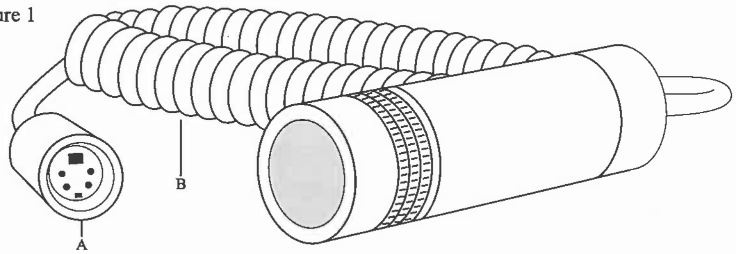
Viosport 12v Rechargeable Battery Pack

IMPORTANT WARNING:
Charge the Li-Ion battery with the charging unit and power adapter included in the package only! Inserting any other power adapters may damage the device, destroy the battery pack, void the warranty, and/or cause injury to the user.

CAUTIONS:
• Always unplug the charger when not in use.
• Always replace frayed or damaged wires and broken plugs immediately.
• Always use the charger with the original AC adapter.
• Always unplug your AC power adapter from the wall outlet before cleaning.
• Do not store, place, or use the AC power adapter where it could come into contact with water or moisture.
• Do not recharge the battery under direct sun light.
• Do not short-circuit the metal contacts of the battery pack.
• Do not disassemble, deform, or reconstruct any part of the battery and charger kit.

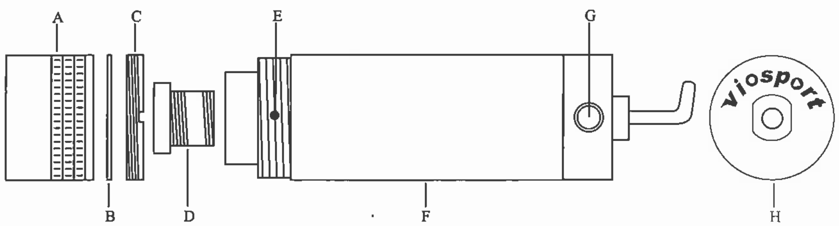
NOTES:
• It is normal for the AC adapter, charging unit, and battery to become warm during regular operation or when charging.
• If the charger does not charge the battery, check to see if the battery is already fully charged, dead, faulty, or worn out. All rechargeable batteries will eventually wear out after being charged for a certain numbers of cycles.
• Always keep metal contacts clean by wiping the surfaces with a dry, soft, and clean cloth.
• Remove the battery from the camcorder, Viosport Adventure Camera, and/or charger after use. These devices will continue to drain a small current from your battery even if they are turned off.
• All batteries will naturally discharge over time even if they are not in use. Be sure to recharge the battery on the same day or the day before you plan to use it.

Figure 1



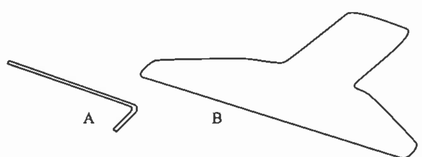
A. Viosport custom 4-pin plug
B. Coiled cable

Figure 2



A. Lens cover
B. Neutral density filter
C. Retaining ring
D. Lens
E. Set screw
F. Main body
G. 1/4-20 female thread
H. Rear of camera

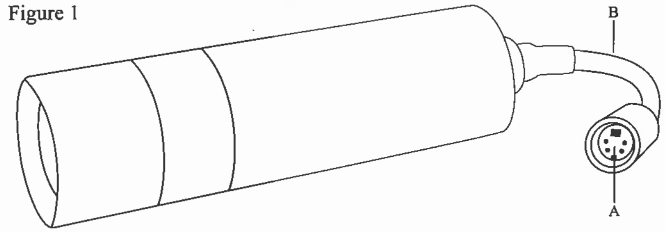
Figure 3



A. Allen wrench
B. T wrench

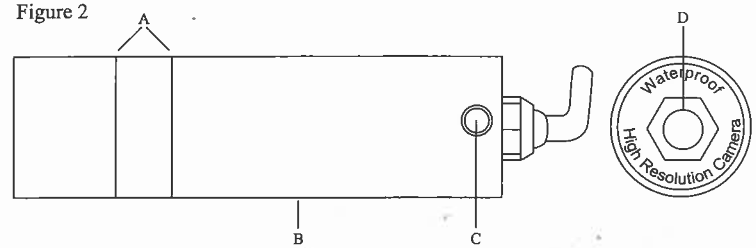
Resolution	520 TV Lines	Light Sensitivity	0.5 Lux F 2.0
CCD Chip	Sony Ex-View 1/3"	Power Supply	12 VDC (+/- 10%)
Lens	3.6mm	Power Consumption	1.2 W (+/- 10%)
Field of View	72.5 degrees	Weight	105g
H x V (pixels)	NTSC: 811 x 508	Dimensions	23mm (Ø)
	PAL: 752 x 582		x 80mm (L)
Outer Casing	Silver		

Figure 1



A. Viosport custom 4-pin plug
B. 4.5" pigtail cable

Figure 2

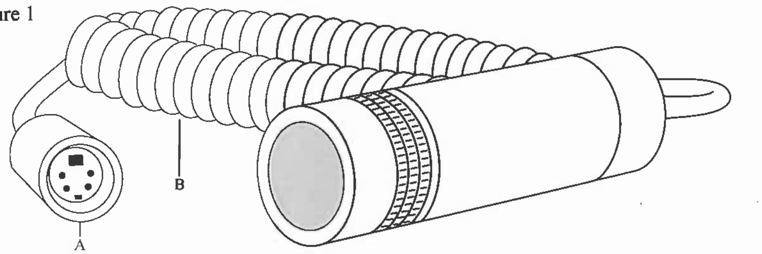


A. Warranty seal
B. Main body
C. 1/4-20 female thread
D. Rear of camera

Resolution	480 TV Lines	Light Sensitivity	0.05 Lux F 2.0
CCD Chip	Sony Hyper HAD 1/3"	Power Supply	12 VDC (+/- 10%)
Lens	3.6mm	Power Consumption	3 W (+/- 10%)
Field of View	93 degrees	Weight	196g
H x V (pixels)	NTSC: 510 x 492	Dimensions	32mm (Ø)
	PAL: 500 x 582		x 110mm (L)
Outer Casing	Silver		

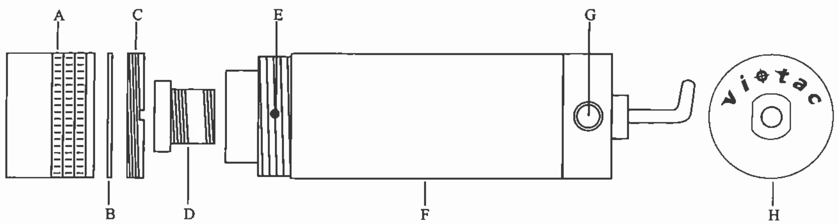
Products: S.C.O.U.T. Cam

Figure 1



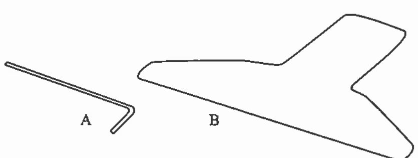
A. Viosport custom 4-pin plug
B. Coiled cable

Figure 2



A. Lens cover
B. Neutral density filter
C. Retaining ring
D. Lens
E. Set screw
F. Main body
G. 1/4-20 female thread
H. Rear of camera

Figure 3

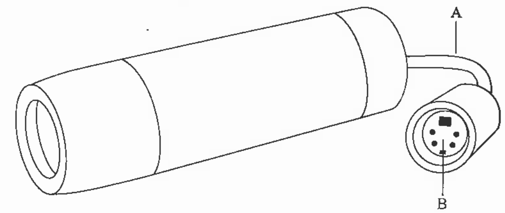


A. Allen wrench
B. T wrench

Resolution	520 TV Lines	Light Sensitivity	0.5 Lux F 2.0
CCD Chip	Sony Ex-View 1/3"	Power Supply	12 VDC (+/- 10%)
Lens	3.6mm	Power Consumption	1.2 W (+/- 10%)
Field of View	72.5 degrees	Weight	105g
H x V (pixels)	NTSC: 811 x 508 PAL: 752 x 582	Dimensions	23mm (Ø) x 80mm (L)
Outer Casing	Matte Black		

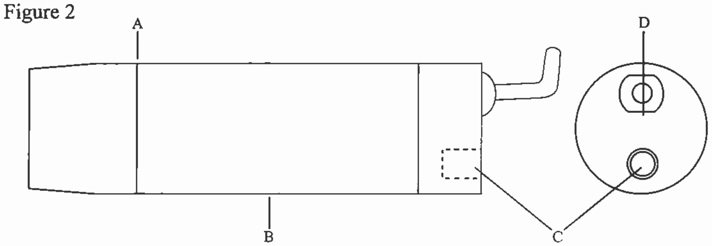
Products: Adventure Cam II

Figure 1



A. Viosport custom 4-pin plug
B. 3" pigtail cable

Figure 2

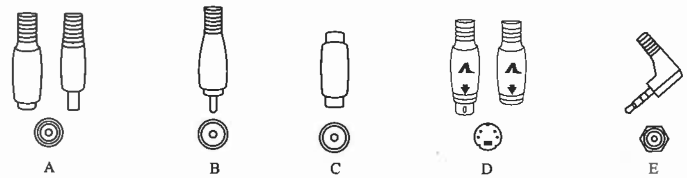


A. Warranty seal
B. Main body
C. 1/4-20 female thread
D. Rear of camera

Resolution	380 TV Lines	Light Sensitivity	1 Lux F 2.0
CCD Chip	Panasonic 1/4"	Power Supply	12VDC (+/- 10%)
Lens	2.9mm	Power Consumption	130mA (+/- 10%)
Field of View	90 degrees	Weight	80g
H x V (pixels)	NTSC: 510 x 492 PAL: 500 x 582	Dimensions	22mm (Ø) x 76mm (L)
Outer Casing	Black		

Products: Plug Types

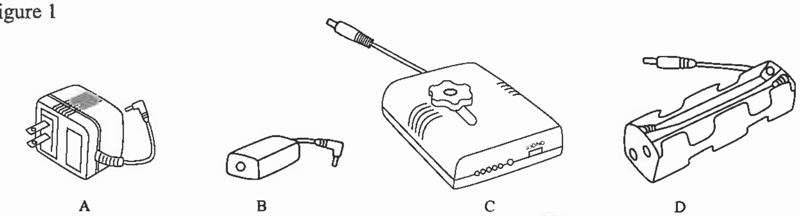
Figure 1



A. 2.1mm power source plug
B. RCA plug
C. RCA female/female adapter
D. Viosport custom 4-pin plug
E. 3.5mm A/V plug

Products: Power Sources

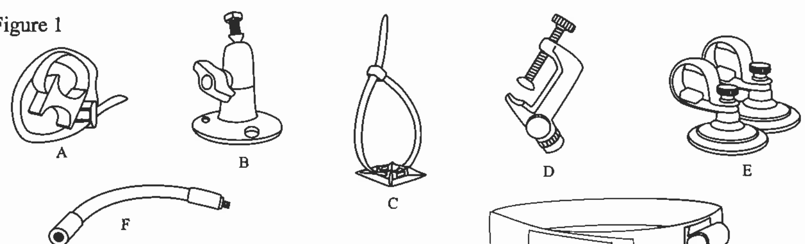
Figure 1



A. AC 12V power supply
B. Charging unit
C. 12V rechargeable battery
D. 8 "AA" battery holder

Products: Mounts

Figure 1

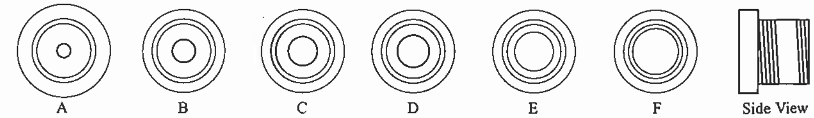


A. Double Hook & Loop Mount
B. Stationary Mount
C. Adhesive Mount
D. ClamperPod 2
E. Dual Suction Cup Mount
F. Flex Mount
G. Headstrap Mount

Please visit www.viosport.com for updates on new mounts and how to use them.

Products: Lenses

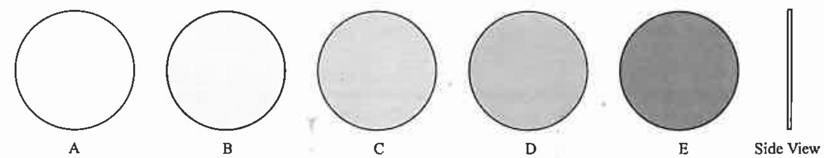
Figure 1



A. 2.5mm: 92.5°
B. 2.9mm: 88°
C. 3.6mm: 72.5°
D. 6.0mm: 47.5°
E. 8.0mm: 36.5°
F. 12.0mm: 24.5°
*Lenses are only compatible with the Adventure Cam 3 and S.C.O.U.T. Cam.

Products: Neutral Density Filters

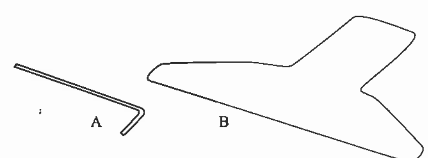
Figure 1



A. 100% (clear glass replacement)
B. 80%
C. 50%
D. 30%
E. 10%
*Density percentages are the amount of light let into the camera.
*Neutral density filters are only compatible with the Adventure Cam 3 and S.C.O.U.T. Cam.

Products: Lens and Filter Tool Kit

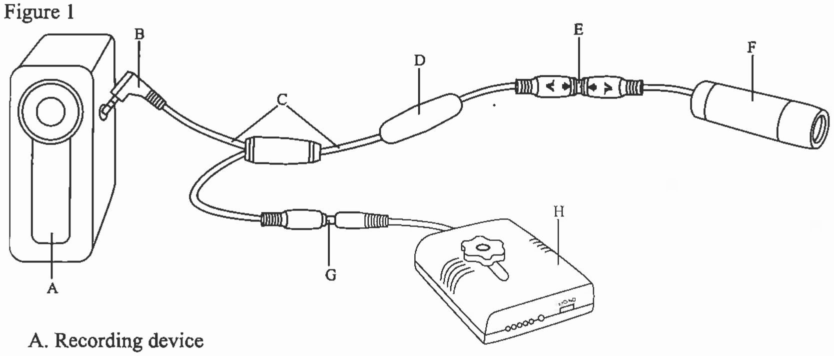
Figure 1



A. Allen wrench
B. T wrench

How To: General Connections

Figure 1

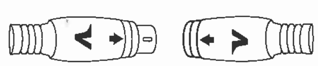


A. Recording device
B. A/V plug (3.5mm plug shown)
C. Patent-pending A/V cable
D. Integrated microphone
E. Viosport custom 4-pin plug connection
F. Viosport helmet camera
G. 2.1mm power source plug connection
H. Power source (rechargeable battery shown)
*Images are not to scale. Individual products may vary.

How To: Connect Cable to Cam

All models of the Viosport Adventure Cams have interchangeable cables and follow the same procedure.

To plug the male mini-din 4-pin connection from the Viosport audio/video (A/V) cable into the female connection on the Adventure Cam.

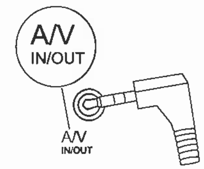


1. Line up the arrows on the connectors and push together. Be sure the connectors 'click' into place to ensure a secure, waterproof connection.

How To: Connect Cam to Recording Device

There are several types of audio/video (A/V) input plugs into recording devices. Use the manual from your recording device to find the location of the input, as well as what type of input is on the device.

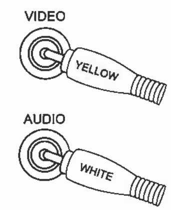
Devices with Composite Mini-plug input:



Use either the 2.5mm or 3.5mm Viosport A/V Cable to connect directly to recording device.

1. Plug the male mini-plug on the Viosport A/V Cable into the A/V input terminal on the recording device.

Devices with RCA inputs:

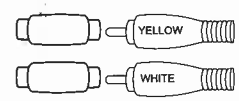


Use the RCA Viosport A/V Cable to connect directly to the recording device.

1. Plug the yellow, (male) RCA plug into the yellow or VIDEO input terminal on the recording device.

2. Plug the white, (male) RCA plug into the white, red or AUDIO input terminal on the recording device.

Devices with inputs not described above:



Use the RCA Viosport A/V Cable in conjunction with two RCA female/female adapters to connect to the A/V Cable supplied with the recording device (for clarity, we'll refer to this cable as the RD A/V Cable).

1. Attach the RCA female/female adapters to the male RCA ends on the Viosport A/V Cable.

2. Plug the yellow RCA plug into the yellow RCA plug on the RD A/V cable and plug the white RCA plug into the white RCA plug on the RD A/V cable.

3. Plug the RD A/V cable into the A/V input on your recording device.

*Some RD A/V cables may have connections that are not used.

How To: Connect Cam to Power Source

Your Adventure Cam runs on 12 volts of power.

Viosport Battery Holder

1. Properly place 8 "AA" batteries into the battery holder.

2. Plug the male power connector from the battery holder into the female power connector on the Viosport A/V Cable.

Depending on conditions of use, the Viosport Battery Holder could give you up to 12 hours of run time. In order to conserve battery power, unplug the Adventure Cam from the battery holder when not in use.

Viosport Rechargeable Battery Pack

Use:

1. Plug the male power connector on the battery into the female power connector on the Viosport A/V Cable.

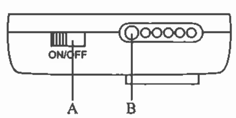
2. Turn the Power Switch to the "ON" position.

If desired, attach the Li-Ion battery to the bottom of your recording device with the tripod bolt built in the battery pack.

In order to conserve the battery power, turn the power switch to the "OFF" position and unplug the Viosport Adventure Cam from the battery when not in use.

Depending on conditions of use, the Viosport Rechargeable Battery could give you up to 6 hours of run time. In order to conserve battery power, unplug the Adventure Cam from the battery holder when not in use.

Charging:



1. Push the CHECK button, located next to the 5-LED fuel gauge (B). The number of lit LED lights indicates the remaining power level in the battery from Low (one LED) to High (five LED's).

2. Turn the power switch to the "OFF" position (A).

3. Insert the output plug of the AC power adapter into the charging unit and plug into an AC outlet. The GREEN LED indicator on the charging unit will light up to indicate it is powered properly and ready for use.

4. Plug the cable of charging unit into the socket of the battery. The LED indicator on the charging unit will turn RED to indicate the battery is receiving charge. As soon as the battery is fully charged, the same LED indicator will turn GREEN to indicate your battery is fully charged and ready for use. Disconnect the charger from the battery after the battery is charged.

The battery will take approximately 2.5 hours to charge.

Viosport Cigarette Lighter

Use:

1. Plug the male power connector on the cigarette lighter power cable into the female power connector on the Viosport A/V Cable.

2. Plug the cigarette lighter power cable into a 12v cigarette lighter.

In order to conserve power, unplug the Viosport Adventure Cam from the cigarette lighter when not in use.

Charging Rechargeable Battery:

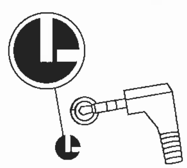
1. Push the CHECK button, located next to the 5-LED fuel gauge. The number of lit LED lights indicates the remaining power level in the battery from Low (one LED) to High (five LED's).

2. Turn the power switch to the "OFF" position.

3. Insert the output plug of the cigarette lighter power cable into the charging unit and plug into a cigarette lighter outlet. The GREEN LED indicator on the charging unit will light up to indicate it is powered properly and ready for use.

4. Plug the cable of charging unit into the socket of the battery. The LED indicator on the charging unit will turn RED to indicate the battery is receiving charge. As soon as the battery is fully charged, the same LED indicator will turn GREEN to indicate your battery is fully charged and ready for use. Disconnect the charger from the battery after the battery is charged.

How To: Connect LANC to Recording Device

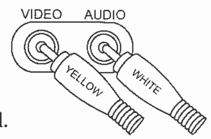


1. Locate the LANC terminal on the camcorder. Plug the LANC remote into the LANC terminal.

2. Make sure your camcorder is in VCR, VTR, or PLAY mode to use it in conjunction with the LANC remote control and Viosport Adventure Cam.

How To: Connect Cam to Television

1. Plug the yellow (male) RCA plug into the yellow or video input terminal on the television and plug the white (male) RCA plug into the white, red, or audio input terminal on the television.



*Be sure to have the Television on the AUX or A/V input channel.

How To: Change the Neutral Density Filters

Removal:

1. Remove the lens cover by twisting it counter clockwise (A).

2. Inside the lens cover is a retaining ring. Insert the T wrench from the Tool Kit into the notches of the retaining ring and turn it counterclockwise until the retaining ring is completely removed. Once the ring is loosened, it may be faster to use your fingers (C).

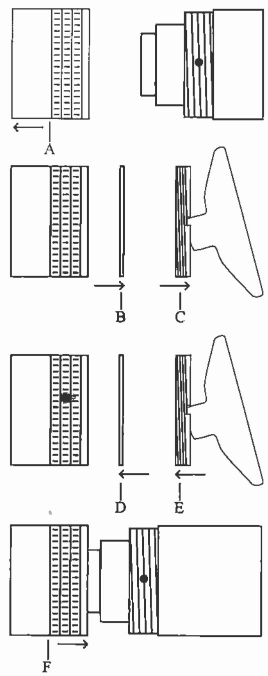
3. Safely remove the filter by turning the lens cover upside down into the palm of your hand or on a soft, flat surface (B).

Replacement:

4. Before inserting a new filter, use a soft cloth to clean off any dirt or fingerprints. Carefully place the clean filter into the lens cover (D).

5. Insert the retaining ring into the lens cover and turn clockwise with the T wrench. Be careful to avoid cross threading. The retaining ring should be tight enough to hold the filter in place, but not too tight that the filter cracks or chips (E).

6. Return the lens cover to the main body by turning clockwise (F).



How To: Change the Lenses

Before you begin changing the lenses, we recommend hooking your cam to a television or recording device to check the focus. Please refer to the How To: Connect Cam to Television on page 14 of this manual for proper hookup instructions.

Removal:

1. Remove the lens cover by twisting it counterclockwise (A).

2. On the threaded section of the main body of the cam, there are two sets of screw holes. DO NOT completely remove the set screws – as they are very small and easily misplaced. With the Allen wrench from the Tool Kit, turn the set screws counterclockwise to loosen (B).

3. Remove the lens by turning it counterclockwise (C).

Replacement*:

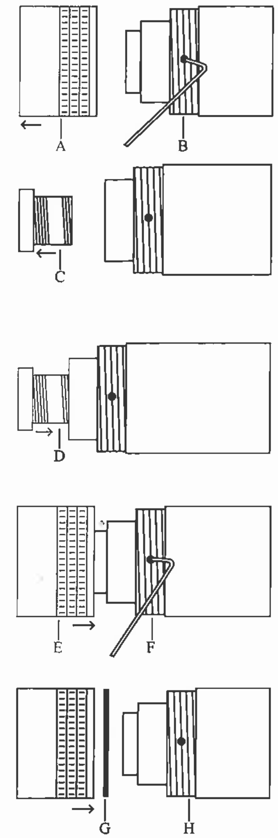
4. Choose the lens that fits your Field of View requirements (see Lenses on page 9). Insert the new lens into the main body and turn clockwise (D). Be careful to avoid cross threading.

5. Find a point of reference that is the approximate distance that you will be recording. Refer to your television or recording device display to focus the new lens. Turn the lens either clockwise or counterclockwise to ensure that the image is focused clearly.

6. With the Allen wrench from the Tool Kit, turn the set screws clockwise to tighten (F).

7. Return the lens cover to the main body by turning clockwise (E).

* Because the 2.5mm: 92.5° lens is slightly larger, an additional rubber washer (G) is required to be inserted around the main body (H) to avoid the potential of cracking the filter.



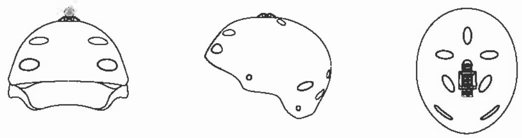
Support: Mounting Tips

There are several ways to mount your Viosport camera to your helmet. In most cases, the best mounting position is to have the camera parallel to the ground; however, since most of your filming will be done while you are in an action-forward position (example: riding a bike), the camera may point slightly upward when your helmet is resting on a flat surface.

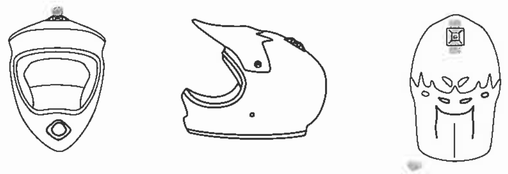
Here are some examples of different helmets and various mounting positions.

Deep-vented bike helmet

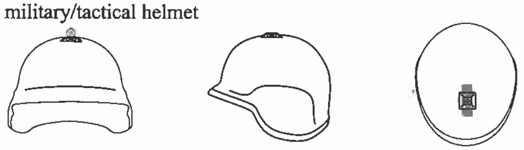
Smooth-surfaced ski/snowboard helmet



Smooth-surfaced full-face helmet



Smooth-surfaced military/tactical helmet



Support: Videography Tips

• When the Viosport Camera is mounted to your helmet, keep your head steady and try not to rotate rapidly from side to side. Keeping steady will create video that is easier to watch.
• For compelling video, use a frame of reference, such as another person.
• When possible, keep the sun at your back.
• Most riders choose to film from their helmet. Mounting the cam to your head provides smoother video, as you act as a shock absorber.
• If you have the need for speed and lead the pack – mount the camera facing behind you to capture the agony as your friends try to catch up. You can accomplish this by mounting the Viosport Camera to your helmet pointing behind you or by mounting it using our ClamperPod2 and Flex Mount.

Support: Cam Comparison

	Adventure Cam 3	Adventure Cam H2O	S.C.O.U.T. Cam	Adventure Cam II
CCD Chip	Sony Ex-View 1/3"	Sony Hyper HAD 1/3"	Sony Ex-View 1/3"	Panasonic 1/4"
TV Lines	520	480	520	380
Low Light Lux Rating	0.5	0.05	0.5	1
Optional Lenses	5	0	5	0
Replacement Glass	yes	no	yes	no
Sun Filters	5	0	5	0
Outer Casing	Silver	Silver	Matte Black	Black
Quick Release Cable	Coil	Pigtail	Coil	Pigtail

Support: Toubleshooting

Problem	Possible Cause	Possible Solution
I see an image from my camcorder lens on my LCD – not from the helmet cam.	**Camera not in the correct mode**	1. Switch your camcorder to VCR (aka VTR or PLAY/EDIT) mode. 2. Refer to the owner's manual to set up the device to accept input from an outside source. You can generally find the instructions in a section entitled "How to record from a TV or VCR".
I can't plug the Adventure Cam into a recording device with the Viosport cables.	**Proprietary input plug type**	If you have a recording device that has an A/V input plug that does not match the plug-type of the Viosport A/V Cable (this applies to several Sony Cameras); follow the instructions on page 11 of this manual to connect your cam to the recorder.
	No A/V input	If you cannot find an A/V input plug on your recording device, your recording device is not compatible and will not work with the Viosport helmet cams.
My LCD is showing a blue screen	**Recording device needs to be set up to accept input from an outside source.**	1. Be sure your recording device is in VCR (aka VTR or PLAY/EDIT) mode. 2. Refer to the owner's manual to set up the device to accept input from an outside source. You can generally find the instructions in a section entitled "How to record from a TV or VCR".
	Adventure Cam not sending video signal	Call Viosport at 888.579.2267 for technical support. If they cannot assist in getting your helmet cam working, they will issue an RMA for you to return the camera for further testing.
My LCD screen shows a blinking red tape.	**Tape not present in the camcorder**	Load a tape into your recording device.
My LANC Remote powers the camera into CAMERA mode.	**LANC Remote incompatibility**	You are using a camera with an electronic toggle to switch modes. Our LANC v.1.6 solves this incompatibility. It is designed to only work in VCR mode and will automatically put your camera in the correct mode.

Problem	Possible Cause	Possible Solution
My LANC lights are flashing uncontrollably.	**Tape not advanced**	Record just a second (or even less) and the tape will move out from its top position and the lights on the remote will return to normal. It's always recommended that you move the tape out of its top position before recording as the image quality in the first frames might be degraded.
My LCD is showing a black screen	**Helmet cam is not getting power**	1. If using the rechargeable battery, make sure the battery is turned on and has a charge. 2. If using the "AA" battery holder, make sure you properly install the batteries and that they are new.
The image from my helmet cam is recording to the memory card and not to the tape.	**Pressing the main record button**	When recording from an outside source in VCR mode, you must refer to your recorder's owner's manual. You can generally find the instructions in a section entitled "How to record from a TV or VCR".

*Additional support can be achieved by visiting www.viosport.com or calling 888.579.2267.

Support: Glossary

12v (12 Volts)
Amount of power needed to operate all Viosport Adventure Cams. Too much or too little voltage may damage the camera.

3.5mm Mini Plug
A terminal in the camcorder which is 3.5mm. Generally, this is the size of the A/V terminal, which is where external audio and video sources connect to the camcorder. It looks similar to a classic headphone jack.

A/V Input (Audio/Video)
This is necessary to connect external audio and video sources, such as our Adventure Cams. Also known as analog input.

AC (Alternating Current)
Basically: A wall outlet. Officially: Occurs when charge carriers in a conductor or semiconductor periodically reverse their direction of movement. The voltage of an AC power source changes from instant to instant in time.

Adventure Cam
Viosport Camera's with the following model names: II, H20, 3 and S.C.O.U.T. Also known as helmet cam, bullet cam, head cam, POV (point-of-view) cam or mini cam, just to name a few.

Camcorder
A portable electronic recording device capable of recording live-motion video/audio for later replay through VCRs, TVs, and, in some models, a personal computer. The most popular recording device for the Viosport Cameras.

CCD (Charge Coupled Device)
One of the two main types of image sensors used in digital cameras. When a picture is taken, the CCD is struck by light coming through the camera's lens. Each of the thousands or millions of tiny pixels that make up the CCD converts this light into electrons. The number of electrons, usually described as the pixel's accumulated charge, is measured, and then converted to a digital value. This last step occurs outside the CCD, in a camera component called an analog-to-digital converter.

Composite
Standard A/V lead for many devices such as DVD players, VCR's, camcorders. Generally 3.5mm in size.

DC (Direct Current)
Basically: Battery powered. Officially: The unidirectional flow or movement of electric charge carriers, usually electron. Direct current is produced by electrochemical and photovoltaic cells and batteries.

Field of View
The horizontal range of view of the camera lens. Adventure Cam II: 90 degrees, Adventure Cam H2O: 93 degrees, Adventure Cam 3: 72.5 degrees, S.C.O.U.T. Cam: 72.5 degrees.

LANC (Lan-cee)
A Sony remote control protocol which is built into various camcorder models. This is found only on select Canon and Sony models.

Lens
A piece of glass or other transparent material used to converge or diverge transmitted light and form optical images.

Lithium Ion Battery
A lithium ion (Li-Ion) battery is a rechargeable battery with twice the energy capacity of a nickel-cadmium battery. It also offers greater stability and safety. The battery has no memory.

LUX
A unit of illumination equal to the direct illumination on a surface that is everywhere one meter from a uniform point source of one candle intensity or equal to one lumen per square meter. Note: lower LUX value cameras work better in low light.

MD4 Extension
Viosport's 12-foot extension cable for Adventure Cam II, H20, 3, and S.C.O.U.T. models.

Mini DV (Digital Video)
A type of camcorder recording media format. Implies recording, manipulating, storing and playing back video images digitally.

Mount
Device used to hold Viosport's Adventure Cams in a desired place.

Neutral Density Filter
Basically: Sun shades. Officially: A thin sheet or disc of glass, plastic or gelatin having plane and parallel faces, toned to some uniform and specific shade of gray, and intended to be used over the camera lens during exposure for the purpose of reducing the intensity of the exposing light without changing its color.

NTSC (National Television Standards Committee)
Standard protocol for television (TV) broadcast transmission and reception in North America. North American camcorders require NTSC version of Viosport Adventure Cams.

PAL (Phase Alternation Line)
The analog television display standard that is used in Europe and certain other parts of the world. If you are using a European model camcorder you would need a PAL-version Adventure Cam.

POV
Point of view.

RCA
An RCA connector is designed for use with coaxial cable. The yellow connection is for video and the red and the white are for audio. Viosport's cams offer only one channel of audio.

Resolution
Resolution is the number of pixels (individual points of color) contained on a display monitor expressed in terms of the number of pixels on the horizontal axis and the number on the vertical axis. The sharpness of the image depends on the resolution and the size of the monitor. The Adventure Cam II offers 380 TV lines of resolution. The Adventure Cam H2O offers 480 TV lines of resolution. The Adventure Cam 3 and S.C.O.U.T. Cam both offer 520 TV lines.

Sony Proprietary Cable
A cable that is specific to Sony devices. The current Sony proprietary A/V cable has a half-moon shape on one-end and RCA male and S-Video ends on the other.

VCR/VTR mode
This mode allows the camcorder to record from an external device such as Viosport Adventure Cams.

Support: Customer Service

Have a question or comment regarding Viosport or our products? There are several ways to get in touch with us.

E-mail

General Information:	info@viosport.com
Sales Information:	sales@viosport.com
Customer Service:	customerservice@viosport.com
Catalog Requests:	catalog@viosport.com
Warranty/Returns:	warranty@viosport.com
Resellers:	dealer@viosport.com
Rentals:	rentals@viosport.com
Government:	government@viosport.com
Production:	production@viosport.com
Website Technical:	viosites@viosport.com
Submit Tips:	tips@viosport.com
Submit Video:	video@viosport.com

Phone

Our Customer Service lines are open Monday-Friday 8:00 am - 5:00 (EST). You may leave a voicemail message during non-business hours. We strive to return each call within 24 business hours.

Toll-free:	888.579.CAMS (2267)
Local:	906.226.9393
Fax:	906.228.6566

Postal Mail

Viosport Camera Systems
100 North Front Street
Marquette MI 49855

Support: Warranty/Returns

Warranty

Viosport warrants all merchandise against defects in material or workmanship for one year from date of purchase unless otherwise specified. The Viosport warranty is limited to the replacement or repair of the defective item at no charge if we determine such item to be defective. This warranty shall not apply to any item subject to misuse including static discharge, failure by Buyer to follow instructions, product modification, ordinary wear and tear, negligent or improper operation, or which has been installed or soldered or altered during assembly or use and is not capable of being tested or resold. Modification, repair, or attempted repair by anyone other than Viosport without the written permission of Viosport will void this limited warranty. Warranty is also voided on any product that is found to have an altered or tampered with serial number.

Defective items must be shipped prepaid. Viosport will ship the return or replacement item to the customer using UPS Ground services. If the customer shipped the item to Viosport using express services, Viosport will match the level of service for the return. If the customer did not use express shipping, but wishes to have the item express shipped to them, Viosport will charge the customer for the upgraded shipping charges.

30-Day Return

Within 30 days of purchase, you may return any item purchased from Viosport for any reason for a refund, exchange, or credit towards another Viosport purchase. The returned items must be in original condition and packaging.

Lifetime Return

If your camera does not qualify for warranty due to:

- outside of one-year time frame
- failure not considered a defect by Viosport
- camera was not manufactured by Viosport

Return your camera to Viosport and we will offer you a 25% discount on the purchase of a new Viosport Adventure Cam.

FIRMWARE VERSION
1454 000 1 02309

MXL

MXL Strada / MXL Pista / MXL PRO

User Manual for

MXL Strada / MXL Pista / MXL PRO

This user manual was written using the following parameters:

Firmware version:	**14.45**
Software version:	**2.20.16**
Manual version:	**107**
Date of publication:	**October the 17th 2005**

Please note:

Dear MXL Owner

Your **MXL Strada / MXL Pista / MXL PRO / MXL PRO 05** is the latest generation of ***AIM*** data acquisition systems for car / bike racing and provides you a stunning, easy to use and multifunctional display. Not just a stunning display that is fully configurable to your needs, the **MXL** can record the performance of you and your vehicle in detail. We offer the **MXL** in a wide range of models with functions and feature sets so you can choose the exact model to match your needs. The **MXL** is part of the total ***AIM*** racing data solution – which includes our **Race Studio 2** software running on your PC, through which you can control and configure your **MXL** (all versions), as well as download and analyze your data (**Pista / PRO / PRO 05**).

The **MXL** allows you to monitor and display RPM, speed, gear number, lap (split) times and other custom sensors on analog inputs. Depending on **MXL** version you can monitor and record 8 to 12 analog inputs and display 6 of them. **MXL** also has a backlight that can be switched on during night or low light racing.

In addition you can create track maps with the internal lateral G-force sensor (**Pista / PRO / PRO 05** only) or the external gyroscope (optional BIKE equipment) allowing you to correlate your data and your track position.

The **MXL** is available with 128kb (**Strada**), 8Mb (**Pista/PRO**) or 16Mb (**PRO 05**) of non-volatile RAM internal memory (the memory is retained even when the power is off).

The **MXL** is equipped with a USB port to interface with a PC. As standard equipment, your **MXL** (**Pista** / **PRO** / **PRO 05**) comes with an infrared lap transmitter and receiver, these are optional equipment for the **MXL Strada**.

Our Technical Support and Customer Service is available every day from 9am to 5pm (call 800.718.9090 in the USA) and, as usual, we are at your side at almost all the major races nationwide, to provide you with personal assistance. If you have any question, need help, or want to give us feedback, please visit our website www.aim-sportline.com (outside USA and Canada), www.aimsports.com (USA and Canada). We are not satisfied until you are satisfied.

Thank you for your choice of an ***AIM*** product. By choosing the **MXL** you have chosen the very best we have to offer.

Table of contents

1 – MXL Kits

AIM has developed different **MXL** kits to fit various situations; the chart below shows the standard equipment in each kit. All MXL kits are designed to be ready for race day, without any extra gear needed to get started:

MXL Strada	MXL Pista	MXL PRO/MXL PRO 05
• **MXL Strada** • Display Backlight • CAN/RS232 Cables • Power Cable • **Race Studio 2**[1] • USB cable	• **MXL Pista** • Display backlight • CAN/RS 232 Cables • Cable Harness • Oil temp. sensor • Water temp. sensor • Speed sensor • RPM Sensor + cable • IR Lap Rx and Tx • USB cable • **Race Studio 2**	• **MXL PRO/ PRO 05** • Display Backlight • CAN/RS232 Cable • Oil Temp. sensor • Water temp. sensor • Speed sensor • RPM Sensor + cable • IR Lap Rx and Tx • USB cable • **Race Studio 2**

OPTIONAL EQUIPMENT

MXL Strada	MXL Pista	MXL PRO/MXL PRO 05
• IR Lap Rx and Tx[2] • Oil Temp. sensor • Water Temp. Sensor • Speed Sensor • RPM sensor + cable • Wirings • Other sensors	• Split Transmitter • Other Sensors	• Split Transmitter • Cable Harness • Other Sensors

[1] **Race Studio 2** is the software properly developed by ***AIM*** to configure the MXL and analyze stored data.
[2] IR Lap Rx and TX means "infrared Lap Receiver and Transmitter(s)".

2 – How to install and power MXL

To **install MXL** in your car or motorcycle:

- Install the **MXL** vertically with the display perpendicular to vehicle's direction of motion in order to correctly measure the lateral g-force using the internal accelerometer[3].
- Choose a location where the display unit is not in contact with oil or fuel.
- Make sure that the gauge is not installed too close to heat sources.
- Protect the **MXL** from vibration: use the included anti-vibration mountings;
- Avoid rigid connections between the display unit and the chassis by using anti-vibration mountings (Silent Blocks).

To **power MXL**:

- Connect **MXL** to an external **9-15 VDC** power source (the vehicle battery, for instance). Do not exceed these limits.
- Connect the red wire to the battery's positive pole (**+**) and the black one to the negative pole (**-**).
- **MXL** is powered by the vehicle master switch.

3 – How to sample the RPM

RPM signal may be sampled in two ways:

- from the ECU: on a square wave signal (from 8 to 50 V);
- from the coil: a high voltage RPM input (from 150 to 400 V).

---

[3] Standard feature on all MXL models except **MXL Strada** which does not support track mapping.

4 – How to install and power receiver and transmitters

MXL works only with infrared beacon transmitters and receivers.

4.1 – Infrared receiver

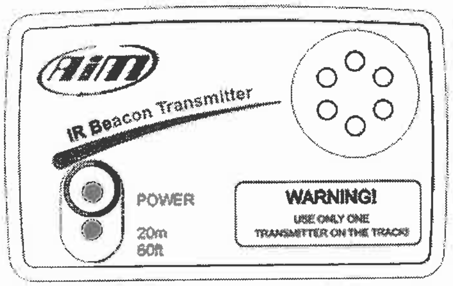
The **Infrared receiver** needs to "see" the transmitter placed on the trackside. Install it with the **receiver's eye** pointed toward the beacon's transmitter. Be sure the receiver has clear line of sight to the beacon transmitter on the correct side of the vehicle. The red circle below indicates the receiver eye.

4.2 – Infrared transmitters

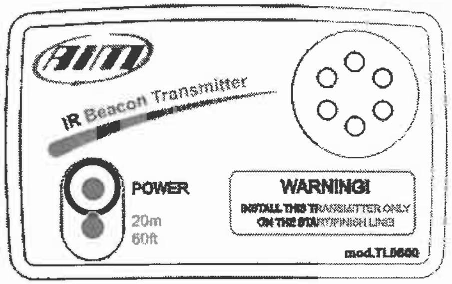
AIM infrared transmitters are: the lap transmitter (traditional or new one) and the split transmitter, that emits a different signal and **MXL** can distinguish them.

4.2.1 – The lap transmitter

The Lap transmitter can be traditional or new type as shown in the figure below.



Traditional Lap transmitter



New Lap transmitter

The Lap transmitter can be **powered**:

- by 8 AA batteries (placed in the transmitter case) or
- by an external 12V power cable.

When battery charge status is low, the **power led** starts blinking each second.

The transmitter has two **operating modes**:

- Low power: track width less than 10 m (30 ft)
- High Power mode: track width more than 10 m (needs external 12V power).

To **activate High/Low Power** function

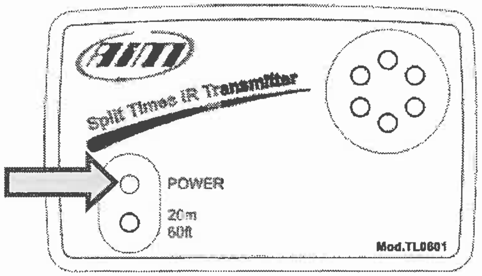
- Unscrew the transmitter case from the back
- Place the jumper clip circled in the figure below over one of the two connectors for low power mode or over both the connectors for high power.

Please note: when the transmitter is set to high power mode, **both power leds** light up when the transmitter is turned on. High power mode needs 12V external power.

When deploying your transmitter at the track, be sure to check for other transmitters which are not always placed at the start / finish line. The simplest approach is for all drivers to use the same transmitter during a race. Use the **Obscuring Time** setting (see how to set the system configuration paragraph) to ensure that **MXL** reads only the transmitter you want. Incorrect Obscuring Time settings or unknown multiple transmitters can cause the **MXL** to record inaccurate or confusing lap times.

4.2.2 – The split transmitter

The Infrared Split transmitter emits a different signal compared to the Lap transmitter; the **MXL** can distinguish the two signals and provide split timing.



The infrared split transmitter

It works and is powered exactly like the lap transmitter. The only difference you can see is that power light (highlighted with an arrow above) is always blinking. When battery charge status is low, power led blinks more quickly.

Use the split transmitters in conjunction with the lap transmitter to mark various track sections for which you want separate times in addition to the overall lap times. This way you can compare your performance through a particular corner, for example, as you try different entry and exit strategies or different vehicle set ups. Using split times can help you find which sections of the track need the most work, allowing you to focus your efforts.

5 – How to connect MXL to the ECU

Your **MXL** can be interfaced with the engine computer (ECU) using an **RS232 serial cable** or a **CAN cable** to sample data out coming from the ECU.

To connect your **MXL** to the ECU, please use a **serial RS232** or a **CAN cable** and connect it to the connectors on the gauge's backside.

If you have a **CAN** communication **protocol** ECU and you have our stock cable, they are already labelled; otherwise connect CAN +, CAN - and GND to your ECU pins. To know which pins support which cable, please refer to your ECU's user manual.

If you have an ECU communicating through an **RS232 protocol**, the standard connection is:

- cable labelled **RS 232 RX** with the **ECU TX**
- cable labelled **GND** with **ECU GND**

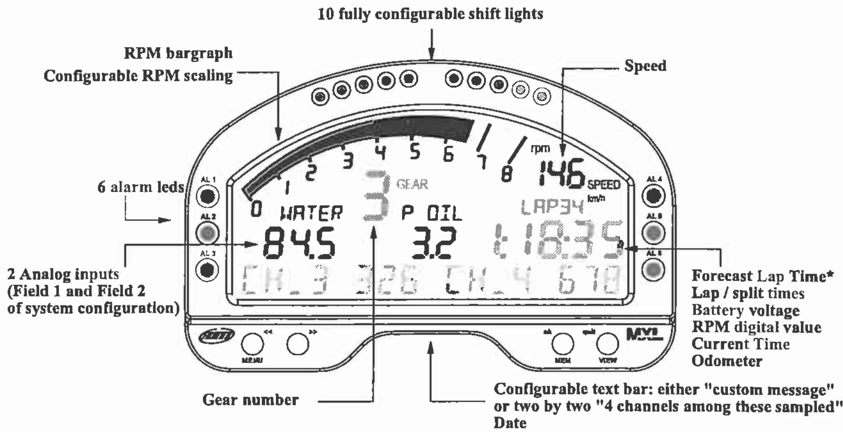
PLEASE REFER TO YOUR ECU'S USER MANUAL TO BE SURE WHICH PINS ARE USED AND WHICH CABLE IS TO BE CONNECTED TO WHICH PIN.

To know if your ECU is supported by **MXL** and for more information about **MXL-**ECU connection, please refer always to our website: www.aim-sportline.com.

As ECU manufacturers continually update their products, refer to the website for the latest information, which may conflict with this manual.

6 – How to read MXL display

MXL's wide display shows a lot of information:



Description of **MXL** display

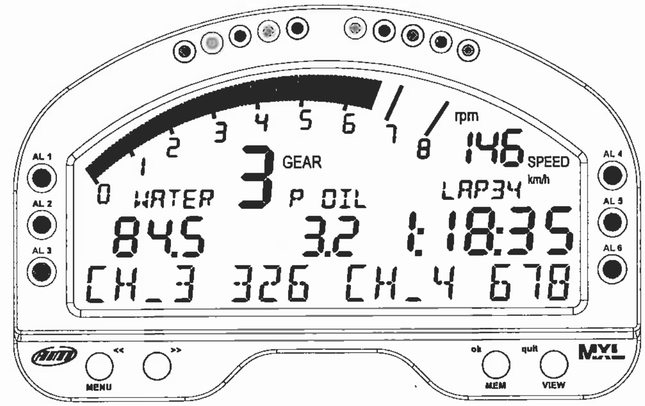
The displayed information is completely controllable via software (see "How to configure your **MXL** through **Race Studio 2** software"). Very often the same display will show multiple pieces of information.

- Use **VIEW** button to switch between Forecast Lap Time[4], Lap/split times, battery voltage, digital RPM value, current time and odometer (in the Figure **MXL** displays lap time – value 1:18:35).
- Use "**>>**" button to switch two by two between the four sampled channels shown on bottom row. Or, if you enabled the static string (see "how to set the system configuration" paragraph) there is nothing you need to do.

---

[4] **Forecast Lap Time** is an algorithm that predicts in real time the current lap time before it is completed. Paragraph **6.2** explains this new **MXL** function.

6.1 – MXL alarm led and shift lights



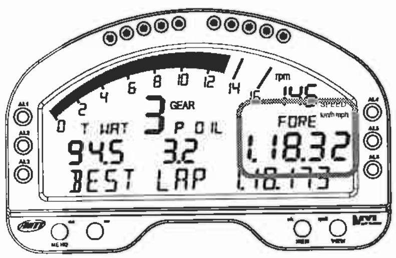
The **6 alarm leds** placed on the sides of the display unit can be linked to 6 different channels and, by setting the related channels threshold values, they can work as maximum or minimum alarms (see "How to configure your **MXL** through **Race Studio 2** software").

The **10 shift lights** on top of the **MXL** display unit are linked to engine RPM; values corresponding to each led can be set via software (see "How to configure your **MXL** through **Race Studio 2** software") or via keyboard (see "Other keyboard functions").

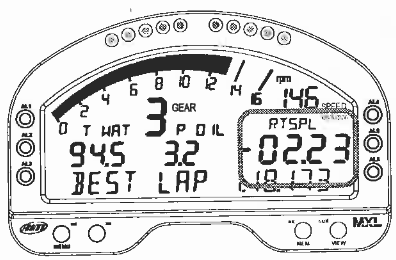
6.2 – Forecast Lap time

Forecast Lap Time is an algorithm that predicts *in real time* the current lap time before it is completed. **MXL** compares each 0.1 km (0.16 miles) the current lap with a reference lap and, using this information, it predicts the final lap time value. **Forecast Lap Time** is updated on the display as soon as a new value is computed. At present **Forecast Lap Time:**

- uses the best lap time as reference lap;
- is always functioning; there is nothing you need to do to activate it;
- only needs speed channel and lap sensor;
- is displayed where Lap Time is usually shown
- can be shown on the display while running pressing press "**VIEW**" button;
- produces two values shown in two pages of the display; the **First Page**, called "**FORE**" is the **Forecast Lap Time** that, using best lap time as reference, shows the complete lap time you are expected to do; the **second page**, called "**RTSPL**" is the **Real Time spit** that, using the best lap time as reference, shows current gap between present lap and best lap time.



Forecast Lap Time – First Page "FORE"



Forecast Lap Time – Second Page "RTSPL"

6.3 – Other useful information

The **MXL** automatically groups data for a track session as a **RUN**. A run is made up of the laps recorded between 2 pit stops / 2 power on/off / 2 samplings.

If the system has been configured to capture **splits** (see "how to set the system configuration") it shows "Split nr.x" up to the number of splits entered. Once times for each split have been recorded, the final segment is displayed as a completed lap.

When **MXL** records best lap time the text "**BEST LAP TIME**" appears in the bottom static string of your logger. This happens also if you have enabled the **static string** (see "how to set the system configuration").

When you switch on your **MXL**, it is set to street mode and automatically switches to track mode when a lap is captured. To return to street mode you need to switch the logger off and on.

The logger has from eight (**MXL Strada**, **MXL Pista**, **MXL PRO**) to twelve (**MXL PRO 05**) analog channels, only six of which displayed. They are displayed as follows:

- on the left of the display are channels set on field 1 and 2 of System Configuration layer (see "How to set the System Configuration") of **Race Studio 2** software.
- the static string area (if static string is not enabled) shows four other channels, two by two

The displayed channels setting is stored by the gauge and restored when it is switched on.

7 – How to install Race Studio 2 and configure your MXL

MXL has been designed to connect with a PC through an USB cable and **can only be configured by using Race Studio 2 software.**
In the **MXL** package you'll find the USB cable and software CD-ROM. **MXL** configuration is possible **ONLY** after software and USB driver installation on your PC.

PLEASE NOTE: the installation process described below is subject to change, please check our website for the most up to date information before proceeding. Further, please check our website for the most up to date Race Studio 2 version and MXL firmware release.

For further information concerning Race Studio 2 and USB drivers installation and troubleshooting, you can always refer to the "Installation_xxx.pfd" file on the same website.

7.1 – How to install Race Studio 2 and the USB drivers

The **Race Studio 2** software has been designed to guarantee maximum working reliability and **proper compatibility has been tested with the following operating systems:**

- **Microsoft Windows 98™;**
- **Windows 2000™;**
- **Windows Me™;**
- **Windows Xp™.**

The following operating systems are **NOT SUPPORTED:**

- **Microsoft Windows 95™;**
- **Microsoft Windows NT™**
- **All non Microsoft operating systems**

To install **Race Studio 2** software and the USB drivers on your PC, please insert the CD in the CD drive and then, depending on your operating system, follow the appropriate directions as detailed below.

7.1.1 - Race studio 2 installation for Windows XP

- **Check** windows "**Drivers signing option**" default setting: click "Start / Settings / Control Panel / System ⇒ select "Hardware" layer ⇒ click on "Driver Signing" option and, if "Block – never install unsigned driver software" is enabled disable it and enable "Warn – Prompt me each time to choose an action" checkbox ⇒ "OK" ⇒ "OK" and close all windows.
- **Close all applications** if any are open and if **MXL** is connected to the Pc **unplug** it.
- Insert **Race Studio 2** CD in the CD Rom drive and, if auto-play function is not enabled browse it and click on Setup icon, otherwise the installation proceeding starts automatically.
- **Click on** "Install Race Studio 2" button
- **Select** installation language
- Press "OK" button
- Press "Continue anyway" button
- Click on "Finish" button
- **Connect USB cable** to both the PC and **MXL** and **switch the logger on**
- Click on "Yes" button
- Click on "Continue anyway" button
- Click on "Next" button
- Click on "Continue anyway" button
- Click on "Finish" button and **Run Race Studio 2**[5] Software
- With the logger connected and switched on, **click on** "logger Identification" button.

[5] If your monitor shows you a distorted window (with, for instance, all buttons displaced) please see **Note 1 "Race Studio 2 visualization problems"** at the end of this chapter.

7.1.2 - Race studio 2 installation for Windows 2000

- **Close all applications** if any are open and if **MXL** is connected to the Pc **unplug** it.
- Insert **Race Studio 2** CD in the CD Rom drive and, if auto-play function is not enabled browse it and click on Setup icon, otherwise the installation proceeding starts automatically.
- **Click on** "Install Race Studio 2 and AIM documentation" button
- **Select** installation language
- Press "Next" button
- Press "Start" button
- Click on "Start" button
- Click on "Finish" button
- **Enable** "Yes, I want to re-start my computer now" checkbox and re-start your Pc.
- **Connect USB cable** to both the PC and **MXL** and **switch the logger on**
- **Run Race Studio 2**[6] Software
- With the logger connected and switched on **click on** "logger Identification" button.

[6] If your monitor shows you a distorted window (with, for instance, all buttons displaced) please see **Note 1 "Race Studio 2 visualization problems"** at the end of this chapter.

7.1.3 - Race studio 2 installation for Windows 98/ME

- **Please check that your Race Studio 2 release is 2.20.00 or later**. If not, please download the latest version from our website.
- **Close all applications** if any is working and if **MXL** is connected to the Pc **unplug** it.
- Insert **Race Studio 2** CD in the CD Rom drive and, if auto-play function is not enabled browse it and click on Setup icon, otherwise the installation proceeding starts automatically.
- **Click on** "Install Race Studio 2 and AIM documentation" button
- **Select** installation language
- Press "Next" button
- Press "Start" button
- Click on "Start" button
- Click on "Finish" button
- **Enable** "Yes, I want to re-start my computer now" checkbox and re-start your Pc.
- **Connect USB cable** to both the PC and **MXL** and **switch the logger on**
- **Run Race Studio 2**[7] Software
- With the logger connected and switched on **click on** "logger Identification" button.

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[7] If your monitor shows you a distorted window (with, for instance, all buttons displaced) please see **Note 1 "Race Studio 2 visualization problems"** at the end of this chapter.

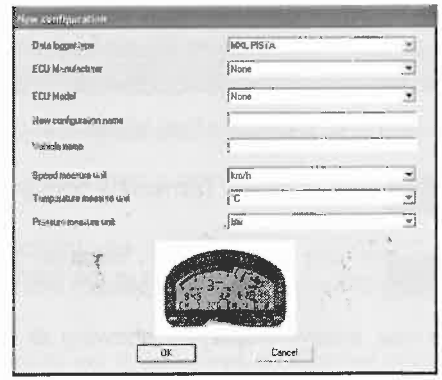
7.2 – How to configure MXL through Race Studio 2 software

To configure **MXL** through **Race Studio 2** software:

- Run **Race Studio 2** software
- Click on **MXL** button on the left vertical toolbar

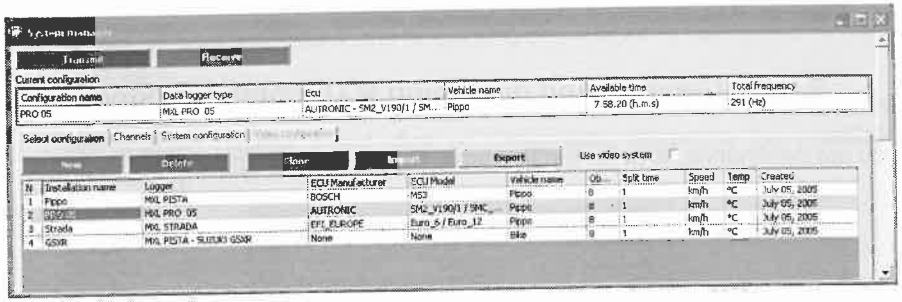
7.2.1 – Creating and managing MXL configurations

If you are configuring **MXL** for the first time, New Configuration window appears:



- Chose your logger from: **MXL Strada, Pista, PRO, PRO 05**;
- Choose the Manufacturer of your ECU if supported (see "**<u>How to connect MXL to the ECU</u>**" chapter).
- Choose your ECU Model;
- Enter a name for your new configuration;
- Enter your Vehicle name;
- Choose Speed, Temperature and Pressure measure unit;
- Press "OK" button

The System Manager window appears. This window is internal to **Race Studio 2** main window and allows you to manage all commands related to **MXL** configuration.



On top of this window are two pushbuttons that allows you to:

Transmit a configuration to the Logger.

Detect an unknown configuration and store it in the configurations database.

Immediately under is a row, always displayed, showing all information related to the configuration you are working on (Current configuration window):

The remaining part of the window is made of four layers:

- Select Configuration
- Channels
- System Configuration
- Video Configuration. This last layer enables only if you checked "Use Video System" checkbox on Select configuration layer and is needed only for DaVid Slave Expansion version owners (see related User Manual for more information).

7.2.2 – How to set and select a configuration

⇒ Activate "**Select Configuration**" layer

⇒ press "**New**" button to create a new configuration

⇒ press "**Delete**" button to delete an existing configuration

⇒ press "**Clone**" button to Clone/Copy an existing configuration

⇒ press "**Import**" button to import a configuration in your database

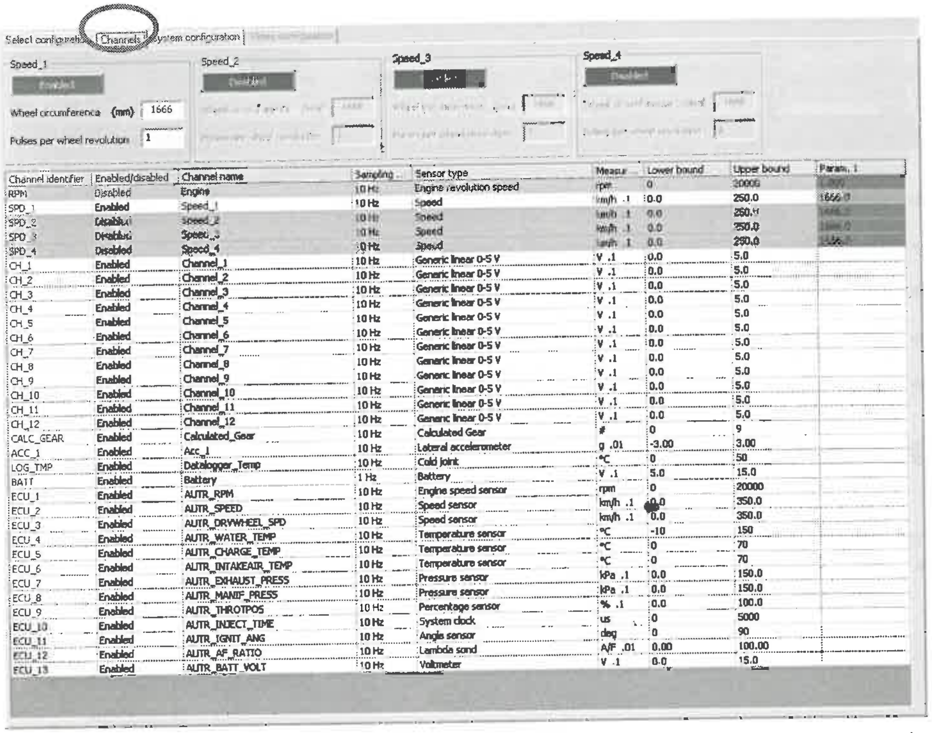
⇒ press "**Export**" button to export a configuration from this database and be able to use it elsewhere

⇒ Enable "**Use video System**" Checkbox if you are using the DaVid Slave Expansion version (see related User Manual for further information about this system);

⇒ Select a configuration to set (it becomes highlighted in yellow).

7.2.3 – How to set MXL Channels

⇒ Activate "**Channels**" layers



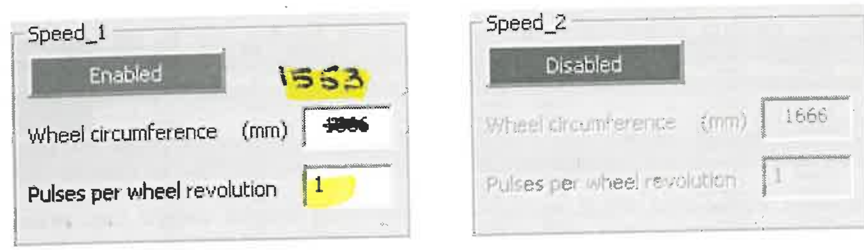
Channel identifier	Enabled/disabled	Channel name	Sampling	Sensor type	Measure	Lower bound	Upper bound	Param. 1
RPM	Disabled	Engine	10 Hz	Engine revolution speed	rpm	0	20000	[illegible]
SPD_1	Enabled	Speed_1	10 Hz	Speed	km/h .1	0.0	250.0	1666.0
SPD_2	Disabled	Speed_2	10 Hz	Speed	km/h .1	0.0	250.0	[illegible]
SPD_3	Disabled	Speed_3	10 Hz	Speed	km/h .1	0.0	250.0	[illegible]
SPD_4	Disabled	Speed_4	10 Hz	Speed	km/h .1	0.0	250.0	[illegible]
CH_1	Enabled	Channel_1	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_2	Enabled	Channel_2	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_3	Enabled	Channel_3	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_4	Enabled	Channel_4	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_5	Enabled	Channel_5	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_6	Enabled	Channel_6	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_7	Enabled	Channel_7	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_8	Enabled	Channel_8	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_9	Enabled	Channel_9	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_10	Enabled	Channel_10	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_11	Enabled	Channel_11	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_12	Enabled	Channel_12	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CALC_GEAR	Enabled	Calculated_Gear	10 Hz	Calculated Gear	#	0	9	
ACC_1	Enabled	Acc_1	10 Hz	Lateral accelerometer	g .01	-3.00	3.00	
LOG_TMP	Enabled	Datalogger_Temp	10 Hz	Cold joint	°C	0	50	
BATT	Enabled	Battery	1 Hz	Battery	V .1	5.0	15.0	
ECU_1	Enabled	AUTR_RPM	10 Hz	Engine speed sensor	rpm	0	20000	
ECU_2	Enabled	AUTR_SPEED	10 Hz	Speed sensor	km/h .1	0.0	350.0	
ECU_3	Enabled	AUTR_DRVWHEEL_SPD	10 Hz	Speed sensor	km/h .1	0.0	350.0	
ECU_4	Enabled	AUTR_WATER_TEMP	10 Hz	Temperature sensor	°C	-10	150	
ECU_5	Enabled	AUTR_CHARGE_TEMP	10 Hz	Temperature sensor	°C	0	70	
ECU_6	Enabled	AUTR_INTAKEAIR_TEMP	10 Hz	Temperature sensor	°C	0	70	
ECU_7	Enabled	AUTR_EXHAUST_PRESS	10 Hz	Pressure sensor	kPa .1	0.0	150.0	
ECU_8	Enabled	AUTR_MANIF_PRESS	10 Hz	Pressure sensor	kPa .1	0.0	150.0	
ECU_9	Enabled	AUTR_THROTPOS	10 Hz	Percentage sensor	% .1	0.0	100.0	
ECU_10	Enabled	AUTR_INJECT_TIME	10 Hz	System clock	us	0	5000	
ECU_11	Enabled	AUTR_IGNIT_ANG	10 Hz	Angle sensor	deg	0	90	
ECU_12	Enabled	AUTR_AF_RATIO	10 Hz	Lambda sond	A/F .01	0.00	100.00	
ECU_13	Enabled	AUTR_BATT_VOLT	10 Hz	Voltmeter	V .1	0.0	15.0	

Channels Layer layout depends on your **MXL** version. It allows you to set the channels acquired by your **MXL** and you have to:

⇒ set as many speed boxes (related to the vehicle wheels) as your logger has or disable those you do not use. This means: **4 Speed** boxes for **MXL PRO** and **MXL PRO 05** and one speed box for MXL **Strada** and **MXL Pista**

⇒ Set channels table

Speed boxes:



You can decide whether to use each of those channels or not.

To **use it**:

⇒ Press Enabled button

⇒ Type in the related wheel circumference (in mm)

⇒ Enter the number of pulses for wheel revolution (the number of magnets you have installed on the wheel)

⇒ The related row in "Channels table" becomes enabled

Not to use it:

⇒ Press Disabled button

⇒ The related row in "channels table" becomes disabled.

RPM
SPEED
CH1. H2O T °C
CH2. O.I.T. °C
CH 3 TO 7. Ø
CH 8 GEAR ~~POTENTIOMETER~~
ACCELEROMETER
DATA LOGGER T °C
BATT. V. Hi/Lo

Channel Table:

Channel identifier	Enabled/disabled	Channel name	Sampling	Sensor type	Measur...	Lower bound	Upper bound	Param. 1
RPM	Disabled	Engine	10 Hz	Engine revolution speed	rpm	0	20000	[illegible]
SPD_1	Enabled	Speed_1	10 Hz	Speed	km/h .1	0.0	250.0	1666.0
SPD_2	Disabled	Speed_2	10 Hz	Speed	km/h .1	0.0	[illegible]	1666.0
SPD_3	Enabled	Speed_3	10 Hz	Speed	km/h .1	0.0	250.0	1666.0
SPD_4	Enabled	Speed_4	10 Hz	Speed	km/h .1	0.0	250.0	1666.0
CH_1	Enabled	Channel_1	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_2	Disabled	Channel_2	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_3	Enabled	Channel_3	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_4	Enabled	Channel_4	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_5	Enabled	Channel_5	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_6	Enabled	Channel_6	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_7	Enabled	Channel_7	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CH_8	Enabled	Channel_8	10 Hz	Generic linear 0-5 V	V .1	0.0	5.0	
CALC_GEAR	Enabled	Calculated_Gear	10 Hz	Calculated Gear	#	0	9	
ACC_1	Enabled	Acc_1	10 Hz	Lateral accelerometer	g .01	-3.00	3.00	
LOG_TMP	Enabled	Datalogger_Temp	10 Hz	Cold joint	°C	0	50	
BATT	Enabled	Battery	1 Hz	Battery	V .1	5.0	15.0	
ECU_1	Enabled	MEFI-4B_RPM	10 Hz	Engine speed sensor	rpm	0	20000	
ECU_2	Enabled	MEFI-4B_ECT	10 Hz	Temperature sensor	°C	0	20000	
ECU_3	Enabled	MEFI-4B_EIV	10 Hz	Voltmeter	V .1	0.0	255.0	
ECU_4	Enabled	MEFI-4B_EOP	10 Hz	Pressure sensor	kPa	30	150	
ECU_5	Enabled	MEFI-4B_SPEED	10 Hz	Speed sensor	km/h .1	-30.0	150.0	
ECU_6	Enabled	MEFI-4B_FUELCONS	10 Hz	Consumption Sensor	gal/h .1	0.0	100.0	
ECU_7	Enabled	MEFI-4B_STATUS	10 Hz	Raw value	#	0	100	
ECU_8	Enabled	MEFI-4B_FUELPRESS	10 Hz	Pressure sensor	kPa	0	15	
ECU_9	Enabled	MEFI-4B_EGRFB	10 Hz	Voltmeter	V .1	0.0	15.0	
ECU_10	Enabled	MEFI-4B_FTEMP	10 Hz	Temperature sensor	°C	0	1000	
ECU_11	Enabled	MEFI-4B_MAT	10 Hz	Temperature sensor	°C	0	255	
ECU_12	Enabled	MEFI-4B_RUNTIME_HOUR	10 Hz	Raw value	#	0	350	
ECU_13	Enabled	MEFI-4B_RUNTIME_MIN	10 Hz	Raw value	#	0	350	
ECU_14	Enabled	MEFI-4B_RPM2	10 Hz	Raw value	#	0	350	
ECU_15	Enabled	MEFI-4B_MAP_VOLTS	10 Hz	Voltmeter	V .1	0.0	350.0	
ECU_16	Enabled	MEFI-4B_MAP	10 Hz	Pressure sensor	kPa	0	350	

Channel Identifier column: identifies each channel (RPM, Speed, Configurable channels, labelled as CH_X, ECU channels if a supported ECU is connected).

Enabled/Disabled column: shows which channels are enabled/disabled and allows you to enable/disable them with a double click on the cell (except for RPM, Speed and gear channels that have to be set through "System Configuration" layer).

Channel name column shows each channel name and allows you to change it by double clicking on the cell and inserting the desired channel name.

Sampling column shows each channel sampling frequency and allows you to change it by double clicking on the cell[8].

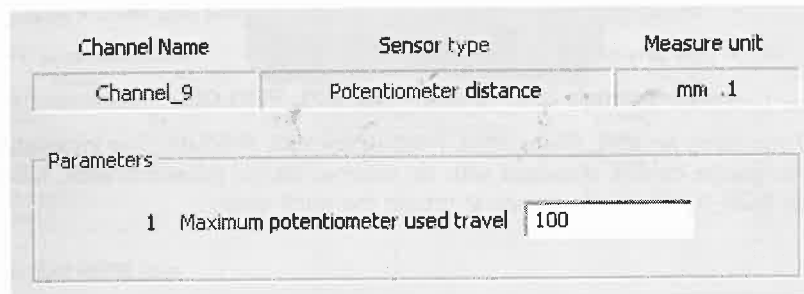
[8] **Please note:** increasing sampling frequency decrease maximum storage time as more samples are created, filling the memory faster (see "**My MXL memory**" paragraph).

Sensor Type column: shows the type of sensor you have installed on each channel and allows you to set a sensor on a configurable channel by choosing it from the list of pre-defined sensors. You can also set a custom sensor by selecting "Custom sensor Manager" and following the sensor customization procedure (see "**Custom sensors**").

Measure Unit column: shows the selected unit of measure for each configured channel and allows you to change it with a double click.

Lower and **Upper bound** columns show sensor lower and upper bounds and allows you to change them with a double click on the cell.

Param. 1 column shows you the first parameter set for each channel. How to change this value depends on the channel it refers to. For Speed, RPM and gear channels you need to set the parameter in the related boxes, for some sensors, like a distance potentiometer for instance, you can double click on this cell and a panel concerning the channel appears on bottom left corner of the screen. In the figure below is a panel referring to a distance potentiometer.



For **single channels configuration**, the characteristics of each channel are explained below:

⇒ Channels labelled **from CH_1 to CH_7** for **MXL Strada / MXL Pista / MXL PRO** and channels labelled **from CH_1 to CH_11** for **MXL PRO 05** are user defined. You may choose the sensor to install among a long list of ***AIM*** standard sensors or set a *custom* sensor through "Custom sensor manager" option (see "**Custom sensors**"). For each configurable channel you can also set channel name and sampling frequency.

⇒ Channel labelled **CH_8** (on **MXL Strada**, **MXL PISTA** and **MXL PRO**) and **CH_12** (on **MXL PRO 05**) setting depends on how you set "Gear sensor" box in "System Configuration" Layer (see "**How to set the system configuration**").

- If you set **"Potentiometer Channel 8/12"** or **"Calculated with neutral signal: Channel 8/12"**, the channel labelled as CH_8/12 switches to Calculated Gear and you can only set Channel Name and sampling frequency.
- if you set **"Calculated"**, **"ECU"** or **"None"** channel labelled as CH_8/12 becomes an user defined channel and works exactly like all the other channels.

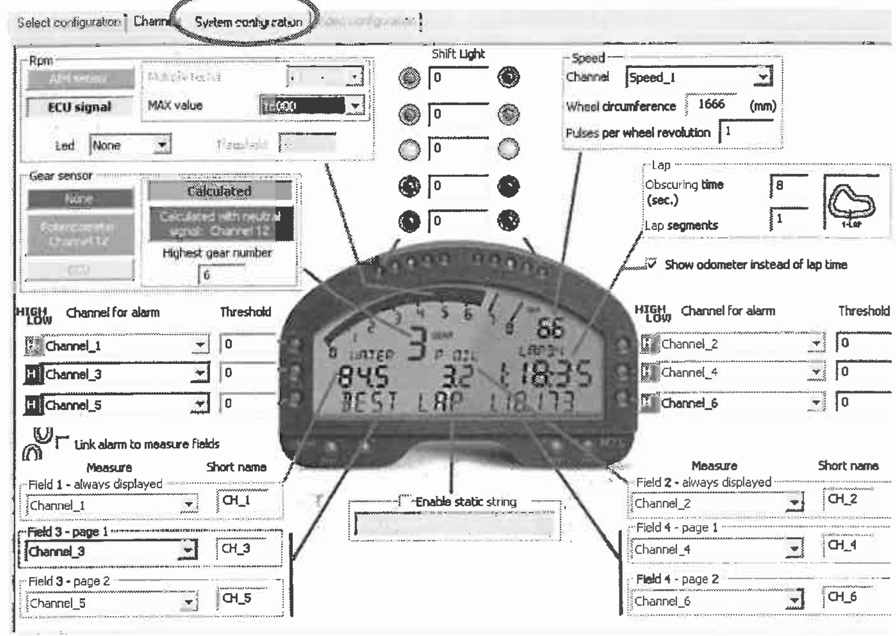
⇒ If you have an **MXL Pista**, **MXL PRO** or **MXL PRO 05** you may also choose a channel for an optional external gyroscope (bike installations), which allows you to create a track map. This sensor can only be installed:

- on channels 4, 5, 6, 7 and 8 for **MXL Strada** and **MXL Pista**
- on any channel for **MXL PRO**
- on channels 8, 9, 10 and 11 for **MXL PRO O5**.

⇒ If you have an **MXL Pista**, **MXL PRO** or an **MXL PRO 05** (Car installations) the gauge comes standard with an internal lateral accelerometer, labelled as ACC_1, which allows you to create the track map.

7.2.4 – How to set the System Configuration

⇒ Activate System Configuration Layer



⇒ Set **RPM** box

⇒ Set **Gear Sensor** Box

⇒ Set **Channel for alarm** boxes and **Measure** Fields

⇒ Set **Enable Static string** box if you wish to use it

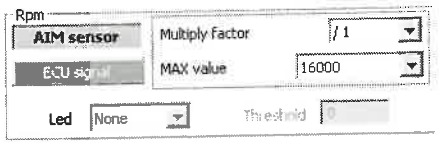
⇒ Set **Lap** box

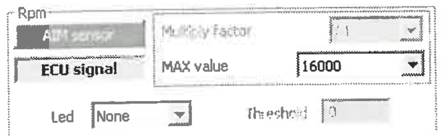
⇒ Set **Speed** box

⇒ Set **Shift Lights** boxes

See below how to set each of these.

Rpm box

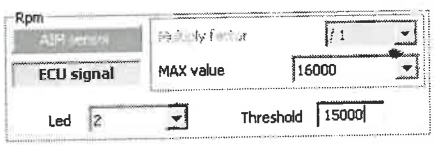




⇒ enable "**AIM Sensor**" and set Multiply Factor and RPM Max Value if you have installed an RPM sensor on your vehicle and connected it to your gauge. The RPM row in the channel table is now enabled.

⇒ enable "**ECU Signal**" and set RPM MAX value if you are sampling this channel directly from the ECU of your vehicle

You can also link RPM Max value to one of the six alarm leds to trigger it when the engine reaches the specified RPM value. In the example below, RPM threshold is 15,000 and linked to Led 2. The led does not switch off until data download is made. In this specific situation, the channel for alarm corresponding to led 2 is disabled, as the RPM Max Value overrides it. We suggest you set threshold value corresponding to ECU's RPM limiter[9].

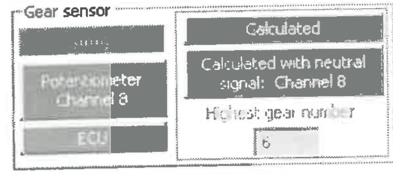


Gear sensor Box

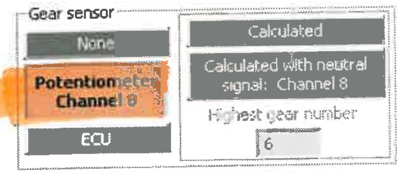
MXL can detect the engaged gear using an on-board gear sensor, sample it from the ECU, or calculate it using an algorithm based on engine **RPM** and **Speed**. Available options are:

- None,
- Potentiometer Channel 8 (Channel 12 for MXL PRO 05)
- ECU
- Calculated
- Calculated with neutral signal Channel 8/12

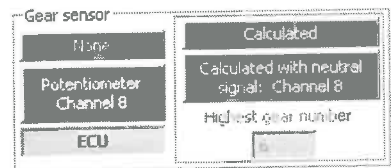
[9] This setting is very useful to quickly highlight an over-rev situation due to poor downshifting without opening **Race Sudio Analysis** software.



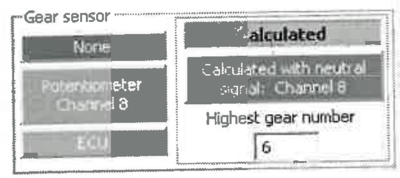
⇒ Select "**None**" if no sensor is installed or you do not wish to see the gear number: this option will be disabled on your display.



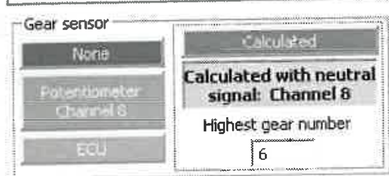
⇒ Select "**Potentiometer Channel 8/12**" if your vehicle is equipped with a gear potentiometer installed on channel 8/12. Ch_8/12 of Channel table sets to Calculated Gear.



⇒ Select "**ECU**" if you wish to see this information coming from your vehicle's ECU (assuming it can transmit it).



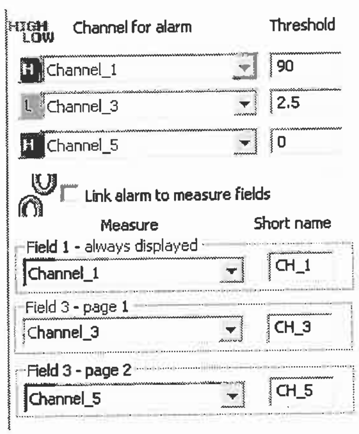
⇒ Select "**Calculated**" to calculate the engaged gear through an algorithm based on RPM and speed; fill in "Highest gear number" box.

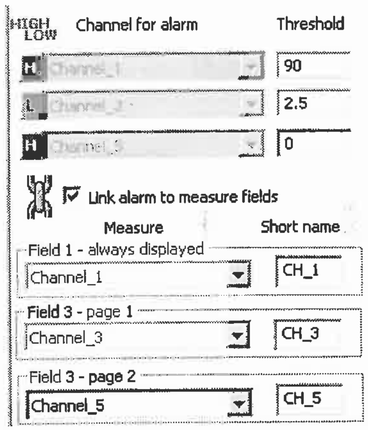


⇒ Select "**Calculated with neutral signal: Channel 8/12**" if you have a neutral sensor you can use to both calculate gears and see neutral gear. Fill in "Highest Gear Number" box.

PRESTO ↳ SHEET2

Channel for alarm and measure boxes





Channel boxes are connected to the 6 alarm leds of your **MXL** display.

⇒ set each channel as *Max*. ("H" high) or *Min*. ("L" low) alarm.

⇒ Insert Threshold value.

Note: if Led option in RPM box (see RPM box) is enabled, the led of the channel linked to RPM max value partially disables: you can only set its threshold value.

Field boxes are linked to the field shown on **MXL** display (see "How to read **MXL** display"). The first on the left and on the right are always displayed. The other four field boxes can be shown two by two on the bottom string of the display with the name written in the column "Short name".

⇒ Select the channel you want to display

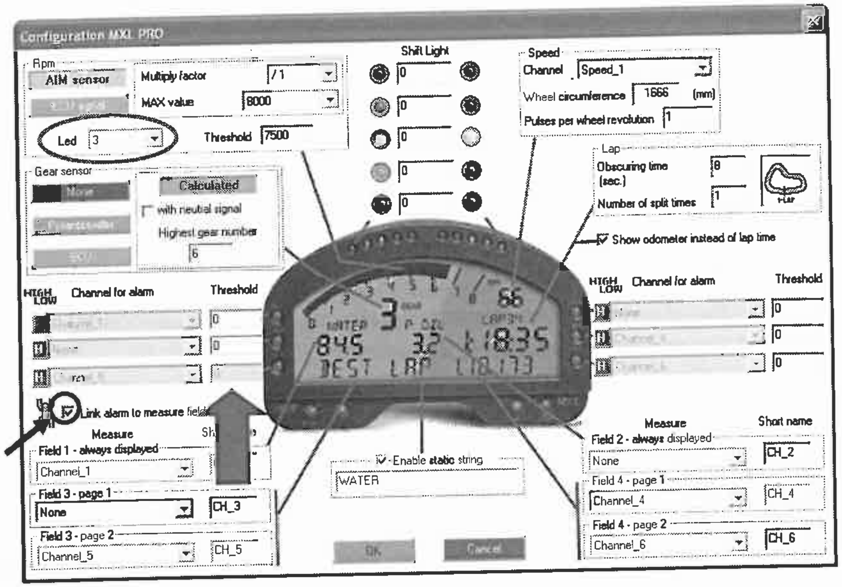
⇒ insert its short name

Link alarm to measure field option (enabled in the figure on the right above):

⇒ allows you to link the 6 alarm leds to the 6 channels you can display;

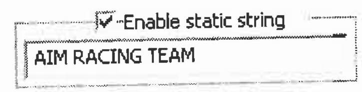
⇒ the channel for alarm boxes disables and you can only set HIGH / LOW thresholds.

⇒ If you enabled "Led" option in **RPM box** this channel is completely disabled.



Alarms are linked to measure fields and led option in RPM box is enabled

Enable static string box



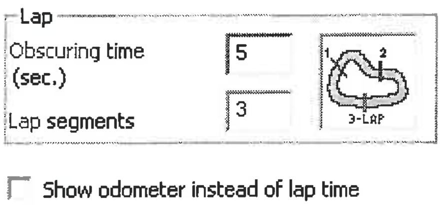
To enable the static string:

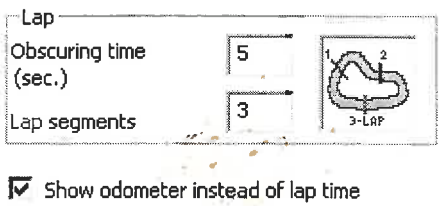
⇒ place a check in the related checkbox

⇒ insert the message you want to display

When static string is disabled the correspondent part of the display shows (two by two) fields 3 and 4 related to page 1 and 2 of the display.
Note: if you set "Gear Calculated" in Gear sensor box, the **MXL** has to compute gears (see "**How to make gear calculation proceeding**"). During gear calculation the static string is excluded; the display shows **"Running Gear Cal"** text.

Lap box





⇒ Insert the obscuring time (accepted value from 3 to 100 seconds)
⇒ Insert the number of segment (accepted values from 1 to 6)
⇒ Enable “Show odometer instead of lap time” if you want to see it.

What is Obscuring time: “Obscuring time” is a time period during which the optic receiver, after having detected a beacon, is “blind” and will ignore other beacons. This needs to be set correctly if more than one beacon is used at the track.

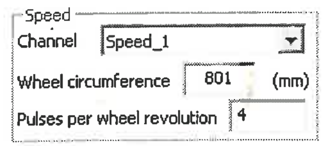
If you do not wish to capture split times on a track where more than one transmitter is positioned, you need to set the obscuring time to a value lower than the track best lap time and higher than the time elapsed between last split and Start/Finish line. If you wish to capture split times, you need to set these parameters to a low value.

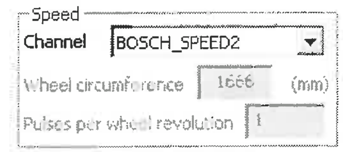
What are Lap segments: “Lap segments” is the number of segments you wish to divide your track in and should coincide with the number of transmitters installed on the track.

Notes:
1. Lap segments configuration is ignored when the track you are running on is equipped with the new lap/split transmitters
2. If you enable **odometer** box the system configuration re-switches automatically to **Lap time** when a lap time is captured.
3. To come back to **“Street mode”**: switch off the instrument and then switch it on again.

WHEEL CIRCUMF. (REAR)
AVON 1557
YOKOHAMA 1709

Speed box

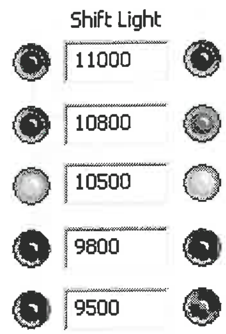




⇒ Choose the speed you want to display

⇒ Set Wheel circumference and Pulses per wheel revolution (except if you choose a speed sampled from the ECU like in the figure on the right).

Shift light box (this function is also settable via keyboard)



⇒ Manages the 10 leds placed on top of **MXL**.

⇒ They turn progressively on; when the engine reaches the RPM value set in the 1st box all leds start blinking, warning you to change gear.

⇒ If a value is set to 0 the corresponding led is disabled.

7.3 – How to transmit the configuration

Once you have the configuration set in the software, you need to transmit it to your **MXL** via the USB connection in order for it to take effect:

⇒ Leave your Pc switched on with **Race Studio 2** running

⇒ Connect USB cable to PC USB port and to port on the left side of the **MXL**

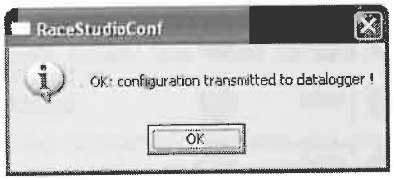
⇒ Switch the **MXL** power on

⇒ Go to **Race Studio 2** System Manager main window

⇒ Press "**Transmit**" button on **Race Studio 2** top toolbar.

⇒ This window appears and led AL2 on the left of **MXL** switches on for a few seconds.

⇒ This window appears and led AL2 on the left of **MXL** has switched off.

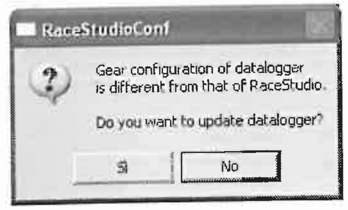


7.3.1 –Configuration transmission troubleshooting

During Configuration transmission you may see various error messages:

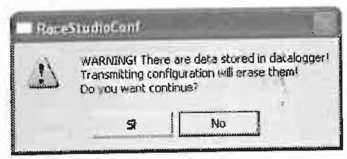
⇒ Check if the USB cable is correctly plugged into the PC and the logger USB port;

⇒ re-try to transmit the configuration.



⇒ You are transmitting to the logger a configuration with a different gear setting (see **Gear Box** paragraph)

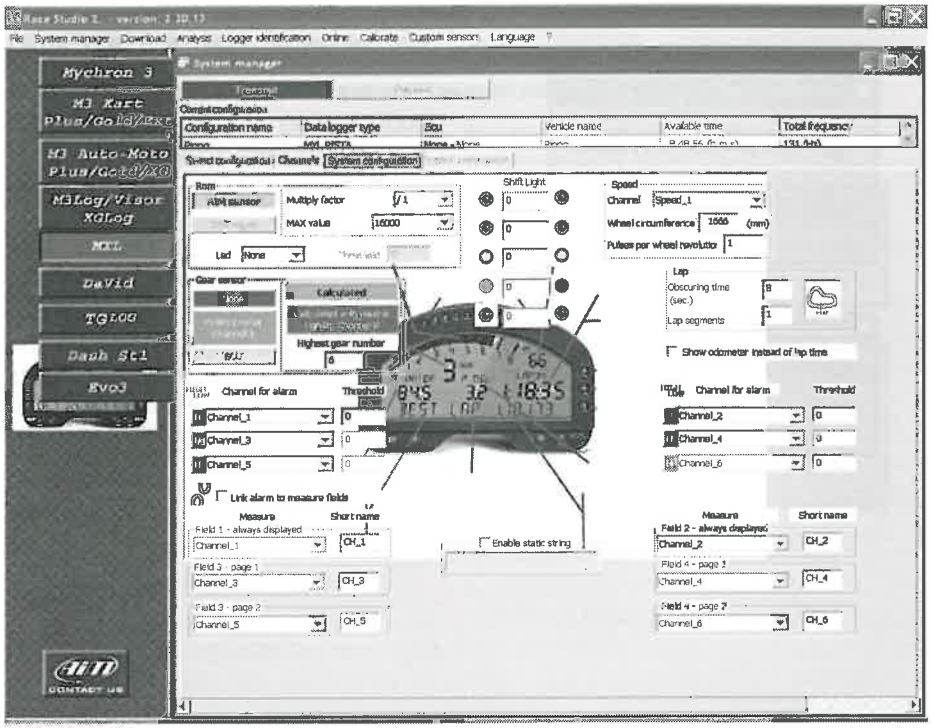
⇒ Press "OK" button if you want to change gear box settings.



⇒ The system warns you that the logger you are trying to transmit the configuration to has data stored in its memory that will be deleted if you transmit the configuration.

Note 1: "Race Studio 2" Visualization problems

If when you run **Race studio 2** you monitor shows you a distorted image, like the one here below reported, you need to change your screen settings. In the example below we pressed "**MXL**" button.

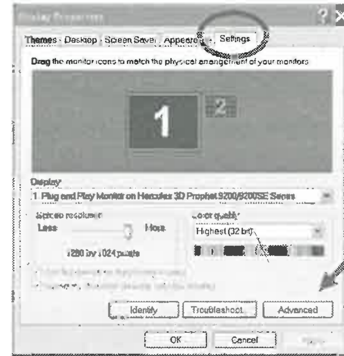


First, close all applications you are running, (**Race Studio 2** included) as after this operation you'll need to re-start your Pc.

To change your screen settings:

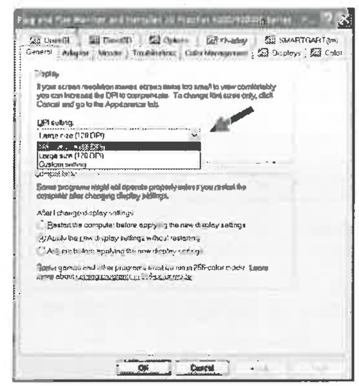
⇒ Click on "Start/Settings/Control Panel/Display

⇒ Display Properties windows appears

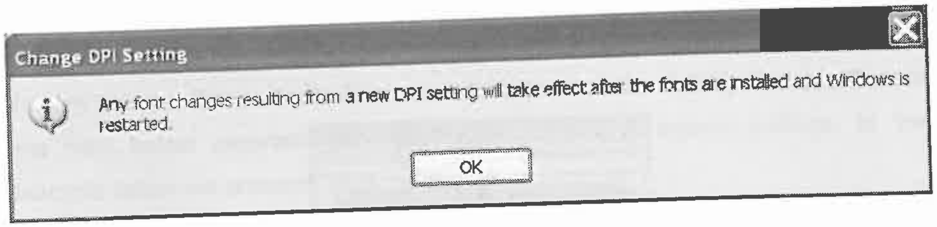


⇒ enable Settings layer

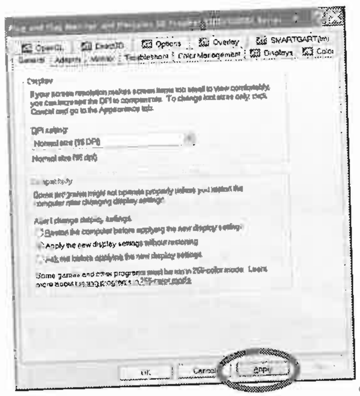
⇒ Press Advanced button



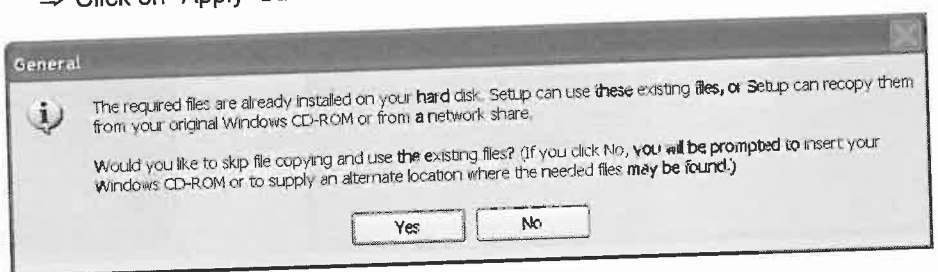
⇒ Set DPI setting on "**Normal Size (96 DPI)**"



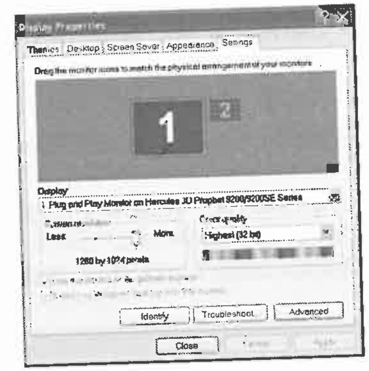
⇒ Click on "OK" button



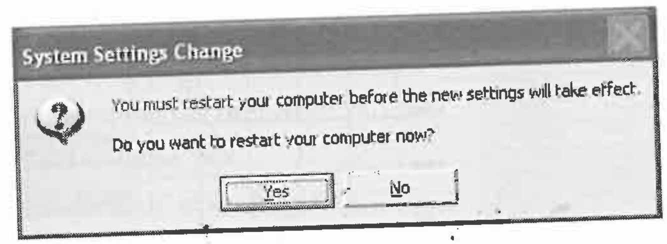
⇒ Click on "Apply" button



⇒ If this message appears, please click on "Yes" button



⇒ Click on "Close" button



⇒ Click on "Yes" button and re-start your computer.

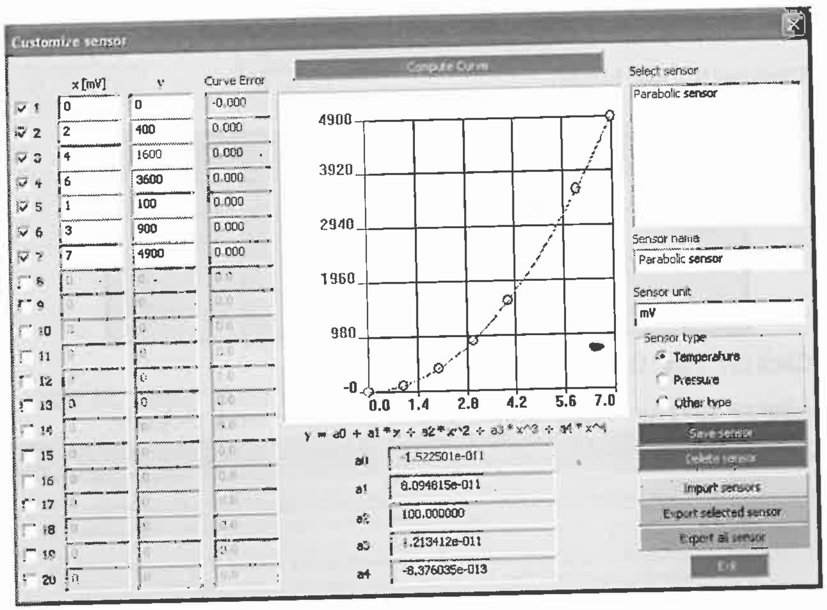
⇒ After re-start run "**Race Studio 2**" and all should work properly.

8 – Sensors Management

MXL can manage both on board and custom sensors. Some sensors, like potentiometers and accelerometers, need to be calibrated / auto-calibrated.

8.1 – Custom sensor (expert users only)

Pressing "Custom sensors" button in the top toolbar. This window appears:



Through it you can:

- ⇒ create a new custom sensor,
- ⇒ modify an existing sensor
- ⇒ import/export a sensor or all sensors using the related button
- ⇒ delete a sensor using the related button

8.1.1 – How to create a custom sensor

- ⇒ Press "**Custom Sensors**" on the top toolbar
- ⇒ **Enable the checkboxes** on the left corresponding to the number of experimental values you want to use (up to 20 experimental values).
- ⇒ **insert the values** corresponding to the sensor you want to create in the three columns on the left of the window considering that:
  - <u>first column:</u> is logger output voltage in mV (abscissa of the calibration curve);
  - <u>second column:</u> are temperature / pressure values corresponding to the voltage output (these values are interpolated using a polynomial)
  - <u>third column</u>: Curve Error, that is useful to verify that the curve calculated by the software is faithful to the experimental values.
- ⇒ click on "**Compute Curve**" button
- ⇒ fill in "**Sensor name**" box
- ⇒ fill in "**Sensor Unit**" of Measure box
- ⇒ select "**Sensor type**": Temperature, Pressure or Other Type
- ⇒ click on "**Save**" Button
- ⇒ click on "**Exit**" button
- ⇒ set the new sensor on the desired channel (see "<u>How to set **MXL** channels</u>").

8.1.2 – How to modify a custom sensor

⇒ press "**Custom Sensors**" on the top toolbar

⇒ select the sensor you want to modify by choosing it in "**Select Sensor**" box

⇒ modify the sensor related values

⇒ click on "**Compute Curve**" button

⇒ fill in "**Sensor name**" box

⇒ click on "**Save**" button

8.2 – How to calibrate / auto-calibrate a sensor

Once the configuration has been transmitted to the **MXL**, it is absolutely necessary to calibrate / auto calibrate the sensors you have installed on your vehicle and then re-transmit the configuration to the logger.

Sensors to be **auto-calibrated** are:

⇒ internal lateral g-sensor

⇒ Gyroscope (for **MXL Pista**, **MXL PRO** and **MXL PRO 05** only)

⇒ Potentiometer distance

Sensors to **calibrate** are:

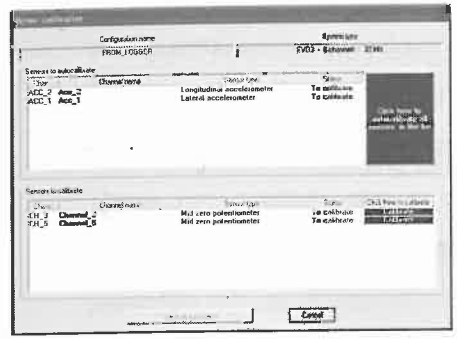
⇒ mid zero potentiometer

⇒ zero based potentiometer

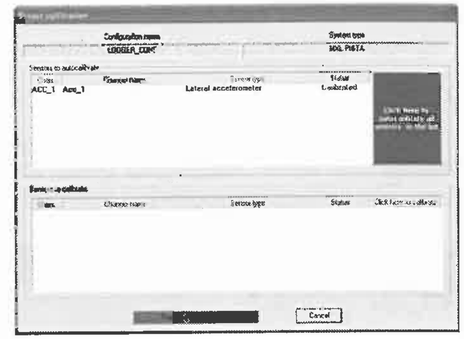
⇒ gear sensor (see "How to calibrate a gear sensor").

To calibrate/auto-calibrate sensors:

⇒ press button "Calibrate" on the top toolbar.



Calibrate / Auto-calibrate sensor



Sensor Calibrated

- Keep the vehicle as horizontal as possible (if your vehicle is a bike leave it on the prop stand) and set the potentiometer in its "0" position.
- Press "Click here to auto-calibrate all sensors in the list" if you are going to auto-calibrate accelerometer, gyroscope or potentiometer distance;
- Press the "Calibrate " button corresponding to the sensor you are going to calibrate if the sensor is Mid Zero potentiometer, Zero Based Potentiometer or Gear Sensor;
- Follow the instruction prompted on your Pc monitor if some appears;
- Calibration status turns from "To calibrate" in "Calibrated".
- Transmit the configuration to the logger.

Please note that the calibration / auto-calibration procedure is fundamental to acquire correct data.

8.2.1 – How to calibrate a Gear sensor (Potentiometer)

To calibrate the gear sensor:

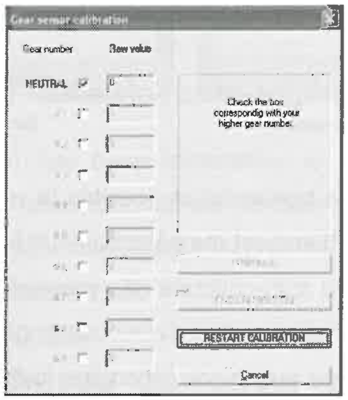
⇒ Set "Potentiometer Channel 8/12" in System Configuration Layer

⇒ Click on "Calibrate" button on the top toolbar

⇒ Press "Calibrate" button corresponding to Gear Sensor

⇒ The following screenshot appears:

Posto : 092



⇒ Check the box corresponding to the first engaged gear number (neutral);

⇒ Engage the neutral gear;

⇒ Press "Continue" button;

⇒ Engage the first gear;

⇒ Press "Continue" button;

⇒ Repeat this procedure until the last gear has been engaged;

⇒ Press "End Calibration" button;

⇒ Transmit the calibration to your **MXL**.

8.3 – How to calculate gears

⇒ Set "Calculated" or "Calculated with neutral signal: Channel 8/12" in System Configuration window (all depending if you have or not a neutral sensor installed on your vehicle).

⇒ The procedure is made of **three steps: activation**, **learning lap** and **calculation**.

⇒ Gear calibration proceeding is made using two inputs: **RPM** and **speed**. These two channels should be correctly configured and the related sensors installed correctly.

⇒ If the logger has more than one speed input, the gear calibration procedure will use as reference speed the one shown on display.

⇒ We recommend using the speed of the driving wheel as the reference speed, since wheel slip can skew the results. You can use non driving wheel speeds but you should pay more attention to prevent the wheels from sliding or being blocked during the learning lap.

8.3.1 – Activate gear calculation proceeding

To start this function or to reset previous values and re-start gear calculation you need to use **MXL** keyboard:

⇒ press **[MENU/<<]** button until you see: `GEAR Calibration`

⇒ press **[MEM/OK]** button and you will see: `calculated gear`

⇒ press **[MEM/OK]** button and set maximum engaged gear number using [<<] and [>>] button;

⇒ confirm the inserted value pressing **[MEM/OK]** button;

⇒ Quit MENU mode pressing **[VIEW]** button. The display shows:

`running GEAR CAL`

⇒ Gear calculation procedure has started.

8.3.2 – Learning lap

After the proceeding activation:

⇒ Run a track lap (learning lap)

⇒ Engage all gears.

⇒ Keep each gear engaged for at least 5-6 seconds.

⇒ Drive in a smooth way avoiding sudden accelerations or wheels blocks during brakes; let the engine keep RPM gradually and keep brakes as long as possible too, in line with track characteristics and traffic situation.

⇒ If your reference speed comes from a non driving wheel, pay particular attention to your driving style to reduce sliding between driving wheels and non driving ones.

⇒ Please go to the pit lane after the learning lap and switch the engine off.

⇒ **Warning**: **please totally avoid** "revs" while the vehicle is moving; **avoid** running through the pit lane with friction engaged.

⇒ If the vehicle needs it you **can** press the accelerator before switching the engine off **but when the vehicle is completely stopped**.

8.3.3 - Gear calculation

After engine switch off gear calculation proceeding starts automatically. During this period

⇒ **LED AL1** blinks

⇒ After a few seconds (duration of the calculation depends on learning lap length) **LED AL1** switches off

⇒ the display no longer shows `running gear cal`

All ***AIM*** systems allow gear calculation to proceed if you need to switch the engine off. In this case you only need to power the **MXL** on and the calculation re-starts automatically with the recorded values. In this case the calculation takes more time and you see blinking before **LED AL2** and after **LED AL1**.

WARNING: do not move the vehicle and do not switch the engine on during gear calculation. If you move the vehicle the logger may record values that can confuse the calculation.

8.3.4 - Final suggestions

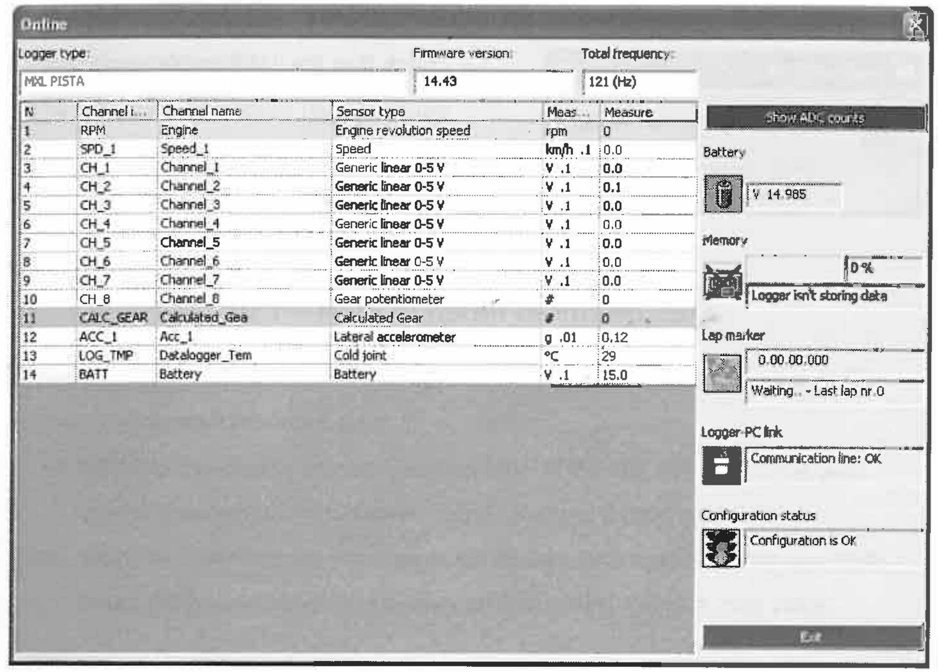
The gear calculation procedure is only possible due to the measurement of the angular speed of the driving shaft and of the driving wheel. When friction is completely engaged between the two speeds, a ratio is defined mechanically by the engaged gear. If the friction slides this ratio is no longer determinable. If reference speed comes from a non driving wheel, the sliding between driving wheel and non-driving one due to accelerations and brakes implies an error in the gear computation. This is why we recommend you to drive as smoothly as possible during learning lap, and to use a driving wheel for the reference speed.

9 – What is the Online option

"Online" button it is used to check that everything works properly.

After sensor calibration / auto-calibration, we suggest you to enter "Online" mode (be sure the **MXL** is connected to the PC and powered on).

⇒ press "Online" button in **Race Studio 2** top toolbar



Online window shows:

⇒ On top: Logger Type, Firmware Version, Total Sampling Frequency

⇒ Central: Channels Table with all channels settings

⇒ On the right: "Show ADC counts" button (mainly used by service staff)

⇒ Battery voltage

⇒ Memory status

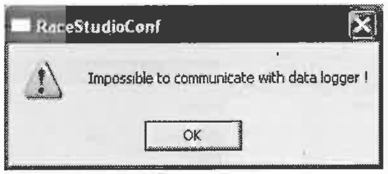
⇒ Lap Marker

⇒ Logger – Pc Link (Status of USB communication connection)

⇒ Logger Configuration Status

⇒ “Exit” button

⇒ If this warning message appears:



⇒ check that the USB cable is correctly plugged both in the PC USB port and **MXL** USB port and try again.

10 – MXL Keyboard function

(Data recall, backlight, clear, set date and time, calculated gears, shift lights, system info, demo mode)

Through **MXL** keyboard you can:

⇒ Recall recorded data

⇒ Enable / disable the backlight

⇒ View / clear total running

⇒ View odometer

⇒ Set date and time

⇒ Set the shift light

⇒ View Firmware Version and serial number.

10.1 – How to recall recorded data

When a test session is finished you can recall recorded data using your **MXL** keyboard. To recall recorded data:

⇒ **MEM** ⇒ the display shows Best lap time of the last run with RPM and speed Max value and Channel 1 and Channel 2 max value.

⇒ With “**<< / >>**” buttons you can scroll all laps and runs with Lap and Split times, RPM and speed max value and channels 1 and 2 max value.

10.2 – Other keyboard function

How to enable / disable the backlight

⇒ "**MENU**" ⇒ Night Vision on/off ⇒ "**OK/MEM**" button to enable/disable the backlight ⇒ "**Quit/VIEW**".
To enable/disable it while running ⇒ "**MENU**" button.
Backlight setting is stored by the gauge: at each power on it restores the setting in use at the when the power was last turned off.

How to view or clear total running

⇒ "**MENU**" **twice** ⇒ Total running in km on the left and in hours and minutes on the right ⇒ "**OK**" to clear ⇒ "**OK**" to confirm ⇒ "Total are cleared"

How to view odometer (not resettable)

⇒ "**MENU**" **three times** ⇒ Odometer in Km is shown on the right

How to set date and time

⇒ "**MENU**" **four times** ⇒Set date and time ⇒ "**OK**" ⇒ "Set **Hour**" ⇒ "**<< / >>**" buttons to set hour ⇒ "**OK**" ⇒ "Set **Minute**" ⇒ "**<< / >>**" buttons to set minute ⇒ "**OK**" ⇒ "Set **Year**" ⇒ "**<< / >>**" buttons to set year ⇒ "**OK**" ⇒ "Set **Month**" ⇒ "**<< / >>**" buttons to set month ⇒ "**OK**" ⇒ "Set **Day**" ⇒ "**<< / >>**" buttons to set day ⇒ "**OK**" ⇒ "Set **weekday**" ⇒ "**<< / >>**" buttons to set weekday ⇒ "**OK**" ⇒ "**Quit / view**" button

How to start / reset gear calibration (only if set during system configuration)

⇒ "**MENU**" **five times** ⇒ "Start Gear Calib" ⇒ "**OK**" ⇒ "Press OK to clear" ⇒ "**OK**" ⇒ "Save new config" ⇒ "**OK**" ⇒ Display shows "Running Gear cal" on the static string (see "How to Calculate gear" chapter).

How to set the shift lights

⇒ "**MENU**" **six times** ⇒ "Shift Light" ⇒ "**OK**" ⇒The **first led** on the right and on the left on top of **MXL** switch on and display shows "Insert RPM value" ⇒ "**<</>>**" buttons to set RPM value (accepted values are from "0" to "22.000") ⇒ "**OK**" ⇒ The **second led** on the right and on the left on top of **MXL** switch on and display shows "Insert RPM value" ⇒ "**<< >>**" buttons to set **and so on until all leds are set** ⇒ "**OK**" ⇒ Display shows "save new config" ⇒ "**OK**" ⇒ "**Quit/VIEW**" button

System information

⇒ "**MENU**" **seven times** ⇒ Display shows **Firmware version** on the left and logger **serial number** on the right

How to run MXL in demo mode/stop demo mode

⇒ Switch on the logger ⇒simultaneously press "**MENU/<<**" and "**>>**" buttons.

⇒ To stop demo mode switch off the gauge.

11 – My MXL Memory

All **MXL** models have non-volatile internal RAM memory whose characteristics depend on the version of your **MXL**. This memory is retained even when power is off or disconnected.

Memory dimensions (these are fixed per model and cannot be changed or upgraded):

⇒ **MXL Strada** 128 kb

⇒ **MXL Pista** 8 Mb

⇒ **MXL PRO** 8 Mb

⇒ **MXL PRO 05** 16 Mb

MXL round memory stores up to 500 laps in two blocks made of 250 laps so when lap number 501 is recorded laps from 1 to 250 are deleted. This means:

⇒ you always have your **last 250 laps** in your logger memory

⇒ your lap memory **never fills up**

Memory Architecture:

MXL memory is divided into two parts:

⇒ first part stores sampled channels and when it fills up the **MXL** display shows "MEMORY FULL"

⇒ second part is round, and stores lap and split times, RPM, Speed and channels 1 and 2 max values for at least your last 250 laps and never fills up.

Memory Functions:

⇒ All **MXL** have a maximum storage time at 380Hz total sampling frequency.

⇒ Maximum storage time depends on sampling frequency and on memory dimensions. Increasing sampling frequency maximum storage time diminishes.

⇒ **MXL Strada / MXL Pista / MXL PRO** have 3 hours max sampling time at 380Hz total sampling frequency; 30 minute max sampling time at 2kHz total sampling frequency.

⇒ **MXL PRO 05**: 6 hours max sampling time at 380Hz total sampling frequency; 60 minute max sampling frequency at 2kHz total sampling frequency.

12 – MXL Maintenance

MXL does not need any special maintenance.

Provided that adequate care is taken of display unit and components, the only suggested maintenance is periodical software and/or firmware upgrading when upgrades are released by ***AIM*** (periodically check **www.aim-sportline.com**).

To upgrade the software/firmware:

⇒ connect to www.aim-sportline.com

⇒ go in "Software download" page

⇒ check if any software and/or firmware upgrade has been released

⇒ download it

⇒ run it

⇒ follow the instructions prompted on your Pc monitor.

This user manual has been written using the following parameters:

⇒ **Race Studio 2 software**: version **2.20.16**

⇒ **Firmware**: version **14.45**

13 – How to download and save test values

Once a test session has finished, you can download data stored in the logger memory and store them in a database management system.

To **download** data:

⇒ switch on your Pc

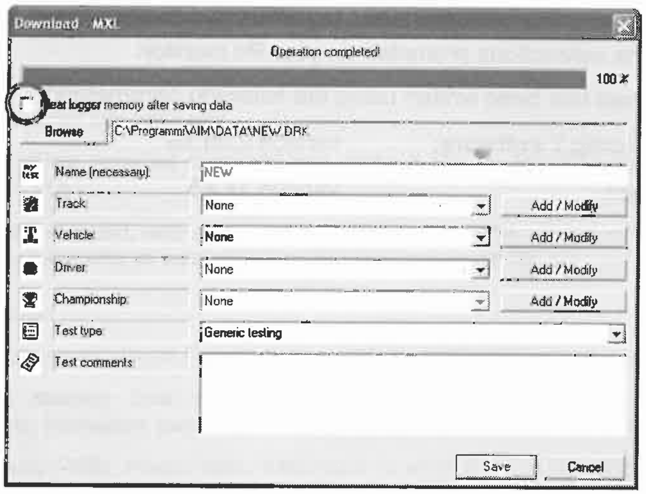
⇒ run **Race Studio 2** software

⇒ connect your **MXL Pista / MXL PRO / MXL PRO 05** to the PC USB port through the USB cable

⇒ switch the logger on.

⇒ click on "Download" button on **Race Studio 2** top toolbar

⇒ this window appears:

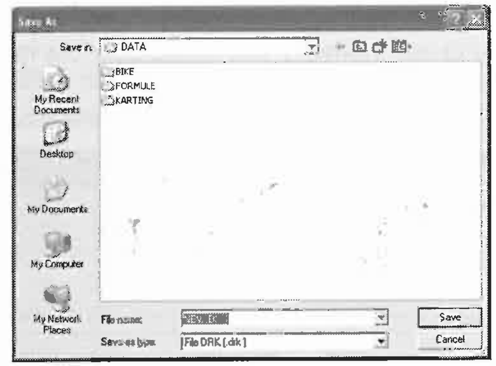


⇒ In the window's upper part is a "waiting-bar" which informs you on the download percentage status.

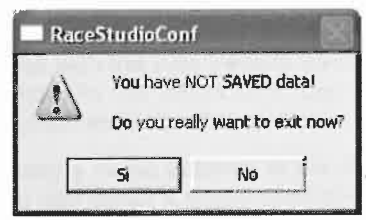
⇒ Below the waiting-bar is a checkbox (circled in the figure) that allows you to "Clear logger memory after saving data". It is enabled by default to avoid filling the logger memory, since this will cause data acquisition to stop. If you do not want to clear logger memory after download disable it (you may need to download data on more than one Pc). Use with care.

⇒ After data download "Save" button enables. If you press it without specifying file name and destination folder the file is automatically saved in the default folder "X:\Program files\AIM\DATA" (where "X" is the hard drive where **Race Studio 2** is installed) with the default name "new.drk".

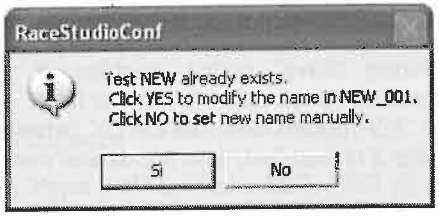
⇒ To save the file with another name and/or in another folder, insert file name in "Name" box and press "Browse" button: save as window appears.



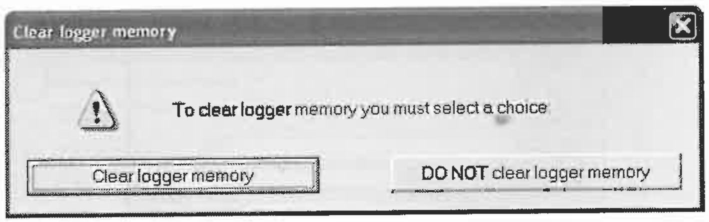
⇒ If you unintentionally close this window without saving the data you will see the following warning:



⇒ If you have already saved files automatically (without specifying file name and destination folder) and you try to save others, the system gives you the choice between an automatic numeric file name and a manual file name.



⇒ If you disabled "Clear logger memory after saving data" checkbox, when download operations are finished the system asks you whether to clear the logger memory or not. Normally you would clear the memory to prevent it from filling up with future data, however you would not clear it if you wanted to download the data to another computer.



13.1 – How to insert the test in a database

Race Studio 2 has a test storage system based on databases.

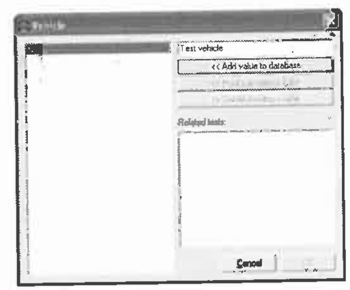
This storing system allows you to save files by specifying 5 properties: vehicle, driver, track, championship and test type. This information is saved together with the test file, and allows you to group files into self-defined categories identified by these 5 properties. When saving a new test file, you can insert it in the previously set database properties or create a new property name.

To **insert a test in the database** after data download:

⇒ click on "Browse" button

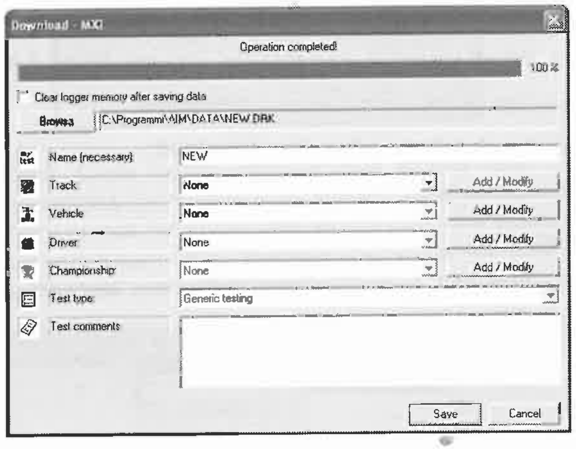
⇒ enter file name;

⇒ click on "Add/Modify" button corresponding to *"Vehicle"* properties. This window appears;



- If the database is empty or you wish to create a new property name, fill the upper right box with the new Vehicle name and then click "Add value to database" button. In the left column the new category appears and "OK" button becomes enabled: click on it.
- If the desired property name appears in the existing database categories (left column), you can select it single-clicking on the name and click "OK" button;

- If you do not wish to specify any category, the file is saved in the database and all attributes set to "None".
- Please, repeat this procedure until all 5 categories have been filled.
- Once all the attributes have been set, like in the following image, please click on "OK" button.



14 – How to use Race Studio Analysis (Except for MXL Strada)

Race Studio Analysis is the software developed by ***AIM*** to analyse data stored in your **MXL**[10]. It is a very powerful instrument for analysing and improving vehicle and driver performance. It allows you to create track maps, compare different laps, plot channels versus time, distance or frequency, has a data animation option, an histograms option and useful math channels.

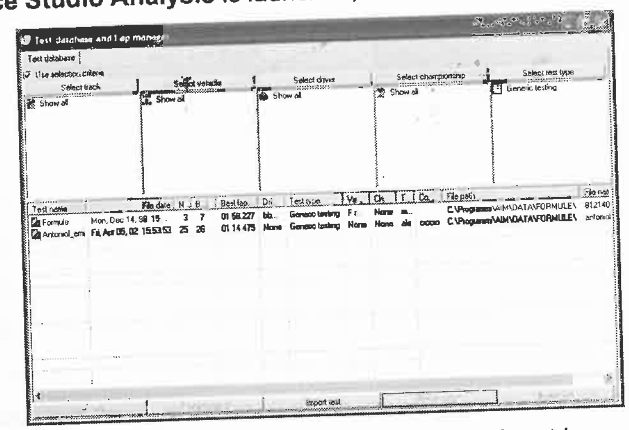
To run **Race Studio Analysis**:

⇒ click twice on the corresponding icon (shown on the right), that you find on the desktop of your PC monitor.

⇒ If you are using **Race Studio 2**, click on "Analysis" tab, or on "Start / Program Files / AIM / Race Studio 2 / Race Studio Analysis" or press "F5" on your PC keyboard

Race Studio Analysis

Once **Race Studio Analysis** is launched, the following window appears:



The "Test database and lap manager" window is made of different layers and allows you to load/unload a test and to manage the database and the loaded tests.

10 **MXL Pista / MXL PRO / MXL PRO 05** only; **MXL Strada** does not download data.

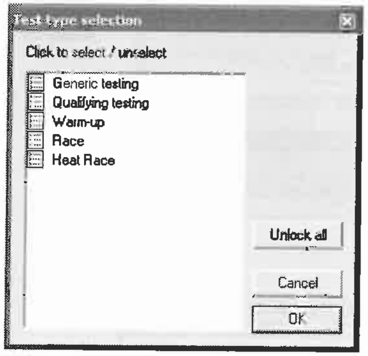
14.1 – How to open a test

You can choose a test to open in two ways: using the 5 selection criteria (recommended) or not.

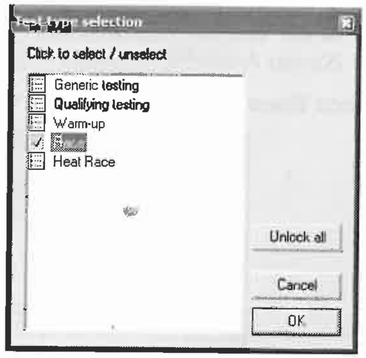
Opening a test using the 5 selection criteria

⇒ enable "Use selection criteria" checkbox. In the lower part of the "Test database and Lap manager" window you can see all tests included in the database and, in the upper part, database categories and sub-categories.

⇒ click on the selection criteria you want to use ("Select track", "Select vehicle", etc…): the corresponding selection window appears.



Test type selection – no type selected



Test type selection – one type selected

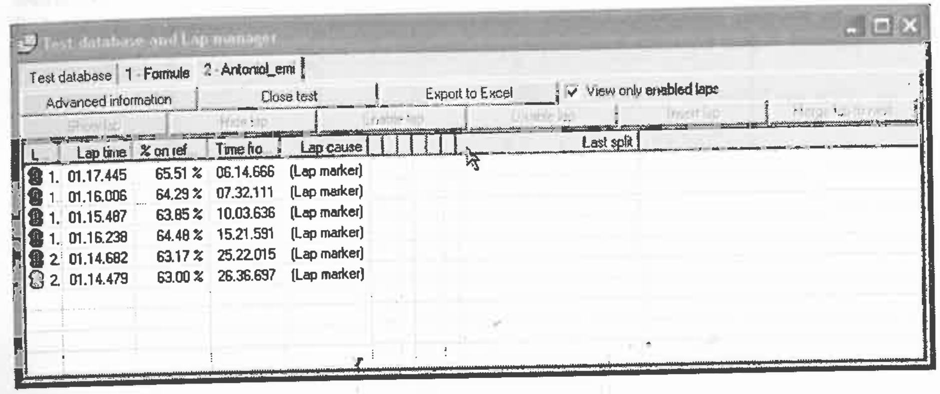
⇒ To choose a database sub-category, enable it as shown in the figure on the right; you can enable more than one sub-category. Please repeat this operation for all criteria. Tests not belonging to these categories are not shown.

⇒ To open a file choose the category and double click on the file or right click on the file and choose open option.

Open a test not using the 5 selection criteria

⇒ disable "Use selection criteria" checkbox.

⇒ you can choose a file to load in three ways: double-click on it, select it and then press button "Open test" on the left of the top toolbar or right-click on the file name and choose "Open test" option.



You can open up to 4 different tests at one time in order to make comparisons between many different laps. In the screenshot reported above you can see three layers: Test database layer and two test layers ("1-Formule", and "2-Antoniol_emi"). To select a particular lap, you may double-click on it or single-click and choose "Show lap" function. When the lap is selected the green icon located on the left of the lap number turns yellow.

14.2 – How to plot a channel

Race Studio Analysis allows you to plot recorded laps and sampled channels versus time, distance and frequency.

How to plot RPM and Speed vs. time

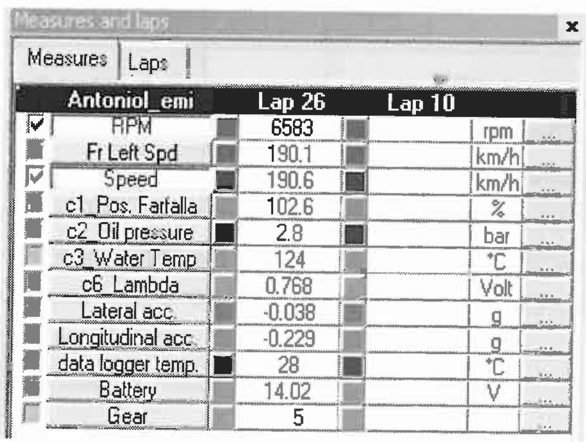
⇒ click on "RPM" and "Speed" in the "Measures and laps" toolbar (to show this toolbar click on "View / Measures toolbar" and it appears on the left part of **Race Studio Analysis** window)

⇒ click on "Plot vs. time" icon.

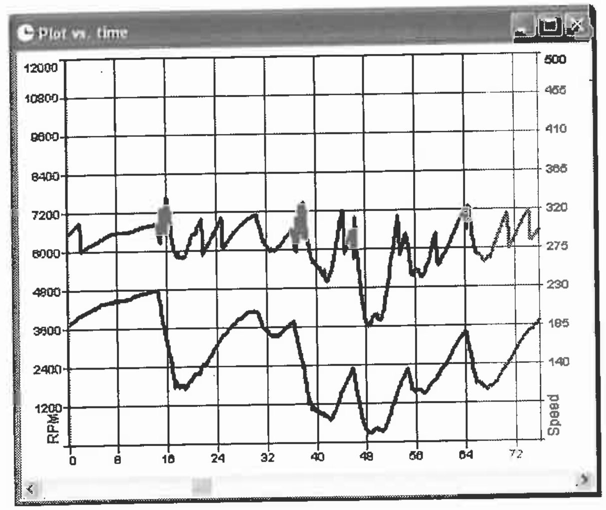
How to plot any channel vs. time

⇒ use "CTRL+F1" shortcut or click "View \ Plot vs. time" command.

The following figures show the "Measures and laps" toolbar (first figure) and speed and RPM diagram during a lap (second figure).



Measures and Laps toolbar



Speed (blue) and RPM (red) diagram during a lap

How to add a sampled channel to the graph

Click on the desired channel name inside the "Measures and laps" toolbar.

How to change the graph color

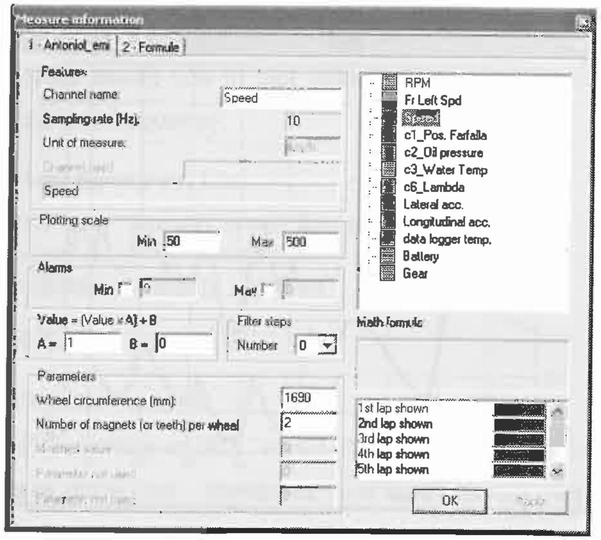
Click on the colored boxes column to set the desired color for each recorded lap and for each sampled channel.

How to add the scale to the graph

Enable the checkbox corresponding to the desired channel name.

How to load and use "Measure information" dialog window

Click on the pushbuttons of the last right column of the "Measures and laps" toolbar: this window allows you to change channel name, plotting scale and unit of measure; you can also amplify and shift the diagram using the "Value=(Value*A)+B" option where A is the amplification factor (from -1000 to +1000), while B is the shift factor (from –500000 to +500000).
The following image shows the "Measure information" dialog box.



Please note: by choosing a channel from the channel list in the upper right box, the parameters you can set (i.e. RPM multiply factor, wheel circumference, pulses per revolution, etc…) will appears in the lower left corner.

14.3 – How to create a track map (Pista / PRO / PRO 05 only)

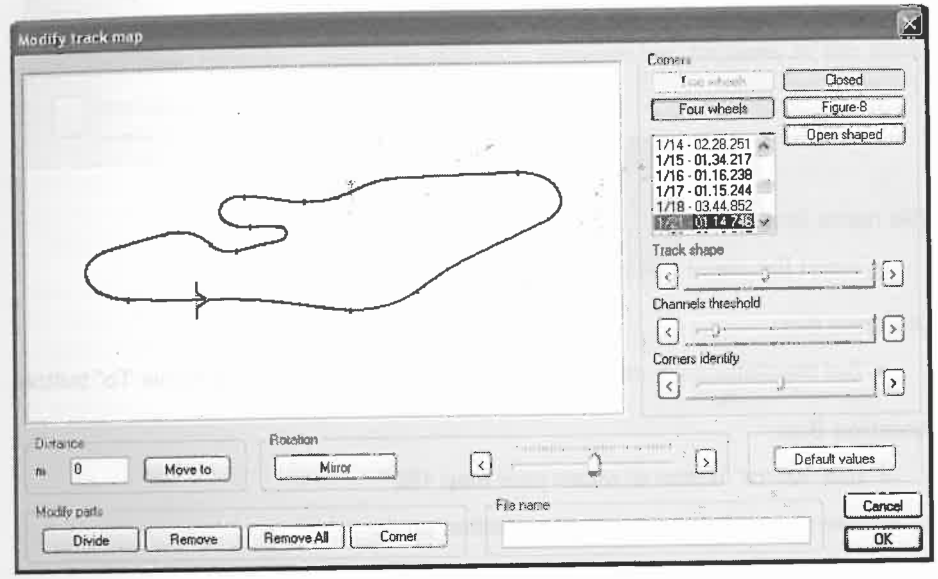
The internal lateral G sensor and/or external gyroscope (only available for **MXL Pista, MXL PRO** and **MXL PRO 05**) allows you to create a track map on your PC.

To create the track map:

⇒ load a test

⇒ select a good lap (labelled as "Lap marker" in the Lap cause column of the Lap manager dialog box)

⇒ press "Map \ New" from the Command toolbar or "Shift+F4" keys: this window appears (Sample map shown, yours may look different):



⇒ Through "Corner" box, "Distance" Box and "Modify parts" box you can draw your map.

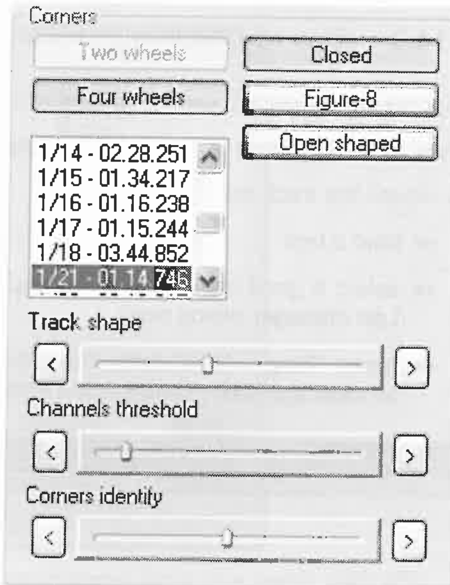
⇒ Press "OK" button to save your map or "Cancel" button not to

Corners Box:

⇒ Select you vehicle wheels number (two or four wheels)

⇒ Select the track type (Closed, Figure 8 or Open shaped)

⇒ "Track Shape", "Channels threshold" and "Corners Identify" allow you to set the track shape using the related sliders.



File name Box:

⇒ Insert the name you want to give to your map.

Distance Box:

⇒ Set the distance in meters you want to move to and press "Move To" button

Rotation Box:

⇒ use "Mirror" button to rotate your map 180°

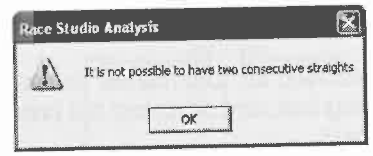
⇒ use the slider to set a custom rotation angle

Modify parts box:

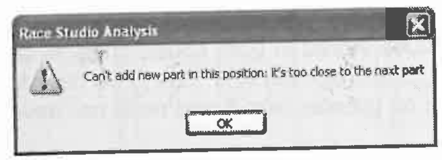
⇒ Divides a split into two separate splits;

⇒ Removes an intermediate split or all;

⇒ Changes a circuit part from Straight (green line) to Corner (blue / red lines) or vice versa. Note: it is not possible to have two consecutive straights; otherwise the following warning window appears

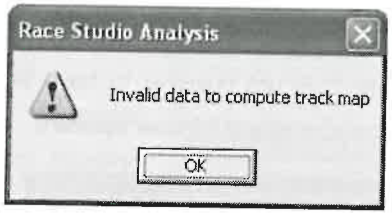


⇒ You have to keep a minimum distance between two sections of the truck, otherwise this warning message appears:



14.3.1 – Possible track map creation troubleshooting

If this warning message appears.



⇒ select a "Good lap", labelled as "Lap marker" in the Lap cause column of the Lap manager dialog box, and de-select the previously used lap (double click on the lap number).

⇒ Select a lap without many skids.

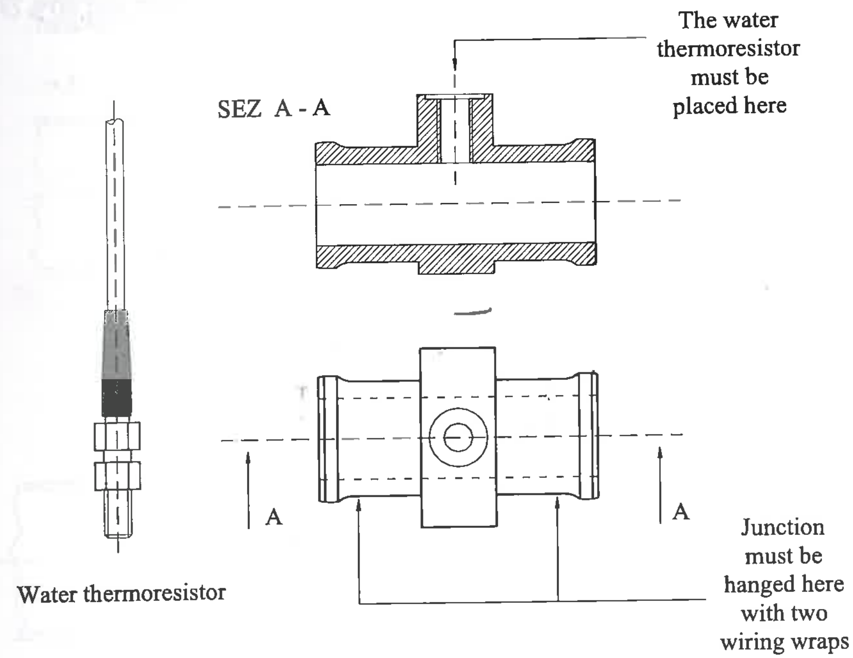
⇒ Verify that the correct vehicle type (2 or 4 wheels) in the "Modify track map" window is set.

⇒ Verify that the values stored in both speed channel and lateral acceleration one are sensible: lateral acceleration has to be near to 0 in the straight line, while speed must be greater than 0 and must not have high or low peaks.

⇒ If lateral acceleration or gyroscope signal in the straight line is not quite near to 0, it is probable that the lateral accelerometer (or gyroscope) has not been auto calibrated. You can solve this problem by summing or subtracting a fixed value (see "Measure Information" dialog box) in order to have 0 in the straight line. **Before starting a new test run remember to calibrate the internal lateral accelerometer.**

Appendix "A" – Installing the H_2O Thermoresistor

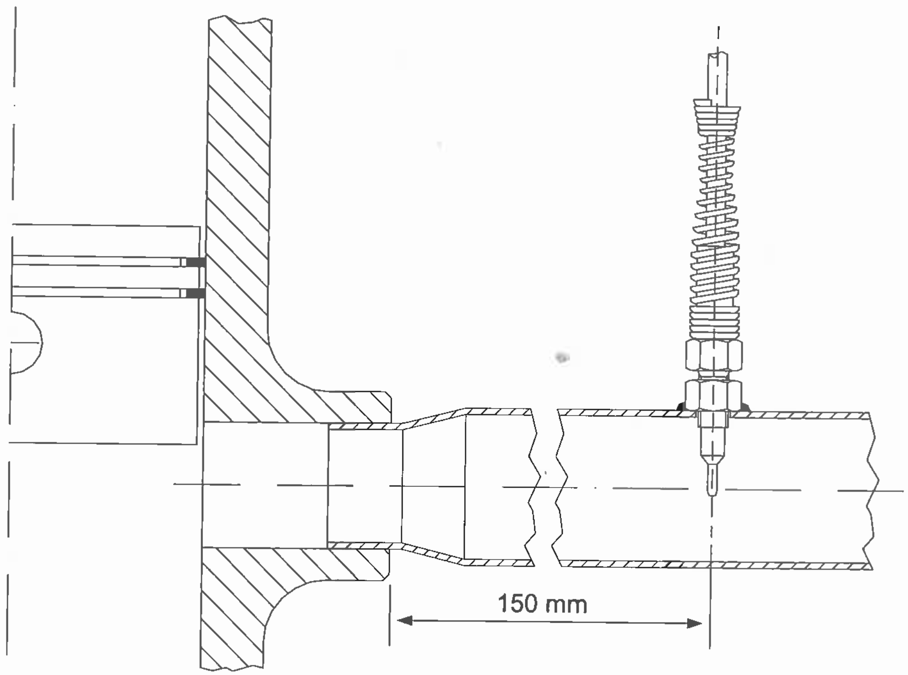
The H_2O Thermoresistor can be installed in the inline water fitting (sold separately). Shown below is how to install the Water Thermoresistor (M5 type).



Appendix "B" – Installing the EGT Thermocouple

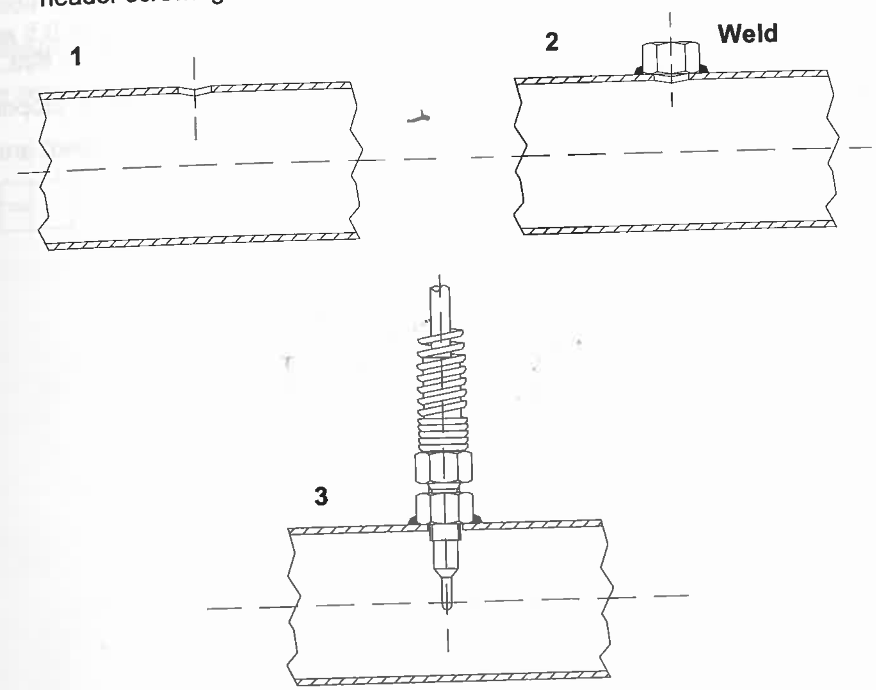
The Exhaust Gas Thermocouple (EGT) should be positioned inside the exhaust header at a distance of 150 mm (5.9 inches) from the exhaust port. Shown below is how to correctly install the EGT thermocouple.

Warning: insert the probe in the exhaust gas header between 25% and 50% of its length.



To install the EGT thermocouple:

- ⇒ Make a 5 mm (0.2 inches) hole inside the exhaust header;
- ⇒ Weld the little nut to the exhaust header in the point where the hole has been drilled;
- ⇒ Connect the remaining part of the thermocouple and fix it to the exhaust header screwing it.



Appendix "C" – Installing the "CAR" speed sensor

The wheel speed sensor for phonic wheel is a "non contact" device and needs a ferrous (magnetic) metal trigger to pass behind the sensor face. **To install the sensor**:

⇒ firmly fix it on a **self-made iron bracket**

⇒ ensure the distance between sensor and phonic wheel is between 0.5 and 2 mm (optimum value: 1 mm) and plug the sensor connector in your **MXL**.

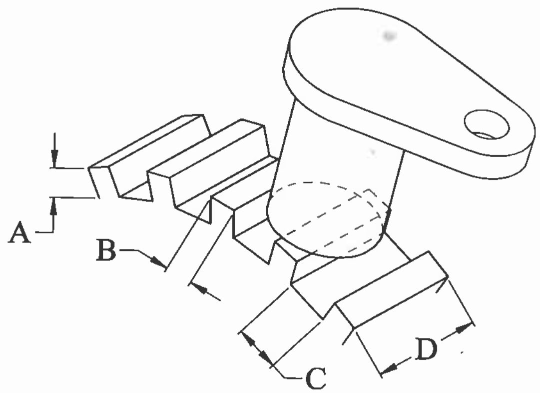
Minimum required **dimensions of the trigger** for the sensor to work properly (with reference to the figure below, that shows the sensor correctly installed) are:

⇒ Tooth height "**A**": 5.06 mm (0.19 inches)

⇒ Tooth width "**B**": 2.54 mm (0.1 inches)

⇒ Tooth spacing "**C**": 10.16 mm (0.4 inches)

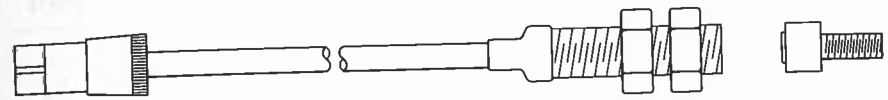
⇒ Tooth thickness "**D**": 6.35 mm (0.25 inches)



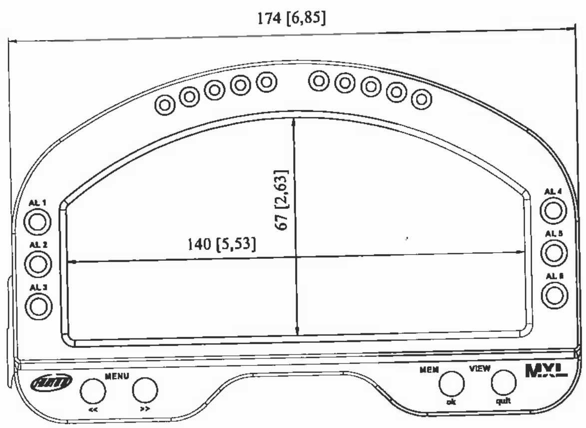
Optimum sensor performance depends on the combination of these variables: trigger material, geometry and speed, sensor trigger gap, magnetic material in close proximity.

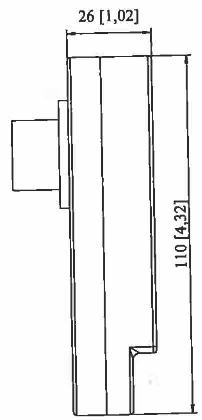
Appendix "C" – Installing the "BIKE" speed sensor

The wheel speed sensor for bike installations is a "magneto resistive – non contact" device and needs a magnetic trigger to pass behind the sensor face. When mounting the sensor (see figure below), please firmly install it on a **self-made iron bracket** and make sure that the distance between the sensor and the magnetic trigger is between 15 and 8 mm (**10 mm is the optimum value**). Once the sensor is installed, please plug the sensor Binder connector in your **MXL**.



Appendix "D" – MXL Strada technical characteristics

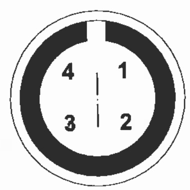




Dimensions in mm (inches)

Connector details (Beacon channel)

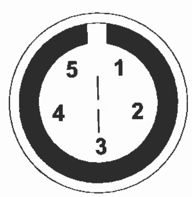
Pin	Function	Pin	Function
1	Magnetic Lap	3	+ VB
2	GND	4	Optic lap



Female 4-pins connector pinout (external view)

Connector details (CAN for external "Expansion modules")

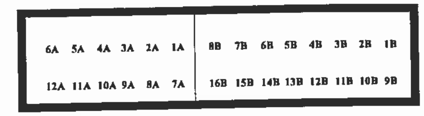
Pin	Function	Pin	Function
1	Can 0 +	4	Can 0 -
2	GND	5	9-15 Battery Input
3	+ VB		



Female 5-pins connector pinout (external view)

Connectors Details

AMP 12 and 16 pins (External view on the right)



28 pins AMP Connector pinout (external view): 12 pins connector is labelled "A" connector and 16 pins connector is labelled "B" Connector

Connector Details (AMP 12 Pins)

Pin	Function	Pin	Function
1A	GND	7A	USB D-
2A	9-15V Battery input	8A	RPM 150-400 V (coil input) and RPM square wave (> 8 V)
3A	Can 1 - (for ECU interface)	9A	+ VB
4A	Can 1 + (for ECU interface)	10A	GND
5A	RS 232 TX (for ECU interface)	11A	+ VB
6A	RS232 RX (for ECU interface)	12A	Speed

Connector Details (AMP 16 Pins)

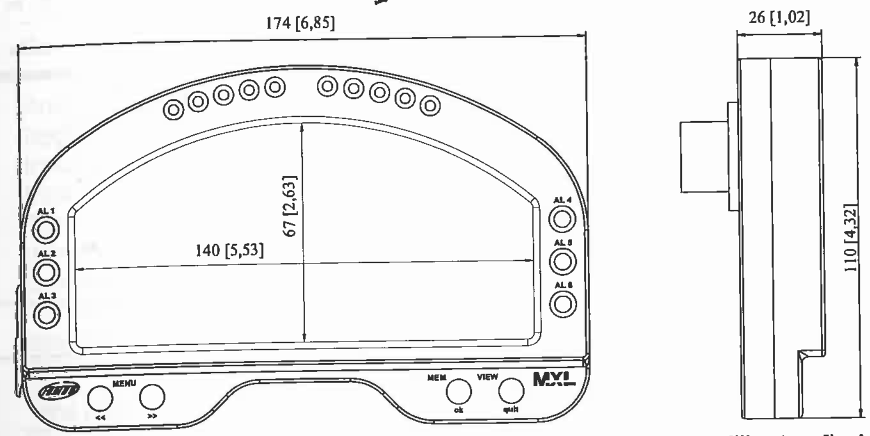
Pin	Function	Pin	Function
1B	Analog Input 4	9B	Analog Input 8
2B	V Reference	10B	USB D+
3B	Analog GND	11B	Analog GND
4B	Analog Input 3	12B	Analog Input 7
5B	Analog Input 2	13B	Analog Input 6
6B	V Reference	14B	V Reference
7B	Analog GND	15B	Analog GND
8B	Analog Input 1	16B	Analog Input 5

Technical characteristics

General characteristics	Value
Analog Input channels	8
Speed channel	1
Input channels from ECU	Max 64
Memory Management	Records Lap Times/Max Ch. Values
External power	From 9 to 15 VDC
Voltage Output (V reference)	4,5 V (for potentiometers)
Internal memory	128 Kbytes
ECU Interface	Serial / CAN protocol
PC Interface	300 Kbytes / sec. USB port

Other characteristics	Value
MXL Strada dimensions	174 x 110 x 26 mm
Display dimensions	140 x 67mm
Chassis	Aluminium

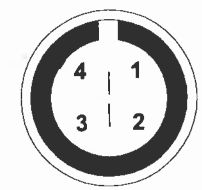
Appendix "E" – MXL Pista technical characteristics



Dimensions in millimetres [inches]

Connector details (Beacon channel)

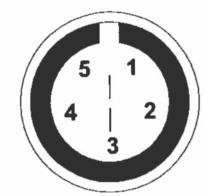
Pin	Function	Pin	Function
1	Magnetic Lap	3	+ VB
2	GND	4	Optic lap



Female 4-pins connector pinout (external view)

Connector details (CAN for external "Expansion" modules)

Pin	Function	Pin	Function
1	Can 0 +	4	Can 0 -
2	GND	5	9-15 V Battery input
3	+ VB		



Female 5-pins connector pinout (external view)

Connectors Details

AMP 12 and 16 pins (External view on the right)

6A	5A	4A	3A	2A	1A	8B	7B	6B	5B	4B	3B	2B	1B
12A	11A	10A	9A	8A	7A	16B	15B	14B	13B	12B	11B	10B	9B

28 pins AMP Connector pinout (external view):
12 pins connector is labelled "A" connector and
16 pins connector is labelled "B" Connector

Connector Details (AMP 12 Pins)

Pin	Function	Pin	Function
1A	GND	7A	USB D-
2A	9-15V Battery input	8A	RPM 150-400 V (coil input) and RPM square wave (> 8 V)
3A	Can 1 - (for ECU interface)	9A	+ VB
4A	Can 1 + (for ECU interface)	10A	GND
5A	RS 232 TX (for ECU interface)	11A	+ VB
6A	RS232 RX (for ECU interface)	12A	Speed

Connector Details (AMP 16 Pins)

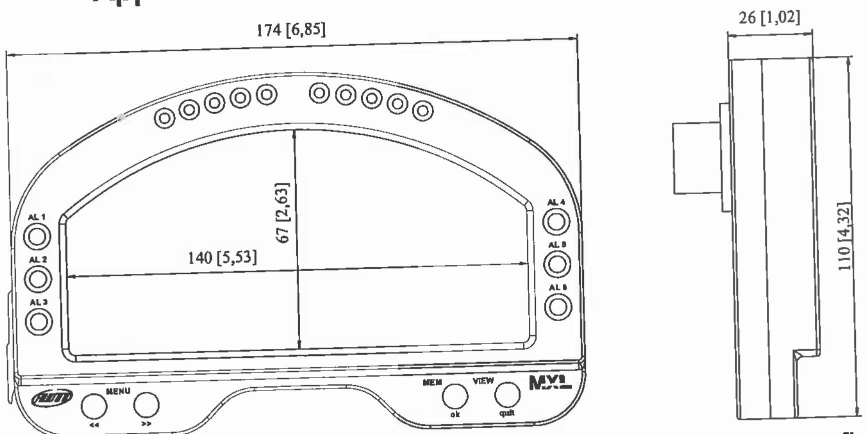
Pin	Function	Pin	Function
1B	Analog Input 4	9B	Analog Input 8
2B	V Reference	10B	USB D+
3B	Analog GND	11B	Analog GND
4B	Analog Input 3	12B	Analog Input 7
5B	Analog Input 2	13B	Analog Input 6
6B	V Reference	14B	V Reference
7B	Analog GND	15B	Analog GND
8B	Analog Input 1	16B	Analog Input 5

Technical characteristics

General characteristics	Value
Analog Input channels	8
Speed channels	1
Input channels from ECU	Max 64
Max Sampling frequency per channel	Up to 500 Hz
Total sampling frequency	2000 Hz
Internal g-sensor	Mono-axial, ±10g
External power	From 9 to 15 VDC
Voltage output (V reference)	4,5 V (for potentiometers)
Internal memory	8 Mbytes
ECU Interface	Serial / CAN protocol
PC Interface	300 Kbytes / sec. USB port

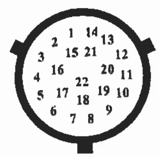
Other characteristics	Value
MXL Pista dimensions	174 x 110 x 26 mm
Display dimensions	140 x 67mm
Chassis	Aluminium

Appendix "F" – MXL PRO technical characteristics



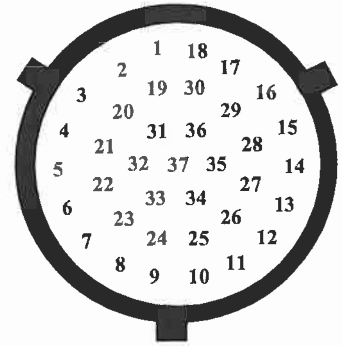
Dimensions in millimetres [inches]

22 Pins Deutsch connector (external view on the right)



Pin	Function	Pin	Function
1	+ VB	12	GND
2	GND	13	+ VB
3	Can 0 + (Ext. expansion modules)	14	MEM
4	Can 0 - (Ext. expansion modules)	15	VIEW
5	Speed 3	16	GND
6	Speed 4	17	RS 232 RX (for ECU interface)
7	USB D-	18	RS 232 TX (for ECU interface)
8	USB D+	19	GND
9	GND	20	Can 1+ (for ECU interface)
10	+ VB	21	Can 1 - (for ECU interface)
11	GND	22	n.c.

37 Pins Deutsch connector (external view on the right)



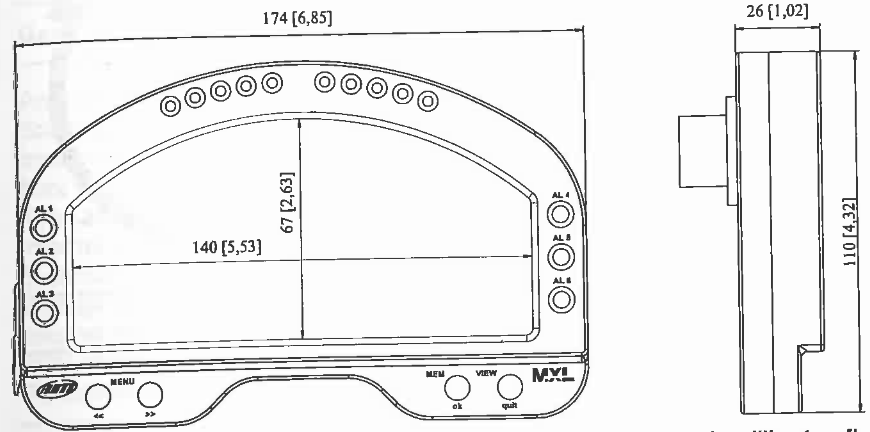
Pin	Function	Pin	Function
1	9-15 V Battery input	20	Analog GND
2	Analog Input 1	21	V reference
3	Analog Input 2	22	V reference
4	Analog GND	23	Analog GND
5	Analog GND	24	V reference
6	V reference	25	Analog GND
7	V reference	26	Analog Input 8
8	Analog Input 3	27	GND
9	Analog Input 4	28	Optic Lap
10	Analog Input 6	29	Magnetic Lap
11	Analog GND	30	Speed 2
12	RPM Square Wave 4-8 V	31	Analog GND
13	RPM Coil 150-400 V and RPM Square Wave (>8V)	32	Analog Input 5
14	+ VB	33	Analog Input 7
15	GND	34	V reference
16	+ VB	35	GND
17	+ VB	36	Speed 1
18	GND	37	GND
19	Analog GND		

Technical characteristics

General characteristics	Value
Analog Input channels	8
Speed channels	4
Input channels from ECU	Max 64
Max sampling frequency per channel	Up to 500 Hz
Total sampling frequency	2000 Hz
Internal g-sensor	Mono-axial ± 10g
External power	From 9 to 15 VDC
Voltage output (V reference)	4,5 V (for potentiometers)
Internal memory	8 Mbytes
ECU interface	Serial / CAN protocol
PC Interface	300 kbytes/ sec USB port

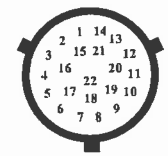
Other characteristics	Value
MXL PRO dimensions	174 x 110 x 26 mm
Display dimensions	140 x 67 mm
Chassis	Aluminium

Appendix "G" – MXL PRO 05 technical characteristics



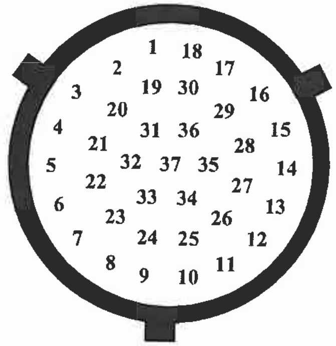
Dimensions in millimetres [inches]

22 Pins Deutsch connector (external view on the right)



Pin	Function	Pin	Function
1	+ VB	12	GND
2	GND	13	+ VB
3	Can 0 + (Ext. expansion modules)	14	MEM
4	Can 0 - (Ext. expansion modules)	15	VIEW
5	Speed 3	16	Gear Flash
6	Speed 4	17	RS 232 RX (for ECU interface)
7	USB D-	18	RS 232 TX (for ECU interface)
8	USB D+	19	GND
9	GND	20	Can 1+ (for ECU interface)
10	+ VB	21	Can 1 - (for ECU interface)
11	GND	22	9-15 V Battery input

37 Pins Deutsch connector (external view on the right)



Pin	Function	Pin	Function
1	9-15 V Battery input	20	Analog Input 12
2	Analog Input 1	21	V reference
3	Analog Input 2	22	V reference
4	Analog GND	23	Analog Input 10
5	Analog GND	24	V reference
6	V reference	25	Analog Input 9
7	V reference	26	Analog Input 8
8	Analog Input 3	27	Analog GND
9	Analog Input 4	28	GND
10	Analog Input 6	29	+ VB
11	Analog GND	30	Speed 2
12	RPM Square Wave 4-8 V	31	Analog GND
13	RPM Coil 150-400 V and RPM Square Wave (>8V)	32	Analog Input 5
14	+ VB	33	Analog Input 7
15	GND	34	V reference
16	+ VB	35	Analog GND
17	+ VB	36	Speed 1
18	GND	37	Lap
19	Analog Input 11		

Technical characteristics

General characteristics	Value
Analog Input channels	12
Speed channels	4
Input channels from ECU	Max 64
Max sampling frequency per channel	Up to 500 Hz
Total sampling frequency	2000 Hz
Internal g-sensor	Mono-axial ± 10g
External power	From 9 to 15 VDC
Voltage output (V reference)	4,5 V (for potentiometers)
Internal memory	16 Mbytes
ECU interface	Serial / CAN protocol
PC Interface	300 Kbytes/ sec USB port

Other characteristics	Value
MXL PRO 05 dimensions	174 x 110 x 26 mm
Display dimensions	140 x 67 mm
Chassis	Aluminium

Manufacturer and dealers

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Fax: 0039.02.92.11.80.24
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Fax: 0049.7260.920444
www.me-mo-tec.com

Meca Racing
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91370 Verrières Le Buisson
France
Tel.: 0033.1.644.90.369
www.meca-racing.com

Roteg Racing b.v.
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8042 AB Zwolle
The Netherlands
Tel.: 0031.38.423.85.82
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E-mail: info@roteg.nl
www.roteg.nl

Vinco Race Co. Ltd
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Tel./Fax: 007.095.287.3860
E-mail: karting@vinco.ru
www.karting.vinco.ru

AMERICAN DEALERS

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www.aimsports.com

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www.aimsports.com

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RPM ECU SIGNAL

LED - NONE THRESHOLD NONE

MULTIPLICATION FACTOR / 2

MAX VALUE 12000

SHIFT LIGHTS 12000 R

11000 R

10000 G

8000 G

6000 G

GEAR SENSOR

ECU

CALCULATED WITH NEUTRAL

SIGNAL - CHANNEL 8

HIGHES GEAR 5

ALARM CHANNEL

CHANNEL 1 H RED 95

BATTERY H RED 15

L GREEN 11

MEASURE

FIELD 1 ALWAYS DISPLAYED

CHANNEL 1 WATER

FIELD 3 PAGE 1 BATT

FIELD 3 " 2 BATT

SPEED

CHANNEL SPEED 1

WHEEL CIRCUMF 1557 $^{m}/_{m}$

PULSES PER REV. 1

LAP

OBSCURING TIME 8

LAP SEGM. 1

MEASURE

FIELD 2 ALWAYS DISPLAYED

CHANNEL 2 T. OIL

FIELD 4 PAGE 1 NONE CH 4

FIELD 4 " 2 NONE CH 6

HI (RED) LOW (GREEN)	THRESHOLD
H (R) CHANNEL 2	110
NONE	0
NONE	0

FireSense response

www.spa-uk.co.uk tel. +44 (0)1827 300150

SPA TECHNIQUE

SPA DESIGN

Common Barn, Tamworth Road, Packington,
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Tel: 01827 300150 Fax: 01827 300151
E-mail: sales@spa-uk.co.uk
Web Site: www.spa-uk.co.uk

FireSense response

www.spa-uk.co.uk tel. +44 (0)1827 300150

MULTI-FLO AFFF SYSTEMS

FIA HOMOLGATION NUMBER: - EX003.98

Installation Instructions

Please read carefully before attempting to install your system.

SPA DESIGN

Common Barn, Tamworth Road, Packington,
Nr. Lichfield, Staffordshire WS14 9PX
Tel: 01827 300150 Fax: 01827 300151
E-mail: sales@spa-uk.co.uk
Web Site: www.spa-uk.co.uk

CONTENTS

Table of Figures: -

ELECTRICAL FITTING INSTRUCTIONS

Unpack all parts and check components against 'kit list'.

- Remove the bottle from it's plinth by undoing the over-centre clips. Decide the best position for the extinguisher – IT IS RECOMMENDED THAT THE BOTTLE SHOULD BE MOUNTED IN THE FORE AND AFT DIRECTION IN THE VEHICLE. The extinguisher label, detailing contents, etc and also the pressure gauge should be visible. Mount the plinth securely to the vehicle and put the bottle back into place. *(Refer to Figure 3.)*
- Mount the power pack in a clearly visible position.
- Switch with red plastic shroud to be fitted in the cockpit so that it is in easy reach of both the driver and/or co-driver when sitting in the normal driving position and wearing fully fastened seatbelts.
- The other switch with flexible red membrane (waterproof) is to be fitted to the outside of the vehicle, close to the exterior master switch (for activation by the Marshals).
- Once the system has been wired as per wiring diagrams *(refer to Figure 1 / 2)*, the following tests should be carried out to check the system is fitted correctly and will operate when required. *(See Page 5)*

SPA DESIGN FIREFIGHTER/ FIRESENSE-RESPONSE ELECTRICAL DETAILS

The SPA FireFighter/ Firesense-Response system uses actuators to operate valves located with in the pressurised container that contains the extinguishant. These are triggered remotely using a battery-powered power pack.

In order to guarantee reliable operation the connectors used are 1P67 and the actuators used are of a military specification with the system / battery test electronics integrated into the power pack. The actuators are designed to either operate indivually, or to be wired in series if two firing heads are used.

The power pack electronics can test the continuity of the wiring, and also provides a high current pulse test to ensure system integrity before use. Unlike other systems, the battery test will not destroy or put an excessive drain on the battery during this critical test. These tests are performed using a three way switch on the power pack box and should be performed before each usage of the system, since the system is only as good as the battery that powers it and the integrity of the wiring loom and its connectors.

To check the condition of the battery. press and hold up the switch on the power pack box. **Every two seconds you will see a YELLOW** light flash.
If the light flashes very dimly the battery must be replaced.

IF IN DOUBT REPLACE THE BATTERY !!!!

To check the continuity of the wiring, ensure that the switch on the power pack box is in the **SYSTEM INACTIVE** to ensure that the extinguisher is not fired.

Press the internal firing button and check that the **RED** light comes on, press the external firing button, and check that this also makes the **RED** light come on.

The external button must be positioned close the the exterior master switch.

DO ensure that the wiring cables do not run next to looms especially if they contain ignition or battery cables

DO ensure that any exposed connections that are likely to get water sprayed are protected.

DO NOT allow cables to run through sharp edged apertures without protection

DO NOT fix cables to any surface that is likely to see excessive temperatures.

MECHANICAL SYSTEM

This SPA Firefighter/Firesense-Response system is a mechanically operated AFFF foam system. The system uses two T-handle pull cables, one 6ft long and one 12 ft long.

FITTING INSTRUCTIONS

Unpack all parts and check components against 'kit list'.

- Remove the bottle from it's plinth by undoing the over-centre clips. Decide the best position for the extinguisher – IT IS RECOMMENDED THAT THE BOTTLE SHOULD BE MOUNTED IN THE FORE AND AFT DIRECTION IN THE VEHICLE. The Unit label, detailing contents, etc and also the pressure gauge should be visible. Mount the plinth securely to the vehicle and put the bottle back into place. *(refer to Figure 3).*
- Insert the end of the decabon tube into the push-in fitting on the lever-valve and lay the length of the tube from the cylinder to the chosen location; plug the nozzle onto the free end of tube and orientate this to point the nozzles onto anticipated fire sources.
- Mount the 6-ft cable in the cockpit within reach of the driver and / or co-driver when sitting in the normal driving position wearing seat-belts. The other end of the cable is to be threaded through one of the adjusting screws on the handle of the lever-valve (on the cylinder). Then threaded through one of the holes in the other handle and the clamp screw made secure on cable against the underside in such a way that movement of the red pull handle will close the handles of the lever-valve, BUT allowing 6mm of free-play. CAUTION: do not allow this testing to actually move the handles or the valve may open and release the extinguishant **(keep the safety pin in place)**.
- Mount the 12-ft cable on the outside of the vehicle (close to the exterior master switch is the recommended position). Lay the cable inside the vehicle and connect to the lever-valve as above.
- Pull cables should be fitted in such a way that no kinks or 'S' bends are formed, which could cause malfunction.
- Removing the safety pin from the lever-valve leaves the system ready for use.
- **SAFETY WARNING Failure to remove safety pin will render the system inoperable when required.**

A.F.F.F. NOZZLES

It is important that all of the nozzles provided in the fire system kit are used.

The nozzles will produce a fine atomised spray with the AFFF emerging as a milky white foam substance, which forms a film barrier starving the fire of oxygen. This foam spray has the capability of excellent fire out times and has a cooling effect, which can control re-ignition. When locating the nozzles it should be noted that there is a 90° cone pattern with a $^1/_2$ metre range. The nozzle is designed to mount through a bulkhead if desired or mounting brackets. Nozzles should not simply be supported by their own pipe work.

Nozzles should be checked for damage/ possible blockage. They should also be tested to ensure that they are in good working order.

Depending on the class of racing / rallying, (which is the competitors responsibility) e.g. International rallying, which needs a 4 lt system, the engine bay must have 3 nozzles installed, with one each side of the motor and 3 nozzles installed in the cockpit.

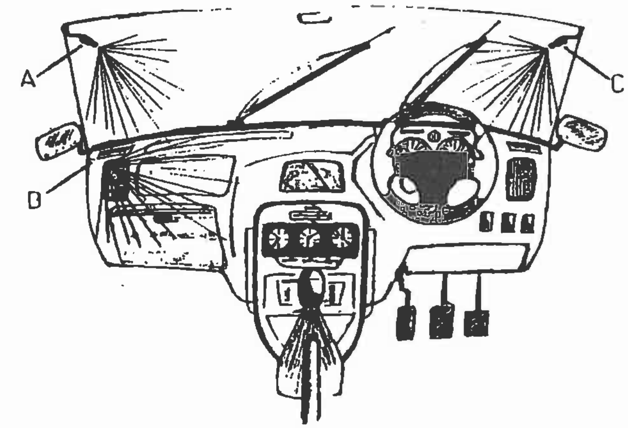
For open cars, the system must include at least one nozzle which should be aimed at the drivers midriff with special care being taken not to spray into the drivers face.

For saloon /closed cars a minimum of 3 nozzles must be fitted (again depending on the system) within the cockpit area. Nozzles should be fitted either to the top of the roll bar main hoop (door B pillar) pointing inwards and downwards towards the foot of the diagonally opposite front roll bar hoop base (door A post) or either under the dashboard aiming at the drivers midriff.

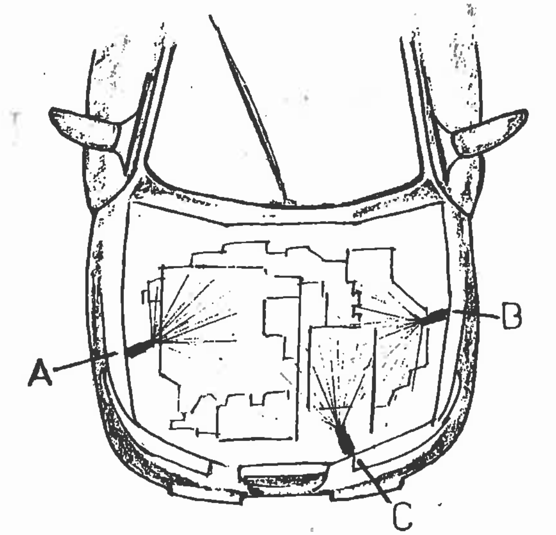
These are only guide lines for competitors using SPA DESIGN fire suppression systems.

IF IN DOUBT, ASK!!!

Please refer to Figure 4/5 (for example) of nozzle location.



EXAMPLE OF ENGINE NOZZLE LOCATION



TUBING

Each Firefighter/Firesense-Response System kit is supplied with Decabon tubing which is plastic coated aluminium tube which can be moulded and flexed to suit this application. The Firefighter/Firesense-Response system has been designed and homologated using this type of tube of 6mm dia. DO NOT substitute this tube for any other type.

TUBE CONNECTIONS

All fittings for tube to nozzles and bottle are of the push-in type. Insert the tube into the fitting, push firmly until it clicks. Once in you should not be able to pull it out.

To remove the tubing, push the tube into the fitting and at the same time push the black collett back towards the fitting and then pull the tube from the fitting.

KIT LISTS

4 LTR MULTI-FLO SINGLE CHAMBER ELECTRICAL

Electrical system comes fitted with firing head.
1 x Base
2 x Straps
1 x Rectangular Strengthening Support Bracket
1 x SP007H – Power Pack (Hirschmann as standard)
2 x SP005H – Plug & Lead
1 x SP011 – Internal Fire Button
1 x SP012 – External Fire Button
5 x SP016 - Decabon Tubing (Mtr)
6 x SP030 – 6mm Nozzle
5 x SP015 – 6mm Tee
1 x SP020 – Bulkhead Fitting
1 x SP017 – 'E' location sticker

4 LTR MULTI-FLO SINGLE CHAMBER MECHANICAL

Mechanical System comes fitted with Lever Valve
1 x Base
2 x Straps
1 x Rectangular Strengthening Support Bracket
1 x SP018 - 6ft Pull Cable
1 x SP019 – 12ft Pull Cable
6 x SP030 – 6mm Nozzle
5 x SP015 – 6mm Tee Piece
1 x SP020 – Bulkhead Fitting
5 x SP016 – 6mm Decabon Tubing (Mtr)
1 x SP017 – 'E' Location Sticker

3.375 LTR MULTI-FLO DUAL CHAMBER ELECTRICAL (PART No: LWE 75 SR3).

Electrical System comes fitted with firing heads.
1 x Base
2 x Straps
1 x Rectangular Strengthening Support Bracket
1 x SP007H – Power Pack
3 x SP005H – Plug and Lead
4 x SP030 – 6mm Nozzle
2 x SP015 – 6mm Tee Piece
1 x SP020 – Bulkhead Fitting
1 x SP011 – Internal Fire Button
1 x SP012 – External Fire Button
5 x SP016 – 6mm Decabon (Mtr)
1 x SP017 – 'E' location Sticker

SAFETY DATA SHEET FOR AFFF
(Aqueous Film Forming Foam)

APPLICATION	Autosport industry – including saloon, single seaters and other racing cars.
CONTENTS	Light Water, Meg and Water
COMPOSITION	Water, Diethylene Glycol, Fluordalkyl, Synthetic Detergents and Fluorochemicals.
APPEARANCE	Clear liquid with an amber colour
pH	Approx. 8.50
BOILING POINT	100°C (initial)
VAPOUR PRESSURE	Approx. 17.6 mm Hg Calc @ 20°C
WATER SOLUBILITY	Miscible
FREEZING POINT	- 10°C
PHYSICOLOGICAL PROPERTIES	Non-harmful.

MAINTENANCE

To ensure maximum possible performance from your SPA Firefighter/Firesense-Response System, the following checks and maintenance procedures should be carried out.

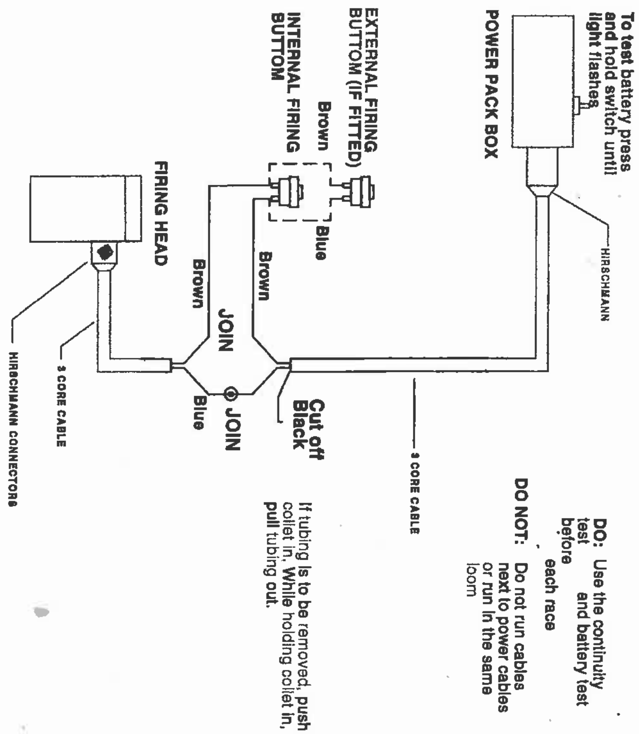
- Regularly check pressure gauge to ensure they are in the green sector.
- Regularly check nozzles for debris or any obstructions.
- Regularly check the integrity of the pipework and fittings.
- Regularly check the cylinder for damage.
- Your SPA Firefighter/Firesense-Response system **must** be serviced every 2 years. A service date is written on the content label on the extinguisher. It is up to you to ensure that the servicing is carried out at the correct intervals. Servicing of the system must be carried out by SPA Design or Approved Vendor
- If your system has been discharged, you must return it to SPA or dealers for servicing and refilling.

NOTES

Please ensure that you monitor the following, as you **MAY NOT** pass scrutineering **IF**: -

- The needle of the gauge is in the red.
- The bottle label is worn, damaged or unreadable.
- The unit is not within the service date.
- The system is in poor condition.

SPA FIRE-FIGHTER/FIRESENSE-RESPONSE ELECTRICAL SYSTEM WIRING SCHEMATIC SINGLE CHAMBER



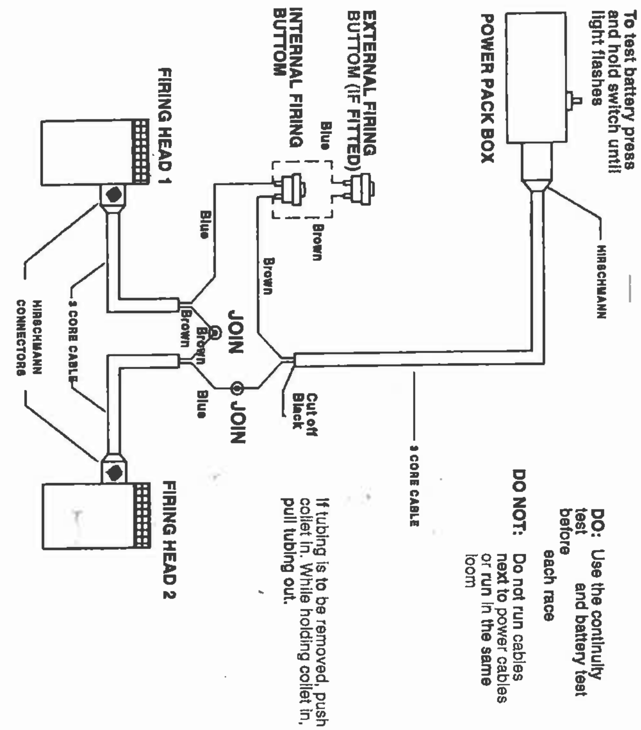
• To test the battery, push and hold lever switch upwards in the "Battery Check" position until green light flashes.

• If the extinguisher tubing is to be removed, push the black collet in and pull the tubing out at the same time.

RECOMMENDED: Use the continuity test and battery test before each race.

DO NOT: Run the cables next to power cables, or in the same loom.

SPA FIRE-FIGHTER/FIRESENSE-RESPONSE ELECTRICAL SYSTEM WIRING SCHEMATIC DUAL CHAMBER



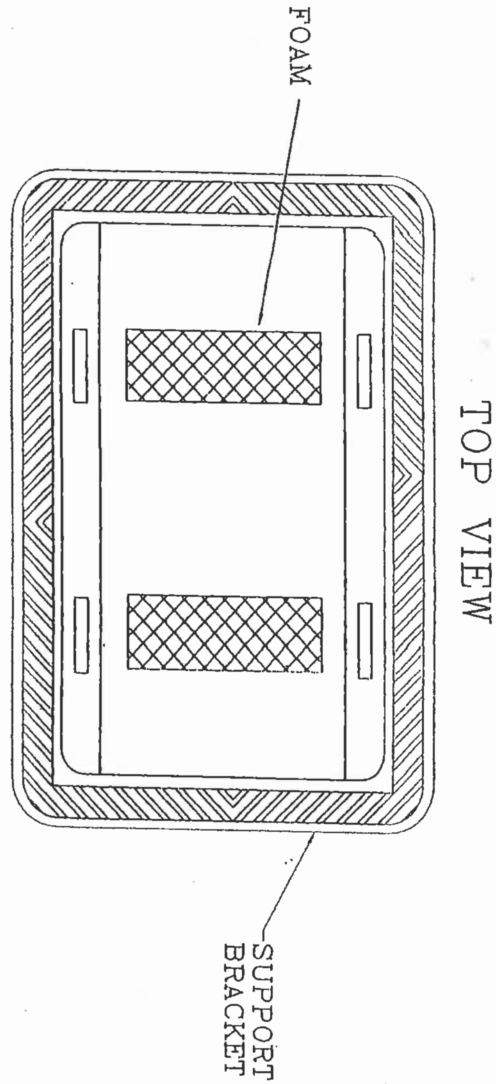
• To test the battery, push and hold the lever switch in the "Battery Check" position until the light flashes.

• If the unit tubing is to be removed, push the black collet in and pull the tubing out at the same time.

RECOMMENDED: Use the continuity test and battery test before each race.

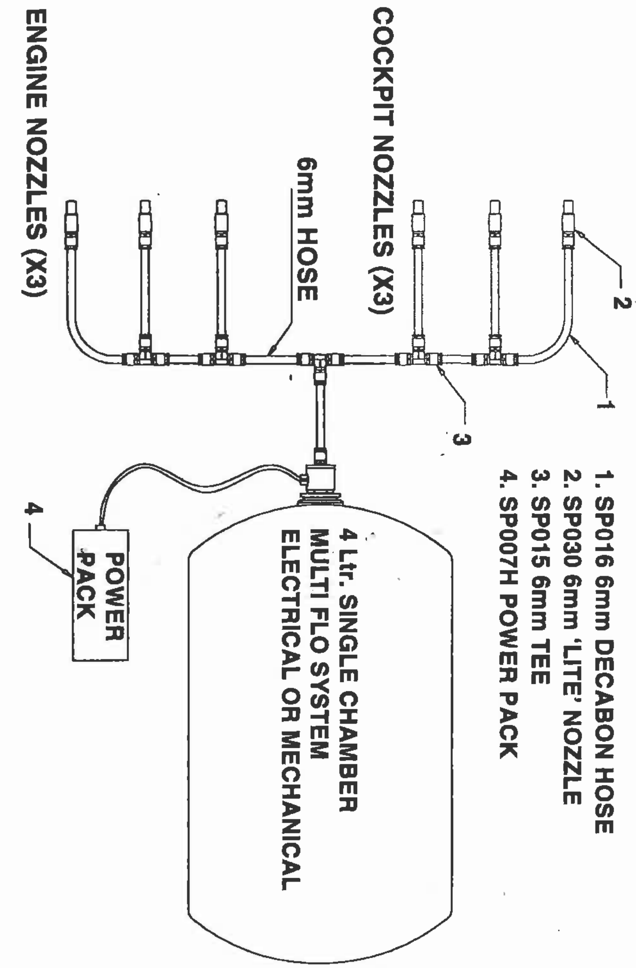
DO NOT: Run the cables next to power cables, or in the same loom

TOP VIEW



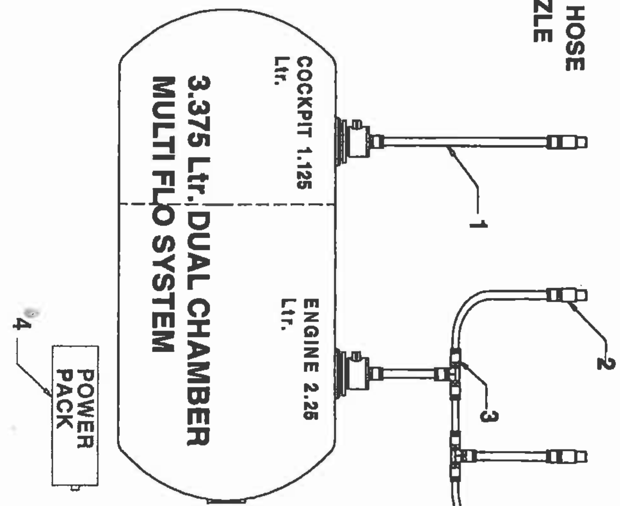
RECTANGULAR STRENGTHENING
SUPPORT BRACKET

NOZZLE LAYOUT FOR 4 LTR SINGLE CHAMBER

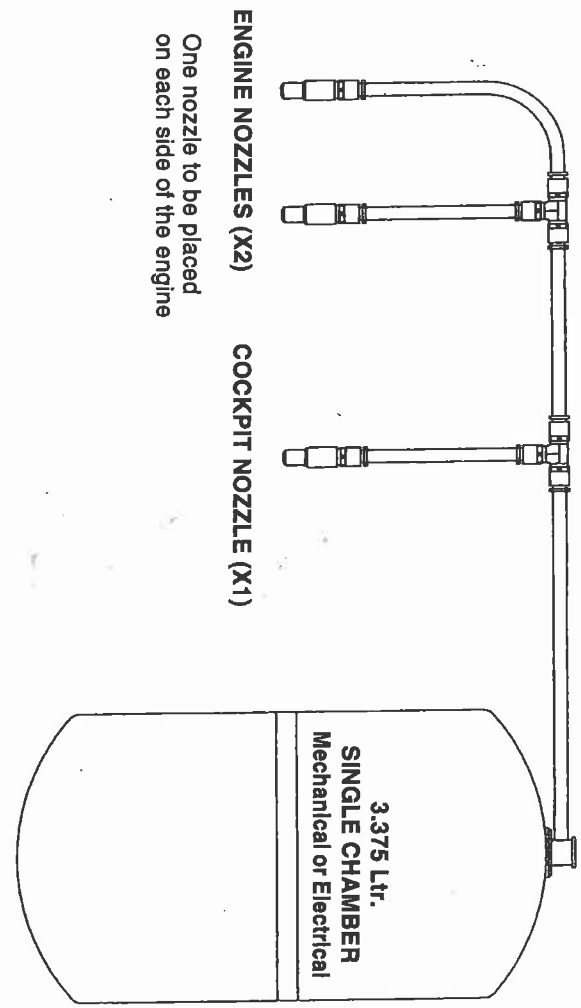


NOZZLE LAYOUT FOR 3.375 LTR DUAL CHAMBER

1. SP016 6mm DECABON HOSE
2. SP030 6mm 'LITE' NOZZLE
3. SP015 6mm TEE
4. SP007H POWER PACK



NOZZLE LAYOUT FOR 3.375 LTR SINGLE CHAMBER



SERVICE AND REFILL AGENTS FOR SPA FIREFIGHTER/FIRESENSE-RESPONSE SYSTEMS.

ATS MOTORSPORT
30 SCHOONGEZICHT RD
BERGBRON
JOHANNESBURG
SOUTH AFRICA
PH : 0027 11 726 6314
FAX : 0027 11 673 5185
E : atsleeke@global.co.za
damiano.logiudice@gieffesrl.it
www. ats-motorsport.co.za

V.D.BOSSCHE
BOOMSESTEENWEG 62
2630 AARTSELAAR
BELGIUM
PH : 0032 3877 3040
FAX : 0032 3877 2452
E : info@vdbracing.com
www. vdbracing.com

DANIELSON EQUIPEMENT
5 RUE CHAMP MAGNY
58470 MAGNY COURS
FRANCE
PH : 0033 386 212 255
FAX : 0033 386 212 265
E : contact@danielson-equipement.com
www. danielson-equipement.com

DAVID GREER MOTORSPORT
5 CADGER RD
CARRYDUFF
BELFAST
BT8 8AU
PH : 02890 815400
FAX : 02890 814532
E : dgm@rallyrentals.co.uk
www. rallyrentals.co.uk

MURRAY MOTORSPORT
UNIT 20 BEECHLAWN IND COMPLEX
GREENHILLS RD
DUBLIN 12
EIRE
PH : 00353 1 4500555
FAX 00353 1 4500585
E : info@murraymotorsport.ie
www. murraymotorsport.ie

GIEFFE SRL
VIASAN GIULIANO 39A
15040 CASTELCERIOLO (AL)
ITALY
PH : 0039 0131 216505
FAX : 0039 0131 216506
E :
www. gieffesrl.it

KH MOTORSPORT
RAMSASEN
665 91 KIL
SWEDEN
PH : 00465 421040
FAX : 00465 421165
E : kh.msport@swipnet.se
www. khmotorsport.se

ORECA
PARC DACTIVITES DE SIGNES
AVE DE ROME
83870 SIGNES
FRANCE
PH : 0033 494 885 801
FAX : 0033 494 328 001
E : lcourdon@oreca.fr
www. oreca.fr

DES MOORE RALLYING
46 CARRICKADUFF RD
CARNAGH
CO. ARMAGH
BT60 3HZ
PH : 02837 538633
FAX : 02837 539286
E : des@dmrr.net
www. dmrr.net

REVOLUTION RACEGEAR
592 WHITEHORSE RD
MITCHAM
VIC 3132
AUSTRALIA
PH : 0061 3987 38700
FAX : 0061 3987 38533
E : tullios@racegear.com.au
www. revolutionracegear.com.au

SERVICE AND REFILL AGENTS FOR SPA FIREFIGHTER/FIRESENSE-RESPONSE SYSTEMS.

BOTH IMPORTS MOTORSPORT
55 NORTH TERRACE
HACKNEY
SA 5069
AUSTRALIA
PH : 0061 8836 24417
FAX : 0061 8836 28811
E : spalite@nttyres.com.au
www. nttyres.com.au

IMPORT PARTS
SEPN 504 BL.C LOJA 34
ED. MARIANA
BRASILIA.DF
BRAZIL
CEP 70. 730 - 523
PH : 0055 61 326 2614
FAX : 0055 61 326 7717
E : ip-parts@uol.com.br
www. ip-part.com

SERVALL INC
GREEN HILL
ST. MICHAEL
BARBADOS
WEST INDIES
PH : 001 246 424 5912
FAX : 001 246 429 4854

MERLIN MAILORDER
THE BRIDGESTONE BUILDING
CASTLE COMBE MOTOR RACING CIRCUIT
NR CHIPPENHAM
WILTSHIRE, SN14 7EX, UK
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FAX: 01249782161

NEIL ALLPORT
UNIT 2 OLIVE RD
PENROSE
AUCKLAND
NEW ZEALAND
PH : 00649 579 0113
FAX : 00649 579 0114
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NOVA ENGINEERING
220 – 1 OHMIKA
OYAMA - CHO
SUNTO - GUN
SHIZUOKA 410 - 1308
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PH : 0081 550 780329
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DK 6040 EGTVED
DENMARK
PH : 0045 75 55 32 90
FAX : 0045 75 55 38 85
E : mail@aaskov-motorsport.dk

37278

New regulations for bottle refills and servicing

National and international requirements for pressurized equipment.

14/2/08

Due to SPA DESIGN'S ongoing product and safety reviews, it has been brought to our attention by authorities and insurance companies that we must comply with both national and international requirements for pressurized equipment.

This will mean that our current fire system service and refill procedure will have to change.

Under FIA/MSA Regulations, hand held and plumbed – in systems must be serviced every 2 years.

We regret that **SPA DESIGN** can only maintain **SPA DESIGN** bottles and other makes of cylinders should be returned to the original manufacturer. (Lifeline, **FEV**, etc)

Alloy and steel bottles will have a life span of 10 years from date of manufacturer. **ALL** carbon fiber bottles will have a life span of 2 years.

Bottles that have not adhered to the 2 year service schedule will not be serviced.

Cylinders that have been modified or not serviced by **SPA DESIGN**, or its authorized service dealers and units that have tampered or modified labels will not be accepted for service.

SPA DESIGN LTD reserve the right on the grounds of safety to reject a cylinder for service if it is felt that a bottle has sustained external damage and can not be safely repaired.

We are sorry for any inconvenience that this may cause, but this issue should be seen as a real safety concern to all parties.

Should you require any further information, please do not hesitate to contact us.

SPA DESIGN LTD and its associated companies reserve the right to change specifications of parts, kits and dimensions without prior announcement.