

THE MODULAR GAS ANALYSER
MGA - 1200

OPERATOR'S MANUAL

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MODULAR GAS ANALYSER - MGA-1200

TABLE OF CONTENTS

INTRODUCTION	PAGE 1
SAFETY PRECAUTIONS	PAGE 2
MGA-1200 CONTROLS	PAGE 7
OPERATING FLOW DIAGRAM	PAGE 9
PREPARATION	PAGE 10
OPERATING PROCEDURE:	PAGE 11
- THE POWER-UP SEQUENCE	PAGE 11
- AUTO-CALIBRATION	PAGE 12
- THE "HC" RESIDUE CHECK	PAGE 12
- THE STANDBY MODE	PAGE 13
- THE MEASUREMENT MODE	PAGE 13
- ENGINE TYPE SELECTION	PAGE 14
- FUEL TYPE SELECTION	PAGE 15
- AIR/FUEL RATIO OR LAMBDA SELECTION	PAGE 15
- PRINTING THE TEST DATA	PAGE 16
- OPERATOR MODES (CODE 1)	PAGE 18
MAINTENANCE - SERVICE	PAGE 24
PRINTER OPERATION AND MAINTENANCE	PAGE 27
OPERATOR/SERVICE MESSAGES	PAGE 30
THE AIR/FUEL RATIO GRAPH	PAGE 31
MGA-1200 OPTIONS & MAINTENANCE PARTS	PAGE 32

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INTRODUCTION

THE MODULAR GAS ANALYSER (MGA-1200) IS A COMPACT UNIT FOR GARAGE USE. IT MEASURES CARBON MONOXIDE (CO), CARBON DIOXIDE (CO₂) AND THE HYDRO-CARBON (HC) CONTENT IN THE EXHAUST EMISSIONS OF PETROL DRIVEN ENGINES BY NON-DISPERSIVE INFRA-RED TECHNOLOGY AND THE PERCENTAGE OXYGEN (O₂) (OPTIONAL) CONTENT BY A GALVANIC CELL.

IN ADDITION IT CAN BE EXPANDED TO DISPLAY ENGINE RPM/OIL TEMPERATURE, LAMBDA OR AIR/FUEL RATIO, CO CORRECTED AND MEASURE BAROMETRIC PRESSURE.

THE CO CORRECTED, IS A CALCULATED VALUE TO COMPENSATE FOR THE EFFECTS OF DILUTION WHEN THE SUM OF CO + CO₂ IS LESS THAN 15%.

THE BAROMETRIC PRESSURE MEASUREMENT IS USED TO COMPENSATE THE GAS MEASUREMENTS FOR THE EFFECTS OF ALTITUDE.

THE MGA-1200 FRONT PANEL; THE DISPLAYS ARE SHOWN IN TWO GROUPS OF FOUR AND THE CONTROL SWITCHES ARE SEPARATED FROM THE DISPLAY AREA.

ABOVE THE DISPLAYS IS A NON-ILLUMINATED SELF ADHESIVE SUN LOGO AND NAME. THE UNIT CAN BE MOUNTED ON A PORTABLE TEST STAND THAT ENABLES OPERATION VIRTUALLY ANYWHERE IN THE WORK SHOP.

THE BASIC UNIT

THE MINIMUM MEASUREMENT CONFIGURATION IS FOR THREE GASES, CO, CO₂ AND HC. THE SOFTWARE (V3.2) ALLOWS FOR THE ENTRY OF ALTITUDE SETTING BY THE OPERATOR IN CERTAIN APPROVAL TYPES AND STORES THIS VALUE IN NON VOLATILE MEMORY.

THE ALTITUDE ENTRY IS IN STEPS OF 100 METERS UP TO 5000 METERS.

IN THE EVENT OF A PARTIAL VACUUM OCCURRING DUE TO BLOCKED FILTERS OR PROBE A LOW FLOW "LOF" INDICATION IS GIVEN, THUS PREVENTING ANY FURTHER MEASUREMENTS BEING TAKEN.

OPTIONAL KITS

THIS SOFTWARE VERSION (V3.2) SUPPORTS THE FOLLOWING OPTIONAL KITS:

- 1: A CENTRONICS PRINTER KIT, 3 SEPARATE KITS.
- 2: THE O₂, LAMBDA/AIR FUEL RATIO MEASUREMENT KIT.
- 3: THE CORRECTED CO READING KIT.
- 4: THE RPM/OIL TEMPERATURE MEASUREMENT KIT.
- 5: THE MAINS VOLTAGE SENSING KIT.
- 6: THE BAROMETRIC PRESSURE SENSING KIT.
- 7: THE RS-232 SERIAL INTERFACE KIT.
- 8: THE "OIML" APPROVAL KIT.

SOFTWARE

USE THIS OPERATOR'S MANUAL WITH SOFTWARE VERSION (V3.2) ONLY.

SAFETY PRECAUTIONS

GENERAL

THIS TESTER IS DESIGNED AND TESTED IN ACCORDANCE WITH THE "IEC" PUBLICATION 348, "SAFETY REQUIREMENTS FOR ELECTRONIC MEASURING APPARATUS" AND MEETS SAFETY CLASS 1.

A DESCRIPTION OF SAFETY CLASS 1 IS GIVEN IN IEC PUBLICATION 348.

THE TESTER IS SUPPLIED IN A SAFE CONDITION. IN ORDER TO KEEP IT IN A SAFE CONDITION AND TO ENSURE SAFE OPERATION OF THE TESTER, THE OPERATING INSTRUCTIONS MUST BE FOLLOWED AND THE WARNINGS & CAUTIONS MUST BE OBSERVED.

ABOUT WARNINGS

A WARNING GIVES INSTRUCTIONS TO PREVENT INJURY TO PEOPLE. WARNINGS WILL BE GIVEN IN THE FOLLOWING LIST AND JUST BEFORE THE SUBJECT IN THIS MANUAL WHERE THE WARNING IS APPLICABLE.

WARNINGS

- 1: BEFORE APPLYING MAINS POWER TO THE TESTER, MAKE SURE THAT THE POWER CABLE IS PLUGGED IN A PROPER POWER OUTLET. (REFER TO THE SERIAL NUMBER PLATE ON THE REAR OF THE CABINET FOR MAINS POWER REQUIREMENTS). A TOO HIGH VOLTAGE CAN DAMAGE THE TESTER AND MAKE IT UNSAFE.

- 2: ONLY USE FUSES WITH THE FUSE RATING WHICH IS INDICATED NEAR THE FUSE HOLDER. THE USE OF INCORRECT FUSES CAN DAMAGE THE TESTER OR THE POWER CABLE AND MAKE THESE ITEMS UNSAFE.

- 3:
 - A. DO NOT MAKE CONNECTIONS TO A VEHICLE BEFORE THE MAINS CABLE OF THE TESTER IS CONNECTED TO THE PROPER SOCKET OUTLET.
 - B. PLUG THE MAINS CABLE IN A SOCKET OUTLET WITH A PROTECTIVE EARTH CONTACT.
 - C. DO NOT DISCONNECT THE MAINS CABLE BEFORE DISCONNECTING THE CONNECTIONS TO THE VEHICLE.IF THE TESTER IS NOT CONNECTED TO EARTH DANGEROUS VOLTAGES CAN BE PRESENT ON THE CASING OF THE TESTER.

- 4: DO NOT OPEN THE CABINET. THERE ARE HIGH VOLTAGES AT SEVERAL POINTS INSIDE THE TESTER.

- 5: DO NOT OPERATE THE TESTER WHEN:
 - IT IS WARMER THAN 40 °C
 - IT IS COLDER THAN 5 °C
 - THE RELATIVE HUMIDITY IS HIGHER THAN 80 %WHEN THE TESTER IS USED BEYOND THESE OPERATING LIMITS ITS FUNCTIONALITY MAY DECREASE.
AT TEMPERATURES LOWER THAN -10 °C THE TESTER MAY BECOME UNSAFE.

- 6: DO NOT OPERATE THE TESTER BEFORE CONTACTING THE LOCAL SUN SERVICE CENTRE, WHEN THE TESTER:
- SHOWS VISIBLE DAMAGE
 - FAILS TO PERFORM THE INTENDED MEASUREMENTS
 - HAS BEEN SUBJECTED TO PROLONGED STORAGE UNDER UNFAVOURABLE CONDITIONS
 - HAS BEEN SUBJECTED TO SEVERE TRANSPORTATION STRESSES.

IT IS POSSIBLE THAT THESE CONDITIONS CAN MAKE THE TESTER UNSAFE.

- 7: ALWAYS PLACE WHEEL CHOCKS IN FRONT AND AT THE REAR OF THE DRIVE WHEELS BEFORE TESTING A VEHICLE. THIS IS TO PREVENT THE VEHICLE FROM MOVING.
- 8: DO NOT INHALE EXHAUST GASES. WORK IN A PROPERLY VENTILATED AREA. EXHAUST GASES CONTAIN CARBON MONOXIDE (CO) WHICH IS A COLOURLESS AND ODOURLESS LETHAL GAS.
- 9: HIGH VOLTAGES ARE PRESENT ON THE SECONDARY SIDE OF THE IGNITION CIRCUIT WHILE THE ENGINE IS RUNNING. ALWAYS USE AN INSULATED PLIERS WHEN HANDLING THE IGNITION SYSTEM COMPONENTS.
- 10: WIPE UP FUEL SPILLS IMMEDIATELY AND DISPOSE OF SOAKED RAGS IN PROPER AIRTIGHT CONTAINERS. THE SOAKED RAGS PRODUCE FUMES WHICH ARE EXPLOSIVE.
- 11: NEVER SMOKE NEAR GASOLINE. GASOLINE FUMES ARE EXPLOSIVE.
- 12: DO NOT OPEN CLOSED COOLANT TESTERS WHILE THE FLUID IS HOT. STEAM WILL ESCAPE WHICH CAN CAUSE SERIOUS BURNS.
- 13: NEVER LOOK DIRECTLY INTO THE CARBURETTOR THROAT WHEN CRANKING OR RUNNING THE ENGINE. BACKFIRING CAN CAUSE BURNS.
- 14: AVOID CONTACT WITH HOT SURFACES SUCH AS:
- EXHAUST MANIFOLDS AND PIPES
 - MUFFLERS
 - CATALYTIC CONVERTERS
 - RADIATORS AND HOSES.
- THESE CAN CAUSE SERIOUS BURNS.
- 15: NEVER USE A NAKED FLAME NEAR THE BATTERY. BATTERIES PRODUCE A HYDROGEN GAS WHICH EXPLODES WHEN IT COMES IN CONTACT WITH FIRE.

- 16: ALWAYS KEEP A FIRE EXTINGUISHER IN THE WORK AREA. IT SHOULD BE SUITABLE FOR A RANGE OF USES INCLUDING GASOLINE, CHEMICAL AND ELECTRICAL FIRES.
- 17: DO NOT LAY TOOLS OR EQUIPMENT ON THE BATTERY. ACCIDENTAL SHORTING OF THE BATTERY TERMINALS CAN CAUSE SHOCKS AND BURNS, AND DAMAGE THE VEHICLE WIRING OR THE BATTERY ITSELF.
- 18: BATTERY ACID CAN DAMAGE CLOTHING AND BURN SKIN OR EYES. IF CONTACT IS MADE WITH BATTERY ACID, WASH THE AFFECTED AREA WITH AS MUCH WATER AS POSSIBLE AND USE A WEAK SODA (SUCH AS BAKING SODA) TO NEUTRALISE THE ACID. IF ACID ENTERS THE EYES, CONSULT WITH A DOCTOR OR A MEDICAL PERSON IMMEDIATELY.
- 19: SAFETY GOGGLES SHOULD BE ALWAYS WORN WHILE WORKING ON A VEHICLE TO PROTECT THE EYES FROM ACID, DUST, GASOLINE AND ANY OTHER LOOSE OBJECTS THAT MAY COME FROM ANY MOVING PARTS.
- 20: DO NOT WEAR A NECKTIE, SCARF OR LOOSE CLOTHING NEAR AN OPERATING ENGINE. KEEP HANDS AND HAIR AWAY FROM MOVING ENGINE PARTS SUCH AS FAN BLADES, BELTS OR PULLEYS. THESE CAN CAUSE A SERIOUS INJURY.
- 21: NEVER WEAR WRIST WATCHES, RINGS OR OTHER JEWELLERY WHEN WORKING ON A VEHICLE. SUCH ITEMS MAY CATCH ON MOVING PARTS OR CAUSE AN ELECTRICAL SHORT CIRCUIT WHICH CAN BURN OR INJURE THE WEARER.
- 22: DO NOT OPERATE THE TIMING LIGHT TOO NEAR FANS OR BELTS. THE TIMING LIGHT HAS THE EFFECT OF MAKING THE FAN SEEM TO "STAND STILL". THIS IS A DANGEROUS OPTICAL ILLUSION WHICH MIGHT CAUSE THE OPERATOR TO CONTACT THE FAN.
- 23: KEEP HANDS AND OTHER OBJECTS AWAY FROM THE ELECTRIC COOLING FAN. THE FAN CAN START UP AT ANY TIME.

ABOUT CAUTIONS

CAUTIONS GIVE INSTRUCTIONS TO PREVENT DAMAGE TO EQUIPMENT. CAUTIONS WILL BE GIVEN IN THE FOLLOWING LIST AND JUST BEFORE THE SUBJECT THE CAUTION IS APPLICABLE.

CAUTIONS

- 1: CHECK THE ENGINE OIL LEVEL AND ADD OIL IF NECESSARY BEFORE PERFORMING ANY TEST. AN ENGINE SHOULD NOT BE TESTED IF THE OIL LEVEL IS TOO LOW.

THE TEST RESULTS WILL BE INFLUENCED AND THE ENGINE CAN BE DAMAGED IF A TEST IS PERFORMED WITH A LOW OIL LEVEL.

- 2: CHECK THE COOLANT LEVEL AND ADD COOLANT IF NECESSARY BEFORE PERFORMING ANY TESTS. AN ENGINE SHOULD NOT BE TESTED IF THE COOLANT LEVEL IS TOO LOW.

IF THE ENGINE IS HOT, CHECK THE LEVEL AT THE OVERFLOW TANK. THE TEST RESULTS WILL BE INFLUENCED AND THE ENGINE CAN BE DAMAGED IF A TEST IS PERFORMED WITH A LOW COOLANT LEVEL.

- 3: FOLLOW THE CAR MANUFACTURER'S INSTRUCTIONS WHEN WORKING ON VEHICLES WITH A CATALYTIC CONVERTER.

THE CONVERTER CAN BE DAMAGED BY BACKFIRES OR BY TOO MUCH UNBURNED FUEL GETTING INTO THE EXHAUST TESTER.

- 4: KEEP THE TEST LEADS AWAY FROM HOT SURFACES OR MOVING ENGINE PARTS. THE TEST LEADS CAN NOT WITHSTAND HIGH TEMPERATURES OR SEVERE MECHANICAL STRESS.

MARKINGS

ON THE REAR OF THE TESTER THERE IS A SYMBOL SHOWN BELOW. THIS SYMBOL INDICATES THAT LETHAL GASES ESCAPE FROM THE REAR OF THE TESTER. THEREFORE IT IS NECESSARY TO WORK IN A WELL VENTILATED AREA.



CALIBRATION & SERVICE

IN ORDER TO COMPLY WITH THE "OIML" APPROVAL THE FOLLOWING MUST BE PERFORMED AS SPECIFIED:

- 1: A COMPLETE GAS CALIBRATION EVERY THREE (3) MONTHS, PERFORMED BY A QUALIFIED SUN ELECTRIC REPRESENTATIVE.
- 2: A DAILY LEAK CHECK (CODE 1, OP 4) MUST BE PERFORMED BY THE OPERATOR.
- 3: FILTER SERVICE AND MAINTENANCE PERFORMED BY THE OPERATOR AS REQUIRED.

STORAGE TEMPERATURES

THE MINIMUM AND MAXIMUM STORAGE TEMPERATURE RANGE OF THE TESTER IS AS FOLLOWS:

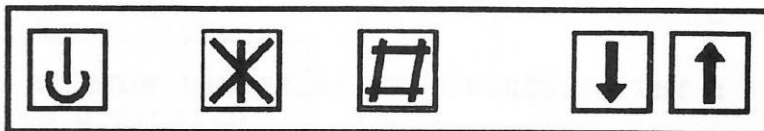
- 4°C TO + 55°C

MGA-1200 CONTROLS



: THE MAINS POWER ON/OFF SWITCH

THE MAINS POWER ON/OFF SWITCH IS LOCATED ON THE REAR PANEL OF THE TESTER.



MGA-1200 FRONT PANEL CONTROLS



: THE MODE BUTTON

PRESSING ONCE SELECTS THE STANDBY MODE.

THE PUMP SWITCHES OFF.
(CODE: STBY) AND "." IS DISPLAYED.

PRESSING A SECOND TIME SELECTS NORMAL MEASUREMENT MODE.



: THE PRINT / DISPLAY FREEZE BUTTON

IF A PRINTER IS CONNECTED AND THIS BUTTON IS PRESSED, THE DISPLAYS ARE FROZEN FOR FOUR SECONDS FOLLOWED BY A PRINT OUT OF THE DISPLAYED DATA.

IF NO PRINTER IS CONNECTED AND THIS BUTTON IS PRESSED, THE DISPLAYS ARE FROZEN FOR A 30 SECOND PERIOD IN ORDER THAT THE OPERATOR CAN NOTE THE DISPLAYED DATA.

PRESS THIS BUTTON AGAIN TO UN-FREEZE THE DISPLAYS.



: THE FUNCTION BUTTON

BY REPEATED PRESSING OF THIS BUTTON VARIOUS FUNCTIONS WILL BE SELECTED WHICH WILL BE IDENTIFIED BY A CODE:

- SELECTION OF ENGINE TYPE 2/4 STROKE.
(DISPLAY CODE: "STR" 2 OR 4).

NOTE: IF TWO STROKE IS SELECTED A YELLOW LED WILL BE ILLUMINATED NEAR TO THE "RPM" DISPLAY.



: THE FUNCTION BUTTON (CONT'D)

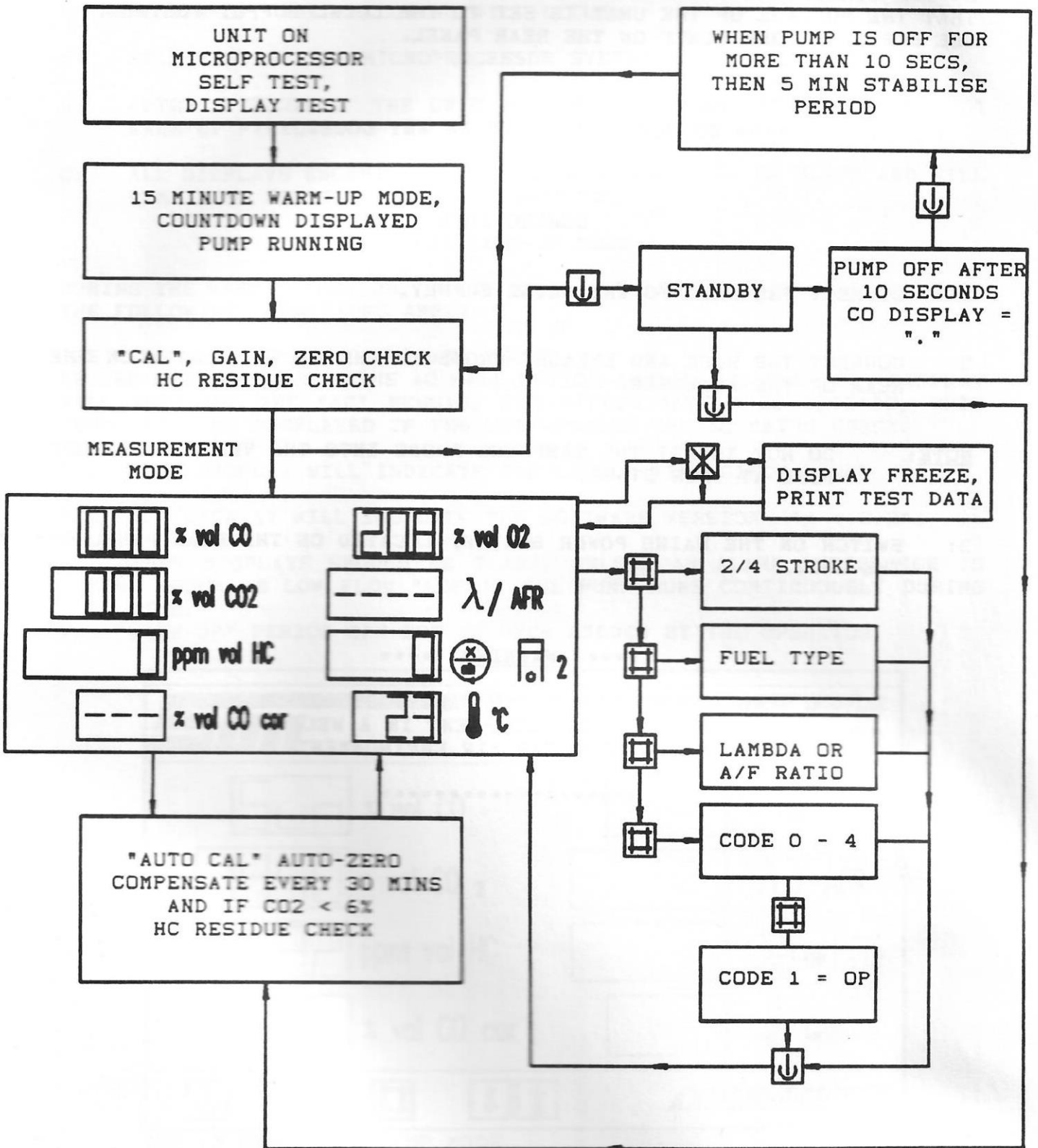
- SELECTION OF FUEL TYPE.
(DISPLAY CODE: "FUEL" 1 TO 3).
- SELECTION OF THE AIR/FUEL RATIO OR LAMBDA.
(DISPLAY CODE: "AFR" 0 OR 1).
- SELECTION OF CODED FUNCTIONS.
(DISPLAY CODE: "CODE" 0 TO 4).



: THE DECREMENT AND INCREMENT BUTTONS

THESE TWO BUTTONS ARE USED TO INCREMENT (INCREASE) AND DECREMENT (DECREASE) THE DISPLAYS WHEN THE FUNCTION BUTTON HAS BEEN PRESSED TO SELECT ONE OF THE ABOVE FUNCTIONS.

OPERATOR FLOW DIAGRAM



PREPARATION

BEFORE CONNECTING THE GAS ANALYSER TO THE MAINS POWER SUPPLY, CHECK THAT THE VOLTAGE OF THE UNIT IS SET TO THE LOCAL SUPPLY VOLTAGE. SEE SERIAL NUMBER PLATE ON THE REAR PANEL.

**** DO NOT PLUG IN IF IN ANY DOUBT ****

CONNECTIONS

- 1: CONNECT THE UNIT TO THE MAINS SUPPLY.
- 2: CONNECT THE HOSE AND EXHAUST PROBE TO THE FILTER SYSTEM ON THE REAR OF THE ANALYSER.

NOTE: DO NOT INSERT THE SAMPLING PROBE INTO THE VEHICLE EXHAUST PIPE AT THIS STAGE.

- 3: SWITCH ON THE MAINS POWER SWITCH, LOCATED ON THE REAR PANEL OF THE UNIT.

**** WARNING ****

FOR YOUR OWN AND THE SAFETY OF OTHERS
OPERATE THIS EQUIPMENT IN A WELL
VENTILATED CLEAN AIR ENVIRONMENT.

OPERATING PROCEDURE

POWER-UP SEQUENCE

AFTER POWER-UP, THE FOLLOWING WILL OCCUR:

- A: SELF TEST OF THE MICROPROCESSOR SYSTEM AND DISPLAY TEST.
- B: AFTER 3 SECONDS, THE UNIT AUTOMATICALLY ENTERS THE 15 MINUTE WARM-UP PERIOD.
- C: ALL DISPLAYS EXCEPT "CO", "CO₂" AND "HC" WILL BE BLANK AND WILL REMAIN SO FOR THE 15 MINUTE WARM-UP.

THE WARM-UP MODE

DURING THE WARM-UP PERIOD, WHICH LASTS FOR APPROXIMATELY 15 MINUTES, THE FOLLOWING CONDITIONS APPLY:

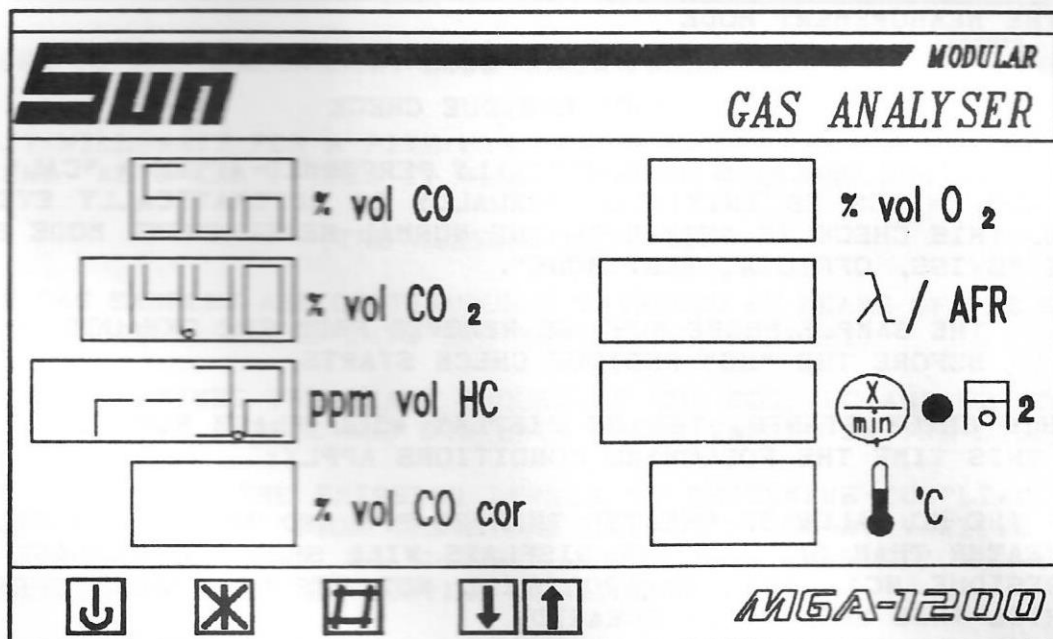
THE "CO" DISPLAY WILL INDICATE "SUN".
IF THE UNIT HAS THE MAINS AC FAIL OPTION INSTALLED, THE "CO" DISPLAY WILL INDICATE THE "AC" MESSAGE FOR APPROXIMATELY 20 SECONDS, THEN "SUN" WILL BE DISPLAYED IF THE UNIT PASSES THE AC MAINS CHECK.

THE "CO₂" DISPLAY WILL INDICATE THE LAPSED TIME SINCE POWER UP.

THE "HC" DISPLAY WILL INDICATE THE SOFTWARE VERSION "r - 3.2".

ALL OTHER DISPLAYS SHOULD BE BLANK, UNLESS AN ALARM INDICATION IS GIVEN. (SUCH AS LOW FLOW "LOF"). THE PUMP RUNS CONTINUOUSLY DURING THIS TIME.

THE "WARM-UP" PERIOD CAN NOT BE OVER RIDDEN BY THE OPERATOR.



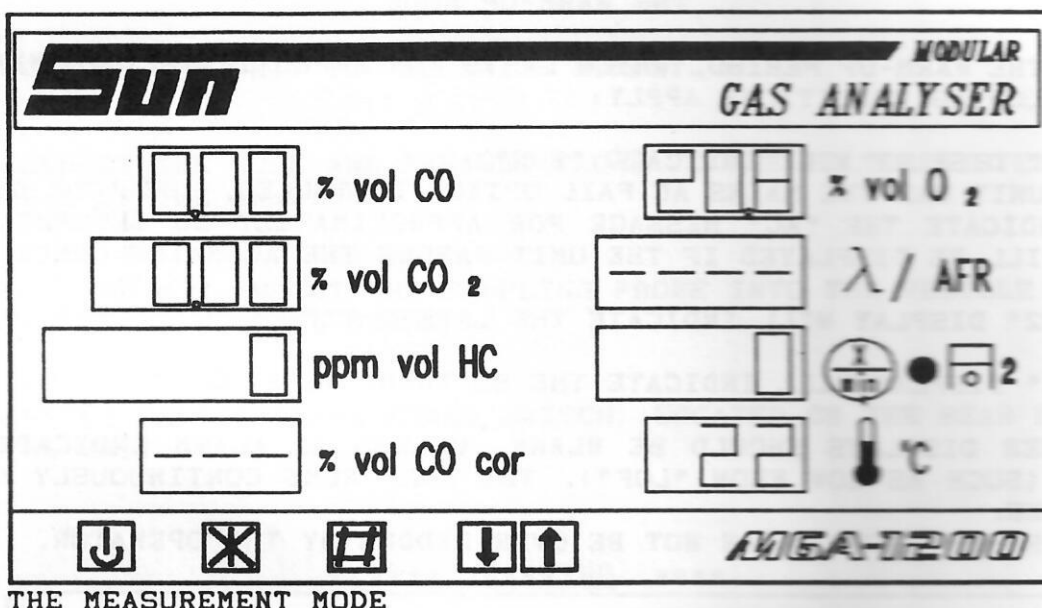
THE 15 MINUTE WARM-UP MODE

AUTO-CALIBRATION

AT THE END OF THE "WARM-UP" PERIOD, THE UNIT GOES INTO "AUTO CALIBRATION" (CAL) AND THEN ENTERS THE "MEASUREMENT" MODE. DURING THE "CAL", THE ZERO REFERENCE AND THE GAIN SETTINGS ARE CHECKED. ALSO, WITH THE "OIML" APPROVAL KIT INSTALLED AN "HC RESIDUE" CHECK IS PERFORMED (SEE BELOW FOR DETAILS). THE "CAL" PERIOD LASTS FOR APPROXIMATELY 20 SECONDS.

ALSO, DURING THIS FIRST "CAL" THE OXYGEN SENSOR (OPTION) ZERO AND REFERENCE POINTS ARE SET. HOWEVER, THIS DOES NOT OCCUR DURING ANY FURTHER "AUTO-CALIBRATION" WHILE THE UNIT IS IN NORMAL OPERATION.

DURING NORMAL OPERATION AN "AUTO-CAL" IS PERFORMED EVERY 30 MINUTES.



THE "HC" RESIDUE CHECK


THE "HC" RESIDUE CHECK IS AUTOMATICALLY PERFORMED AFTER A "CAL" OR AN "AUTO-CAL", WHICH IS INITIATED MANUALLY OR AUTOMATICALLY EVERY 30 MINUTES. THIS CHECK IS ACTIVE IN THE NORMAL MEASUREMENT MODE EXCEPT FOR THE "SWISS, OFFICIAL TEST MODE".

NOTE: THE SAMPLE PROBE MUST BE REMOVED FROM THE EXHAUST TAILPIPE BEFORE THE "HC" RESIDUE CHECK STARTS.

WHEN THIS CHECK STARTS, THE HC DISPLAY WILL FLASH FOR 20 SECONDS. DURING THIS TIME THE FOLLOWING CONDITIONS APPLY:

- 1: IF THE HC VALUE IS GREATER THAN 20 PPM AND IF THE CO₂ VALUE IS GREATER THAN 6%, ALL THE DISPLAYS WILL SHOW THE MESSAGE "RHC" (RESIDUE HC). THE MGA-1200 WILL NOT RESUME NORMAL OPERATION UNTIL THIS MESSAGE IS CLEARED.

2: IF THE HC VALUE IS LESS THAN 20 PPM AND IF THE CO2 VALUE IS LESS THAN 6%, THE "HC" RESIDUE CHECK HAS PASSED AND THE UNIT WILL RESUME NORMAL OPERATION.

HOWEVER, IF THE UNIT FAILS THE "HC" RESIDUE CHECK ("RHC" DISPLAYED, AS IN CONDITION 1), QUICKLY PRESS THE MODE  BUTTON TWICE TO RESTART THE "AUTO-CAL" AND "HC" RESIDUE CHECK.


NOTE: REMEMBER THE SAMPLE PROBE MUST BE REMOVED FROM THE EXHAUST TAILPIPE BEFORE THE "HC" RESIDUE CHECK STARTS.

IF THE UNIT FAILS THE "HC" RESIDUE CHECK AGAIN, THEN CLEAN THE SAMPLE HOSE AND PROBE. (SEE "MAINTENANCE AND SERVICE" FOR DETAILS).

AFTER CLEANING THE SAMPLE HOSE AND PROBE, REPEAT THE "HC" RESIDUE CHECK AGAIN. IF IT FAILS AGAIN, SWITCH IT OFF AND ON AGAIN TO RESET.

IF IT FAILS THE "HC" RESIDUE CHECK YET AGAIN, SERVICE IS REQUIRED.

THE STANDBY MODE

IT IS RECOMMENDED TO LEAVE THE UNIT SWITCHED ON ALL DAY. HOWEVER, WHEN IT IS NOT IN USE IT IS RECOMMENDED TO PUT THE UNIT INTO STANDBY MODE, BY PRESSING THE "MODE"  BUTTON.

TO RETURN QUICKLY TO THE MEASUREMENT MODE. PRESS THE "MODE" BUTTON AGAIN WITHIN 10 SECONDS WHILE "STANDBY" IS DISPLAYED AND BEFORE THE PUMP SWITCHES OFF.

AFTER 10 SECONDS "." WILL BE DISPLAYED ON THE CO DISPLAY AND THE PUMP SWITCHES OFF, THE UNIT IS NOW IN STANDBY MODE.

TO RETURN TO THE MEASUREMENT MODE AGAIN PRESS THE "MODE"  BUTTON.

THE UNIT WILL WAIT FOR A FIVE MINUTE STABILISE PERIOD FOLLOWED BY A 20 SECOND "AUTO-CAL". THEN IT WILL BE READY FOR USE AGAIN.

THE MEASUREMENT MODE

EXHAUST GAS SAMPLES ARE CONTINUOUSLY GATHERED BY MEANS OF THE EXHAUST SAMPLING PROBE INSERTED INTO THE VEHICLE'S TAILPIPE.

THE UNIT DETERMINES THE EXACT AMOUNT OF CO, CO2, HC AND O2 (OPTION) CONTAINED IN THE SAMPLE AND DISPLAYS THESE VALUES ON THE DISPLAYS.






BESIDES MEASURING THE EMISSION LEVELS TO DETERMINE COMPLIANCE WITH LEGAL STANDARDS, EMISSION TESTS CAN BE PERFORMED AT VARIOUS ENGINE SPEEDS AND CONDITIONS TO QUICKLY UNCOVER A VARIETY OF ENGINE, IGNITION AND FUEL SYSTEM SERVICE REQUIREMENTS.

PRIOR TO EMISSIONS TESTING, TWO SIMPLE PRELIMINARY TESTS MUST BE PERFORMED IN THE MEASUREMENT TO ENSURE THE INTEGRITY OF THE SYSTEM:


A) LOW FLOW INDICATOR TEST:

- 1: TO CHECK THE LOW FLOW INDICATOR, BLOCK OFF THE SAMPLE INLET HOLES AT THE PROBE TIP. ALL THE GAS DISPLAYS SHOULD DISPLAY THE MESSAGE "LOF" INDICATING A LOW FLOW CONDITION.
- 2: WHEN THE INLET HOLES ARE CLEARED, THE "LOF" MESSAGE SHOULD DISAPPEAR. IF NOT, CLEAN THE SAMPLE HOSE AND PROBE. (SEE "MAINTENANCE AND SERVICE" FOR DETAILS).


B) LEAK CHECK:



- 1: PRESS THE FUNCTION  BUTTON UNTIL "CODE 0" IS DISPLAYED.
PRESS THE INCREMENT  BUTTON TO DISPLAY "CODE 1".
- 2: PRESS THE FUNCTION  BUTTON TO DISPLAY "OP 0", REPEATEDLY
PRESS THE INCREMENT  BUTTON TO DISPLAY "OP 4", PRESS THE
FUNCTION  BUTTON TO DISPLAY "LC" (LEAK CHECK).
- 3: BLOCK OFF THE INLET HOLES ON THE PROBE TIP, AFTER 20 SECONDS THE PUMP WILL SWITCH OFF.

THE PUMP WILL RESUME OPERATION AFTER A FURTHER 25 SECONDS.
IF A LEAK IS DETECTED DURING THIS TIME, THE DISPLAY WILL SHOW THE "LEC" MESSAGE. CHECK THE FILTER BOWL SEATING AND THE HOSE CONNECTIONS.

THE UNIT WILL NOT RESUME NORMAL OPERATION UNTIL THIS MESSAGE IS CLEARED.
- 4: IF NO LEAKS ARE DETECTED, THE UNIT WILL RESUME OPERATION AND THE DISPLAY WILL REVERT BACK TO "OP 4".
- 5: UNBLOCK THE SAMPLE HOSE AND PRESS THE MODE  BUTTON TO RETURN TO THE MEASUREMENT MODE.



ENGINE TYPE SELECTION

- 1: PRESS THE FUNCTION  BUTTON TO DISPLAY "STR".

USE THE INCREMENT  OR THE DECREMENT  BUTTONS TO SELECT ENGINE TYPE (2/4 STROKE). IF 2 STROKE IS SELECTED A LED WILL ILLUMINATE TO THE RIGHT OF THE RPM DISPLAY.

FUEL TYPE SELECTION

2: PRESS THE FUNCTION  BUTTON TO DISPLAY "FUEL".



USE THE INCREMENT  OR THE DECREMENT  BUTTONS TO SELECT FUEL TYPE (1 TO 3).

1 = SUPER,	0.86 CARBON,	14.70 STOICHIOMETRIC FRACTION
2 = REGULAR,	0.86 CARBON,	14.80 STOICHIOMETRIC FRACTION
3 = L.P.G.,	0.82 CARBON,	15.50 STOICHIOMETRIC FRACTION


NOTE: THESE VALUES CAN NOT BE ALTERED. REFER TO PAGE 31 FOR MORE INFORMATION.


AIR FUEL RATIO OR LAMBDA SELECTION

3: PRESS THE FUNCTION  BUTTON TO DISPLAY "AFR".

USE THE INCREMENT  OR THE DECREMENT  BUTTONS TO SELECT AIR/FUEL RATIO OR LAMBDA.

0 =	AIR/FUEL RATIO
1 =	LAMBDA

4: PRESS THE FUNCTION  BUTTON AGAIN.

5: PRESS THE MODE  BUTTON IN ORDER TO RETURN TO THE MEASUREMENT MODE.

6: INSERT THE SAMPLING PROBE AT LEAST 30 CM INTO THE VEHICLE'S TAILPIPE.

NOTE: DO NOT LEAVE THE PROBE IN THE TAILPIPE WHEN MEASUREMENTS ARE NOT BEING TAKEN, AS THIS WILL SHORTEN THE WORKING LIFE OF THE FILTER ELEMENTS.

RPM OPTION

7: CLAMP THE RED TRIGGER PICK-UP AROUND ONE OF THE ENGINE'S SPARK PLUG LEADS.

OIL TEMPERATURE OPTION

8: INSERT THE OIL TEMPERATURE PROBE IN PLACE OF THE ENGINE'S DIP STICK. START THE ENGINE.

NOTE: IT IS RECOMMENDED TO WAIT UNTIL THE OIL TEMPERATURE HAS REACHED AT LEAST 75 °C, IN ORDER TO OBTAIN AN ACCURATE CO READING.

9: THE DISPLAYS WILL INDICATE THE CO, CO2 AND HC CONTENT OF THE EXHAUST SAMPLE.

DEPENDING ON THE OPTIONS INSTALLED; THE O2 VALUE, THE CO CORRECTED VALUE, THE ENGINE RPM, THE ENGINE OIL TEMPERATURE, LAMBDA OR THE AIR/FUEL RATIO WILL ALSO BE DISPLAYED.

WHEN TESTING HAS BEEN COMPLETED AND THE TEST RESULTS HAVE BEEN PRINTED OR NOTED, REMOVE THE SAMPLE PROBE FROM THE EXHAUST TAILPIPE AND STORE IN A DUST & WATER FREE AREA UNTIL IT IS REQUIRED AGAIN.

NOTE: HAVING REMOVED THE SAMPLE PROBE FROM THE TAILPIPE, THE HC READING, UNLIKE THE CO INDICATION, WILL NOT IMMEDIATELY RETURN TO ZERO, BUT WILL STILL INDICATE SOME 15/20 PPM.

THIS IS CAUSED BY ANY UNBURNT PETROL LEFT BEHIND IN THE SAMPLE TUBE. DURING NORMAL TESTING, THIS WILL NOT LEAD TO A TOO HIGH HC INDICATION, AS THE LOW LEVEL OF HC IS COMPLETELY ABSORBED BY THE EXHAUST GAS.

PRINTING THE TEST DATA

THE TEST RESULTS CAN BE PRINTED OUT AT ANY STAGE OF TESTING, BY PRESSING THE PRINT DATA BUTTON, THE DISPLAYS WILL BE FROZEN

WHILE THE TEST RESULTS ARE PRINTED. (SEE PAGE 17 FOR AN EXAMPLE).

IF THERE IS NO PRINTER CONNECTED, THE DISPLAYS WILL BE FROZEN FOR A 30 SECOND PERIOD WHEN THE PRINT BUTTON IS PRESSED SO THAT THE

TEST RESULTS CAN BE NOTED.

THE UNIT WILL RETURN TO THE MEASUREMENT MODE AFTER THIS 30 SECOND PERIOD OR WHEN THE PRINT BUTTON IS PRESSED AGAIN.

SEE PAGE 27 FOR INFORMATION ON THE PRINTER OPERATION AND MAINTENANCE.

EXAMPLE OF MGA-1200 TEST RESULTS PRINT OUT



M G A 1 2 0 0

* * * * *

SUN ELECTRIC EUROPE

EXHAUST GAS ANALYSIS DATE: _ _ / _ _ / _ _

VEHICLE REGISTRATION : _ _ _ _ _

RESULTS OF MEASUREMENT:

* * * * *

% vol CO	1.07
% vol CO cor.	*.**
% vol CO2	14.53
ppm vol HC	150
% vol O2	1.13
λ	1.032
⊕/min	1250
°C	85

* * * * *


OPERATOR MODES (CODE 1)




CODE 1	DESCRIPTION	ACTIVE IN APPROVAL TYPES
OP 1	ALTITUDE SETTING	GENERAL, GERMANY, SWEDEN, PRESSURE OPTION MUST BE <u>OFF</u>
OP 2	GAS TAG VALUES	NETHERLANDS, SWISS
OP 3	AUTO-GAS CALIBRATION	NETHERLANDS, SWISS
OP 4	LEAK CHECK	ALL APPROVAL TYPES
OP 5	GAS CAL CHECK	NETHERLANDS, SWISS, SWEDEN
OP 6	CLOCK/CALENDAR	SWISS ONLY

OP 1: ALTITUDE SETTING



NOTE 1: THIS MODE IS NOT ACTIVE IF THE PRESSURE MEASUREMENT OPTION IS ON OR IF "APK" (THE NETHERLANDS), "SIM" (FRANCE) OR "SWISS" APPROVAL TYPES ARE SELECTED.


NOTE 2: IF THE LOCAL ALTITUDE IS NOT KNOWN, CONTACT THE NEAREST AIRFIELD FOR THE CORRECT LOCAL ALTITUDE INFORMATION.



STEP 1: FROM THE MEASUREMENT MODE REPEATEDLY PRESS  UNTIL "CODE 0" IS REACHED.

STEP 2: PRESS  UNTIL "CODE 1" IS REACHED. PRESS  TO DISPLAY "OP 0". PRESS  TO DISPLAY "OP 1".

PRESS  THE CURRENT ALTITUDE SETTING WILL BE DISPLAYED.



STEP 3: USE  AND  BUTTONS TO SELECT CORRECT ALTITUDE. VALUES IN STEPS OF 100 METERS, BETWEEN 0 - 5000 METERS.

STEP 4: PRESS  WHEN THE DESIRED ALTITUDE HAS BEEN REACHED. THIS VALUE IS NOW STORED IN N.V. MEMORY. THE DISPLAY RETURNS TO "OP 1".



STEP 5: PRESS  TO DISPLAY "OP 2", OR PRESS  TO RETURN TO THE MEASUREMENT MODE.

OP 2: GAS-TAG VALUES

NOTE: THIS MODE IS ACTIVE IN "APK" (THE NETHERLANDS) AND "SWISS" APPROVAL TYPES ONLY.

STEP 1: PRESS  TO DISPLAY "OP 2". PRESS  TO ENTER THE GAS TAG ENTRY MODE. THE PUMP IS RUNNING AND THE PURGE INLET SELECTED.


STEP 2: THE CURRENT GAS-TAG VALUES ARE DISPLAYED ON THEIR CORRESPONDING DISPLAYS.



THE CO DISPLAY IS FLASHING, USE  AND  BUTTONS TO

SELECT A CO GAS-TAG VALUE BETWEEN:

APK : 3.00 - 7.00. EG: 5.00.

SWISS : 1.30 - 1.70. EG: 1.50.


STEP 3: PRESS THE FUNCTION  BUTTON TO ENTER THE CORRECT VALUE AND TO SELECT THE CO2 GAS-TAG VALUE.



THE CO2 DISPLAY IS FLASHING, USE  AND  BUTTONS TO

SELECT A CO2 GAS-TAG VALUE BETWEEN:

APK : NOT APPLICABLE.

SWISS : 10.40 - 11.50. EG: 11.00.


STEP 4: PRESS THE FUNCTION  BUTTON TO ENTER THE CORRECT VALUE AND TO SELECT THE HC GAS-TAG VALUE.

THE HC DISPLAY IS FLASHING, USE  AND  BUTTONS TO



SELECT A HC GAS-TAG VALUE BETWEEN:

APK : NOT APPLICABLE.

SWISS : 540 - 680. EG: 600.

STEP 5: PRESS THE FUNCTION  BUTTON TO STORE THE CORRECT HC VALUE.

THE DISPLAY REVERTS BACK TO "OP 2".



STEP 6: PRESS THE  TO DISPLAY "OP 3", OR PRESS THE MODE  BUTTON TO RETURN TO THE MEASUREMENT MODE.

OP 3: AUTOMATIC CAL GAS CALIBRATION

NOTE: THIS MODE IS ACTIVE IN "APK" (THE NETHERLANDS) AND "SWISS" APPROVAL TYPES ONLY.

FOR SWITZERLAND, THIS MUST PERFORMED ON A WEEKLY BASIS.

THIS MODE PERFORMS AN UPDATE ON THE CALGAS-CALIBRATION FACTOR FOR EACH GAS (APK: CO, SWISS: CO/CO2/HC) SEPARATELY. THE GAS TAG VALUES SET IN "OP 2" ARE USED AS REFERENCE SET POINTS FOR THE CURVES.

STEP 1: PRESS  TO DISPLAY "OP 3". PRESS  TO ENTER THE AUTOMATIC CAL GAS CALIBRATION MODE.

AN "AUTO-CAL" IS PERFORMED. (APPROX 20 SECONDS).

STEP 2: THE PUMP SWITCHES OFF AND "GAS" IS DISPLAYED, CONNECT THE GAS CYLINDER, SET THE GAS FLOW RATE TO 5 L/MIN AND TURN ON THE GAS.


PRESS THE  BUTTON.



"GAS CAL" WILL BE DISPLAYED FOR APPROX. 30 SECONDS WHILE THE GAS CALIBRATION VALUES ARE UP-DATED.

IF THE DISPLAYS SHOW "OFF" (FLASHING), THE CALIBRATION HAS FAILED AND NO UPDATE WILL BE MADE AND THE PREVIOUS CALIBRATION REMAINS VALID.

IF THE DISPLAYS SHOW "OFF" (NOT FLASHING), NO UP-DATE IS MADE BECAUSE THE "GAS-TAG" SETTINGS WERE SET TO "OFF" AND THE PREVIOUS CALIBRATION REMAINS VALID.

IF THE DISPLAYS SHOW "ON", THE CALIBRATION HAS PASSED AND THE GAS VALUES WILL BE UP DATED WHICH WILL OVER WRITE THE PREVIOUS VALUES.


STEP 3: PRESS THE  BUTTON TO DISPLAY "OP 3".

PRESS THE  TO DISPLAY "OP 4", OR PRESS THE MODE 

BUTTON TO RETURN TO THE MEASUREMENT MODE.

OP 4: LEAK CHECK

NOTE: THIS MODE IS ACTIVE IN ALL APPROVAL TYPES AND THIS MUST BE PERFORMED EVERY DAY.

STEP 1: FROM "OP 3", PRESS  TO DISPLAY "OP 4", PRESS 
TO ENTER THE LEAK CHECK (LC).

STEP 2: BLOCK OFF THE INLET HOLES ON THE PROBE TIP, AFTER 20 SECONDS THE PUMP WILL SWITCH OFF AND WILL RESUME OPERATION AFTER A FURTHER 25 SECONDS.



IF A LEAK IS DETECTED DURING THIS TIME, THE DISPLAY WILL SHOW THE "LEC" LEAK MESSAGE.

CHECK THE FILTER BOWL SEATING AND THE HOSE CONNECTIONS.

THE UNIT WILL NOT RESUME NORMAL OPERATION UNTIL THIS MESSAGE IS CLEARED.

STEP 3: IF NO LEAKS ARE DETECTED, THE UNIT WILL RESUME OPERATION AND THE DISPLAY WILL REVERT BACK TO "OP 4".



STEP 4: UNBLOCK THE SAMPLE HOSE AND PROBE TIP.


STEP 5: PRESS THE  TO DISPLAY "OP 5", OR PRESS THE MODE 
BUTTON TO RETURN TO THE MEASUREMENT MODE.



OP 5: CALGAS CHECK

NOTE: THIS MODE IS ACTIVE IN "APK" (THE NETHERLANDS), "SWISS" AND "SWEDEN" APPROVAL TYPES ONLY.

THIS MODE DISPLAYS THE UP-DATED CALGAS CALIBRATION VALUES.


STEP 1: FROM "OP 4", PRESS  TO DISPLAY "OP 5", PRESS  TO ENTER THE CALGAS CHECK.

STEP 2: THE UP-DATED CAL GAS VALUES ARE DISPLAYED. PRESS  TO LEAVE THE CALGAS CHECK.

STEP 3: PRESS THE  TO DISPLAY "OP 6", OR PRESS THE MODE  BUTTON TO RETURN TO THE MEASUREMENT MODE.

OP 6: CLOCK/CALENDAR SETTING


NOTE: THIS MODE IS ACTIVE IN THE "SWISS" APPROVAL TYPE ONLY. TO ENTER THIS MODE OPTION 6 (CLOCK/CALENDAR) MUST BE ON.

STEP 1: FROM "OP 5", PRESS  TO DISPLAY "OP 6", PRESS 
TO ENTER THE CLOCK/CALENDAR SETTING.

THE CURRENT CALENDAR SETTINGS WILL BE DISPLAYED IN THE FORMAT SHOWN BELOW:

PAGE 1, CALENDAR:

CO DISPLAY = DAY, (1 - 31)
CO2 DISPLAY = MONTH, (1 - 12)
HC DISPLAY = YEAR, (1990 - 2020)
COcor DISPLAY = BLANK


PRESS  TO DISPLAY PAGE 2;



PAGE 2, CLOCK:

CO DISPLAY = HOURS, (0 - 24)
CO2 DISPLAY = MINUTES, (0 - 60)
HC DISPLAY = SECONDS, (0 - 60)
COcor DISPLAY = WINTER/SUMMER TIME, (ST 0, ST 1)
(FLASHING)

STEP 2: USE THE  AND THE  BUTTONS TO SELECT THE CORRECT WINTER (ST 0) OR SUMMER (ST 1) TIME SETTING.

PRESS  TO STORE THE SETTING IN MEMORY.

OR PRESS THE MODE  BUTTON IF NO UP-DATE IS REQUIRED.

STEP 3: PRESS THE  TO DISPLAY "OP 0", OR PRESS THE MODE 
BUTTON TO RETURN TO THE MEASUREMENT MODE.

MAINTENANCE AND SERVICE

THE SUN MODULAR GAS ANALYSER (MGA-1200) IS A PRECISION DIAGNOSTIC INSTRUMENT THAT REQUIRES LITTLE CARE. THE MAINTENANCE AND SERVICE PROCEDURE PRESENTED IN THIS SECTION ARE THOSE WHICH THE OPERATOR CAN PERFORM. ALL OTHER SERVICE SHOULD BE PERFORMED BY AN AUTHORISED SUN ELECTRIC REPRESENTATIVE.

IMPORTANT: FAILURE TO MAINTAIN FILTER ELEMENTS VOIDS WARRANTY.

SAMPLE HOSE MAINTENANCE

PERIODICALLY INSPECT THE SAMPLE HOSE FOR ANY SIGN OF DAMAGE SUCH AS LEAKS, CUTS, KINKS, ETC. REPLACE IF NECESSARY.

REMOVE THE HOSE FROM THE UNIT AND BLOW OUT THE HOSE AT LEAST ONCE A WEEK WITH A COMPRESSED AIR SUPPLY TO REMOVE ANY DIRT, FOREIGN MATTER OR CONDENSED WATER.

WHEN CLEANED RE-INSTALL THE HOSE, ALSO CHECK THE TIGHTNESS OF THE SAMPLE HOSE CONNECTIONS, RE-TIGHTEN IF NECESSARY.

SAMPLE PROBE MAINTENANCE

FREQUENTLY INSPECT THE SAMPLE PROBE FOR DAMAGE.

CHECK FOR CLOGGED HOLES IN THE PROBE TIP, IF HOLES ARE CLOGGED USE A PIECE OF STIFF WIRE TO DISLodge AND REMOVE ANY FOREIGN MATTER.

FILTER SERVICE

THE FILTERS IN THE MGA-1200 SHOULD BE CLEANED OR REPLACED WHEN THE LOW FLOW INDICATION LIGHTS (LOF).

IT IS RECOMMENDED THAT PROBE MAINTENANCE SHOULD BE CARRIED OUT BEFORE REPLACING THE FILTERS.

THE MGA-1200 HAS TWO FILTERS, A PRIMARY AND A SECONDARY FILTER. THE SECONDARY FILTER SHOULD BE REPLACED AS NECESSARY, IT IS NOT POSSIBLE TO CLEAN THIS FILTER.

THE PRIMARY FILTER CAN BE CLEANED/REPLACED AS FOLLOWS:

- 1: DISCONNECT THE WATER OUTLET AND THE AIR INLET HOSE FROM THE FITTING ON THE FILTER BOWL.
- 2: UNSCREW THE FILTER BOWL FROM THE HOUSING BY TURNING THE FILTER BOWL COUNTER CLOCKWISE.

NOTE: TAKE NOTE OF THE POSITION OF THE "O" RING SEAL ON BOWL RIM, DO NOT DAMAGE THIS SEAL.

- 3: TURN THE ELEMENT RETAINER NUT COUNTER-CLOCKWISE AND REMOVE THE FILTER ELEMENT.
- 4: CLEAN THE FILTER BOWL IN A SOLUTION OF WATER AND DETERGENT AND ALLOW TO DRY. REPLACE FILTER ELEMENT IF NECESSARY.
- 5: RE-ASSEMBLE IN REVERSE ORDER MAKING SURE THE "O" RING SEAL IS PROPERLY POSITIONED IN THE GROOVE AT THE UPPER EDGE OF THE BOWL. RECONNECT THE WATER OUTLET AND AIR INLET HOSES.

THE SECONDARY FILTER ELEMENT MUST BE REPLACED WHEN IT BECOMES DIRTY OR CLOGGED, SERVICE THE SECONDARY FILTER AS FOLLOWS:

- 1: UNSCREW THE PLASTIC DRAIN PLUG FROM THE FILTER BOWL.
- 2: UNSCREW THE FILTER BOWL FROM THE HOUSING BY TURNING THE FILTER BOWL COUNTER CLOCKWISE.

NOTE: TAKE NOTE OF THE POSITION OF THE "O" RING SEAL ON BOWL RIM, DO NO DAMAGE THIS SEAL.

- 3: TURN THE ELEMENT RETAINER NUT COUNTER-CLOCKWISE AND REMOVE THE END CAP.

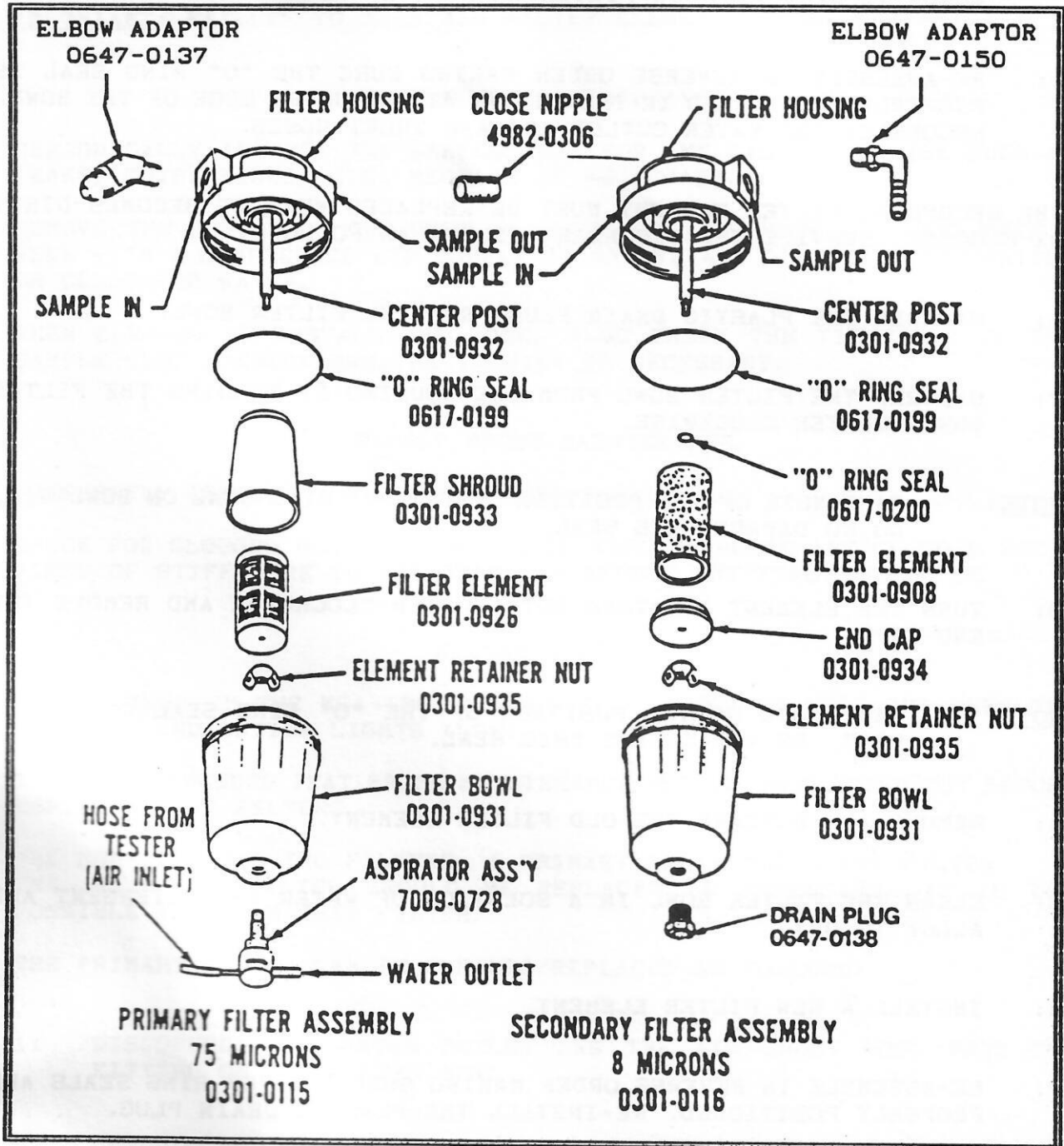
NOTE: TAKE NOTE OF THE POSITION OF THE "O" RING SEAL ON CENTER POST, DO NOT DAMAGE THIS SEAL.

- 4: REMOVE AND DISCARD THE OLD FILTER ELEMENT.
- 5: CLEAN THE FILTER BOWL IN A SOLUTION OF WATER AND DETERGENT AND ALLOW TO DRY.
- 6: INSTALL A NEW FILTER ELEMENT.
- 7: RE-ASSEMBLE IN REVERSE ORDER MAKING SURE THE "O" RING SEALS ARE PROPERLY POSITIONED. RE-INSTALL THE PLASTIC DRAIN PLUG.

COOLING FAN FILTER GAUZE

REMOVE THE COOLING FAN FILTER GAUZE ON THE REAR PANEL AND CLEAN BY BLOWING COMPRESSED AIR THROUGH THE FILTER GAUZE.

SAMPLE FILTER ASSEMBLIES



PRINTER OPERATION AND MAINTENANCE

THE MGA-1200 OPTIONAL PRINTER IS INSTALLED TO PROVIDE SERVICE SHOPS WITH ACTUAL PROOF OF EXHAUST EMISSION TESTS PERFORMED ON VEHICLES.

INSTALLATION AND PRINTER SET-UP IS PROVIDED BY SUN SERVICE PERSONNEL.

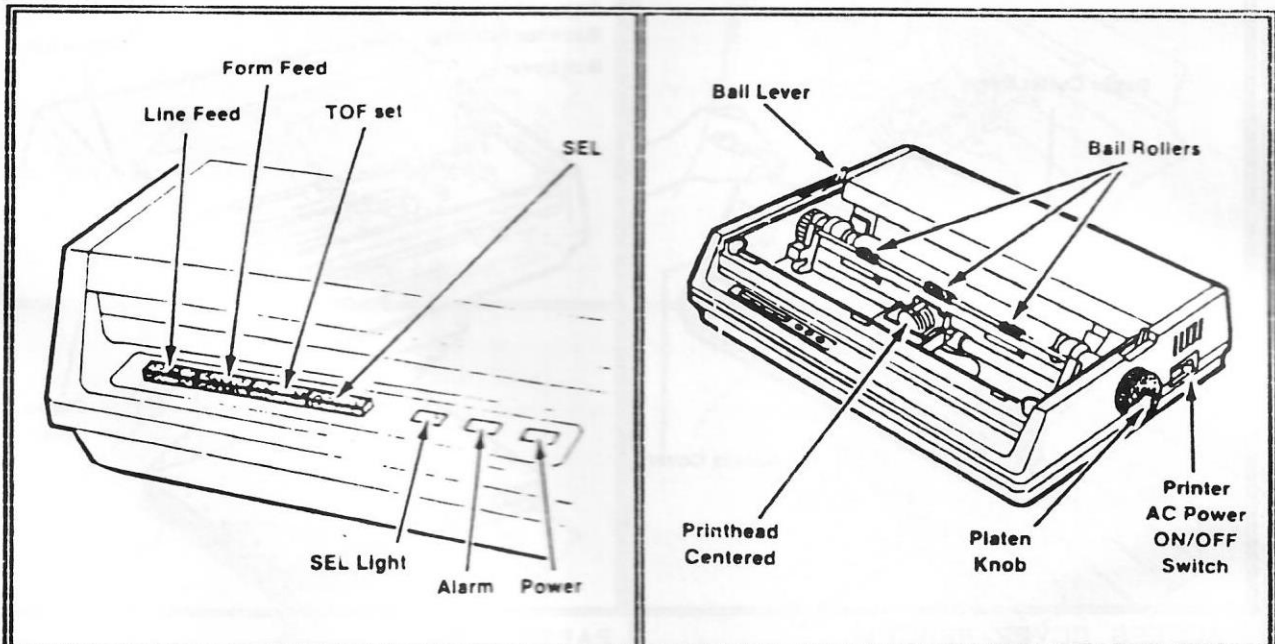
PRINTER CONTROLS

NOTE: PRESSING THE PRINTER BUTTONS CAN AFFECT PRINTER OPERATION.

ALL CONTROLS ON THE FRONT OF THE PRINTER SHOULD BE DISREGARDED SINCE ALL PRINTER FUNCTIONS ARE PERFORMED THROUGH THE MGA-1200 UPON INSTALLATION AND POWER-UP.

THE THREE INDICATOR LIGHTS ON THE PRINTER FRONT PANEL DO PROVIDE THE OPERATOR WITH USEFUL DATA:

- 1: SEL LIGHT, THIS LIGHT INDICATES COMMUNICATION WITH THE MGA. IT MUST BE ON FOR THE PRINTER TO OPERATE.
- 2: ALARM LIGHT, THIS LIGHT INDICATES A FAULT SUCH AS PAPER OUT OR THE PRINT HEAD IS JAMMED.
- 3: POWER LIGHT, THIS LIGHT INDICATES THAT THE AC MAINS IS BEING SUPPLIED TO THE PRINTER.



FRONT PANEL BUTTONS
AND INDICATORS

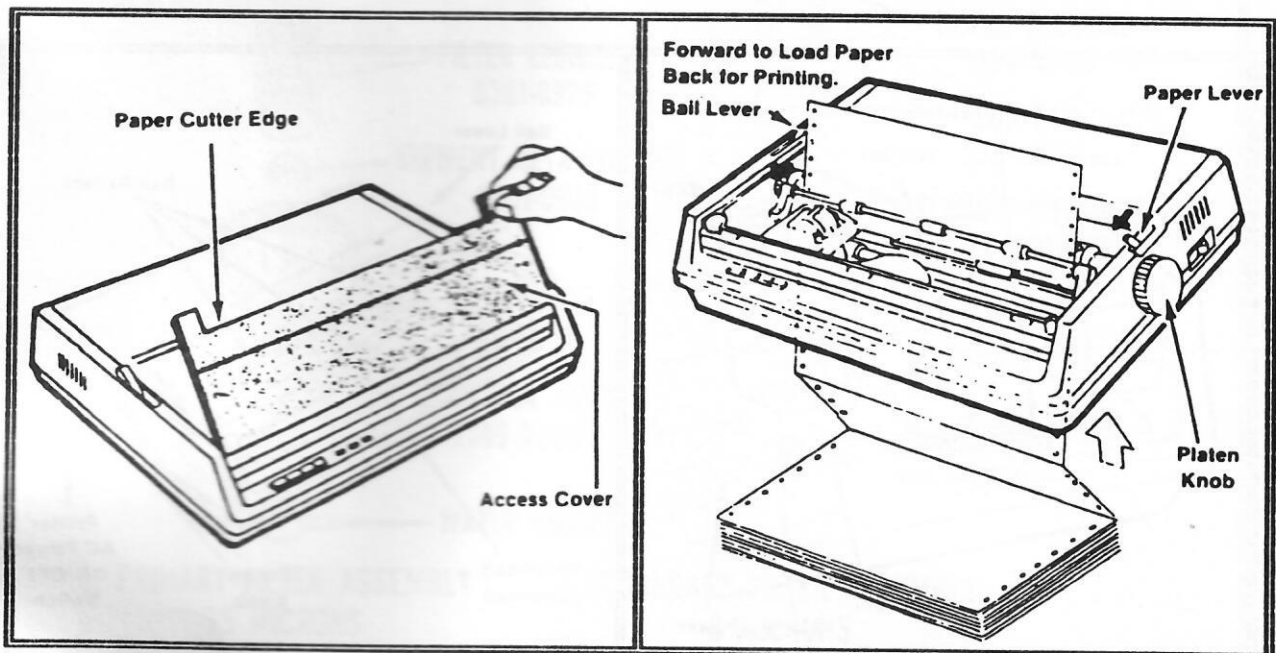
LOCATION OF CONTROLS

PAPER LOADING

- 1: SLIDE OUT THE PRINTER DRAWER.
- 2: TURN THE PRINTER AC POWER SWITCH OFF. (POWER LIGHT OFF).
- 3: REMOVE THE PRINTER ACCESS COVER BY LIFTING IT OFF.
- 4: PLACE THE STACK OF PRINTER PAPER IN THE COMPARTMENT BELOW.

NOTE: ONLY USE PERFORATED PAPER 8.5" x 11", PART NO: 0528-0994.

- 5: LIFT THE BAIL. (BAIL LEVER FORWARD). THE PAPER LEVER SHOULD BE OPEN (FORWARD).
- 6: TAKE THE FIRST SHEET OF PAPER, FEED IT THROUGH THE BOTTOM OF THE PRINTER INTO THE PAPER GUIDES AS SHOWN BELOW.
- 7: ALIGN AND MOUNT THE HOLES IN THE PAPER WITH THE CORRESPONDING PINS.
- 8: LOWER THE BAIL AND REPLACE THE ACCESS COVER.
- 9: TURN ON THE POWER (POWER LIGHT AND THE SEL LIGHT ON).
- 10: SLIDE THE DRAWER BACK IN PLACE, THE PRINTER IS NOW READY FOR OPERATION.



ACCESS COVER REMOVAL

PAPER FEED

RIBBON CARTRIDGE REPLACEMENT

ONLY USE GENUINE OKI REPLACEMENT PRINTER RIBBONS. (P/N: 0528-0995) INFERIOR QUALITY RIBBONS ARE PRONE TO SHREDDING WHICH CAN CAUSE SEVERE DAMAGE TO THE PRINT-HEAD. ALSO, USING AN INFERIOR QUALITY RIBBON INVALIDATES THE WARRANTY OF THE PRINTER.

- 1: SLIDE OUT THE PRINTER DRAWER. TURN THE PRINTER POWER SWITCH OFF.
- 2: REMOVE THE PRINTER ACCESS COVER BY LIFTING IT OFF.
- 3: GENTLY SLIDE THE PRINT HEAD TO THE CENTER.
- 4: REMOVE THE OLD RIBBON CARTRIDGE BY HOLDING IT ON EITHER SIDE AND GENTLY LIFTING IT UP.
- 5: INSTALL THE NEW RIBBON CARTRIDGE (PART NO: 0528-0995) BY INSERTING THE CARTRIDGE ONTO THE PRINT HEAD PLATE.
- 6: PRESS GENTLY ON THE CARTRIDGE UNTIL IT SNAPS INTO PLACE.
- 7: MAKE SURE THE PRINT HEAD GAP LEVER IS SET TO THE (1) POSITION.
- 8: TURN ON THE PRINTER POWER. (POWER LIGHT AND THE SEL LIGHT ON).
- 9: SLIDE THE DRAWER BACK IN PLACE, THE PRINTER IS NOW READY TO USE.

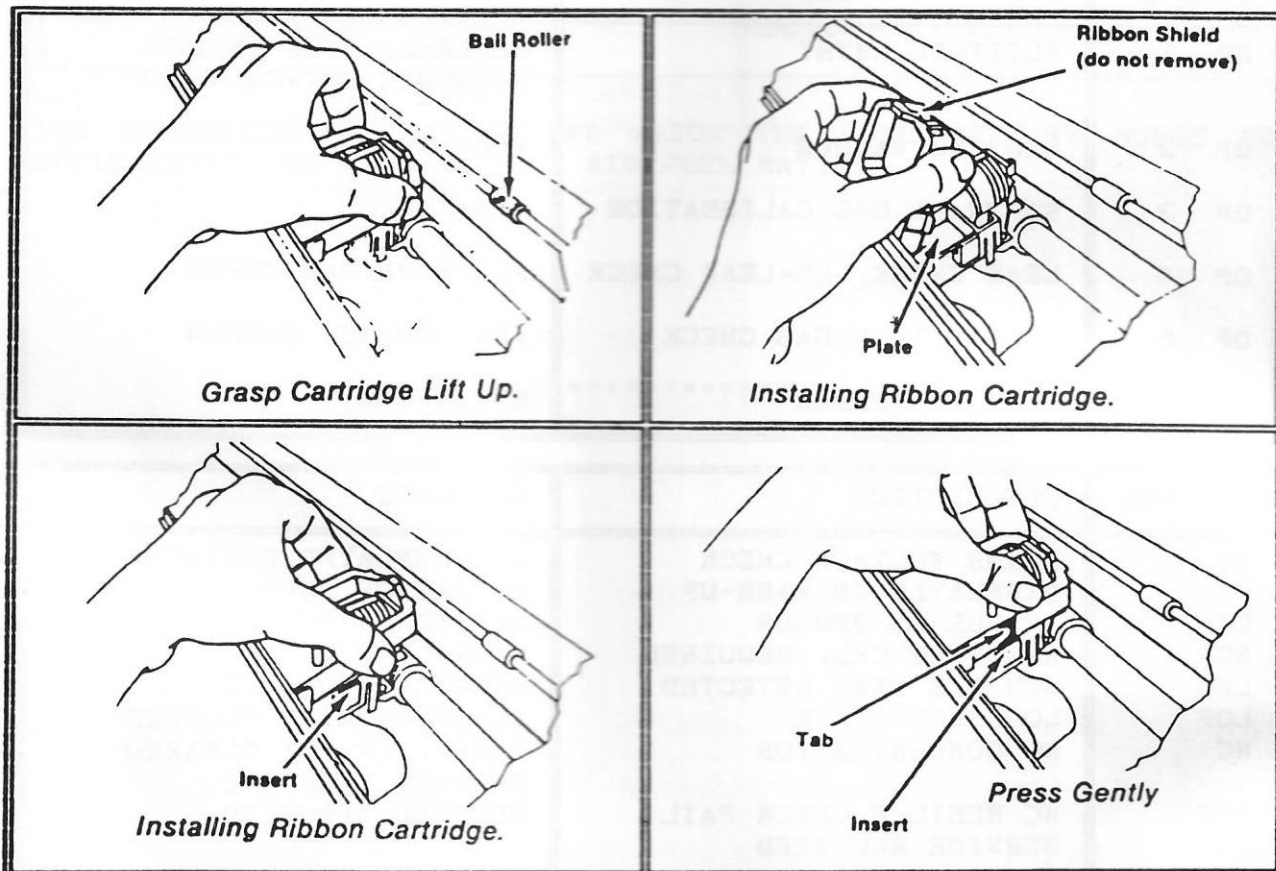


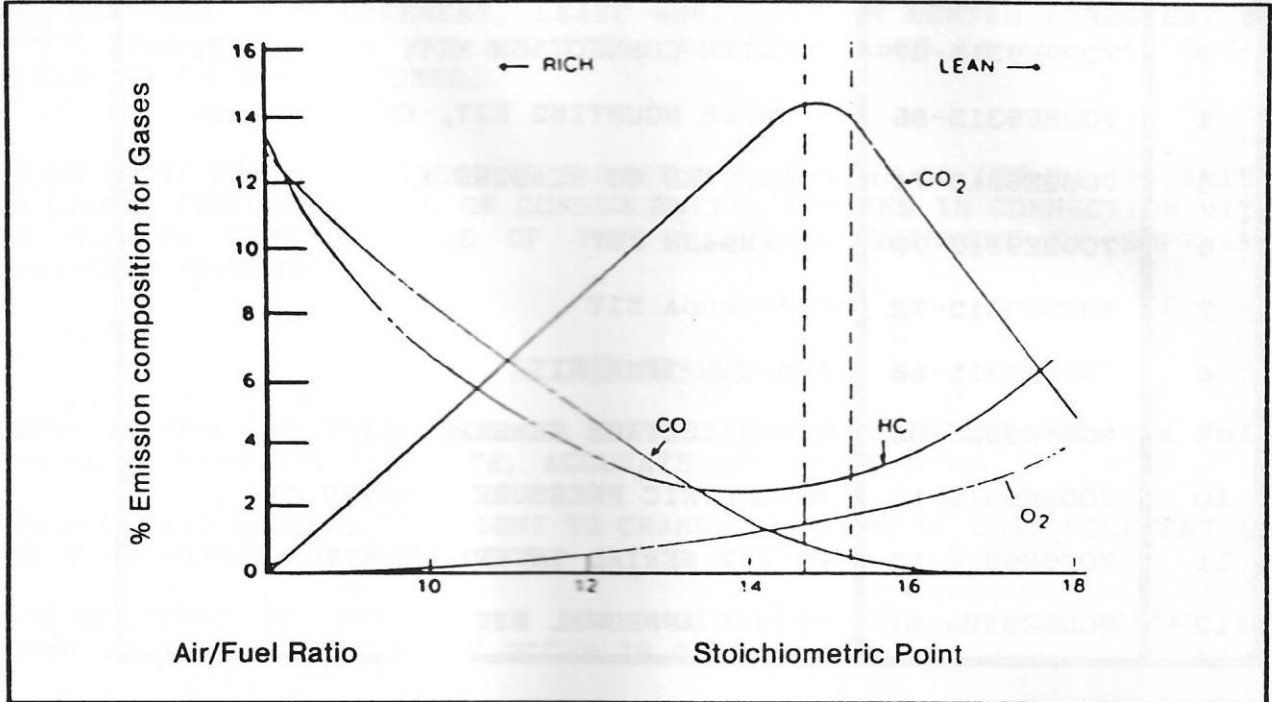
TABLE OF OPERATOR / SERVICE MESSAGES

MESSAGE	DESCRIPTION	COMMENTS
SUN	DISPLAYED DURING WARM-UP	COUNT DOWN ON CO2 DISPLAY
r - 3.2	SOFTWARE REVISION LEVEL	V3.2
CAL	TESTER IN SELF CALIBRATION MODE	AUTO-ZERO, EL-SPAN CHECK, GAIN CHECK, O2 CURVE SET, HC RESIDUE CHECK
STBY	GOING INTO STANDBY MODE	IN STANDBY, DISPLAY ". "
AUTOCAL	UNIT IN AUTO-CALIBRATION	AUTO-ZERO COMPENSATE
STR	SELECTS TYPE OF ENGINE	2 OR 4 STROKE ENGINE
FUEL	SELECT TYPE OF FUEL	SELECT 1, 2 OR 3
AFR	SELECT AIR/FUEL RATIO OR LAMBDA	0 = AIR/FUEL RATIO 1 = LAMBDA
CODE X	SELECTS CODED FUNCTIONS	WHERE X = 0 TO 4
CODE 1	OPERATOR MODES	ACTIVE IN APPROVAL TYPES:
OP 1	ALTITUDE ENTRY	GENERAL, PTB, SWEDEN, PRESSURE OPTION = OFF
OP 2	GAS-TAG VALUES	APK, SWISS
OP 3	SOFTWARE GAS CALIBRATION	APK, SWISS
OP 4	LEAK CHECK, LC=LEAK CHECK	ALL APPROVAL TYPES
OP 5	CALIBRATION GAS CHECK	APK, SWISS, SWEDEN
OP 6	CLOCK/CALENDAR	SWISS ONLY

MESSAGE	DESCRIPTION	COMMENTS
AC	MAINS VOLTAGE CHECK	IF DISPLAYED DURING NORMAL OPERATION, CHECK MAINS
CC	DISPLAYED IN WARM-UP	SERVICE REQUIRED
HCR	CHANGE O2 SENSOR	SERVICE REQUIRED
LEC	HARDWARE CAL. REQUIRED	SERVICE REQUIRED
LOF	SERIOUS LEAK DETECTED	SERVICE REQUIRED
NC	LOW FLOW STATE	CLEAN/REPLACE FILTERS
	NO COMMUNICATION	RESET, IF NOT CLEARED
RHC	HC RESIDUE CHECK FAIL	SERVICE REQUIRED
SR	SERVICE REQUIRED	SERVICE REQUIRED

THE AIR/FUEL RATIO GRAPH

THE AIR/FUEL RATIO AT WHICH THE FUEL BURNS MOST EFFICIENTLY IS CALLED THE "STOICHIOMETRIC" POINT. AT THIS POINT THE HC AND CO EMISSIONS ARE LOWEST AND THE CO₂ IS AT THE HIGHEST. SEE THE GRAPH BELOW FOR DETAILS:



THE STOICHIOMETRIC POINT (AT WHICH THE FUEL MIXTURE BURNS MOST EFFICIENTLY) IS AT 14.7 TO 1 AIR/FUEL RATIO.

MGA-1200 OPTIONS

ITEM	SUN PART NO:	DESCRIPTION
1	PTS-43	PORTABLE TEST STAND FOR MGA-1200
2	7096E4056-95	PRINTER, OKI 182E (IORN GREY)
3	7009E9315-87	PRINTER CONNECTION KIT, CABLES ETC
4	7009E9315-86	PRINTER MOUNTING KIT, ONTO PTS-43
5	7009E9315-71	CORRECTED CO READING KIT
6	7009E9315-70	EXTENSION KIT
7	7009E9315-72	O2/LAMBDA KIT
8	7009E9315-68	RPM/OIL TEMP KIT
9	7009E9315-95	MAINS VOLTAGE SENSING KIT
10	7009E9316-13	BAROMETRIC PRESSURE SENSING KIT
11	7009E9316-15	RS-232 SERIAL INTERFACE KIT
12	7006E9316-51	"OIML" APPROVAL KIT

MGA-1200 MAINTENANCE PARTS

ITEM	SUN PART NO:	DESCRIPTION
1	7009E9315-63	ACCESSORY KIT 1
2	0301-0926	FILTER ELEMENT PRIMARY (75 MICRONS)
3	0301-0908	FILTER ELEMENT SECONDARY (8 MICRONS)
4	0617-0199	"O" RING SEAL (LARGE)
5	0617-0200	"O" RING SEAL (SMALL)
6	0301-0931	FILTER BOWL
7	7009-0511	EXHAUST PROBE
8	3988-0202	EXHAUST HOSE
9	7049-0004	OXYGEN SENSOR
10	0528-0994	PRINTER PAPER
11	0528-0995	PRINTER RIBBON CARTRIDGE

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