

VNKI - UNPUBLISHED MANUSCRIPT
HARRISON, E J (1982)

HARRISON

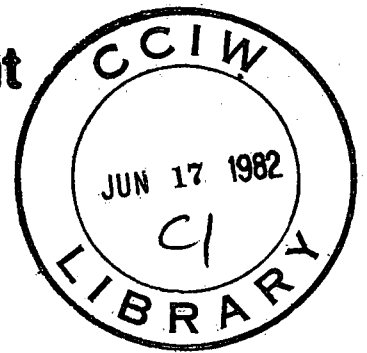


**Environment
Canada**

**Environnement
Canada**

**National
Water
Research
Institute**

**Institut
National de
Recherche sur les
Eaux**



AWQUALABS SPECIAL HARDWARE

HANDBOOK NOTES

by

E.J. Harrison

TD
7
H376
1982

ES-1114

AWQUALABS SPECIAL HARDWARE

HANDBOOK NOTES

by

E.J. Harrison

Engineering Services Section
Hydraulics Division
National Water Research Institute
Canada Centre for Inland Waters
Burlington, Ontario, Canada L7R 4A6

May 1982

PREFACE

This document is intended for use by those who must understand the inner workings of the AWQUALABS (Automated Water Quality Analytical Laboratory System) HARDWARE, to repair, install, or modify it. It is not suitable for the reader who wishes to have a general knowledge of the AWQUALABS system. It does not cover the configuration of the computer system itself which is documented in Digital Equipment supplied manuals. Also, it does not cover any aspects of the AWQUALABS software. For information on any of these other aspects of the AWQUALABS system, contact

Mr. Francis Philbert
Chief, Water Quality Branch
Canada Centre for Inland Waters
P.O. Box 5050
Burlington, Ontario, Canada L7R 4A6
Telephone: (416) 637-4663

TABLE OF CONTENTS

	<u>PAGE</u>
PREFACE	i
TABLE OF CONTENTS	ii
LIST OF FIGURES AND TABLES	iii
1.0 INTRODUCTION	1
1.1 Approach to Hardware Documentation	1
2.0 GENERAL ASPECTS OF THE HARDWARE DESIGN	3
2.1 Accepted Means of Data Transfer	3
2.2 Data Format	3
3.0 HARDWARE CHECK-OUT PROCEDURE	4
3.1 Digital Instruments Check-out	4
3.2 Analog Instruments Check-out	5
4.0 DRAWING PACKAGE	6
4.1 Awqualabs System Block Diagram	6
4.2 Plan of the 7th Floor Laboratory, with Cable Routing.	8
4.3 Individual Room Layouts	9
4.4 Interface Wiring Diagrams	19
4.4.1 Perkin-Elmer PE-403 interface wiring	19
4.4.2 Perkin-Elmer PE-603 interface wiring	23
4.4.3 Technicon auto analyser (digital) interface wiring	25
4.4.4 Technicon auto analyser (analog) interface wiring	27
4.4.5 SPO4000 Gas chromatograph processor interface wiring	28
4.4.6 Carbon analyser interface wiring	29
4.4.7 ARL plasma jet analyser interface wiring	31
4.4.8 Total alkalinity analyser interface wiring	32
4.4.9 UV-VIS spectrometer interface wiring	33
4.4.10 Analog buffer amplifier	34
4.5 Computer Input/Output Assignments	35
4.5.1 Communications rack layout and wiring	39

LIST OF FIGURES AND TABLES

		<u>PAGE</u>
1.1	List of Manufacturers' Manuals	2
4.1	AWQUALABS System Block Diagram	7
4.2	Plan of 7th Floor Lab, with cable routing	8
4.3.1	L702 Computer Room	10
4.3.2	L510 Toxic Substances	11
4.3.3	L742 Nutrients	12
4.3.4	L738 Atomic Absorption	13
4.3.5	L745 IAL Auto Analyser	14
4.3.6	L750 Plasma Jet Analyser & Receiving	15
4.3.7	L761 Ship Support	16
4.3.8	L771 Gas Chromatography	17
4.3.9	L774 GC/Mass Spectrometry	18

INTERFACE WIRING DIAGRAMS

4.4.1	PE-403 Atomic Absorption	21
4.4.2	L&F Serializer	22
4.4.3	Pe-603 Atomic Absorption	24
4.4.4	Technicon II (Digital)	26
4.4.5	Technicon II (Analog)	27
4.4.6	SP-4000 G.C. Processor	28
4.4.7	Carbon Analyzer (Beckman 865)	29
4.4.8	Carbon Analyzer (Beckman 215)	30
4.4.9	Total Alkalinity Analyzer.	32
4.4.10	UV-Vis Spectrometer	33
4.4.11	Analog Buffer Amplifier	34

COMPUTER INPUT/OUTPUT ASSIGNMENTS

	<u>PAGE</u>
4.5.1 Analog Input Assignments	35
4.5.2 Computer Terminal/Port Assignments	36
Explanator Notes for Item 4.5.2	37
4.5.3 Colour Codes	38
4.5.4 Communications RACK Layout	40
4.5.5 Terminal Panel Wiring - Panel 1	41
4.5.6 Terminal Panel Wiring - Panel 2	42
4.5.7 Terminal Panel Wiring - Panel 3	43
4.5.8 AWQUALABS Terminal Box Wiring	44
4.5.9 EIA/CL Convertor Schematic	45
4.5.10 Barcode Reader Wiring	46

All other relevant information regarding AWQUALABS hardware is contained in the DEC manuals, and in particular, the Site Management Guide.

1.0 INTRODUCTION

The primary concerns in the design of the AWQUALABS hardware system were to make as much use of standard hardware and interfaces as possible, and to simplify the overall architecture of the system. There was no mandate to improve the performance of any of the instruments. There was a need to minimize the impact of any changes on the operation of the instruments.

The decision was made to use primarily serial digital data transmission in the system. This was based on the fact that most of the instruments were readily adaptable, via procurable interfaces, to this technique. Although modifications were required to most instruments, the modifications were relatively minor, compared to that required by other approaches.

1.1 Approach to Hardware Documentation

The instruments and the computer in the AWQUALABS system are reasonably well documented via the manuals supplied by the various manufacturers. These manuals are maintained by the individuals who are responsible for each lab area. If one is to modify or repair an instrument, then it is only reasonable to approach the responsible lab head, and obtain the appropriate manuals for reference. Indeed, reviewing the manufacturers' manuals is a prerequisite to making any changes to a given instrument.

This document provides only supplemental information to the manufacturers' documents. Where appropriate, it refers to sections in the manufacturers' manuals.

The manuals referred to are listed in Table 1.1.

TABLE 1.1. List of Manufacturers' Manuals

1. Beckman Model 215A, 315A, and 415A Infrared Analyzers, Beckmán Instructions 1635-B.
2. Beckman Model 865 Infrared Analyzer, Beckman Instructions 015-082438.
3. Instructions Model 403 Atomic Absorption Spectrophotometer, Reskin-Elmer, 990-9663.
4. Instructions, Model 603 Atomic Absorption Spectrophotometer, Reskin-Elmer, 993-9208.
5. Operation Manual for Technicon Autoanalyzer II System, Technicon Technical Publication TA1-0170-10.
6. Operation Manual for the Technicon Moduler Digital Printer, Technical Publication No. TA1-0278-20.
7. List of Digital Equipment Supplied hardware Maintenance or Installation Manuals:
 - PDP-11/60 Installation and Operation Manual EK-11060-OP-002.
 - PDP-11 Family Field Installation and Acceptance Procedure EK-FS003-IN-001.
 - 861 Power Controller User's Manual EK-861AB-OP-002.
 - ME11S-K MOS Memory User's Guide EK-MF11K-UG-001.
 - M9301 Bootshop/Terminator Module Maintenance EK-M9301-TM-002.
 - RK611/RK06 Disk Subsystem Installation Manual EK-RK611-1M-001.
 - RK611/RK06 Dis Subsystem User's Manual EK-RK611-OP-002.
 - LA180 DEC Printer I User Manual EK-LA180-OP-002.
 - DZ11 Maintenance Manual EK-DZ11-MM-PRE.
 - DL11-W Serial Line Unit/Real-Time Clock Option Maintenance Manual EK-DL11W-MM-001.
 - ICS-11 Industrial Control Subsystem Maintenance Manual EK-1CS11-MM-002.

(See associated print set as required.)

2.0 GENERAL ASPECTS OF THE HARDWARE DESIGN

2.1 Accepted Means of Data Transfer

Each instrument is connected to the computer via an isolated, passive, 20mA current loop link. Each instrument appears to the computer as though it were a normal computer terminal. (Although the computer ports which are normally occupied by instruments are 'slaved', which means that instrument output is completely ignored by the computer unless there is a running program which expects data from that instrument.)

The connectors and cabling have been arranged so that any instrument or terminal can be connected any to any available port on the computer. Only the transfer rate (Baud rate), need be adjusted to match. This is done with the 'SET/SPEED=ttt:rate:rate' command from any nearby terminal. This capability means that instruments can be moved from lab to lab without too much disruption, and minimal re-wiring.

2.2 Data Format

The data itself is coded ASCII. Each instrument sends out fixed length messages terminated by a 'CARRIAGE-RETURN' (CR). The messages consist purely of nulls and displayable characters. The content and length of the message varies according to the type of instrument, and the programs which request the data, unpack and use the data appropriately.

The structure of the characters themselves is always set to seven bits/characters, even or forced to zero parity, and one stop for baud rates greater than 110. For 110 baud, two stop bits are used.

3.0 **HARDWARE CHECK-OUT PROCEDURE**

3.1 Digital Instruments Check-Out

Digital instruments are checked out using the PIP utility on the computer. If the PIP program causes the data to be displayed properly, then any apparent problem is probably due to a software malfunction. Use the following procedure to verify the correct operation of an instrument.

1. Ensure that the instrument has been modified for use with AWQUALABS. There should be a label on the back, indicating the date that the modifications were made.
2. Install the instrument on the bench as per the manufacturer's set-up instructions, close to an AWQUALABS terminal box.
3. Connect the instrument to the blue box via the special cable made for that type of instrument.
4. Turn on the instrument and check that the red light on the blue box above the connector for your instrument is lit. If it does not light, check that the instrument is turned on correctly, and operational. If there is an 'ON-LINE/OFF-LINE' switch, set it to the 'ON-LINE' position. If the red light still does not light, then check with the system manager to ensure that the port is active. (At CCIW the system manager is Hubert Clignett, ext. 505.)
5. Once the red light is lit, log in at a nearby terminal. (See the AWQUALABS Software manuals for the log-in procedure.) Type in 'PIP TI:=TTxx<CR>', where xx is the port number for the instrument. 'xx' can be found by looking up the port number in the table on page 41, in this manual or by checking with the system operator.
6. If the message displayed at the terminal is not the one you expected when you initiated a transfer from the instrument, then make sure that the port is set up for the correct speed. If it is, then check through the above steps once again. If the messages are still not correct, then tell the system manager and he will arrange for repairs, or check in the appropriate section of this manual for further information about the instrument in question.

7. To finish the test type 'CTRL C' and 'ABO' at the terminal. This action will abort PIP, and allow you to log out or do other work at the terminal.

3.2

Analog Instruments Check-Out

The easiest way to check that analog signals are reaching the computer is to set up a strip chart recorder in the computer room, and monitor the signal in question at the appropriate terminal panel. It is advisable to have the computer operator assist in this activity, since there is some risk of interfering with other AWQUALABS communications. The signal appearing on the chart should be a replica of the one recorded in at the instrument, except that the full scale value at the computer room will be 5.0 volts, no matter what the instrument output.

4.0 DRAWING PACKAGE

The drawing package which follows contains descriptions of the various hardware elements of the AWQUALABS system at CCIW, and drawings which may be used to construct or repair any of the special hardware for the AWQUALABS system. References to other documents are given, where supplemental information is needed.

4.1 AWQUALABS System Block Diagram

The hardware system block diagram provides a functional overview of the system at CCIW. It is not intended to be an accurate indicator of all aspects of the system, since the configuration is quite dynamic. That is, instruments and terminals are moved about as requirements change. The block diagram is only a 'snap-shot' taken at a given point in time.

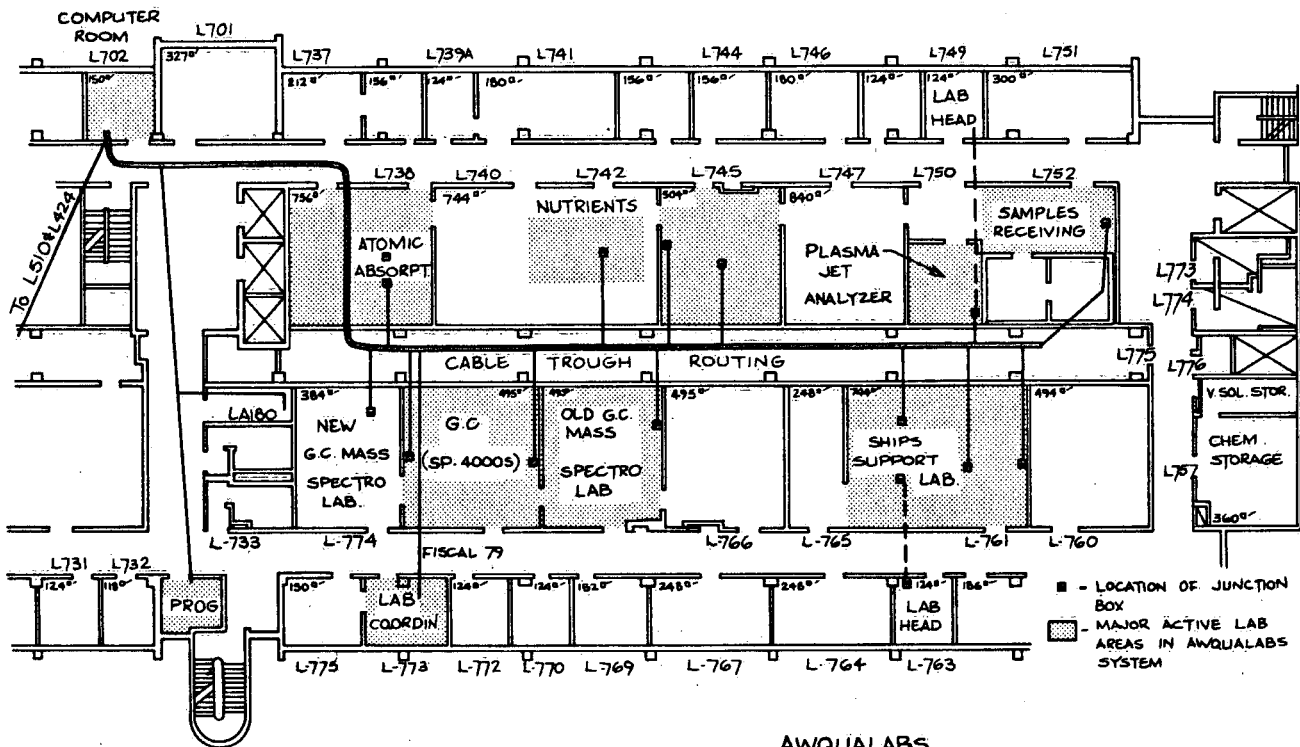
To be sure about a given capability of the system, check with the lab head or system manager.

4.2 Plan of 7th Floor Laboratory, With Cable Routings

The AWQUALABS system is mainly on the 7th floor at CCIW. The floor plan gives an indication of the physical layout of the system. The heavy black line extending from the computer room L702 to the utility corridor shows the path of a cable trough mounted in the suspended ceiling. The trough also contains a rope which allows the pulling of additional cables as necessary.

The junction box locations (points where instruments or terminals may be connected to the system) are shown as black squares. These are not easily located, but extension cables can be made up to locate a terminal in an office or remote part of the lab.

FIGURE 4.2. Plan of the 7th Floor Laboratory, showing the CABLE TROUGH ROUTING



AWQUALABS
CABLE TROUGH ROUTING

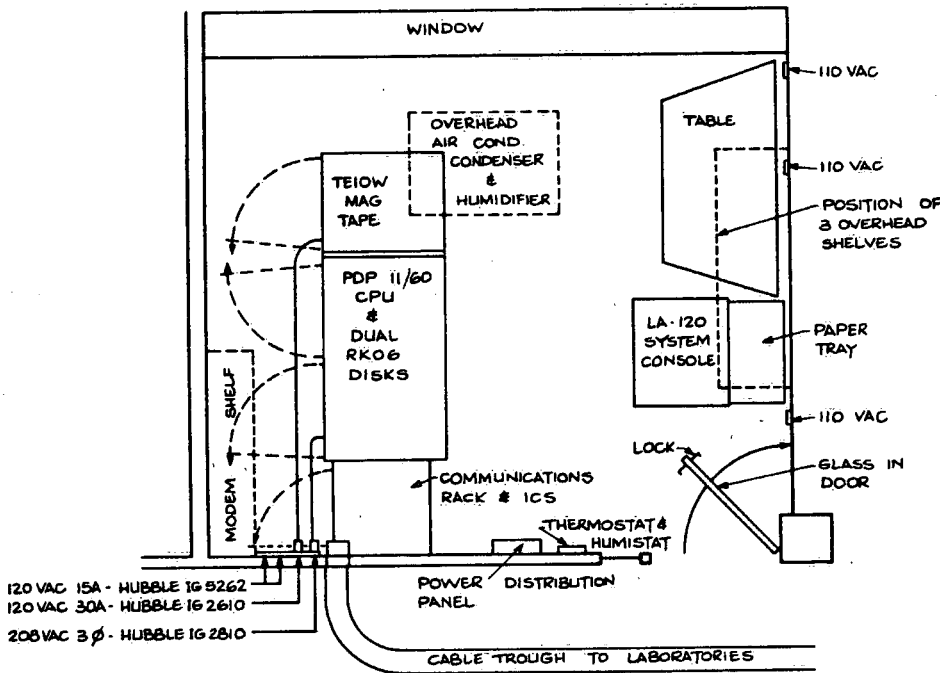
4.3. Individual Room Layouts

Figures 4.3 through 4.11 show the individual rooms/laboratories where AWQUALABS equipment has been installed. The routing of cables to each on-line instrument is shown, together with identifiers for each blue terminal box (e.g., L510A).

A few short forms need definition:

- ICOM marks an intercom connection. These are not normally used.
- OPT CRT is an optional terminal port, which must be patched into the computer, before it can be used.

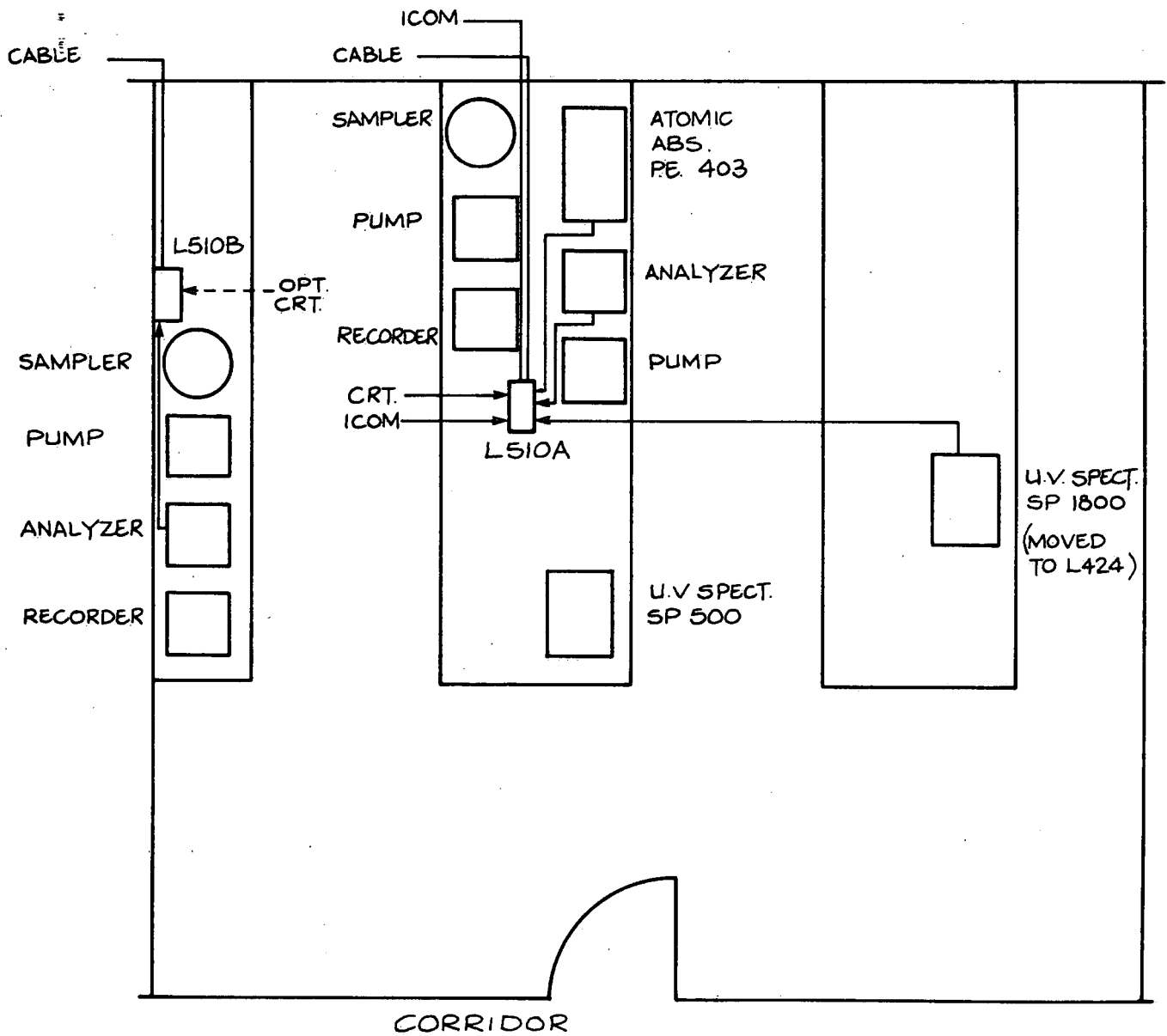
FIGURE 4.3.1. L702 Computer Room Layout



- Notes:
1. AIR CONDITIONING: BLDG PLUS 20,000 BTU OF AUXILIARY A/C.
 2. AC POWER IS SUPPLIED FROM 575 VAC BUS VIA ISOLATION TRANSFORMER 15 KVA AVAILABLE.
 3. BOTH A/C CONDENSOR & ISOLATION TRANSFORMER ARE THE SERVICE CORRIDOR BEHIND L730.

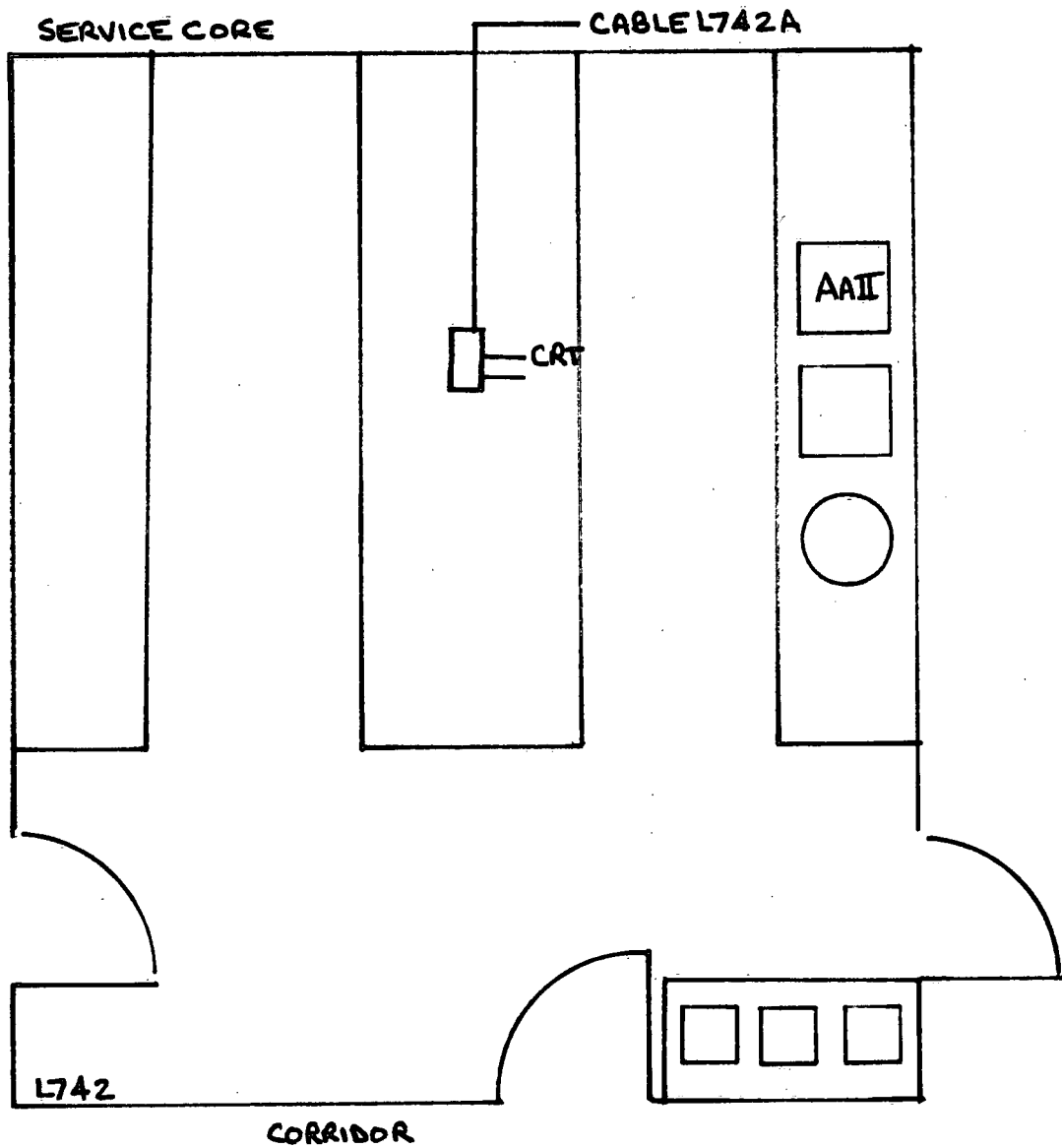
AWQUALABS:
COMPUTER ROOM
L702 ROOM LAYOUT

FIGURE 4.3.2. L510 Toxic Substances Layout



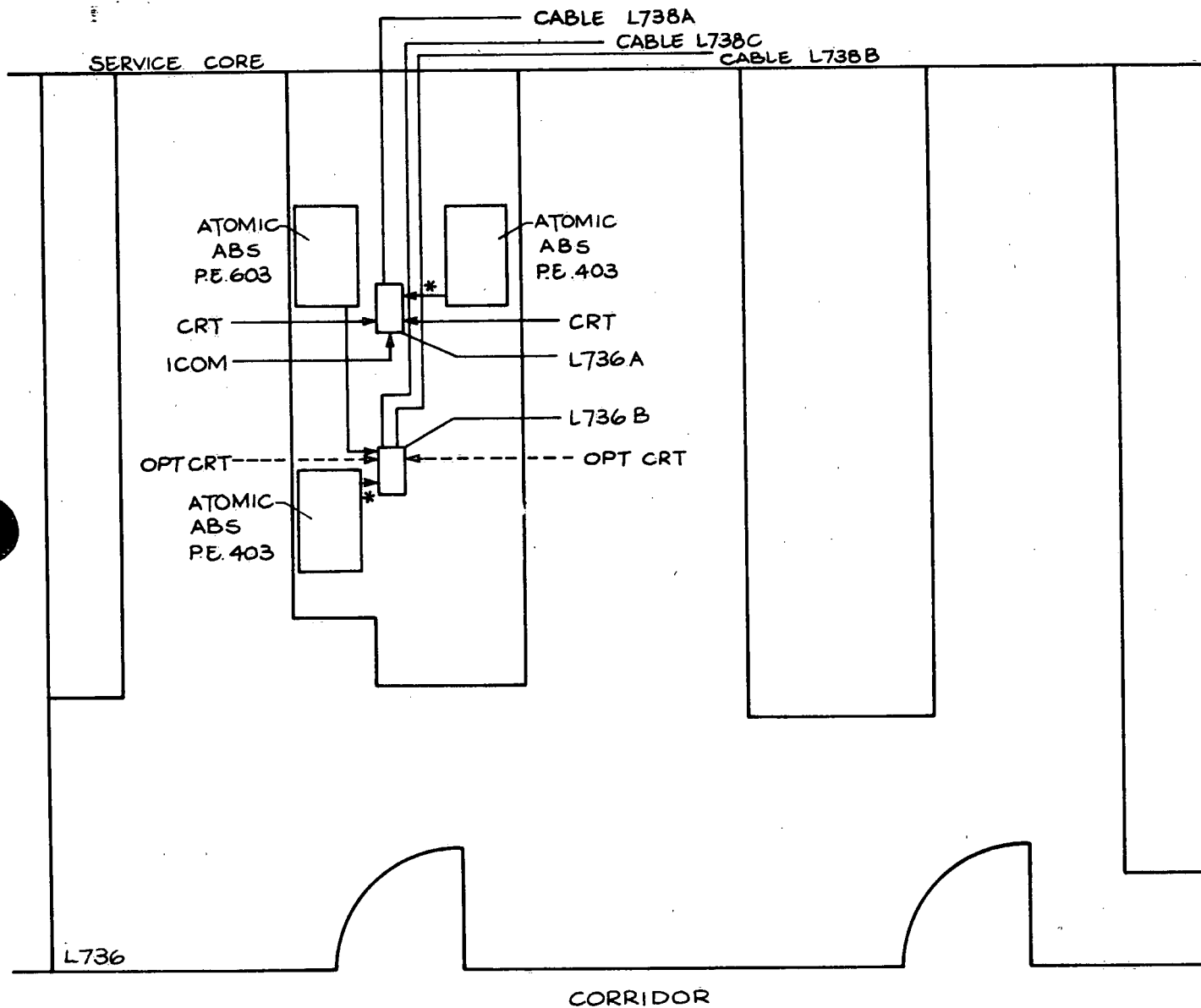
AWQUALABS:
L510 TOXIC SUBSTANCES
LAB WIRING.

FIGURE 4.3.3. L742 Nutrients Room Layout



AWQUALABS
L742 NUTRIENTS LAB WIRING

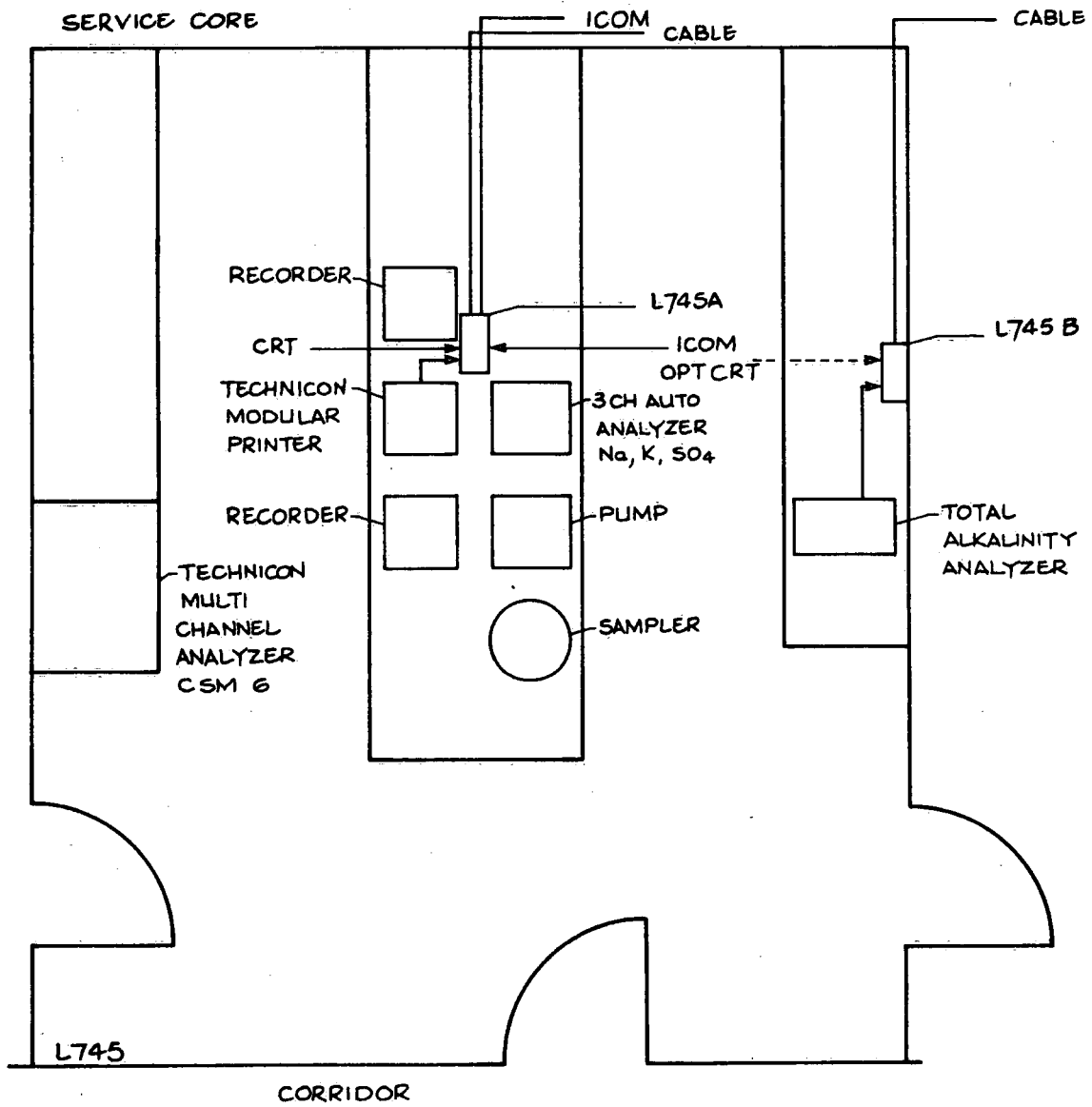
FIGURE 4.3.4. L738 Atomic Absorption Room Layout



Note: * L & F SERIALIZER IN LINK
SEE INDEX ITEM 13B

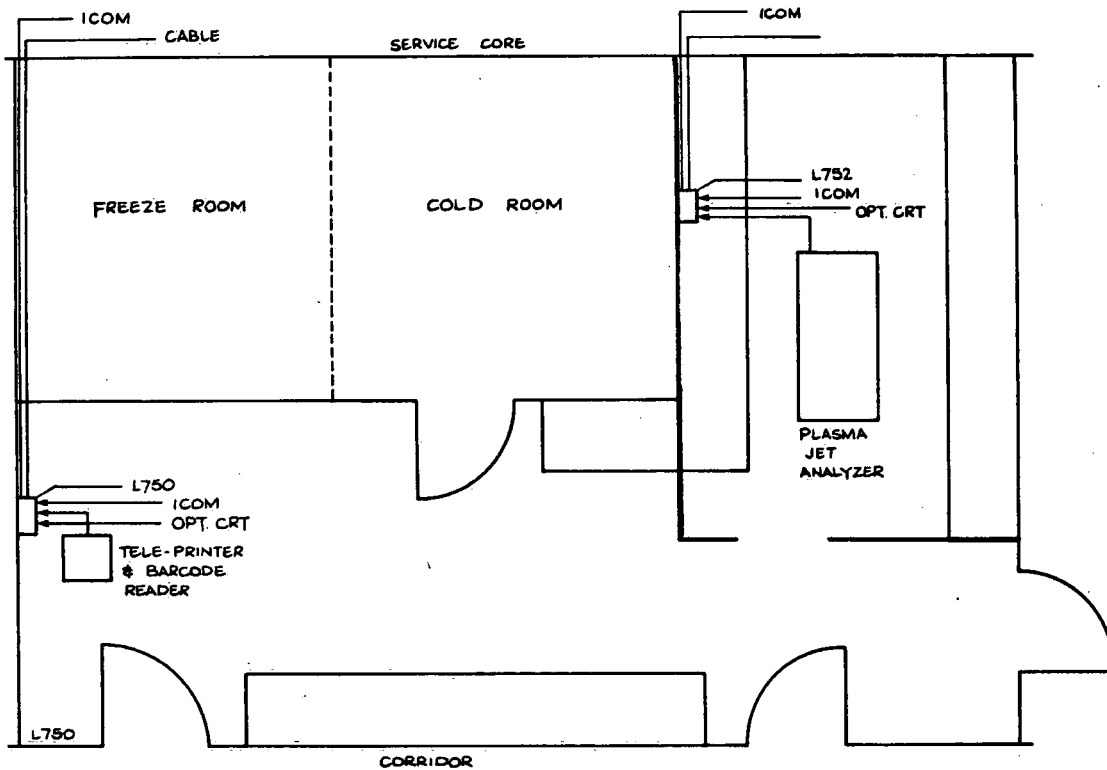
AWQUALABS:
L738 ATOMIC ABSORPTION LAB.
WIRING

FIGURE 4.3.5. L745 IAL Auto-Analyzer Room Layout



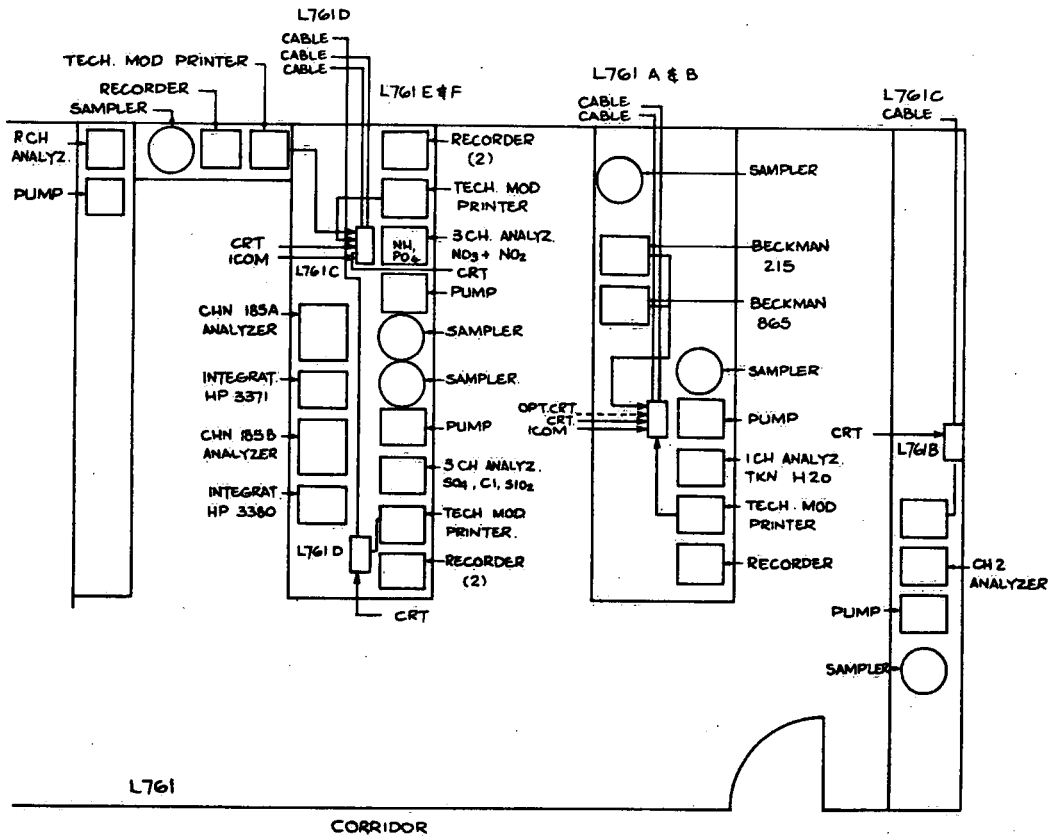
AWQUALABS
L745 IAL AUTO ANALYZER LAB WIRING

FIGURE 4.3.6. L750 Plasma Jet Analyzer and Samples Receiving Room Layout



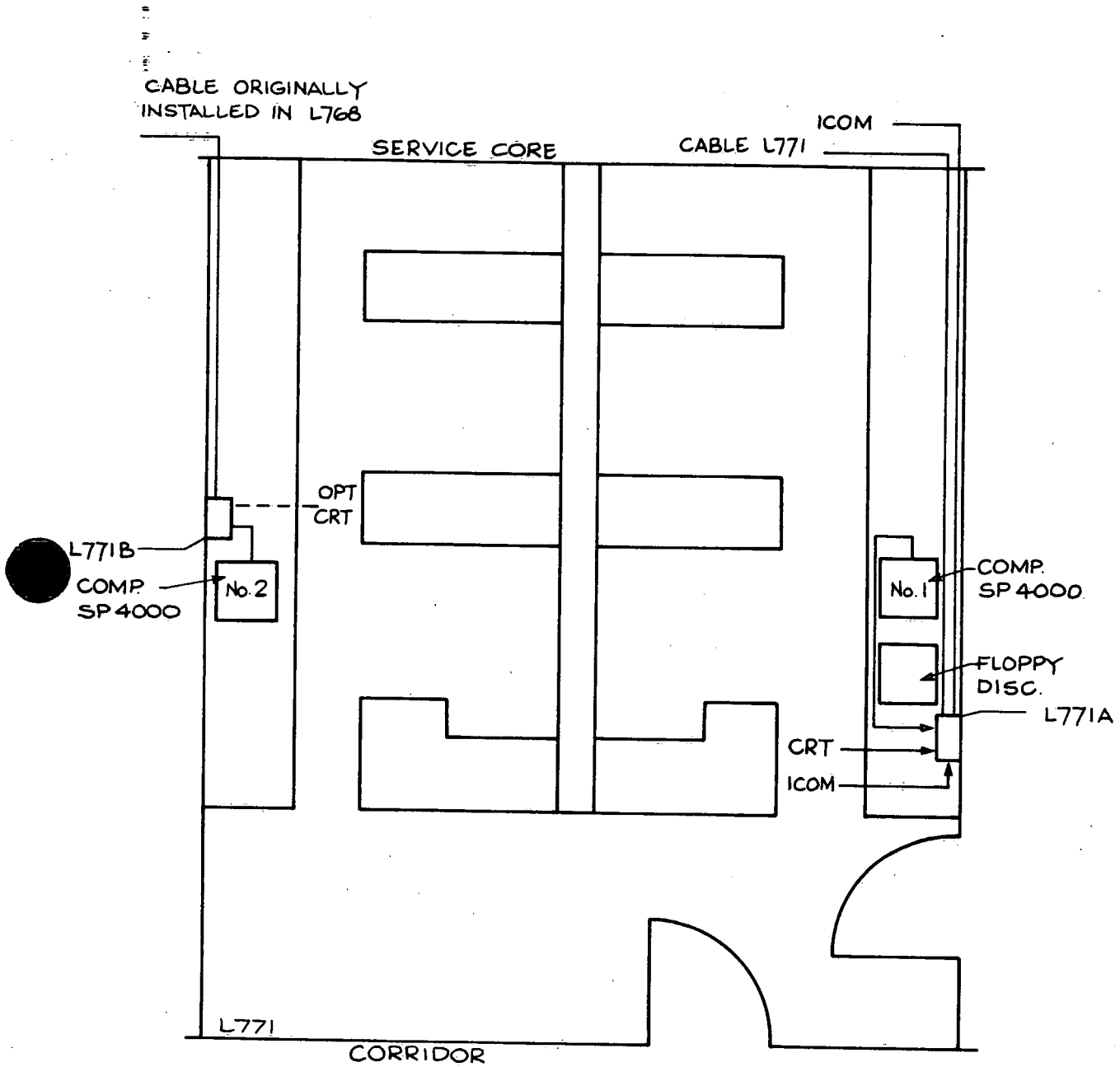
AWQUALABS
L750/752 SAMPLES RECEIVING &
IMMEDIATE TESTS LAB WIRING

FIGURE 4.3.7. L761 Field Chemistry and Ship Support Lab Room Layout



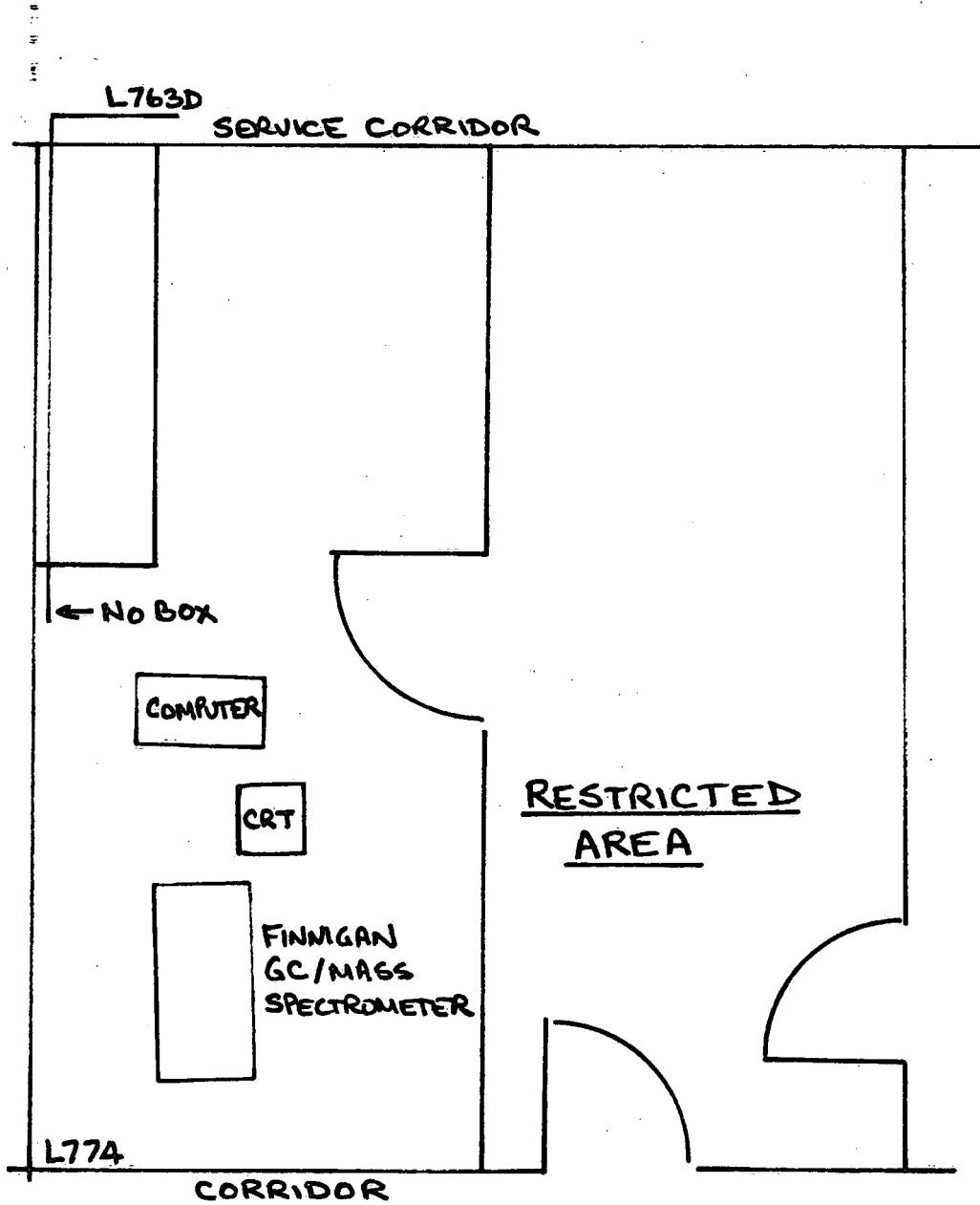
AWQUALABS
L761 FIELD CHEM. & SHIP
SUPPORT LAB WIRING

FIGURE 4.3.8. L771 Gas Chromatography Room Layout



AWQUALABS
L771 GAS CHROMATOGRAPHY
LAB WIRING

FIGURE 4.3.9. L774 GC/Mass Spectrometry Room Layout



AWQUALABS
L774 GC/MASS SPEC. LAB
WIRING

4.4 Interfacing Wiring Diagrams

This section contains detailed information about each instrument interface. It describes any modifications that have been made, and the wiring diagrams for any special plugs and cables.

4.4.1 Perkin-Elmer PE-403 interface wiring

This instrument required the most extensive modifications to make it work with the AWQUALABS system. Although it provided digital outputs, the design was done in 1966 prior to any reasonable communication standards. The result was a non-standard coding of the data; questionable control of the data transfer, and curious changes in the operation of the machine when used on-line. Furthermore, the design of the instrument itself is quite convoluted, that is, all the functions in the system interact with each other. In the author's opinion, there are no modifications which can be easily made to this instrument.

Perkin-Elmer's notation is hereby clarified. The 'slot' refers to the position of a given printed circuit card in the right hand side of the instrument. The 040-50xx number shown in schematic SKE-7075B (on the next page) is the identifying number on the printed circuit card itself, and the 040-08xx number refers to a PE schematic describing the circuit contained in slot 21xx. Refer to PE 403 Instruction Manual 990-9663.

With this background in mind, the following modifications can be made:

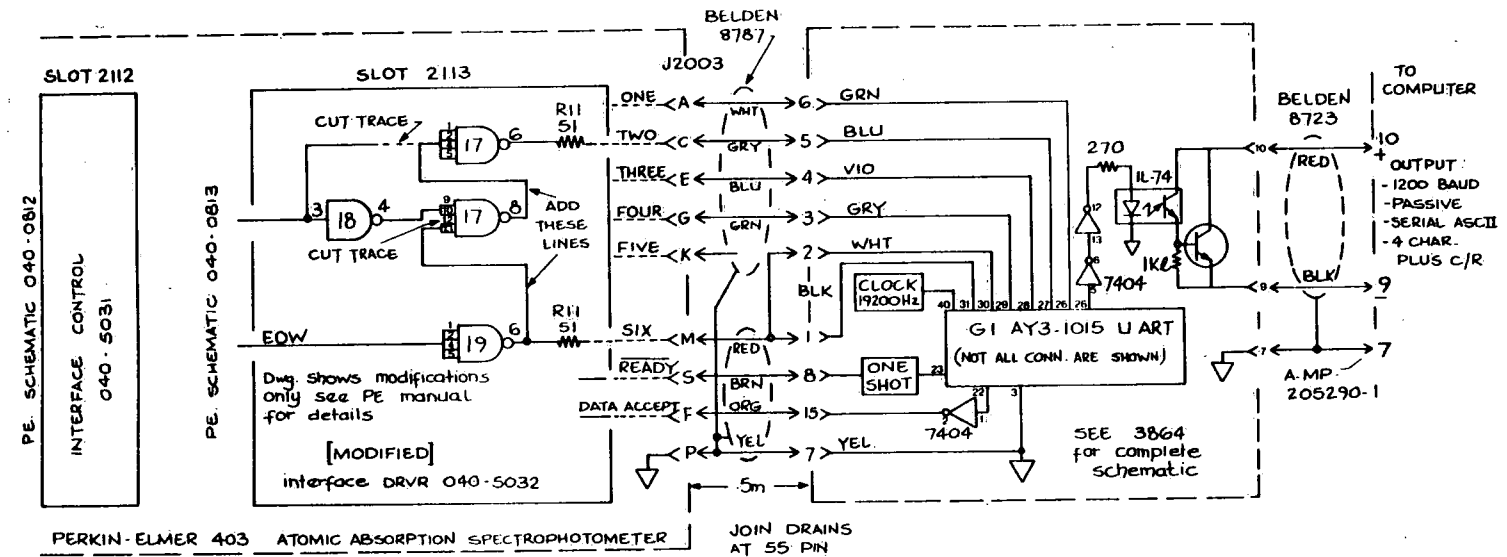
1. Change instrument so that it operates in the same way for either 'on-line' or off-line' mode. Follow other required changes shown on schematic SKE-7075B, items 1) and 2).
2. Remove a contact bounce problem, caused by the foot switch, by making the changes listed in items 3) and 4). The components are on the board to do the logic, they just need some minor rearranging.
3. Finally, make the changes shown in the schematic itself for the 040-5032 card (slot 2113). These changes convert the non-standard

sequence of characters to acceptable ASCII. The sequence output is "dddd<CR>".

The changes described above allow the instrument to operate in 'on-line' manual mode, with an active analog chart output. But, the characters that are output are bit parallel and character serial. Therefore, they need to be serialized with another box. The schematic for the serializer is shown in schematic 3864 on page 22. This box serves the dual function of serializing the data and isolating the instrument from the computer.

The circuit shown in schematic 3864 is based on the General Instruments UART chip which does the serialization and adds start and stop bits as required. The clock generates 19200 Hz which is 16 times the desired baud rate of 1200 baud. The chip is wired to send 8 bit characters, but bits seven and eight are set to zero, so effectively, the parity bit is forced to zero. The only subtle aspect of the circuit is the mono-stable (74121) which prevents the UART from triggering on the relatively high level of noise present in the PE 403.

FIGURE 4.4.1. Perkin-Elmer PE-403 Interface Wiring [SKE-70758]



PERKIN-ELMER 403 ATOMIC ABSORPTION SPECTROPHOTOMETER

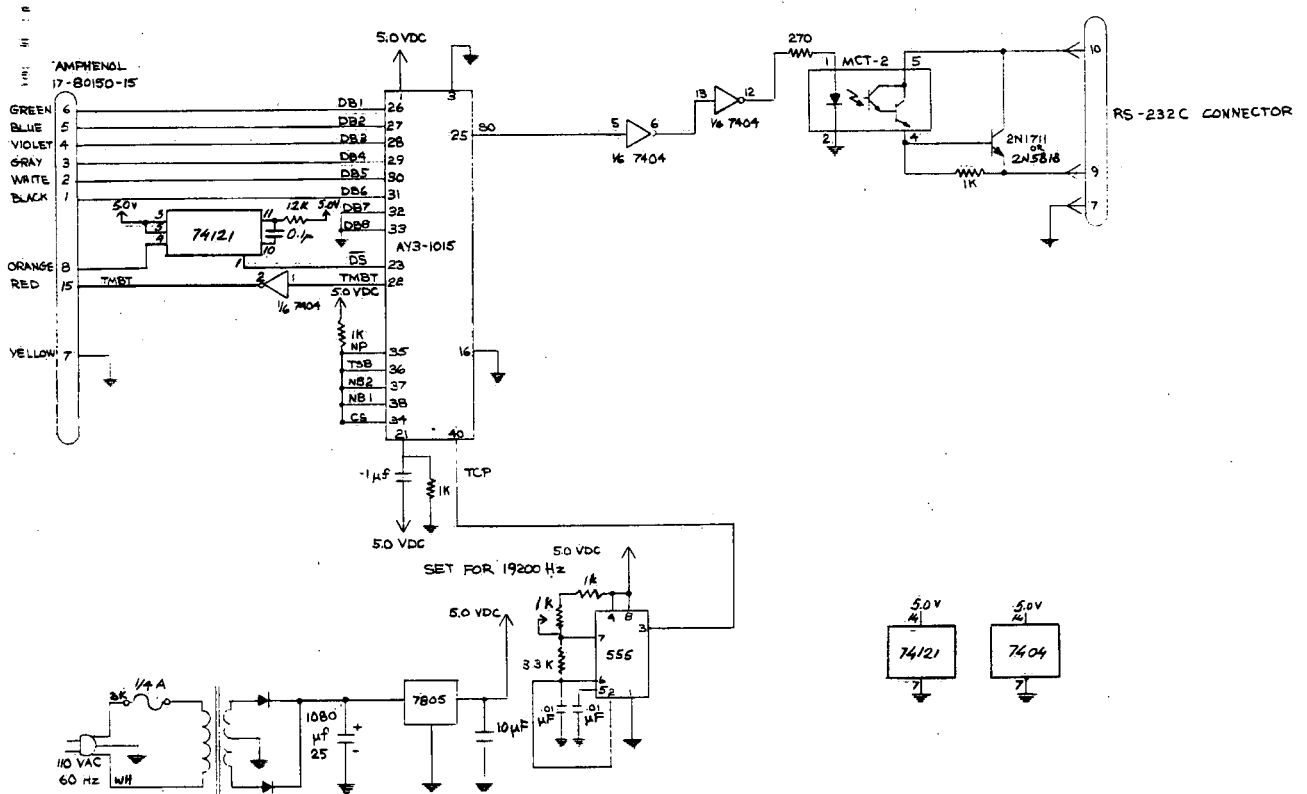
OTHER REQUIRED CHANGES:


- 1) SLOT 2106 : cut trace to PIN K; connect anode of CRI to Logic ground; cut trace between +5V & R21; ground free end R21
- 2) SLOT 2107 : cut trace to PIN 6; ground IC3 PIN 10 (Also IC2 PIN 13)
- 3) SLOT 2108 : Remove C3; replace C4 with a 10µF/25V capacitor; adjust R18 to give 20ms pulse at IC8 PIN 6; cut trace between IC8 PIN 6 & IC7 PIN 4; use single pole double throw foot switch; wire common to J2005-D & J2005-A; wire NC to J2005-B; NO to J2005-C.
- 4) SLOT 2113 : cut traces to PIN 10 & between IC12 PIN 9 & R25; connect PIN 10 to R25.

AWQUALABS:

PE 403 SERIAL DIGITAL COMPUTER INTERFACE

FIGURE 4.4.2. L&F Serializer Schematic (Drawing No. 3864)



 Environment Canada Canada Centre for Inland Waters		Environnement Canada Centre Canadien des Eaux Intérieures	
TITLE AWQUALABS - P.E. 403 L&F ASSOCIATES SERIALIZER			
DESIGNED BY	CHECKED BY	APPROVED BY	
DRAWN BY P.M.	CHECKED BY <i>A. Hamish</i>	DRAWING NO. 3864	
SCALE	DATE 12 1978	SHEET OF	

4.4.2 Perkin-Elmer PE 603 interface wiring

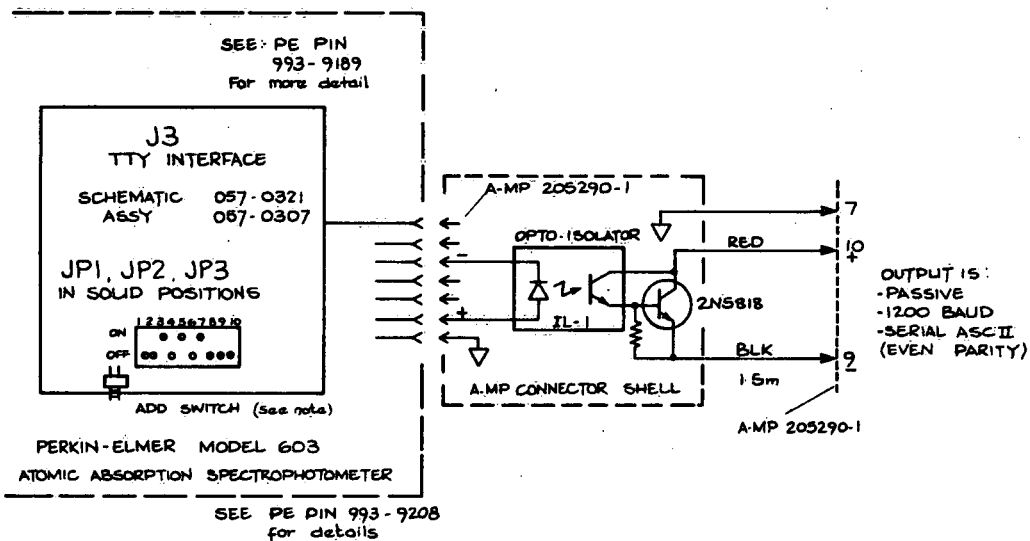
The PE 603 Atomic Absorption Spectrophotometer is a much newer instrument than the PE 403 covered in the previous section. Interfacing of the PE 603 to the AWQUALABS system requires only the installation of PE interface 057-0307, and the addition of an optical isolator in the output connector (See Schematic SKE-7074B.)

Make sure that the switches on the interface card are set up correctly (as shown in the schematic) to provide 1200 baud, 8 bits/char., and no parity.

The only problem with the arrangement is that when the TTY interface is installed, the printer on the PE-603 does not operate. Addition of the switch shown in the schematic allows the use of either the printer or the computer interface, by merely flipping the switch. The switch should be installed in a convenient place on the side or front panel of the instrument.

One other difference between the operation of the PE-403 and PE-603 is that the digital display on the PE-603 does not update when in 'on-line' mode. The analyst must use the analog chart to determine when a peak has been reached.

FIGURE 4.4.3. Perkin-Elmer PE-603 Interface Wiring (SKE-7074B)



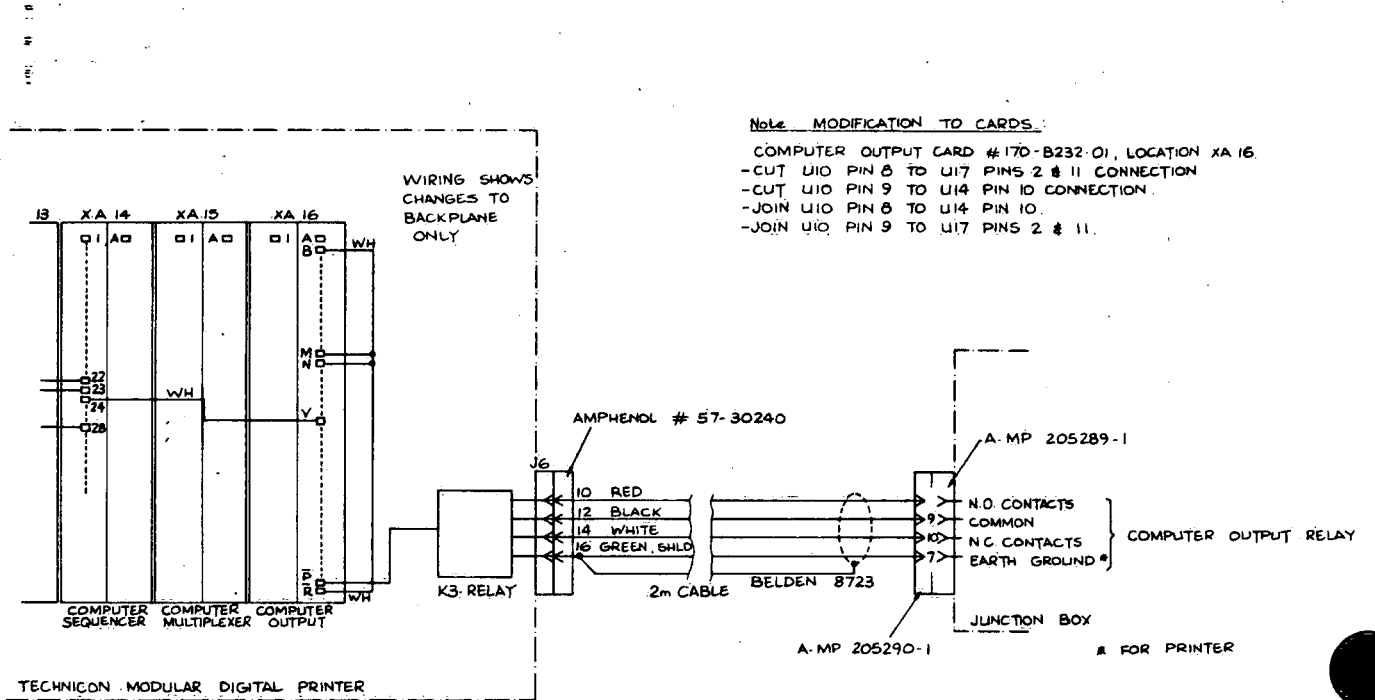
Note: COMPUTER INTERFACE DISABLES OPERATION OF THE 603 PRINTER. TO DISABLE COMPUTER & ENABLE PRINTER PLACE SWITCH IN DOWN POSITION. (MOUNTED IN 3rd POSITION FROM BACK OF MACHINE.)

AWQUALABS:
PERKIN-ELMER 603 SERIAL DIGITAL COMPUTER INTERFACE

4.4.3 Technicon-II modular printer interface wiring

The Technicon II modular printer can be interfaced to AWQUALABS by the addition of a group of three cards called the "Computer Sequencer," "Computer Multiplexer," and "Computer Output" plus a "K-3 Relay." These components provide an isolated 110 baud ASCII interface. The only problem is that the order that the characters are sent out is unreasonable for use with the AWQUALABS system. The output sequence can be changed to a displayable message up to 35 char. long terminated by a <CR>, by making the wiring changes shown in schematic SKE-7059B. Note that changes are required both to the computer output card, and to the instrument back-plane.

FIGURE 4.4.4. Technicon Modular Printer Interface Wiring (SKE-7059B)



Note MODIFICATION TO CARDS:

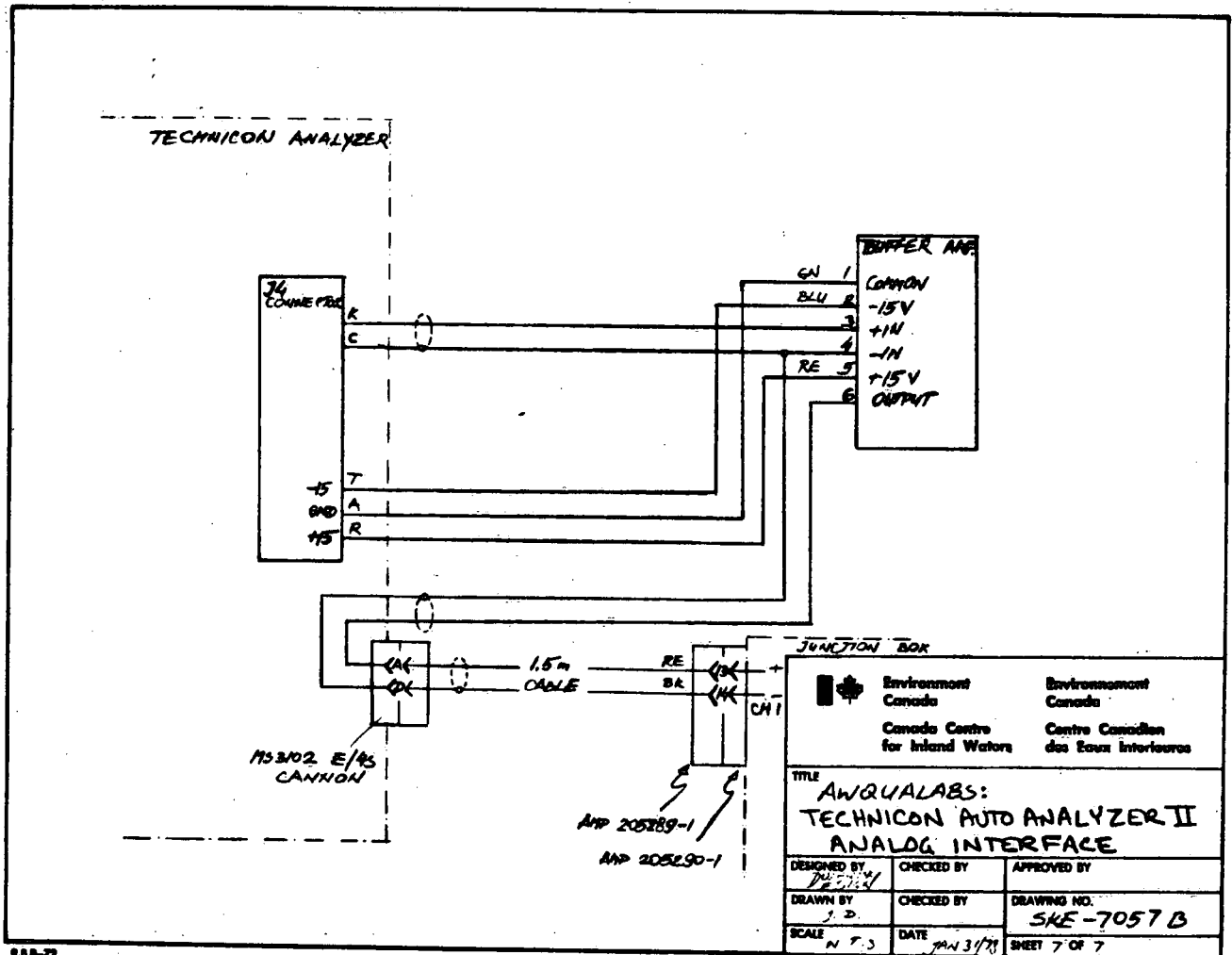
- COMPUTER OUTPUT CARD #170-B232-01, LOCATION XA 16.
- CUT U10 PIN 8 TO U17 PINS 2 & 11 CONNECTION
- CUT U10 PIN 9 TO U14 PIN 10 CONNECTION
- JOIN U10 PIN 8 TO U14 PIN 10
- JOIN U10 PIN 9 TO U17 PINS 2 & 11.

AWQUALABS:
TECHNICON DIGITAL INTERFACE

4.4.4 Technicon-II analog interface wiring

The analog interface is accomplished with an AWQUALABS STANDARD BUFFER AMPLIFIER (SKE-7051A) mounted in the colorimeter housing. The details are shown in Figure 4.4.5.

FIGURE 4.4.5. Technicon-II Analog Interface Wiring (SKE-7057B)

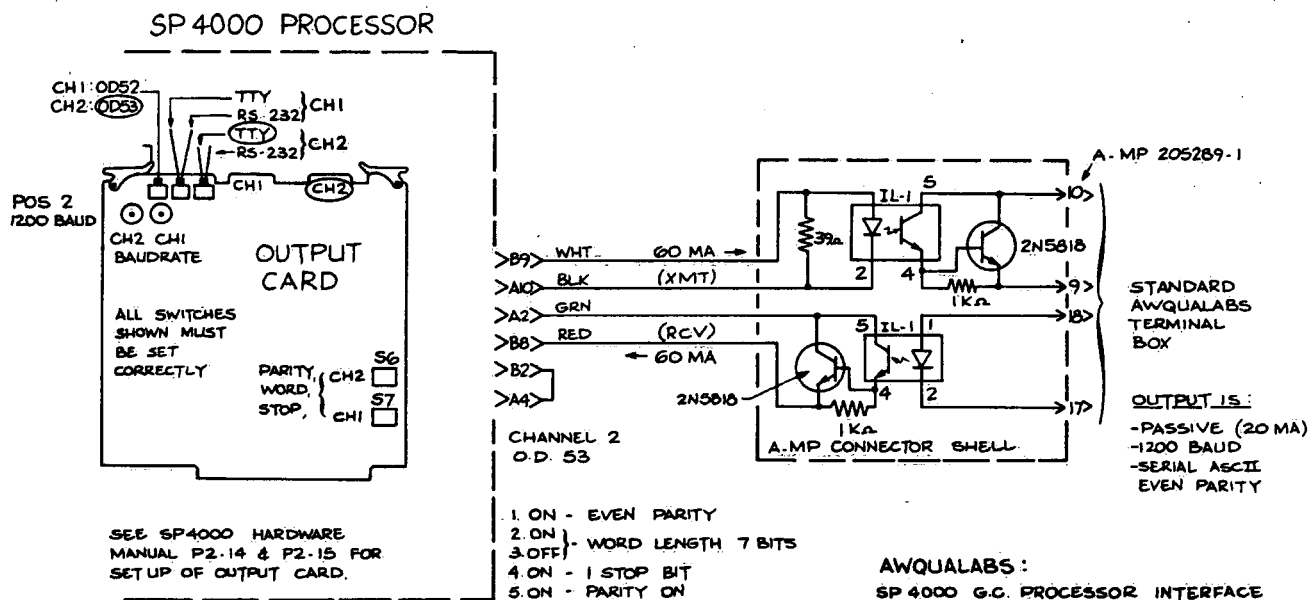


4.4.5 SP-4000 spectra-physics gas chromatograph processor interface wiring

The SP-4000 processor provides serial interfaces for either RS-232C or 60 mA current loop data communications. An adapter, which is conveniently mounted in a connector shell, provides the conversion from 60 to 20 mA, and vice versa, as well as optical isolation. The switch settings shown in SKE-7099B provide a two way link operating at 1200 baud.

A two way link is required in this case since the SP-4000 can be commanded from the remote computer to move its data across the link.

FIGURE 4.4.6. SP-4000 GC Processor Interface Wiring (SKE-7099B)



4.4.6 Carbon analyzer interface wiring

The carbon analyzer actually consists of two separate analyzers. The analog interface to the AWQUALABS system is implemented using two standard buffer amplifiers as shown in schematics SKE-7055B and SKE-7056B.

FIGURE 4.4.7. Beckman Model 865 Interface Schematic (SKE-7055B)

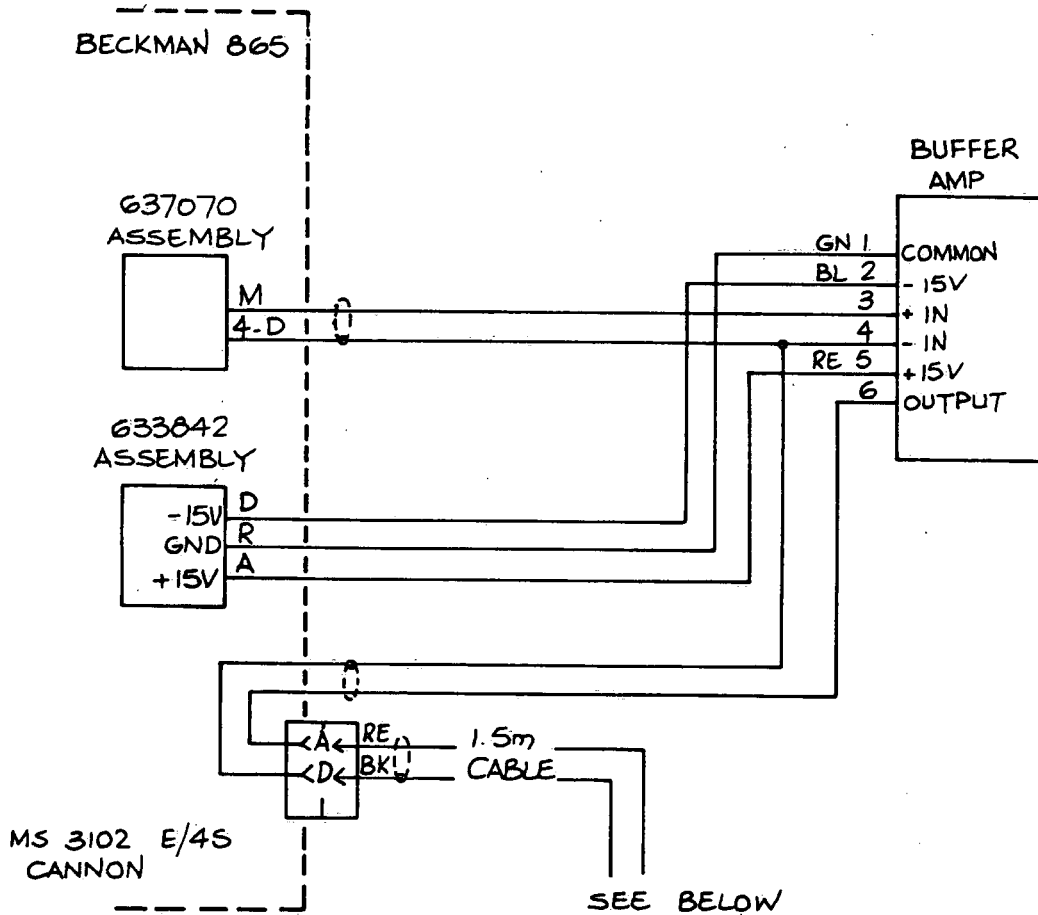
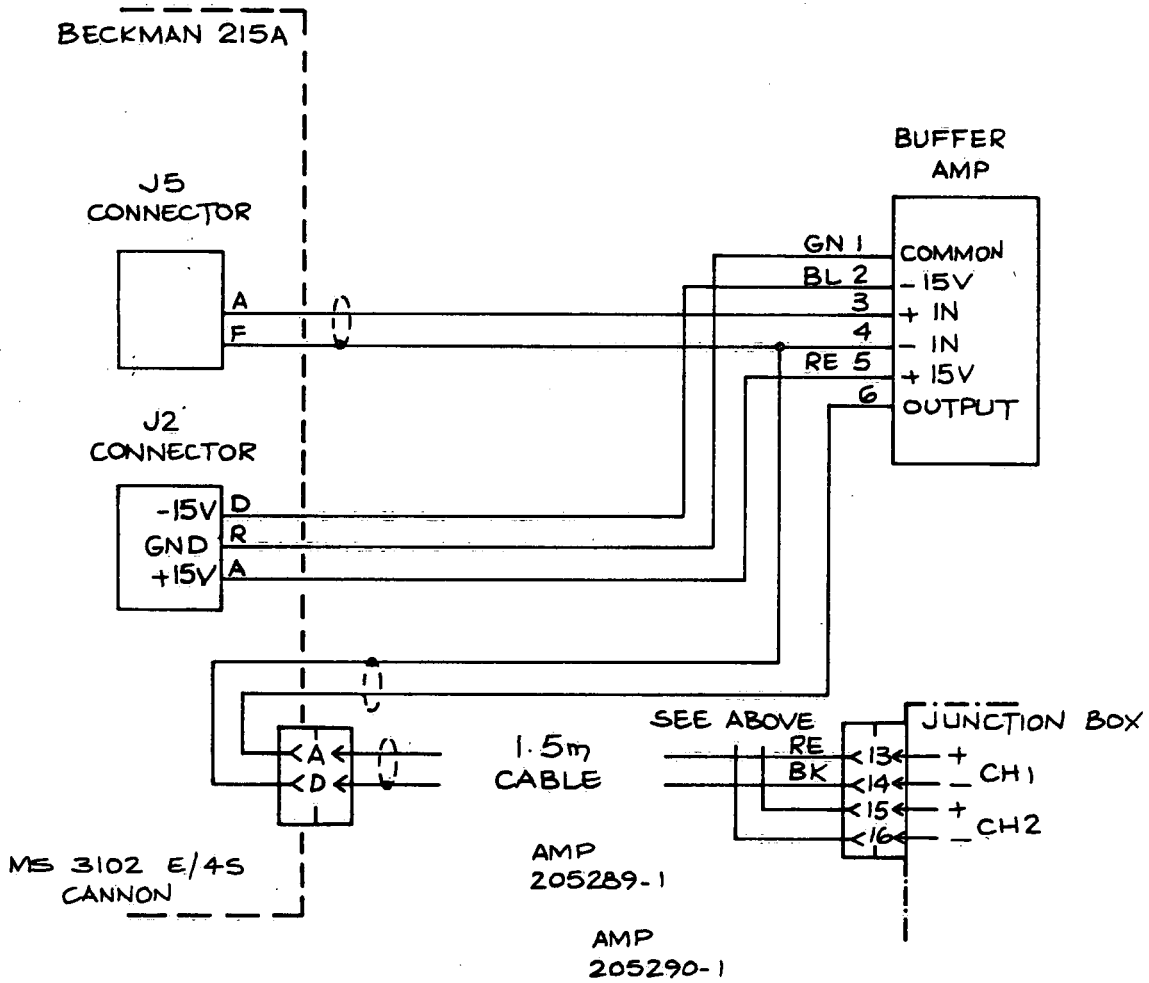


FIGURE 4.4.8. Beckman Model 215 Interface Schematic (SKE-7056B)



AWQUALABS
CARBON ANALYZER

4.4.7 Plasma jet analyzer interface wiring

The ARL Plasma Jet Analyzer is interfaced to the AWQUALABS system via a standard Digital Equipment Communications interface DL11-WA. The interface can be installed in any available quad slot in the Plasma Jet Analyzer computer (A PDP-11/04).

The DL11-WA should be set up with the following characteristics:

Address: 177510 octal
Vector: 000200 octal
I/O Table: Address 144
Content 177515 octal
Baud Rate: 1200 baud
Parity: Disabled
Char. Length: 8 bits
Stop Bits: 1

See the installation manual supplied with the interface for exact details on how to do the set up.

The cable wiring is as shown below:

Berg Connector	Mate-N-Lok	AWQUALABS
J1	8 pin	25 pin
Xmit -ve---> KK >-----blk-----< 2 <--wht-----> 9 >---blu 1		
Xmit +ve---> AA >-----wht-----< 5 <--blk-----> 10 >-N-grn 1 to Rm 702		
Recv -ve---> S >-----red-----< 3 <--red-----> 17 >---gry 1		
Recv +ve---> K >-----grn-----< 7 <--grn-----> 18 >---wht 1		

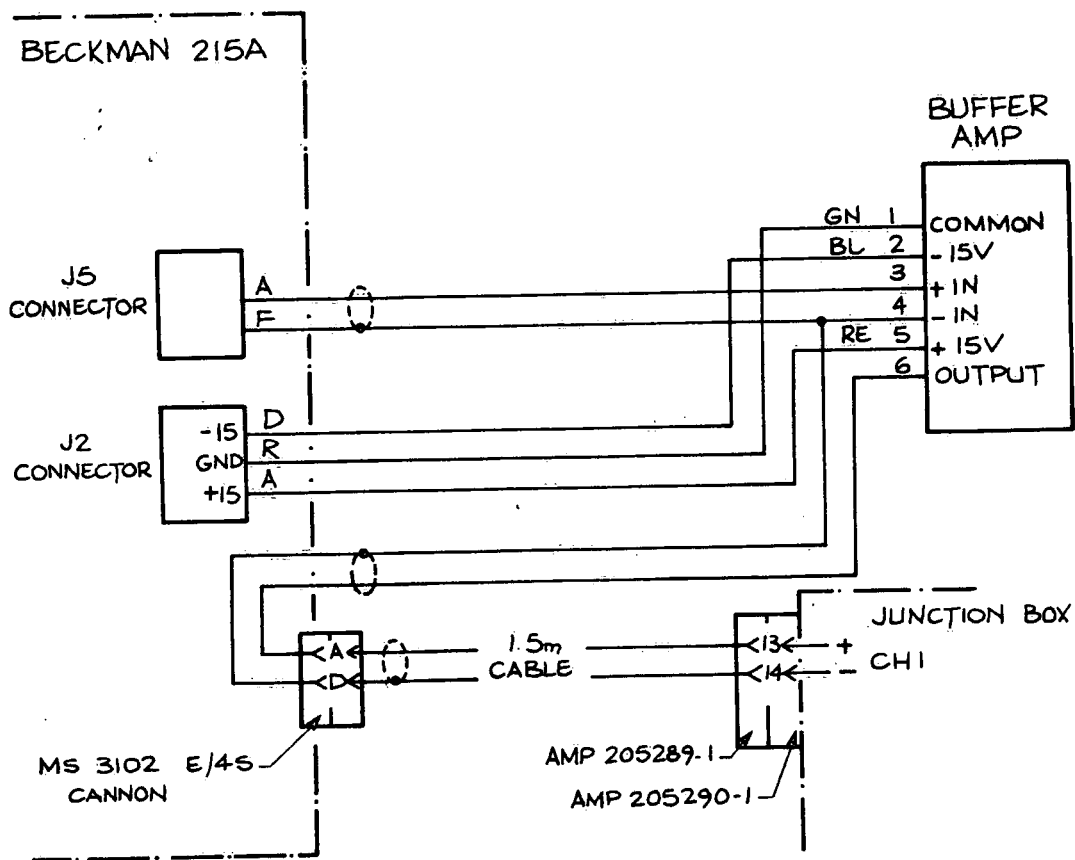
DL11-WA I/F	7008360 Cable	Special
	from Digital	AWQUALABS Cable

Wiring updated 29-Oct-79 EJJ

4.4.8 Total alkalinity interface wiring

The same comments apply as for the Carbon Analyzer in Section 4.4.6.

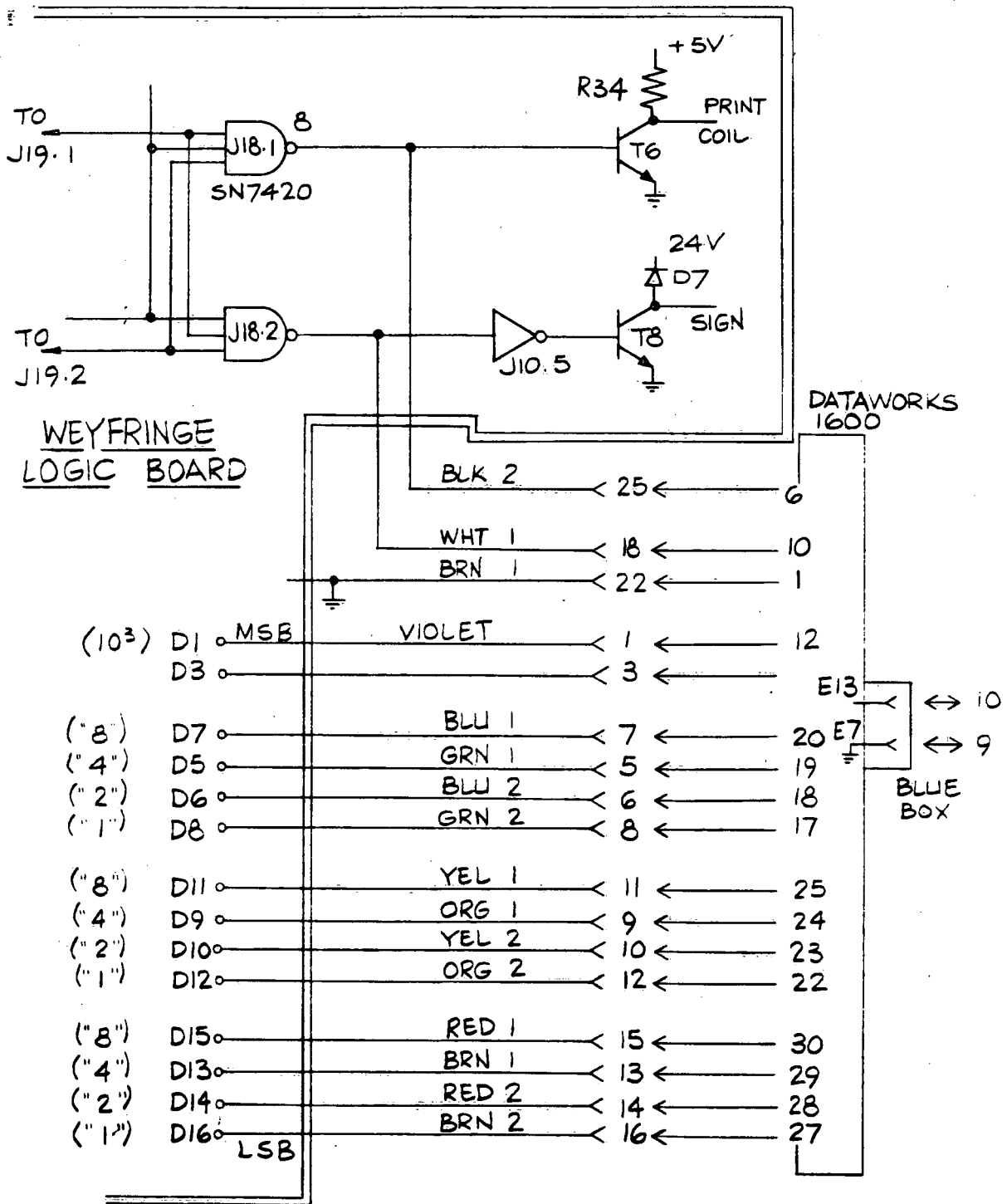
FIGURE 4.4.9. Total Alkalinity Analyzer Interface Wiring (SKE-8042B)



AWQUALABS
TOTAL ALKALINITY -
BECKMAN MOD. 215A

4.4.9 UV Vis spectrometer interface wiring

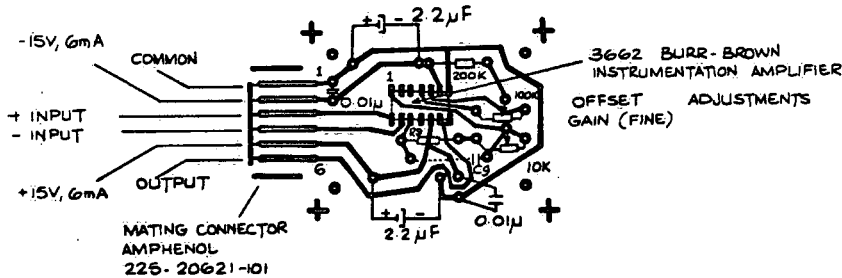
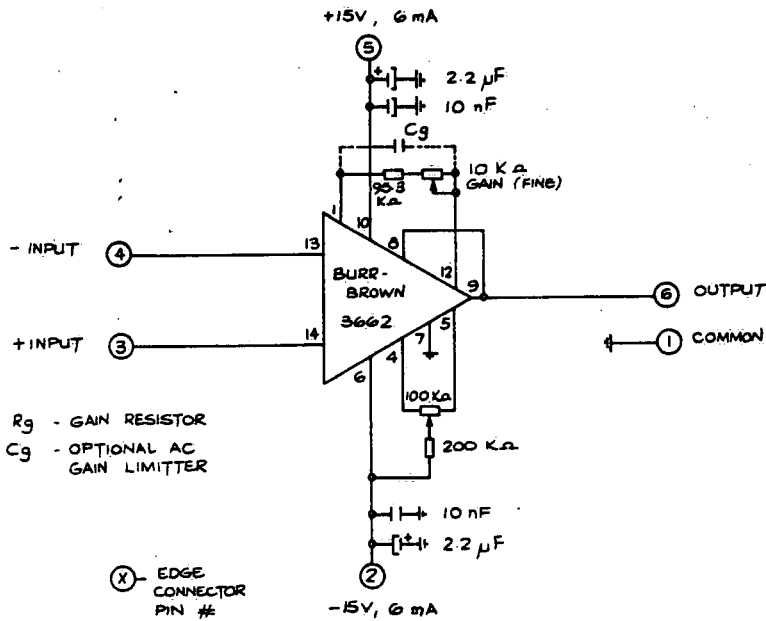
FIGURE 4.4.10. UV-Vis Spectrometer Interface Wiring



INTERCONNECTION OF WEYFRINGE PRINTER TO DATAWORKS COUPLER FOR UV-VIS TO AWQUALABS

4.4.10 Analog buffer amplifier

FIGURE 4.4.11. Analog Buffer Schematics (SKE-7051, 7052)



R_g - GAIN RESISTOR ($G=1/R_g=95.3\Omega$)
 C_g - OPTIONAL AC GAIN REDUCTION
 ALL RESISTORS 1/4W
 ALL CAPACITORS MIN. 20V RATING

AWQUALABS
 BUFFER AMPLIFIER

4.5 Computer Input/Output Assignments

This section describes all the communications input/output related aspects of the computer system. Table 4.5.1 lists the assignment of the analog inputs. Table 4.5.2 details all the significant identifying points for each communications port on the computer. The explanatory notes following the table give the definition of any short forms used. Finally, the standard conventions or colour codes for all cabling in the system is given in Table 4.5.3.

TABLE 4.5.1. Analog Input Assignments

<u>CH. No.</u>	<u>Instrument</u>	<u>Lab</u>
00	Carbon Analyzer (215)	L761
01	Carbon Analyzer (865)	L761
02	Auto-Analyzer (Chan A)	L510
03	Auto-Analyzer (Chan B)	L510
04	Total Alkal.	L745
05-07	Un-Assigned	

TABLE 4.5.2 AWQUALABS: Terminal/Port Assignments

PORT	DIST	PATCH	TP	CABLE	GRP	ROOM	BOX	BAUD	INSTRUMENT	COMMENTS
TT0:	-	-	-	-		L702	-	1200	System Console	
TT1:	M2L0	-	-	-		L735	-	1200	LA-180 Printer	
TT2:	M2L1	-	1/3	L761A	W	L761	A/2	110	AU1 Technicon	
TT3:	M2L2	-	1/2	L761C	W	L761	B/2	110	AU3 Technicon	
TT4:	M2L3	-	1/5	L761D	W	L761	D/2	110	AU? Technicon	
TT5:	M2L4	-	1/6	L761E	W	L761	C/2	110	AU5 Technicon	
TT6:	M2L5	-	2/9	L761F	W	L761	C/4	110	AU6 Technicon	
TT7:	M2L6	-	3/1	L742A	W	L742	A/2	110	AU? Technicon	(Guy's Lab)
TT10:	M2L7	-	1/7	L736A	W	L738	A/2	1200	AA1 PE 403	
TT11:	M1L0	-	1/8	L736B	W	L738	A/4	1200	AA2 PE 603	
TT12:	M1L1	-	2/3	L736C	W	L738	B/2	1200	AA3 PE 403	
TT13:	M1L2	-	2/4	L736D	W	L774	A/1	1200	GC/Mass Spec.	
TT14:	M1L3	-	2/7	L510B	W	L424	A/1	1200	UV/VIS Spectrometer	*
TT15:	M1L4	-	2/5	L768A	W	L771	B/2	1200	SP4000 No. 2	
TT16:	M1L5	-	2/8	L771A	W	L771	A/2	1200	SP4000 No. 1	
TT17:	M1L6	-	2/8	L771A	C	L771	A/1	2400	CRT	
TT20:	M1L7	-	1/1	L732A	C	L732	-	2400	CRT	Rarely Used
TT21:	U1L0	L1	1/9	L752	C	L752	A/1	1200	Decwriter	Samples Receiving
TT22:	U1L1	L2	1/3	L761A	C	L761	A/1	2400	CRT	
TT23:	U1L2	L3	1/2	L761C	C	L761	C/1	2400	CRT	
TT24:	U1L3	L4	1/5	L761D	C	L761	D/1	2400	CRT	
TT25:	U1L4	L5	1/7	L736A	C	L738	A/1	2400	CRT	
TT26:	U1L5	L6	2/3	L736C	C	L738	B/1	2400	CRT	
TT27:	U1L6	L7	2/6	L510A	C	L510	A/?	2400	CRT	
TT30:	U1L7	L8	1/10	L747A	W	L750	A/2	2400	CRT	
TT31:	U2L0	L9	1/4	L761B	C	L761	A/3	2400	CRT	Port Problems
TT32:	U2L1	L10	1/6	L761E	C	L761	C/1	2400	CRT	
TT33:	U2L2	L11	2/9	L761F	C	L761	C/3	2400	CRT	
TT34:	U2L3	L12	1/10	L747A	C	L750	A/1	2400	Plasma Jet Analyzer	
TT35:	U2L4	L13	2/4	L736D	C	L773	-	2400	CRT	*
TT36:	U2L5	L14	3/1	L742A	C	L742	A/1	2400	CRT	
TT37:	U2L6	L15	2/2	L113A	W	L113	-	2400	CRT	J. Dowell
TT40:	U2L7	L16	2/2	L113A	C	L116	-	2400	CRT	J. Hodson
TT41:	LJ1	-	1/8	L736B	C	L738	A/3	2400	CRT	
TT42:	LJ2	-	2/5	L768A	C	L771	B/1	2400	CRT	*
TT43:	LJ3	-	2/10	L745A	C	L745	A/1	2400	CRT	
TT44:	LJ4	-	-	-	-	-	-	-	-	
TT45:	LJ5	-	-	-	-	L702	-	2400	CRT	In Computer Room
TT46:	LJ6	-	-	-	-	-	-	300	-	416-637-4261
TT47:	LJ7	-	-	-	-	-	-	300	-	416-637-4510
TT50:	LJ8	-	-	-	-	-	-	300	-	416-637-4511

Note: See following page for explanation of shortforms.

Explanation of Shortforms used in Terminal Port Assignments

- PORT:** Identity of the communications port in the computer's interface.
- DIST:** Connector or terminal block identification on the DEC supplied H317F distribution panels. Each entry consists of M,U, or L for middle, upper, or lower, plus the actual connector number identified on the printed circuit card.
- PATCH:** This Ln number identifies the line of the patch panel if used.
- TP:** TP identifies where on the three terminal panels, one the front of the green rack, the lines are routed. The location is in the form 'n/m' where n is the panel number, and m is the terminal block number on the panel.
- CABLE:** This identifier is located on the jacket of the cable itself. It usually corresponds to the room where the cable terminates.
- GRP:** Each block on the terminal panel contains two groups of wires (plus intercom) warm (W) and cool (C).
- ROOM:** Identifies the room where the cable terminates.
- BOX:** Each room contains one or more blue boxes, these are labelled A,B,C, etc. Each box contains up to four connectors, which are identified as 1 to 4 from left to right.
- BAUD:** The normal operating speed of the terminal device is given in this column.

TABLE 4.5.3 Colour Codes

DZ11 SGNL.	H317 CON.	PATCH COLOUR	8787 WARM	CABLE COOL	25 PIN CONNECT.	8723 CABLE	TERMINAL WIRING	TERMINAL SIGNAL
REC+	1	YELLOW	ORG	GRN	10	GRN	25	XMT+
REC-	2	BLACK	RED	BLUE	9	RED	21	XMT-
XMT-	3	RED	BRN	GRY	17	BLK	19	REC-
XMT+	4	GREEN	YEL	WHT	18	WHT	18	REC+
-	-	-	drain wire		7	shield	7	sig.grnd.

Patch Panel Colour Codes: (Computer Side)

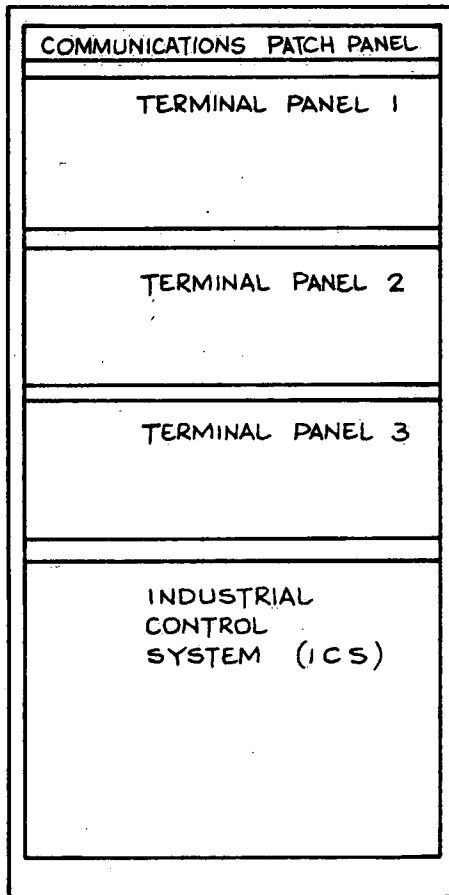
LINE	XMT (from Comp)	REC (from CRT)
1	blu-wht	org-wht
2	grn-wht	brn-wht
3	gry-wht	blu-red
4	org-red	grn-red
5	brn-red	gry-red
6	blu-blk	org-blk
7	grn-blk	brn-blk
8	gry-blk	blu-hel

Note: Base colour is the negative of the signal in each case. The colours are given in the order MARK-BASE.

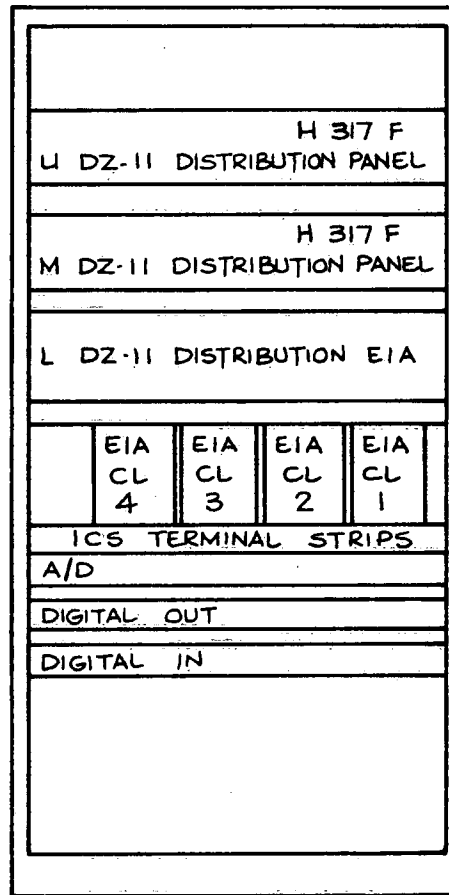
4.5.1 Communications rack information

The following six figures provide the layout and wiring for all the special hardware contained in the computer room L702. Anything which is not mentioned in these figures can be found in the Digital Equipment supplied document set, which is also maintained in the computer room.

FIGURE 4.5.4. Communications Rack Lay-Out



FRONT VIEW



REAR VIEW

AWQUALABS

COMMUNICATIONS RACK LAYOUT

FIGURE 4.5.5. Terminal Panel Wiring No. 1

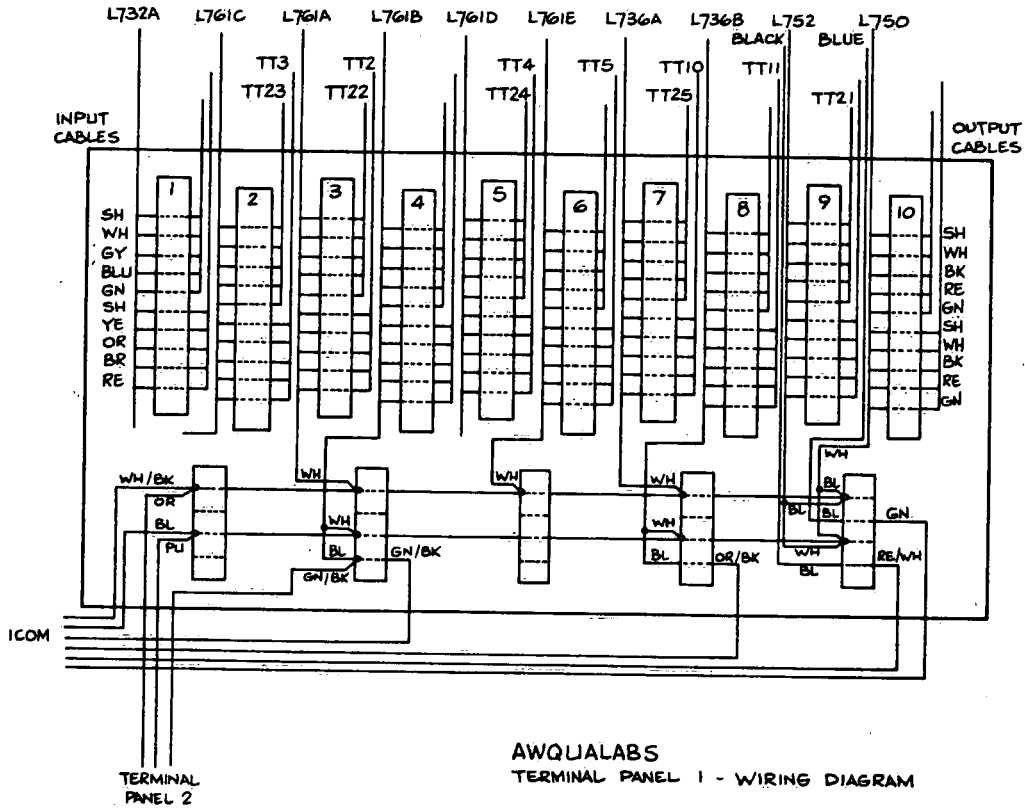


FIGURE 4.5.6. Terminal Panel Wiring No. 2

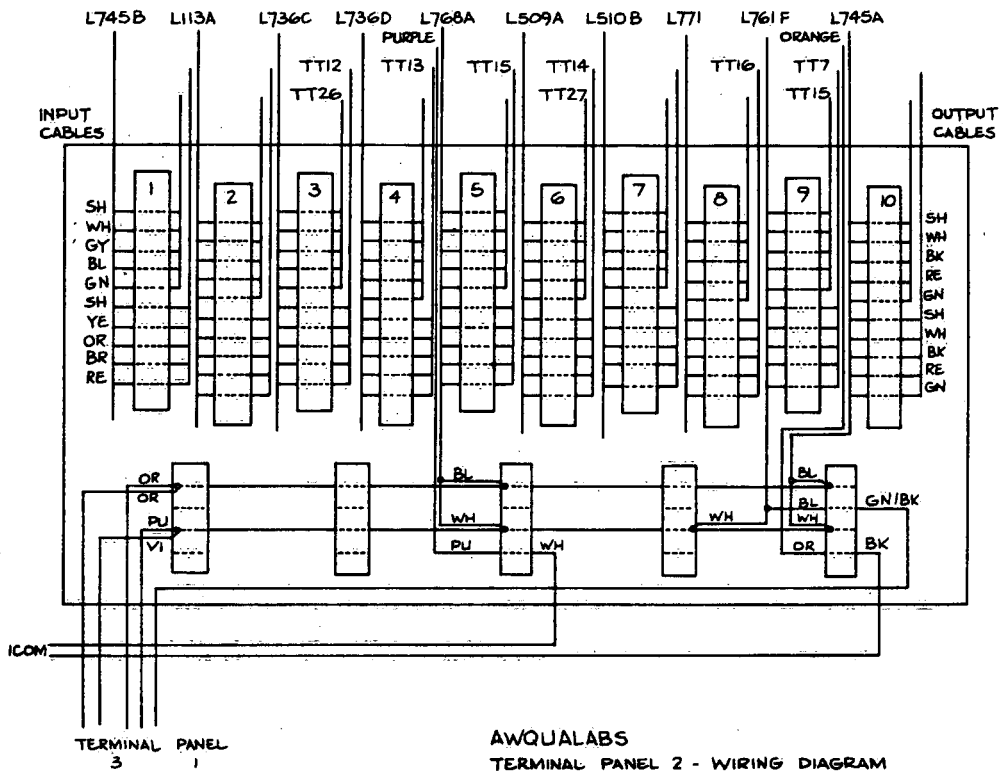


FIGURE 4.5.7. Terminal Panel Wiring No. 3

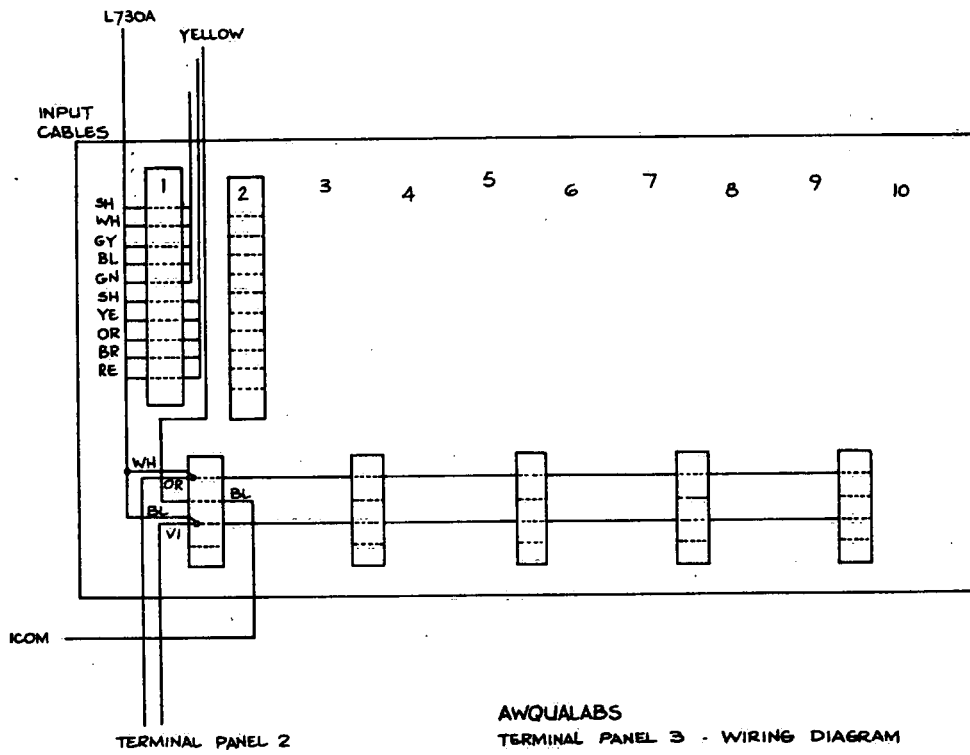
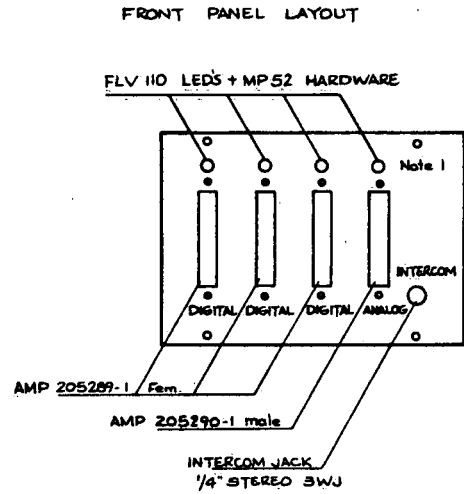
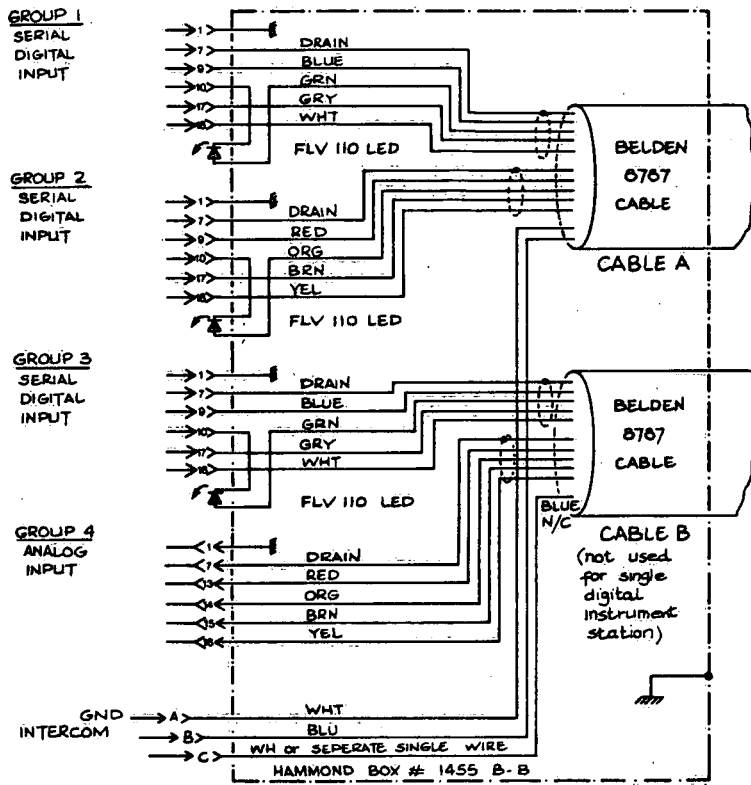


FIGURE 4.5.8. AWQUALABS Terminal Box Wiring



- Note:
1. IF 4 DIGITAL LINES IN BOX, THEN GROUP 4 BECOMES THE SAME AS GROUP 2.
 2. LED NOT PRESENT IF ANALOG INPUT.
 3. IF MORE THAN 2 ANALOG CHANNELS ARE REQUIRED THEN GROUP 2 BECOMES AS GROUP 4.

AWQUALABS
JUNCTION BOX WIRING DIAGRAM



BLACK BOX DATA

8/9/79 BLACK BOX MODELS 101-2 A & P, EIA/LOOP INTERFACES

The 101-2 A/P is provided in two models. The 101-2A is "active" and is to be installed with a passive 20 mA loop device. The 101-2P is "passive" and is to be installed with an active 20 mA loop device.
NOTE: Active 101-2A provides current & passive 101-2P does not provide current - to the loop.

INSTALLING THE 101-2 A/P

Models 101-2 A & P are factory wired for half duplex operation. If full duplex operation is desired (on the RS-232 side), a jumper on the internal printed circuit board must be cut or removed. To modify for full duplex:

- A. Unplug to remove AC power.
- B. Open the unit by removing the four large screws located on the four corners of the face plate.
- C. Find the jumper wire that is located in the upper corner of the PC board. (The transformer is located in the upper left)
- D. Cut the jumper wire.
- E. Replace the cover.

EIA DEVICE:

Connect the RS-232 device to the DB25 connector on the 101-2 A/P.

Active leads are:

- 1 = Chassis ground
- 2 = Transmit data, from the 101-2
- 3 = Receive data, to the 101-2
- 4 = RTS, held high (on) by the 101-2
- 6 = DSR, held high (on) by the 101-2
- 20 = DTR, held high (on) by the 101-2
- 7 = Signal ground

LOOP DEVICE:

Connect the loop device to the 5 conductor cable provided with the 101-2. (This cable is separate from the power cable)

For Full Duplex (101-2 A or P) For 2-Wire Loop, Half Duplex (101-2P only)

Green = chassis ground
Brown = receive +
Black = receive -
Red = Transmit +
White = Transmit -

Green = chassis ground
Brown = short to white
Black = loop -
Red = loop +
White = short to brown

NOTE: Tie brown & white together & use red & black for loop current. Remove internal half duplex jumper in this mode.

EXPANDOR INCORPORATED

400 SAINTE CLAIRE PLAZA • PITTSBURGH, PENNSYLVANIA 15241 • 412/746-2910 • TWX 510-697-3125

AC POWER:

Connect the AC power cord to 115 VAC, 50-60 Hz. A 1/4 amp fuse is located inside the 101-2.

MOUNTING:

A double backed gum tape is provided with the 101-2 A/P to permit semi-permanent mounting to a convenient surface.

CONNECTION DIAGRAM:

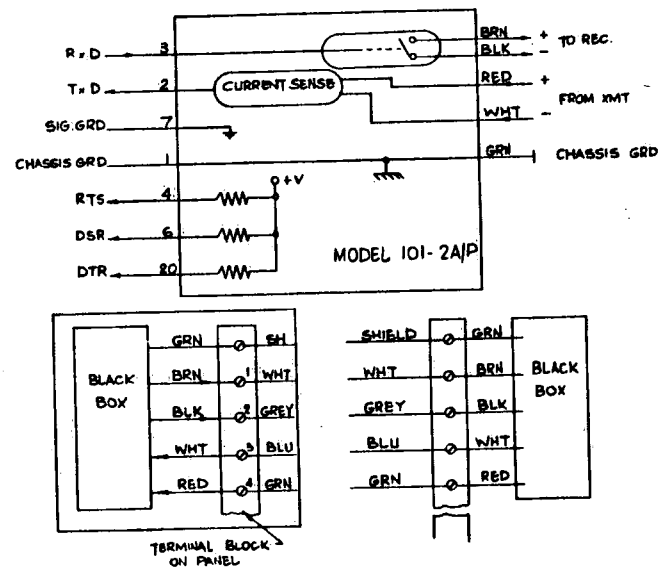


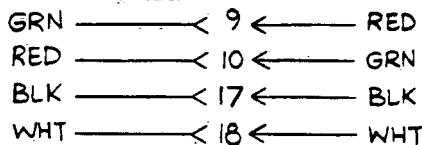
FIGURE 4.5.9. EIA/Current Loop Converter Schematic

FIGURE 4.5.10. Bar-Code Reader Wiring

HAZELTINE TO BAR CODE READER

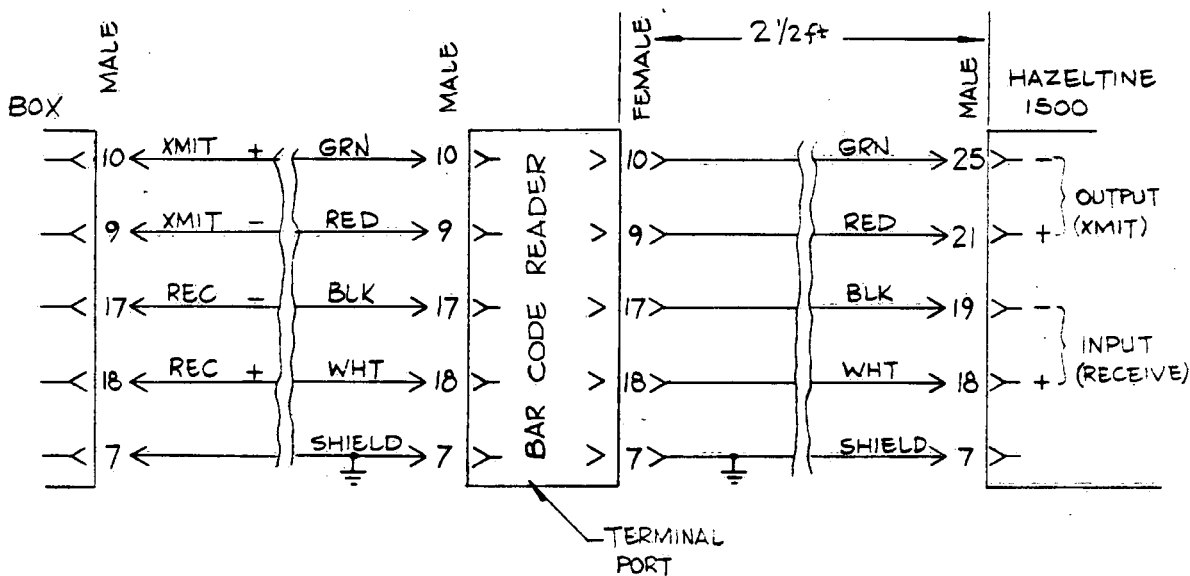
WIRING :

DZ-11
BOX



TO VT50
TERMINAL

USE BELDEN # 8723 CABLE



Bar Code Reader Model 9210 Switch set-up to test with the Hazeltine terminal Model 1500

IN HALF DUPLEX AT 2400 BAUD

SW	1	2	3	4	5	6	7	8
	0	0	0	1	0	0	1	0

Switch set-up to interface to computer at FULL DUPLEX

SW. NO.	12	34	56	7	8
2400 BAUD	00	11	10	1	0
MODEM & TERMINAL					
CR					
ODD PARITY					
REGULAR OPERATION					

15811

ENVIRONMENT CANADA LIBRARY, BURLINGTON



3 9055 1016 7472 8