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Date: 1990

ICL OPD - ONE PER DESK

Issue G/Aug. l990

INTRODUCTION

The OPD computer was manufactured by ICL who badge engineered it as the MERLIN

TONTO for BT and as the COMPUTERPHONE for Telcom. Australia (APT). The 3 models

were released in late 1984/early 1985. A version for North America was produced

in small quantity. The computer resulted from collaborative development by ICL,

Sinclair and BT, with PSION providing the XCHANGE programs. The hardware

skeleton is based on the Sinclair QL. This includes the 68008 CPU, the two main

QL ULAs (Uncommitted Logic Arrays), the method of dynamic RAM (DRAM) and screen

management, the real time clock and the microdrives.

1. HARWARE SUMMARY

1.1 CPU

The main processor is a Motorola 68008P8, 8X16 bit device with a 7.S Mhz clock

and a 1 Mbyte memory address capability. A second processsor, an 8051 in the

modem, controls the keyboard and the communications functions

1.2 MEMORY

The memory map is shown in Fig.1. The main components of the map are:-

1.2.1 RAM

128k DFRAM (2 banks of 64K K 8 bit, using 4164-15 ICs)

2K Battery backed CMOS RAM. (The PERMANENT STORE: a TC5516AP-2 IC).

32k of RAM is allocated to the screen. This, plus standard demands, leaves

approximately 75k of work space [ 150 blocks of 512 bytes ].

128K is reserved for expansion RAM. (To allow a total of 256k of DRAM).

1.2.2 ROM, INTERNAL

128k of Operating System (0S) (4 off 32K x 8 bit ROMs) (16K of Speech

synthesiser ROM is controlled directly by the speech synthesizer IC and is

outwith the 68008's memory map).

64K is reserved for expansion of the Operating System.

1.2.3 ROMPACK, OPTIONAL

160k of ROM (144K XCHANGE + 14k Operating System, five 32K x 8 bit ROMs).

64k maximum in ROM capsules in a 2-slot ROMPACK.

128K maximum in ROM capsules in a 4-slot ROMPACK.

The ROMPACK detail above refers to the OPD as released in 1984, the following

changes subsequently occurred:

i). In 1985 ICL introduced the 4-slot ROMPACK. Space for the 2, additional,

'slots' was obtained by squeezing XCHANGE into 2 ROMs. Version 2.5 of XCHANGE

plus the ICL firmware in the ROMPACK (CALCULATOR etc.) was containd in a 128k x

8 bit PROM (i.e. a 1 megabyte PROM) and a 32k x 8 bit PROM (27256 equivalent).

These devices were the XFAA01 (ICL/PSION - 1M) and XBAJ02 (PSION 256K).

ii). ICL then developed their 128K memory expansion unit (MEU). This had XCHANGE

2.5 in the two PROMs (as above) and a further 8k x 8 bit EPROM (27C64)

containing the test/initialisation routines for the new memory and firmware for

the MEU'S slow RS232 port.

iii). PCML produced their smaller, neater 128k memory expansion, TELESTORE in a

ROMPACK case. This had the test and patch code for the expanded memory, XCHANGE

2.5 and the ICL firmware (CALCULATOR etc.) contained in two PROMs. These were

the XFAA01 PROM and a 27C512 EPROM.

The capsule addresses of the 2-slot ROMPACK are different from those of the

4-slot at ROMPACK 192K is reserved for the 6 capsule addresses of the 2 ROMPACK

types. As a results there is potential to operate the OPD with 6 capsules. PCML

exploit this in the latest version of their TELESTORE which accommodates 6

capsules.

Six capsules, if some are multi-program canbe too much for the standard OS to

accommodate. Appendix 1 shows how to alter the OS to accept a greater number of

ROM programs if the INTERFILE ROMCAP is available.

There is no 'spare' space in the OPD memory map. Space not listed was 'reserved'

by ICL for I/O (Input/Output) and possible future applications. There are,

however, 3 'reserved' 32k slots, that may be available if the address de-coding

of ULA3 is improved and other changes made.

The OPD DRAM REFRESH method is the same as the QL's i.e. there is no separate

REFRESH circuitry. REFRESH is achieved by accessing the DRAM routinely to

generate the VDU screen and for other regular, repetitive proceedures. This

results in delays and a loss of potential memory speed. The OPD has advantage

over the QL because much of the OPD memory is allocated to ROM which is not

subject to the same delays as DRAM.

1.3 MODEM

The modem is a plug-in, BT approved (and designed), dual line,

auto-dial/auto-answer unit based on the ADM7910 IC. The following facilities are

provided:-

1200 bps half duplex, (Bell 202, CCITT V23 mode 2)

600 bps half duplex, (CCITT V23 mode 1)

75/1200 bps full duplex, (Viewdata)

300 bps full duplex, (Bell 103, CCITT V21)

Different modems are available for different operating locations e.g. USA and

Australia. Australian modems have distinctive 4 pin line plugs with the APT

logo. Pulse or DTFM (tone) dialling can be selected by DIL switches in the

modem. The keyboard is inoperable if the modem is absent. Transmission format is

configurable from internal firmware e.g. parity, stop bits, data bits and start

bits.

There is 1 (or 2 depending on the model) ceramic 'sounders' in the modem. The

Ring Equivalent Number (FREN) of the OPD (modem plus telephone) is 1 per line.

The maximum line loading, allowed by BT, to ensure reliable ringing, is REN 4

e.g. 4 OPDs or 1 OPD plus 3 normal phones of REN 1 etc.

A computer access directory with 'search-and-browse', short code dialling and a

profile store is provided in similar format to the telephone directory (1.4

refers).

1.4 TELEPHONE The telephone handset is a standard BT 'Sceptre' type. There is an

8 ohm 250mW moving coil loudspeaker in the control unit but no in-built

microphone. Facilities include 'hands-free' call initiation, loudspeaker call

monitoring, auto-dial from memory or manual dial from the keyboard and store

plus re-call/re-dial of the last 6 numbers used. The directory is capable of

holding 500+ entries but at this level there is little memory left for other

functions. The telephone directory has 'browse-and-search' facilities plus short

code dialling A single screen priority directory can be displayed by the LIST

key and there is a facility to record the cost of calls.

The basic telephone functions for manual dialling are battery backed, allowing

one line to make and receive voice calls if mains power is lost.

1.5 SPEECH SYNTHESISER

This consists of a Texas TMP5220C IC with a vocabulary in a separate, custom ROM

of 152 words, plus letters and numbers. Facilities include limited text-to-voice

conversion from keyboard entry and playback-to-test. Up to 16 messages can be

pre-assembled and 2 used, automatically, by time-of-day selection, for

auto-answer of incoming voice calls. Incoming voice messages cannot be recorded

l.6 MICRODRIVES

There are 2 microdrives each of 100K nominal capacity (95K minimum). They are

not identical to the QL drives in mechanical construction, or operational

protocol, but the blank microdrive cartridges can be used on either machine. An

adjustable 'end-of-life' warning is provided for tape data quality/total number

of seconds used.

[ The OPD micro drives have greater data packing density than the QL but more

space between data blocks resulting in comparable overall capacity. Certain

metal components are replaced with plastic and the amount of lubrication on the

tape has been changed ]

1.7 REAL TIME CLOCK

The clock is the same as the QL except that the start date is l/l/1970 while the

QL start date is l/l/1961. The clock output is displayed in the Notice Board at

the bottom of the screen.

1.8 VDU (Monitor)

The OPD control unit is designed to be permanently powered and to blank the VDU

screen if the keyboard is not used for 10 minutes. Operating any key recovers

the display.

The ON/OFF switch removes full voltage from the monitor, but maintains a reduced

supply to prewarm the tube heater for fast start-up This switch does not affect

supplies to the control unit The intent was that the monitor should be switched

OFF between sessions but the control unit should remain powered for MESSAGING

and other, unattended, functions.

The VDU case contains the mains power supply which is an ASTEC 30 watt SMPS

(Switched Mode Power Supply) card (types AA12630, AA12635, or similar) The

colour monitor has its own power supply but the mono monitor is powered from the

ASTEC card which has the following rating:-

+5 volts 3 to 3.5 Amps

+12 volts 1.5 Amps

-5 volts 0.1 Amps

The power supply can be connected for 115 or 240 volts, both +/- 10% and draws a

nominal mains current af 0.75 Amps.

The 9 inch mono monitor uses a Philip's Chassis and contains an ICL composite

video board. Colour and mono monitors have LED (or neon) indicators for 'Mains

ON' and 'Monitor Power ON' plus a contrast control.

Power supplies and video signals are coupled from the monitor, via a multi-core

cable, to a 15 way D plug on the control unit.

2 VDU options were available when the OPD was introduced:

A 9" white screen unit with levels of contrast matching the number of colours in

a particular screen mode, or a 14" Microvitec colour monitor available in medium

resolution with high resolution as a later option.

Screen Format

The screen format is similar to the QL. It is bit mapped and has 2 modes

selectable from software:-

256x256 pixels, 40 characters per line, 24 lines plus a 2 line 'Notice Board' at

the bottom of the screen. Green, red and blue can be displayed on a colour

monitor, giving 8 shades (contrast levelled plus flashing, on a monochrome

monitor.

512x256 pixels, 40 or 80 characters per line, 24 lines plus a 2 line 'Notice

Board'. Red and green only are available on a colour monitor giving 4 shades on

a monochrome monitor.

In BASIC the screen size available as display for the running program is less

than the gross figures quoted above e.g. in the 512x256 mode the BASIC program

display area is only 480x200.

1.9 PRINTER INTERFACE

This is a single RS423 serial port which is compatible with RS232 for printer

duty. The port consists of a 9 way female D connector on the OPD control unit

(only 3 pins of the connector are used).

The ICL package printer was an OKI thermal, colour printer with a draft printing

speed of 80 cps and 40 cps in NLQ.

Epson RX80 compatible printers are catered for in the software and printer

configuration programs. The normal BT Tonto printer is the Merlin M1880,

described as a standard graphics printer The M1880 appears to be MOA printer

MP1711 (WM80) and to be a Shinwa SP80 badged for BT. The MP1713 (WM100) DMP was

also issued with some Tontos.

The daisywheel printer recommended for the Tonto was the Dyneer DW16.

1.10 BATTERIES

The OPD has 2 batteries: BAT1 is a 9 volt, PP3, manganese battery which backs

the telephone and the Real Time Clock. It is fitted under the microdrive cover

and is user replaceable. The Operating System checks BAT1 voltage during

power-up and under the HOUSEKEEPING function. BAT2 is a 3 volt lithium unit

(with a life of at least 5 years) which backs the PERMANENT STORE CMOS RAM. It

is soldered to the motherboard; is not considered user replaceable and is not

checked directly by the Operating System.

1.11 KEYBOARD

The 73 key keyboard is QWERTY layout with 10 of the keys colour coded to act as

function keys and double as a 'telephone style' numeric pad. The keyboard is

manufactured by ALPS using individual switches of rubber membrane construction.

Keyboards with black QWERTY keys, and a red ENTER key, are export units intended

for Australian. Keyboards in standard OPD/Tonto Colours but with inverted '�'

and '#' symbols, and 3 letter 'telephone' groups on the front faces of the

number pad keys, are thought to be export units for North America. Later

versions of the keyboard have blocking diodes on 5 keys.

1.12 ROMPACK

The ROMPACK included, as an option, XCHANGE in ROM. The original 2 slot ROMPACK

has 5 off 32K ROMs. Later, 4 slot versions, and TELESTORE, use a high capacity

ROM to make room for the additional slots. ROM capsules mount in the slots and

can be 8, 16 or 32K.

+5 volt supplies, address and data buses, plus READ/WRITE and EXTINT lines are

available on the 30 pin 'slot' connectors to allow their use as a simple

expansion ports.

1.13 ROM CAPSULES

The ROM capsules are normally constructed on single sided PCB, with the ROM IC,

a resistor and a supply decoupling capacitor surface mounted, to obtain minimal

capsule thickness. The ROM IC must be de-soldered to remove it.

A capsule's presence is signalled by a link on its 30 way connector which

enables that 'slot's' section of the PLA de-coding (in the ROMPACK). Capsule

ROMs have a specific firmware header which the OS checks at Power-up The System

verifies that the capsule ROM is a valid OPD device and, if valid, 'logs' it

onto the OS. (Detail of capsule construction is given in Appendix 5).

1.14 PHYSICAL PPE5ENTATION

The OPD is made up of 4 units:

Control Unit

Modem

ROMPACK

VDU and Power Supply

The control unit includes the main PCB, 'piggy-back' CPU board, keyboard,

telephone hookswitch, loudspeaker, 2 batteries and 2 microdrives.

The telephone handset is wired directly to the modem. The modem and the ROMPACK

plug into the rear of the Control unit.

The monitor includes the power supplies for itself and the other units.

Sizes

Control unit 440mm x 250mm x 95 mm

Mono Monitor 250mm x 280mm x 280mm

Weights

Control unit 3 kg

Mono Monitor 4.15 kg.

1.15 SPECIAL COMPONENTS

The OPD main board uses the 2 Sinclair QL ULAs (ZX8301 and ZX8302 or

equivalents). Each microdrive uses a QL Ferranti/Sinclair 2GO075ES device. Two

ICL 'ULAs' are employed. One is ULA3 on the main board which controls the non-QL

functions i.e telephone, speech synthesizer, battery backed static RAM etc. The

second ICL 'ULA' is the PLA device for address de-coding and interfacing in the

ROMPACK.

[ 5 types of ICL PLA have been identified:

KVAB02 - Standard 2-slot ROMPACK

KVADO1 - Standard 4-slot ROMPACK

KVAE01 - MEU

KVAG01 - MEU

KVAL01 - TELESTORE 4-slot

The 4 and 6 slot TELESTORE use a PCML CMOS PLA ].

The Texas vocabulary ROM is an OPD special. The modem uses six thick film,

hybrid circuits. Excluding Capsules there are ten ROM ICs in an original OPD

with XCHANGE. Identified ICL ROMs are listed in Appendix 3.

2. FIRMWARE

The design concept was that, for ease of operation, fast loading and

optimisation of the relatively small RAM, the major applications programs would

be provided in ROM. This was in keeping with the targeted, non-technical

executive market. The intent being that the OPD would not rival a desk-top PC

for general computing. The following ROM firmware was produced for the OPD:

2.1 OPERATING SYSTEM (OS)

The OS is an ICL multi-tasking 'special'. up to 5 tasks can be run concurrently.

It is not QL QDOS nor is it an industry standard which can take advantage of

existing software. The OS is contained in 4 X 32K ROMs on the CPU board. A

further 14K is carried in the ROMPACK. ICL called the OS 'BFS' (Basic Functional

Software)

The following make up the BFS:

KERNEL - manages the hardware, the memory map, input output device control, and

also handles interrupts.

DIRECTOR - is higher level firmware handling applications and the telephone. It

controls START, RESUME and REVIEW key functions and allocates resources.

TELEPHONE HANDLER - manages the 'nuts and bolts' of telephone usage.

TELEPHONE DIRECTORIES - 2 directories are managed, one for telephone voice calls

and one for computer services. CALCULATOR - A simple 16 digit calculator with

memory. (CALCULATOR firmware is in the ROMPACK).

SCREEN IMAGE PRINTER - A screen dump to printer on a single keystroke.

FIELD EDITOR - provides cursor and text editor control.

2.2 XCHANGE

The PSION standard package (Quill - word processor: Archive - database: Easel

business graphics and Abacus - spread sheet) is provided in ROM, as an option,

and mounts in the ROMPACK. Version 2.5 was in service by mid 1985 but surplus

units are generally the earlier version 2.3. On entering XCHANGE from the

APPLICATIONS menu the version number is displayed. In general the 2-slot

RROMPACK has version 2.3 and the 4-slot ROMPACK, TELESTORE and the MEU have

version 2.5.

2.3 DATALINK (BT Reference M1824)

A single capsule introduced to overcome, in part, the isolation of the XCHANGE

programs from the communications facilities. It allows incoming communications

data (from a computer service or mainframe) to be imported, 'via microdrive', to

XCHANGE. It also allows QUILL format files to be exported, 'via microdrive', by

the communications facilities of the OPD.

2.4 MESSAGING (BT Reference M1821)

A single capsule which provides desk-to-desk text messaging between OPDs;

unattended receipt; auto-send; dump to microdrives and a print or resend option.

2.5 ADVANCED MESSAGING (BT Reference M1822)

An expansion of MESSAGING which occupies 2 capsule slots, providing all the

facilities of Messaging plus auto-retry; multiple addressing and an interface

facility with EXPORT format files.

2.6 INTERFILE (BT Reference M1823)

Occupies 1 capsule slot allowing file transfer from OPD-to-OPD via the modem.

Facilities include auto-retry and transmission at pre-set times. The INTERFILE

ROM includes 'patch' code to permit more than 6 ROM applications to be connected

to the OPD at the same time.

2.7 ICL-LINK

Occupies l capsule slot, allowing communication with ICL mainframe computers and

emulation of a full XBM Screen Mode Terminal. ICL-LINK requires a Desk Terminal

Connection Unit (DTCU) for the link interface.

2.8 VT-LINK/VT-LINK 2 (BT References M1825/M1826)

Occupies 1 slot and provides terminal emulation for communication with Digital

Equipment Corporation (DEC) VT series computers. VT-LINK covers VT52 and VT100

emulations. VT-LINK 2 covers the VT52, and VT102. Its manual states it also

covers VT100. VT-LINK 2 includes an improved printer configuration program

CONPRIN allowing condensed 132 column printing in some applications. This

CONPRIN can conflict with the disk based CONFIGURATION programs supplied for

TELEDRIVE.

2.9 ILLUSTRATOR EGO (Executive Graphics Option)

Occupies 1 capsule slot, allowing connection of an QPD to an ICL mainframe (via

ICL-LINK, and a DTCU ) to view professional graphics on the OPD. Graphics may be

viewed and stored on microdrive but cannot be altered or edited by the OPD.

2.10 COMBINED COMMS.

Combines the functions of ICL-LINK, VT-LINK and TERMILINK in a single capsule.

2.10.1 ICL-LINK is for general ICL computers, providing emulation of a full XBM

Screen Mode Terminal. It requires a Desk Terminal Connection Unit for

interfacing.

2.10.2 VT-LINK provides terminal emulation of the DEC VT52 and VT100.

2.10.3 TERMILINK provides terminal emulation for the ICL 6402 and 6404 QUATRO

series desktop computers.

COMBINED COMMS. is incompatible with VT-LINK 2. If both are fitted to the

ROMPACK at the same time the OS will log-on only the VT-LINK \* program with the

lowest memory address. (Both programs have the same name viz ~DD).

2.11 DB-LINK

A Capsule from MGB Micro Products which allows the OPD to auto-log-on and

auto-answer when used in conjunction with the MGB Dialback Security System.

2.12 MGB-LINK

A capsule from MGB Micro Products including all the facilities of DB-LINK plus

the ICL-LINK terminal emulation package (2.7 refers).

2.13 ACTION DIARY 2

An upgraded version of ACTION DIARY from Satellite Computing

2.14 ROLLAPAGE

A computer access page store with enhanced facilities including archiving,

organising and merging of stored pages and self-running displays.

2.15 BASIC TELEPHONY INTERFACE

A Satellite Computing Romcap linking Basic programs and the telephone.

2.16 PRESENTER

A Satellite Computing Romcap providing a graphics display system for producing

transparencies and designing, and running, flipchart style presentations using a

rolling, on-screen display.

2.17 C COMPILER and ASSEMBLER

A 3 capsule set from Computer One was scheduled for release in mid-1986. The

Compiler was in 2 capsules and the Assembler in one. These were to be supplied

with a 4-slot ROMPACK containing XCHANGE with QUILL being used to prepare and

edit programs.

2.18 BASIC COMPILER and INTERPRETER

This also was from Computer One and intended for release as a special ROMPACK

assembly. XCHANGE was not available with this ROMPACK but the system included an

editor for program preparation.

3 ICL SOFTWARE

3.1 ICL OPDBASIC (BT MERBASIC Reference M1851)

BASIC is not resident in the OPD. It is loaded from microdrive and is a subset

of Sinclair QL SuperBASIC. It lacks SuperBASIC features especially graphics. (In

multi-tasking, there is insufficient memory to store several complete graphics

screens and recall them with the RESUME and REVIEW keys).

ICLBASIC was intended as a high level bridge to QL software but, as such, it has

limited capabilities. BASIC version 07 was available in 1986. The version in use

can be displayed by the PRINT VER$ command. The early Basic versions included

features which were discontinued in later versions e.g. Ver. 5.02 includes

Tokenised SAVE and PUBLISH commands TK\_SAVE and TK\_PUBLISH respectively. These

allow Basic programs to be saved in a coded form with a table of keywords and

commands. This increases the length of small and medium files but can reduce

programme loading times by factors up to 3.

The BASIC cartridge contains the factory-set default values of the PERMANENT

STORE plus configuration programs for the OPD, the printer and the telephone

(CONFIG, CONPRIN and CONTEL respectively).

[ Unlike the QL the OPD ROM and cartridge formats are similar making it possible

to transfer the ICLBasic interpreter to EPPOM. The file length of version 05

BASIC is approximately 38K. Version 07 is shorter ].

3.2 ICL WELCOME (BT Reference M1850)

This cartridge was supplied as part of the WELCOME package to provide

information and to demonstrate the equipment's capabilities to the new user.

3.3 ICL/PSION - HELP (BT Reference M1854)

HELP files for the XCHANGE programs are provided as a microdrive cartridge.

3.4 ICL - DEMO (BT Reference M1853)

A demonstration program for XCHANGE including a '.dbf' file on geography for

working through ARCHIVE.

4. REVIEW CPITICISMS

These relate to the OPD as released in 1984. The references in brackets refer to

subsequent introductions of hardware, or software, to correct, or reduce, the

identified deficiency.

4.1 Serious memory shortage and fragmentation of the available memory as the

work session proceeds.(5.1 and 5.2 refer).

4.2 PSION XCHANCE is not integrated with the Operating System. QUILL cannot

access the modem or the real time clock etc.. (2.3 refers).

4.3 BASIC is not in ROM and has to be loaded from microdrive, absorbing scarce

PAM. (Memory expansion of 5.1 and 5.2 refer; see also the note in 3.1).

4.4 Multi-tasking is limited by memory shortage and the Operating System e.g.

in-coming telephone calls can abort Operations in progress such as microdrive

formatting. (Memory expansion of 5.1 and 5.2 refer).

4.5 The Operating System is an ICL 'special', So preventing the use of standard

software. (The CP/M facilities of 5.2.1 refer).

4.6 ICLBasic is a curtailed subset of Sinclair SuperBASIC but is not compatible

with it e.g. ICLBasic does not include SuperBASIC graphics such as LINE, CIRCLE

and ARC.

4.7 The standard mono monitor is not of high quality. It has no brightness

control, in consequence, the display can be difficult to optimise. (The optional

colour monitors provide an improved display and are preferred by most business

users).

4.8 PSION XCHANGE, in ROM, is not fully developed and is inflexible regarding

update and improvement by third party software e.g. QUILL cannot be modified for

spelling checkers and cursor acceleration programs such as SPELLBOUND, FILEBOUND

and TURBOQUILL+ while ARCHIVE cannot save the faster '\_pro' programs.

4.9 The numerical routines for access by menu, together with the hierarchical

menu structures, are cumbersome and lack mnemonics or similar logical features

to help the operator remember them.

4.10 The keyboard has a number of multi-function/shifted keys; some keytops

having 3 legends.

4.11 Device names, such as the microdrives, change between normal OPD operation

and operation in BASIC.

4.12 An OPD (with 4 ROM capsules) can have over 400K of firmware in ROM (14 ROM

ICs). This yields benefits in speed and simplicity of operating but up-dating to

later, improved versions of the firmware can be expensive when PROMs rather than

re-programable EPROMs are used i.e. new ROM devices have to be obtained and the

old devices discarded. [ In general early OPDs used EPROMs but the bulk of the

main OPD production used PROMs. ]

4.13 Many of the OPD functions have a raw, unfinished feel as if they needed

refining to reach release standard.

5. HARDWAPE EXPANSION

The OPD was not provided with a dedicated expansion port. The ROMPACK connector,

or a ROMPACK capsule slot, is used to link expansion hardware to the internal

circuitry.

The connector on the main board, for the ROMPACK, (J5) is provided with a

variety of interface connections which are not used by the ROMPACK (or fed

through it) but can be used for comprehensive expansion if the ROMPACK is not in

place. The socket pin-out is shown in Fig. 2.

5.1 MEMORY EXPANSION

The memory map makes provision for only 128K of RAM expansion (256K total DRAM).

A disk interface can include more RAM, generally in RAMDISK configuration, by

incorporating a dedicated processor to manage the RAMDISK and the disk drives

yet absorbing no more than one 32K slot on the OPD memory map.

5.1.1 MEU

ICL developed a 128K Memory Expansion Unit (MEU) [sometimes called a Store

Expansion Unit (SEU)]. This was intended to be the main unit of an ICL expansion

system. It had a slow RS232 port (for bar code reading, printers etc.), 4

capsule slots, a RESET button and a 60 pin expansion port. The MEU was large,

approximately 10.5"x 7.2"x 1.5". The case was steel with a plastic overcover.

Connection to the OPD was via a 6 inch length of ribbon cable and a modified

ROMPACK case containing line drivers and receivers.

The MEU memory duplicates the basic arrangement in the OPD and is controlled by

a ZX8301 with a 12Mhz crystal. The address lines to the ULA are modified to

position the memory at the expansion addresses. Two 74HCT2S7s provide DRAM

address multiplexing and a 74HCT245 acts as the data bus transceiver. The memory

itself uses four 256K DPAM ICs (81464 devices, each 64Kx4 bit).

The serial port is based on the RCA CDP65C51E1 IC with a 1.8432 Mhz crystal.

XCHANGE version 2.5 is provided in two PROMs. A third ROM, a 27C64-25 EPROM,

carries firmware to initialise the new memory and service the RS232 port.

Two PLA devices provide the overall addressing and interfacing. The MEU design

was bulky and expensive. When PCML produced the smaller, cheaper TELESTORE, ICL

terminated the MEU and adopted TELESTORE as the official memory expansion for

the OPD.

5.1.2. TELESTORE

The PCML 128K memory expansion, TELESTOPE, fits into a ROMPACK case. The

original version had 4 'slots' plus version 2.5 of XCHANGE. A later, 1987

version, was built into an extended case and accommodated 6 capsules (in single

line outwards from the case).

PCML designed the TELESTORE with a fairly standard ROMPACK base board plus a

'piggy-back' board containing the extra memory. Unlike the standard ROMPACK the

main components are soldered into the board to cut down height and allow the

assembly to fit into the standard case. The 'piggy-back' memory board is mounted

on a 34 way, in-line header strip.

The 128K memory is 4 off 4464 ICs (64K x 4 bit each), controlled by a Toshiba

TC17G014AP-12 CMOS gate array which is custom programmed and uses a 12 Mhz

crystal. The 'piggy-back' board also contains two 74HCT257 address multiplexers

and a DIL resistor network.

The base board contains 2 PLA devices, buffers and XCHANGE 2.5 in two ROMs. The

ROMs are the ICL/PSION XFAA01 and a 27C512 EPROM containing the remainder of

XCHANGE plus the initialisation firmware for the extra memory.

Both the MEU and TELESTORE included special initialisation and checking firmware

for the memory expansion. When an OPD is powered-up with TELESTORE (or the MEU

connected) the screen displays that an 'Invalid Capsule' is present and

HOUSEKEEPING shows the standard free store capacity of about 150 blocks. The

special initialisation routine then checks and logs-on the new memory and the

updated HOUSEKEEPING Store Report shows the increased memory of about 400

blocks. This extra process takes about 15 seconds and does not cause

illumination of the line LEDs, as in the normal initialisation.

5.2 DISK DRIVES

5.2.1 Computer One

Computer One supplied disk drives and an interface. This consists of a inverted

'L' shaped interface which plugged directly into a ROMPACK slot. The interface

connected via a 34 way ribbon cable to a standard disk drive unit with an

internal torroidal transformer power supply.

The circuit was a relatively standard 10 IC arrangement built round a WD1772 IC.

The disk unit could have 1 or 2 x 3.5 inch DS/DD drives (720K formatted

capacity/drive) or, optionally, 5.25 inch drives could be provided. The disk

format was claimed as MSDOS but a single sample of the interface was tested. It

would not read standard 3.5 inch disks from PCs or the TELEDRIVE neither would

the interface write to disks formatted on other MSDOS machines. Similarly PCs

and PC compatibles could not read disks from the interface.

The interface failed to gain the acceptance achieved by TELEDRIVE and is no

longer advertised.

5.2.2 TELEDRIVE

As an extension to their previous work on QL disk interfaces, PCML developed

TELEDRIVE, a dual, 3.5 inch disk drive unit with 720K per drive formatted

capacity and a MSDOS operating system. The use of MSDOS allows TELEDRIVE to

exchange disks with PCs; see Appendix 4. The unit has 256K of DRAM (part of

which can be configured as RAMDISK) and its own HD64180 (CMOS Z80) processor. It

connects to the OPD via a ROMPACK capsule slot, is self-powered by a linear

power supply and has provision to accept a further two external, Shugart

compatible drives.

Two RS232 ports for computer to computer communications were intended for later

versions but no sign of this facility has been seen in the field. In 1986 PCML

intended to expand further to include a 10Mb hard disk with a SASI interface.

The status of this is unknown.

[Part of the 256k of memory is required to service the interface. l80K. remains

available for RAMDISK but this reduces to 72K if CP/M is running.]

The overall size is 10.6" long x 4.3" x 4.1" .

To run the late issue PCML disk programs and CPM the 27256 TELEDRIVE EPROM must

be Version 2.0 or later. CP/M is not an emulation but CP/M running concurrently

on the TELEDRIVE CPU.

Early model TELEDRIVES had a weakness in their power supply which could allow

some disk drives to pull the 5 volt rail to-the electronics below acceptable

operational limits. This caused the two disk drives to run simultaneously and

lock in that condition. The fault can corrupt data on the disks and in extreme

cases disk and drive damage can occur.

Three PCML software packages were produced for the TELEDRIVE:

5.2.2.1 CP/M OPERATING SYSTEM

This allowed CP/M+ (version 3.0, 56K TPA) to be run on the OPD, via the disk

drive, and so take advantage of CP/M commercial and public domain software. The

CP/M system includes two disks; a LOADEP and a the CP/M system disk. The

pre-release version provides three CP/M disk formats (Superbrain, QX10UK and

QX10US). This allowed import of programs from other CP/M machines. The QX10

formats were allocated to drives C and D. To implement their use extra drives

had to be provided or the internal selection links altered in drive B.

On the final CP/M version the system disk contains programmes to import and

export files between the normal TELEDRIVE MSDOS format and CP/M. This permits

program material to be provided from PD libraries, or similar, on standard MSDOS

3.5 inch disks.

5.2.2.2 TELETOOLKIT

A general utilities disk for inspecting and altering the content of files. The

later versions of TELETOOLKIT included improved versions of the configuration

programs.

5.2.2.3 TELELOADER

Allows the standard top level menu to be replaced by a menu offering up to 20

applications.

5.3 DATA COMMUNICATIONS ADAPTOR (DCU) - BT Reference 1887

This was provided for the Tonto by BT. It connects via a ROMPACK capsule slot,

is powered from the OPD and provides outputs (via a 25 way, female D connector)

which are compatible with RS232C, RS423 and CCITT V24 standards. Emulation of

the following terminal types is possible: DEC VT52 and VT100 (80 column mode

only) and IBM 3278 via a suitable protocol converter. Baud rates from 50 to 9600

can be configured from software. 2400 is the recommended rate.

5.4 ASYNCHRONOUS COMMS. UNIT (ACU)

The ACU was designed, by ICL, as part of the MEU expansion system and offers

speeds of up to 19200 bps by, optionally, by-passing the OPD's integral modem,

so allowing high speed communication and networking under control of one of the

terminal emulation programs. Canadian Standards and ULA approvals were obtained

and the unit was still available from ICL, in early 1988.

This unit's program is called a LOCAL COMMS. CONFIGUPATOR and allows profiling

of port parameters and operation by ACU or by modem. The ACU was designed to

compliment the MEU, was contained in a steel case approximately 4.5"x 10.5"x

1.5" and powered from the OPD, either direct from a ROMPACK slot or,

alternatively, it could sit on the MEU fed from that unit's 60 way expansion

port. The ACU 'footprint' is the same as the TELEDPIVE's.

The ACU has a single 25 way D connector, RS232C port based on an 'intelligent',

Intel P80C31BH processor with a 7.37280 Mhz crystal. A series of 74HCT257

multiplexers allow control to be taken over from the OPD, by the P80C31.

Firmware is provided in 2 EPROMs (a 27C256 and a 27C64). A small ASTEC

encapsulated SMPS is 5 powered from the +5 voLt rails to generate standard

RS232C port voltages which are not available via the ROMPACK slot (i.e. +12 and

-12 volts). Two 2K CMOS RAM ICs provide buffering for data.

Transmission and reception speeds can be specified separately in the range from

50 to 19200 bps. Other adjustable parameters are word length, parity, input and

output buffer sizes buffer filling and emptying levels, X-ON and X-OFF and flow

control.

Profiles/patterns for various port configurations can be set-up, stored in the

OPD PERMANENT STORE and recalled for particular applications

5.5 DESK TERMINAL CONNECTION UNIT (DTCU)

A free standing, self-powered, adaptor for connecting OPDs, running ICL-LINK, to

ICL SME or TME mainframe computers at speeds up to 9600 bps. Full XEM (ICLC-03)

terminal emulation is provided with dual screen capability and auto-answer from

the OPD. The DTCU microcode (E13100/01) is teleloaded from the mainframe.

5.6 ASYNCHRONOUS NETWORK COMMUNICATIONS ADAPTOR (ANCA)

A free standing, self-powered unit that works with VT-LINK to provide OPD to IBM

mainframe communications. Full screen working to the IBM host is available at

speeds up to 9600 bps together with access to the host's applications. Security

features are included with auto-answer from the OPD.

5.7 DATEX 90

This provides simultaneous voice and data communications on a single telephone

line.

5.8 DISTBIBUTED ASYNCHRONOUS TERMINAL SERVICES (DATS)

This can connect the OPD to ICL DRS series computer systems via DRS model 110.

5.9 INFORMER

Allows files to be transferred between OPDs and IBM PCs.

5.10 TELEBOX 3

Allows the OPD to be used as a Telex station

5.11 TELELOCK

A security device produced by PCML. It consists of an in-line plug/socket

assembly which plugs into the 2 'D' connectors on the OPD control unit (the

supplies/video and the printer connectors) and provides 2 new 'D' connectors, at

its outboard end, for the original leads. There is a lock on the unit operated

by a Yale type key. The OPD can be disabled, for security purposes by locking

and removing the key.

5.12 TILT and SWIVEL STAND

BT produced a tilt and swivel stand for the mono monitor.

6 THIRD PARTY SOFTWARE

The following list is not exhaustive:

6.1 BASIC COMPILER and INTERPRETER

Computer One produced a Microsoft compatible BASIC COMPILER and INTERPRETER

providing performance improvements of 3 to 4 over OPD Basic. (2.18 refers).

6.2 'C' COMPILER and ASSEMBLER

Computer One also offered a 'C' COMPILER and ASSEMBLER. (2.17 refers).

6.3 TYPING TUTOR

Produced by Computer One.

6.4 CROSS-DEVELOPMENT PACKAGE

Metamco supply a cross-development package which allows OPD software to be

developed on an ICL or IBM PC.

6.5 CHESS

This is available from PSION for the OPD with 28 levels of play.

6.6 TOP DESK

A small business accounting package from A.M. Programmers.

6.7 PLANT DATABASE SYSTEM

Superplant Software offer a database system which uses ARCHIVE to help with tree

and plant selection and care.

6.8 ACTION DIARY

Satellite Computing produce an ACTION DIARY.

6.9 PROJECT PLANNER

This is produced by Satellite Computing.

6.10 QL/OPD INTERCHANGE PROGRAMS

 These are produced by:

D.J. Walker, 22, Kimptons Mead, Potters Bar, Herts., EN6 3HZ Tel. 0707 52791

They consist of a QL/OPD FILE INTERCHANGE program and a QL/OPD DIRECT I/Q

TOOLKIT. The same author produces the DISCOVERY programme which allows disks to

be interchanged between the QL and PC compatables. This programme allows the QL

to write to disks that the TELEDRIVE can read.

6.11 ABACUS TEMPLATES

A program for creating special spreadsheet templates for income tax, budgeting,

financial reports etc. Patrick and Leach.

6.12 ARCHIVIST

A program to simplify basic ARCHIVE application which the user can then tailor

to his individual needs. It requires XCHANGE vers. 2.5. and is available from

Ark Distribution.

6.13 OPD FORECASTER

A business forecasting program from Control-C Software.

6.14 POCKET' WORDSTAR

A cut down version of WordStar for use with the TELEDRIVE disk unit running

CP/M.

6.15 BRAINSTORM+

A program from Control-C Software for jotting down ideas which can be refined at

a later date.

7. LITERATURE

7.1 BOOKS

Century Communications Ltd. (Newtech Publishing Ltd.) produce 3 guides to the

'Merlin-Tonto' at a listed price of �12.95 each. These books are user orientated

and contain no significant technical detail of the internals of the 'Tonto'.

They are:

"Business Communications with the Merlin Tonto" by Martin Gandoff ISBN 0-09

1681-6

"Introducing the Merlin Tonto" by Garry Marshall ISBN 0-09-161661-1

"Business Computing on the Merlin Tonto" by Stephen Morris ISBN \_0-09-161671-97

7.2 REVIEWS The OPD was reviewed, or discussed, in the following periodicals:

'Personal Computer World' December 1984

'Which Computer?' February 1985

'Practical Computing' January 1985

'Practical Computing' April 1985

'Micro Decision' February 1985

'Byte' June 1985

'Computing - The Newspaper' July 18, 1985

'Communications' November 1985

'Accountancy' June 1986

'Surveyor' January 1985

'Computing Magazine' April 25, 1985

'Informatics' December 1984

The OKI printer, OKImate 20, was reviewed in 'Practical Computing' May l985.

7.3 USERS JOURNAL

ICL issued a quarterly newsletter 'OPD - Today' which was distributed free to official users. The last issue was July 1987.

7.4 MANUALS

7.4.1 ICL/BT MANUALS

The following user manuals were provided by ICL or BT:

 Installation'(BT Reference TPU 12A)

 'Handbook' (BT Reference TPU 12B)

 'Basic'(BT Reference TPU 12C)

 'MESSAGING'(BT Reference TPU 12D)

 'Xchange'(BT Reference TPU 12E)

 'Welcome Package'(BT Reference TPU 12F)

 'Advanced Operations'(BT Reference TPU 12G)

 'Installing Telephone Lines and Sockets'(BT Reference TPU 12H)

 'INTERFILE'(BT Reference TPU 428)

 'VT-LINK'

 'VT-LINK 2'(BT Reference TPU 730)

 'ICL-LINK'

 'COMBINED COMMS.'

 'EGO ILLUSTRATOR'(Leaflet only)

 'DATALINK'

 'ADVANCED MESSAGING'

 'Exchange quick reference' (BT Reference TPU 192)

 'MP1887 DATACOMMS ADAPTOR'(BT Reference TPU 116)

 'XCHANGE QUICK REF. CARD'(BT Reference TPU 242)

 'M1880 PRINTER MANUAL'(BT Reference TPU 249)

 'M1881J2 PRINTER MANUAL'(BT Reference TPU 332)

 'OPD VT100 LINK'(BT Reference TPU 334)

 'TILT AND SWIVEL STAND INSTALLATION'(BT Reference TPU 409)

 'USING MP11881 WITH TONTO'(BT Reference TPU 439)

 '14 INCH COLOUR MONITOR'(BT Reference TPU 17J)

 'MERIN TONTO Some Questions and Answers'(BT STAFF ONLY)