

Useful Notes:

TDM Type 'S2'

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TDM S2 (Worksop) Useful Pocket Notes Page 1 of 8

Basic operation:

The TDM consists of an Office (signalbox end) and Field (the RR end). To save on multicore cables, a TDM can do the same job but only uses a pair of telecoms wires between the office and field.

The system itself is non-vital as it only carries information, the interlocking in the SB and RR ensures the safety of the signalling.

A contact of a relay feeds the channel of the DIP or DOP card (known as the Input switch). If voltage* is present it is converted into a '1', if no voltage is present it is converted into a '0' these are known BITS. The cards which receive the data (from the relay) are the DIP cards.

The data is then scanned by the scanner which arranges it into serial format for transmission. The voltage levels produced by the scanner are around 12v. As well as the BIT codes an address code is also sent which corresponds to the position of the card.

The data is sent to the office by a MODEM.

At the office end, the scanner converts the signal back into a binary code of either a 1 or 0 and then the DOP card converts it again into a voltage. At the office a '1' will cause a relay to energise, a '0' will cause it to de-energise.

Each DIP card will have a corresponding DOP card at the other end.

Dual systems use two highways known as A & B, however highway B is known as C in the system. (A = A & B=C). A switch on the signalman's panel enables manual switchover if a failure is detected.

**Voltage depends on card type, Worksop has wetting supply of 50v POS.*

TDM S2 (Workshop) Useful Pocket Notes Page 2 of 8

Equipment in housing:

- **DIP/DOP cards:**
Digital **I**n**P**ut and **D**igital **O**ut**P**ut cards, handle 32 data bits, up to 16 can be fitted. They are fitted L to R and numbered 0,1,2,3 etc, however the diagrams will state 1,2,3 etc. I.e. card 1 as stated on diagram will be in position 0.
On the top of the card there is a two digit number which is the card type. This signifies the Input wetting supply and input polarity. It is very important the correct card is fitted if a replacement is needed.
(At Workshop type 09 for DIP & type 06 for DOP).
- **Scanner Module Card:**
Labelled as SCN 02, this card exchanges data with the DIP/DOP cards. During normal operation scanner A is on-line and scanner B is on standby. A signalman's changeover switch is included on the panel to switch from A to B or vice versa should one highway fail.
- **Monitor Card:**
This card is used a fault finding/monitoring tool.
It can be fitted into any DIP or DOP slot, but is usually fitted into its own position.
See page three for layout of the card and page eight on how to use it.

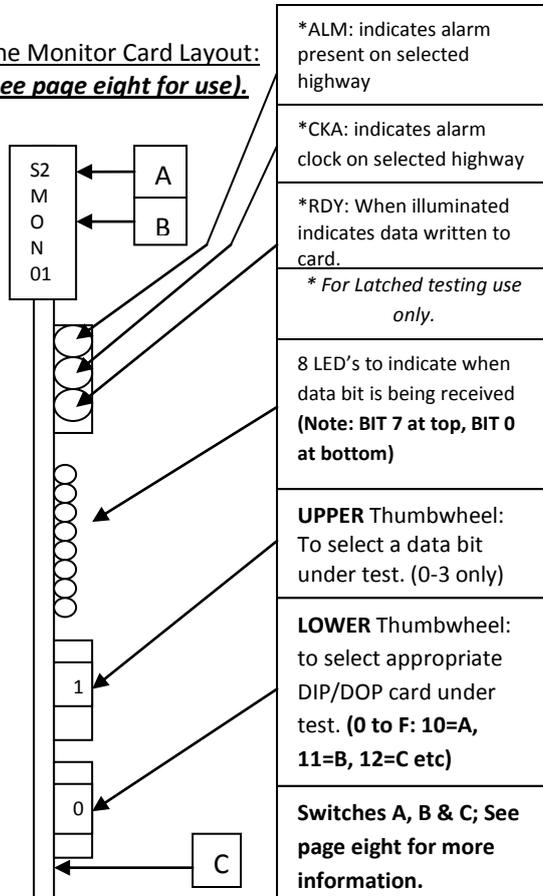
TDM S2 (Workshop) Useful Pocket Notes Page 3 of 8

Fault finding:

The TDM system is very reliable. However if a failure occurs it can be difficult to find the cause as it would be with relay interlocking.

To aid fault finding, LED's are provided and also a 'Monitor Card'.

The Monitor Card Layout:
(see page eight for use).



TDM S2 (Workop) Useful Pocket Notes Page 4 of 8

Faulting continued (LED indications):

- On the Scanner Card:
Large LED top: Hardware status OK if flickering.
Large LED bottom: Software OK if lit.

Four LED's below:

Tx: VFC transmitting

Rx: VFC receiving

Top two indicating only if no separate MODEM fitted.

Tx: MODEM transmitting

Rx: MODEM receiving.

NON-CRITICAL ALARMS:

- **Power supply failure:** brief audible alarm of SM (*signalman's*) panel, no need to acknowledge. The power failure will be indicated on the Office panel only by flashing system A or B light and call tech light. (Some systems have just a fault light).

CRITICAL ALARM:

- **Scanner failure:** On SM panel, 'AVAILABLE' LED extinguishes, if the on line scanner fails, the 'IN-USE' LED will also extinguish. Fault indication flashes, audible alarm sounds.
- **DIP/DOP card failure:** Indication the same as total failure, except the AVAILABLE LED will flash on the office alarm panel. If card faulty at field end, the SYSTEM AVAILABLE LED are extinguished on field alarm panel. If fault is at office end, there is no effect on field panel.

TDM S2 (Workshop) Useful Pocket Notes Page 5 of 8

Faulting continued; Carrier fault finding chart:

| | I/O CARDS | | SCANNER | | CARRIER | | AUX | | STATUS LEVEL |
|--------|-----------|------|---------------|---------------|---------|----------|-------|-------|--------------------------|
| | DIPs | DOPs | HIGHWAY ALARM | PROGRAM ALARM | RTS | DCD | AXO 0 | AXO 1 | |
| OFFICE | FLASHING | OFF | FLASHING | ON | ON | OFF | HIGH | X | Tx LEVEL FROM OFFICE LOW |
| FIELD | FLASHING | OFF | FLASHING | ON | ON | OFF | HIGH | X | |
| OFFICE | FLASHING | OFF | FLASHING | ON | ON | OFF | HIGH | X | Rx LEVEL FROM OFFICE LOW |
| FIELD | FLASHING | OFF | FLASHING | ON | ON | FLASHING | HIGH | X | |
| OFFICE | FLASHING | OFF | FLASHING | ON | | *** | HIGH | X | Tx LEVEL FROM FIELD LOW |
| FIELD | FLASHING | OFF | FLASHING | ON | | *** | LOW | X | |
| OFFICE | FLASHING | OFF | FLASHING | ON | ON | FLASHING | HIGH | X | Rx LEVEL FROM FIELD LOW |
| FIELD | FLASHING | OFF | FLASHING | ON | ON | OFF | HIGH | X | |

AUX OUTPUT: LOW: 0v HIGH: 12V ***FLASHING AT IRREGULAR INTERVALS

TDM S2 (Workshop) Useful Pocket Notes Page 6 of 8

Faulting continued; Point to Point fault finding chart:

| Ref | I/O cards | Scanner alarms | | Carrier alarms | | System status |
|-----|---|----------------|---------------|-------------------|-------------------|---|
| | a UPPER c LOWER | Highway Alarm | Program Alarm | RTS Request Alarm | DCD Carrier Alarm | |
| 1 | Flashing | Flashing | ON | ON | ON | NO FAULT |
| | Flashing | Flashing | ON | ON | ON | INCORRECT I/O CONFIG AT REMOTE END |
| 2A | ALL OFF | OFF | ON | OFF | OFF | HIGHWAY FAULT DETECTED LOCALLY |
| 2B | ALL DOP'S OFF | OFF | ON | OFF | OFF | HIGHWAY FAULT DETECTED REMOTELY |
| 3 | X | X | OFF | X | X | SCANNER FAILING TO COMPLETE PROGRAM |
| 4 | DIP'S FLASHING DOP'S OFF | OFF | ON | X | X | SCANNER DOES NOT RECEIVE VALID Tx FOR 5 SECONDS OR MORE |
| 5 | X | X | X | OFF | X | CARRIER RTS INPUT NOT ACTIVE |
| 6 | X | X | X | ** | X | CARRIER LEVEL LOW |
| 7 | DIP/DOP REMOVED OR UPPER LED EXTINGUISHED | OFF | X | X | X | DIP OR DOP FAILURE |
| 8 | OCCASIONAL | OFF | X | X | X | DIP OR DOP BYTE(S) FAILURE |
| 9 | OFF | ON | X | X | X | LED &/OR DRIVER FAILED |

X: PREVIOUS CHECK OK OR DOES NOT MATTER **SEE TABLE ON PAGE 5

TDM S2 (Workshop) Useful Pocket Notes Page 7 of 8

Changing cards and general notes:

- Static Electricity:

If a card needs to be swapped, you MUST be aware of static electricity.

We can produce up to **39Kv** simply by walking on a carpet.

This build up of static can be fatal for a circuit board.

YOU MUST wear an anti-static strap when changing over any circuit boards whether powered up or not.

If you have to change a board:

- Use an Anti-static strap connected to the earthing point provided.
- Make sure you get signallers permission before changing.
- Make sure the replacement is the correct type.
- Change one card at a time.
- If fault is not cured, replace the original card.
- Label the cards for easy identification.
- S2 cards can be changed with the power on.
- Only handle cards by their edges or handles.
- Always carry spare cards in an anti-static bag.

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TDM S2 (Workshop) Useful Pocket Notes Page 8 of 8

Monitor Card for faulting use:

1. If monitor card not already plugged in, plug it in.
2. Using button A, select the Highway (system) that is running; look on the status panel to see if A or B system is currently on. *The centre position of the switch turns off the card and resets it.*
3. On switch B, select which type of card you are wanting to monitor; (DIP or DOP).
4. Switch C, is used for either fleeting or latched, Fleeting is for constant 'live' monitoring of all of the data, Latched is used to monitor all 4 bytes of data for a set card. (See *TDM student notes for more on the latched diagnosis*).

| Example Town TDM | | DIP card 02 |
|------------------|-----|-------------|
| BYTE | BIT | FUNCTION |
| | 0 | 123 TPR |
| | 1 | 789 DGPR |
| | 2 | 456 T1PR |
| | 3 | 234 UCPR |
| | 4 | 890 T2PR |
| | 5 | 567 TPR |
| | 6 | 678 UCPR |
| | 7 | 101 H/DGPR |

Diagram annotations: A box labeled '5' has an arrow pointing to the 'DIP card 02' header. A box labeled '6' has an arrow pointing to the '01' label next to the 'BYTE' column.

5. Using the example diagram above, (*consult the diagrams on-site for your fault*), select the card number (*eg: see arrow 5 above*) on the **LOWER** thumbwheel.
6. Again using example above, select the data byte to be monitored on the **UPPER** thumbwheel, (*eg: see arrow 6 above*)
7. The BIT number (*middle column*) represents the LED on the card display. **Note: On the card, the LED's are numbered zero at the bottom and 7 at the top**, (*eg: 567 TPR will be 3rd LED from top*).
8. Ask signaller to operate suspected faulty equipment or dis the circuit (for TPR fault etc), the corresponding LED will light when voltage should be received, if no LED lights **when expected**, the fault lies at this end. If all OK, go the other end (office or field) and repeat above. If a fault is detected at the office OR field end that card has to be replaced, if no card available, there may be spare 'bit' sections on another card fitted to swop with, you **MUST** ensure however it is the same type (DIP OR DOP), and location specific [if renewing] (see page two).