

Background:

Aster tracks were introduced to eliminate the need for insulated block joints and therefore reducing costs. They were developed from the Aster 1 watt type.

Both '1 watt' and 'U' type Aster tracks are becoming obsolete due to no new equipment being manufactured. Therefore all spares, either working or faulty are classed as strategic spares. **All** faulty equipment must be returned for service.

The replacement for the Aster TC is the 'TI21' track circuit.

Basic principle of operation:

The basic circuit layout consists of a transmitter, a receiver, a track transformer, tuning units, and a power supply.

The transmitter transmits a signal and the feed end (TX) tuning unit tunes it to the required frequency.

The signal is then fed onto the rails which is then picked up by the primary windings of the track transformer from the rails at the receiving end (RX).

The receiver then amplifies the signal, if it is of the correct frequency and amplitude, the receiver will feed out a supply to the track relay.

When a train occupies the track circuit, it will cut off the signal and the relay will subsequently drop and occupy the track circuit in the signalbox.

The track transformer is used for two reasons; one as a 'feed back monitor' at the transmitter end to reduce TX's output when a train is nearby to protect the equipment from current overload.

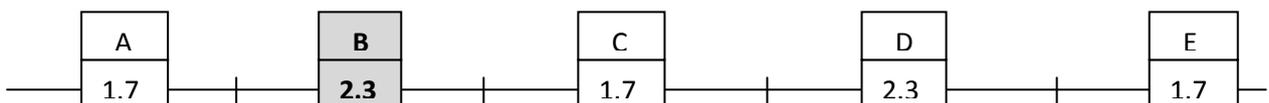
It is also used as a 'pick up' at the RX end i.e. receiving the signal and passing it on to the receiver.

The power supply unit in the loc at the TX and RX end provides a feed to the transmitter and receiver of 24v DC. It is adjustable to provide a range of 22.5 – 29.5v. the input voltage is either 100 or 240v AC.

There are four different transmitters and receivers each has its own set frequency, and only two of the frequencies can be used on ONE track, they **MUST** never be mixed. See table below:

Frequency (kHz)	Colour of unit	Colour of writing on unit
1.7 (track one)	Red	Red
2.3 (track one)	Red	Black
2.0 (track two)	Yellow	Red
2.3 (track two)	Yellow	Black

A **wrong side failure** could occur if it becomes necessary to disconnect two tuning units at both ends of the same TC. If an Aster TC needs to be disconnected in this way, then disconnection of the adjoining TC must be carried out. See example below:



If TC 'B' with frequency of 2.3 kHz was disconnected, TC 'A' with a frequency of 1.7kHz could false feed TC 'C' with the same 1.7kHz frequency. So if TC 'B' needs to be disconnected, TC 'A' **OR** 'C' **MUST** be disconnected too.

Centre fed (CF) track circuits:

Some track circuits share the same number but are split into two parts i.e. TC 123(a) & 123(b). These track circuits will share the same transmitter tuning unit and track transformer and are usually both fitted back to back at the rail side on the same spike at the centre of the track circuit. It is not necessary for both track sections to be the same length. A receiver at each end of the track will determine which section is occupied with a train.

Track side equipment & configuration:

The transmitter and receiver tuning units and track transformers are mounted in fibreglass housings and mounted on spikes knocked into the ballast. (with the exception of a CF Aster as mentioned)

The housings should be no less than 0.85m from the nearest rail. The top of the housing should be no more than 0.28m above the rail head.

They are mounted 13m apart (from the centre of the track transformers) and in-line with the track ends.

The minimum length of an Aster track is 50m up to a maximum of 1000m, this is measured between the track transformers of both track circuits.

It is vitally important that all associated cables are the correct length, a wrong side failure could occur if the cables are too long, see below:

Nominal length up to	Max total cable length	Max cable between transmitter and tuning unit	Max cable between receiver and track transformer
700m	700m	50m	700m
800m	500m	50m	500m
900m	300m	50m	300m
1000m	100m	30m	100m
Minimum core size should be 7/0.67mm.			

If an Aster track adjoins another type of track circuit (i.e. DC), the isolating insulated block joints (IBJ's) MUST not be more than 1m from track transformers track ends.

An Aster track could be split with IBJ's if two frequencies of the same type are together i.e. at a junction.

Asters can be used in point work, but it has become best practise to avoid this due to the requirements that have to be met.

Faulting Aster track circuits:

Aster track circuits have proved to be fairly reliable if the track conditions are right i.e. ballast clean, rail insulations present and undamaged etc.

They can be difficult to fault especially if the fault is not present when on arrival.

The 'gain' setting can be adjusted depending on the track circuit length to give a required drop and pick up shunt. It is available in the SMTH along with other information including the desired specifications. The SMS's detail the maintenance specifications required.

There are faulting flow charts available which are included in these notes for both the feed end and relay end.

This document is uncontrolled and is NOT Network Rail endorsed. It may be subject to errors or omissions, therefore it is only a guide. It MUST not be used for testing or commissioning purposes. SMS's and SMTH MUST always be followed before returning a TC to working service.