

# Fares Feed Data - Fare Validation

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# Fare Validity

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Checking that a fare is valid for a particular journey involves applying some business logic, referencing several areas of the fares feed data and applying some hard coded rules that are not defined in the feed.

This document covers how to use the data in the fares feed rather than the specifics of the data structure, as that is defined in [RSPS5045](#).

Checking fare availability with NRS is not covered by this document. If the ticket type is marked as having a required reservation availability must be checked with NRS.

Application of the National Routeing Guide is not covered by this document and there is some overlap between the rules applied.

# Lingua Franca

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There are many overlapping terms and concepts in the rail industry. For the purpose of this document it can be assumed the following words or phrases have the meaning defined here.

## **Fare**

.A conceptual price for a ticket comprised of an origin, destination, route code, status code, restriction code and ticket type code.

## **Ticket**

An instance of a fare that has concrete dates as opposed to a date period or duration. Once a ticket has been created it is a passenger's right to travel.

## **Coupon**

A physical representation of a ticket (the thing you hold). In the case of CCST tickets, one ticket may product two coupons. One coupon for the outward portion and one for the return portion.

## **Ticket Type**

Each fare has a ticket type, denoted by a three character ticket type code. A ticket type code will in turn specify a two digit validity code that contains the validity period information.

The ticket type code will specify contain a number of properties common to any fare with the ticket type code, such as min/max passengers, whether or not a reservation is required and the quote date.

## **Location**

A location may be a physical station or a logical location used for fare setting. Locations may be used to define origins or destinations that only exist for fare setting purposes (i.e PlusBus stations), group stations which contain several physical stations as members or a cluster may contain several other locations for the purpose of mapping fares.

## **Physical station**

A station that a journey may stop at or pass through.

## Origin and Destination

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The first check is to ensure that the origin and destination of the journey (physical stations) are either the same as the fare origin and destination or the fare origin and destination are group stations that the journey origin and destination are members of.

### London Terminals

London Terminals is a group station but it has additional rules to determine the members of its group.

The IDMS London Terminals Mapping file is an XML file that can be used to calculate the group members given an opposing location and route.

For example using the following data:

```
<Station>
  <CrsCode>AAP</CrsCode>
  <LondonTerminalsMappings>
    <LondonTerminalMapping>
      <LondonTerminals>
        <Terminal>KGX</Terminal>
        <Terminal>MOG</Terminal>
        <Terminal>OLD</Terminal>
      </LondonTerminals>
      <StartDate>2014-02-19</StartDate>
      <EndDate>2999-12-31</EndDate>
      <FareRoute>00000</FareRoute>
    </LondonTerminalMapping>
  </LondonTerminalsMappings>
</Station>
```

We can determine that when travelling between Alexandra Palace and London Terminals on route code 00000 (Any Permitted) the group members of London Terminals are London Kings Cross, Moorgate and Old Street.

Travel in either direction is permitted for season tickets, travelcards and some carnets. Travel in the opposite direction is permitted for returns as long as it's within the return validity period.

These rules can be implemented using the rules in the National Routeing Guide rather than the London Terminals mapping.

Relevant data:

- FFL (flow)
- NFO (non-derivable fare)
- LOC (location, location group, location group member)
- IDMS (London terminals mapping)

## Validity Periods

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A fare has an outward validity period and a return validity period and these are set by the validity code of the ticket type. For example, a return ticket might have an outward validity period of 00M01D and a return period of 01M00D. That means that you must travel out at the start of your ticket validity and you can return any time within a month. It may seem obvious that you travel out at the start of the validity but it is not always the case, many Anytime tickets have an outward validity of 5 days. Theoretically you can travel out on any one of those days.

The validity code can also specify that the return must be a certain number of days or months after the outward journey. It can also specify that the return must be after a particular day. For instance some weekender tickets specify that you have to return after the Friday.

When calculating the validity dates of a ticket it's worth bearing in mind that the dates are inclusive. So if you have a 7 day season that is valid from 1st January the last day of validity is 7th. The number of days to add from the first day of validity is: validity period (7) - 1 day. With months this gets a bit more complicated - 1st February + 1 month - 1 day = 28th February. Most date libraries will handle this sort of thing but it's important to work in date intervals or periods rather than absolutes otherwise it may go wrong.

Using the example of a 7 day ticket that ends on the 7th, the validity technically ends at 23:59 on the 7th January but it is valid on trains and through gates until 04:29 on the 8th January. That's not in the data, it's just one of those rules. It's import to note that despite the validity ending at 04:29 on the 8th it should still be written as the 7th January to ensure the correct number of days is display on the coupon.

In the case of validating a validity period for a fare, it's only necessary to check that the return journey date is within the maximum validity period (assuming it

starts on the date of the outward journey) and after the return period and day of week.

Relevant data:

- TTY (ticket type)
- TVL (ticket validity)

## Route

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The journey's route should be checked using the National Routeing Guide and the route code of the fare should match the one of the valid route codes of the journey.

As part of the routeing guide check the fares data will be referenced in order to check the journey either goes via or avoid a particular location.

The route locations data state that the route must include (I) or exclude (E) certain locations. In the case of an include rule the location must be excluded at least once and in the case of an exclude it must not be included by and calling point.

Relevant data:

- National Routeing Guide
- RTE (route, route location)

## Cross London Journeys

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Flow fares will have a Cross London Indicator that indicates whether journeys are permitted across London on the Underground, cross London not on the Underground, cross London on Thameslink, or not across London at All.

The non-derivable fares are just a boolean value of allowed or not.

Relevant data:

- FFL (flow)
- NFO (non derivable fare override)



## Advance Tickets

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Where an Advance ticket is being offered there must be at least one reservable leg of the journey as the ticket cannot be retailed without a reservation.

## Restrictions

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The restriction code is primary mechanism for validating whether a journey is possible for a given fare. The restriction code can prohibit travel by time or service, allow or disallow the use of a railcard, apply additional restrictions based on a railcard and apply a minimum fare to a fare with a railcard applied..

The restriction data is divided into current and future data. The restriction date records contain date ranges for these sets of data and other restriction data applies it's own date ranges inside those dates.

To see whether the rules within a restriction apply to a journey check that the restriction header and header date bands apply on the day of travel.

If the date of the journey is within the current data set date range, look for a restriction header date with the `CF_MKR` set to `c`. The header date record will contain a `DATE_FROM` and `DATE_TO` field specified in months and days (`MMDD`). These are the date bands inside the current/future date bands that apply to this record. For example, if the current date bands are `2016-10-01` to `2017-06-30` and the `DATE_FROM` and `DATE_TO` of the header are `0215` and `0515` respectively, the record applies between `2017-02-15` and `2017-05-15`.

Occasionally the end month in the `DATE_TO` field will exceed the end date of the current timeband. It seems that that is allowed, making the end date redundant.

Do the equivalent using the future date bands if the journey is within those date ranges.

Assuming the restriction code applies we can then see what restrictions it actually puts in place.

Relevant data:

- RST (restriction date, restriction header)

## Restriction Header

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The restriction header contains "change indicator" field that determines whether or not a change of train is allow or whether the journey has to be direct.

Relevant data:

- RST (restriction header)

## Time restrictions

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The time restrictions data specifies a time and location that you either cannot depart from, arrive at or go via. As with the header record the time restrictions date records should be checked to ensure that the record applies. Unlike the header record, if there is no corresponding date record it can be assumed that the time restriction applies during the whole current/future date range.

The time restrictions should also be cross referenced against the time restriction TOC records to check whether the restriction applies to all TOCs or a specific one.

These rules have an outward/return marker to specify whether it applies to an outward or return journey.

The time restrictions can also specify that a minimum fare must be applied to a fare if a railcard has been used and the ticket type has an entry in the minimum fares data.

Relevant data:

- RST (time restrictions, time restriction date bands)

## Train restrictions

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Train restrictions are similar in structure to the time restrictions and their date records should be checked in the same manner.

The restriction header record has TYPE\_OUT and TYPE\_RET fields that determine whether the train restriction records act as a positive or negative restriction.

Negative restrictions indicate that a fare is not valid on a specific service. Positive is restrictions indicate that a service is valid despite any time restrictions that might apply.

It may be that a fare is not valid between 04:30 and 09:00 at a given station, except for a specific service that has an easement.

Relevant data:

- RST (train restriction, train restriction date bands)

## Train Quota Restrictions

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The train quota restrictions specify that arriving or departing a particular stations on a specific service may be permitted or restricted (depending on the TYPE\_OUT/TYPE\_RET of the restriction header).

Relevant data:

- RST (train restriction, train quota restrictions)

## Time / Service Date Bands

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Time and service restrictions may also have a specific time band, if one is specified then use it, if none is specified fall back to the time band of the restriction header.

## Railcards

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Railcard restrictions can be applied in one of two ways. Either the railcard restriction record will apply a total ban or it will apply another restriction code. A total ban indicates that the railcard can't be used with the fare at all and a restriction code means that it can be applied but only on a limited number of services (as dictated by the corresponding restriction code).

If the railcard restriction is a total ban it may be applied duration the fare lookup, if it is a restriction code it needs to be validated per journey.

If the additional restriction code does apply it will either prohibit the use of the fare or apply a minimum fare depending on the min fare flag on the time

restriction entry. Where the time restriction applies a min fare it is assumed that there are no corresponding service restrictions.

The minimum fare data contains a lookup of ticket type and railcard code to minimum fare.

Relevant data:

- RST (railcard restrictions, time restrictions)
- RLC (railcards)
- RCM (railcard minimum fares)

## TOC Specific Tickets

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The TOC specific tickets file contains a list of rules that can apply to a ticket type code if the fare has a restriction code, has no restriction code or it doesn't matter if a restriction code is present.

Provided the rule applies it may dictate that the whole journey must be solely on the given TOC or one leg must be on the given TOC.

The stock list information is not typically populated and the inc/exc stock field is assumed to be redundant.

Relevant data:

- TSP (TOC specific tickets)

## Other restrictions

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It is assumed that calendar restrictions have been applied during the fare lookup as opposed to the fare validation. Railcard total bans can also be applied during the fare lookup.

The RSPS5045 feed specification describes many other types of restriction but they are not currently populated.

Relevant data:

- RST (ticket calendar, railcard restrictions)

## Additional rules

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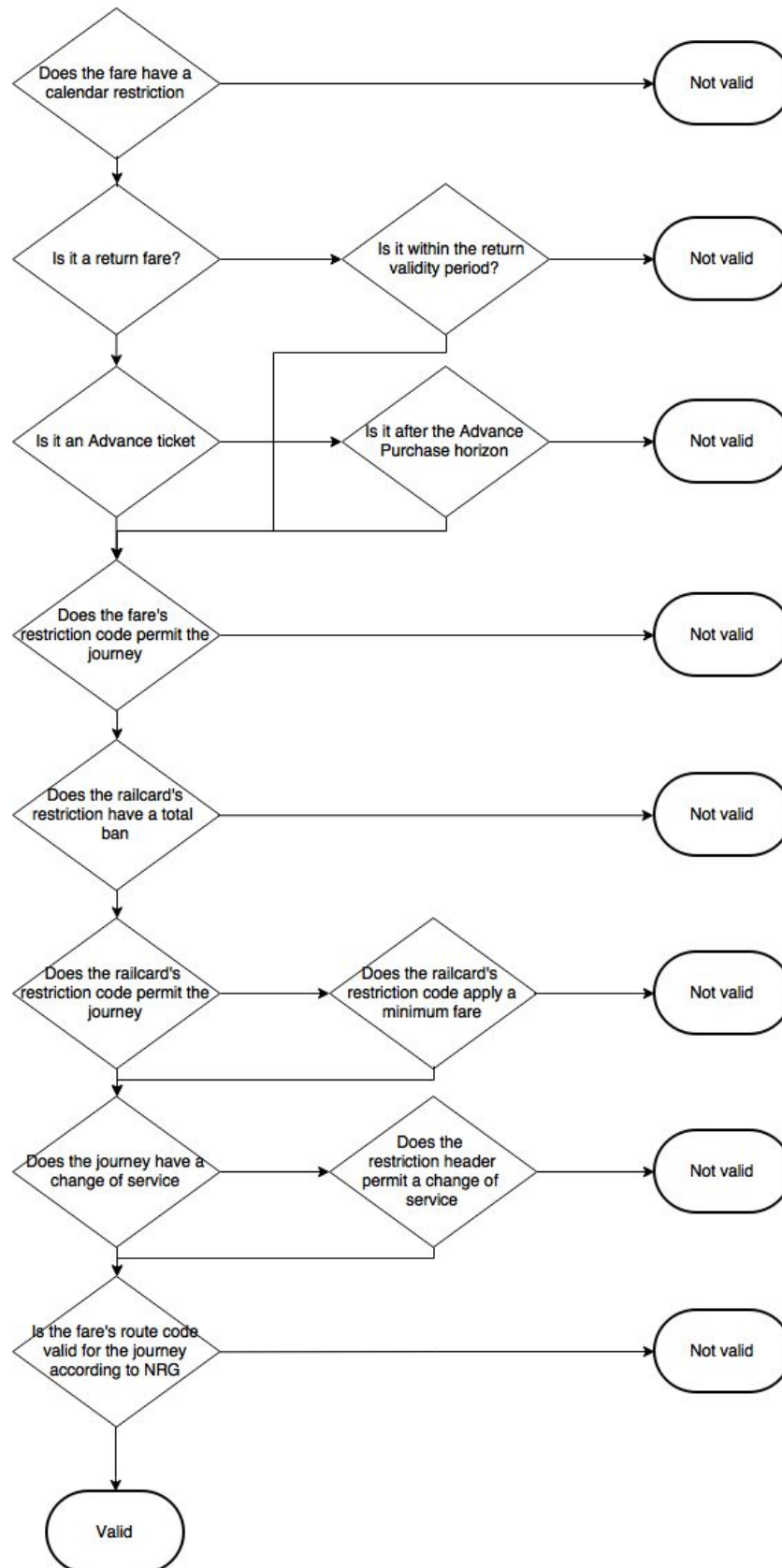
As ever there are more rules without any data to back them up. One example is the weekender tickets are only valid out on a Friday but there is no way to specify that with the data structures in the feed so it is written in the description of the restriction.

There are many rules written in a system called Knowledge base (not public) that are not represented in data. Another example of this would be text like "On Tuesday 13th July restriction XX does not apply, use restriction XY instead".

The application of railcards is another commonly "hardcoded" area. Some railcards (senior railcard for example) only apply to off-peak tickets but there is no way of indicating whether a ticket is "off-peak" or not using the data. This can lead to ambiguity when there is no peak ticket.

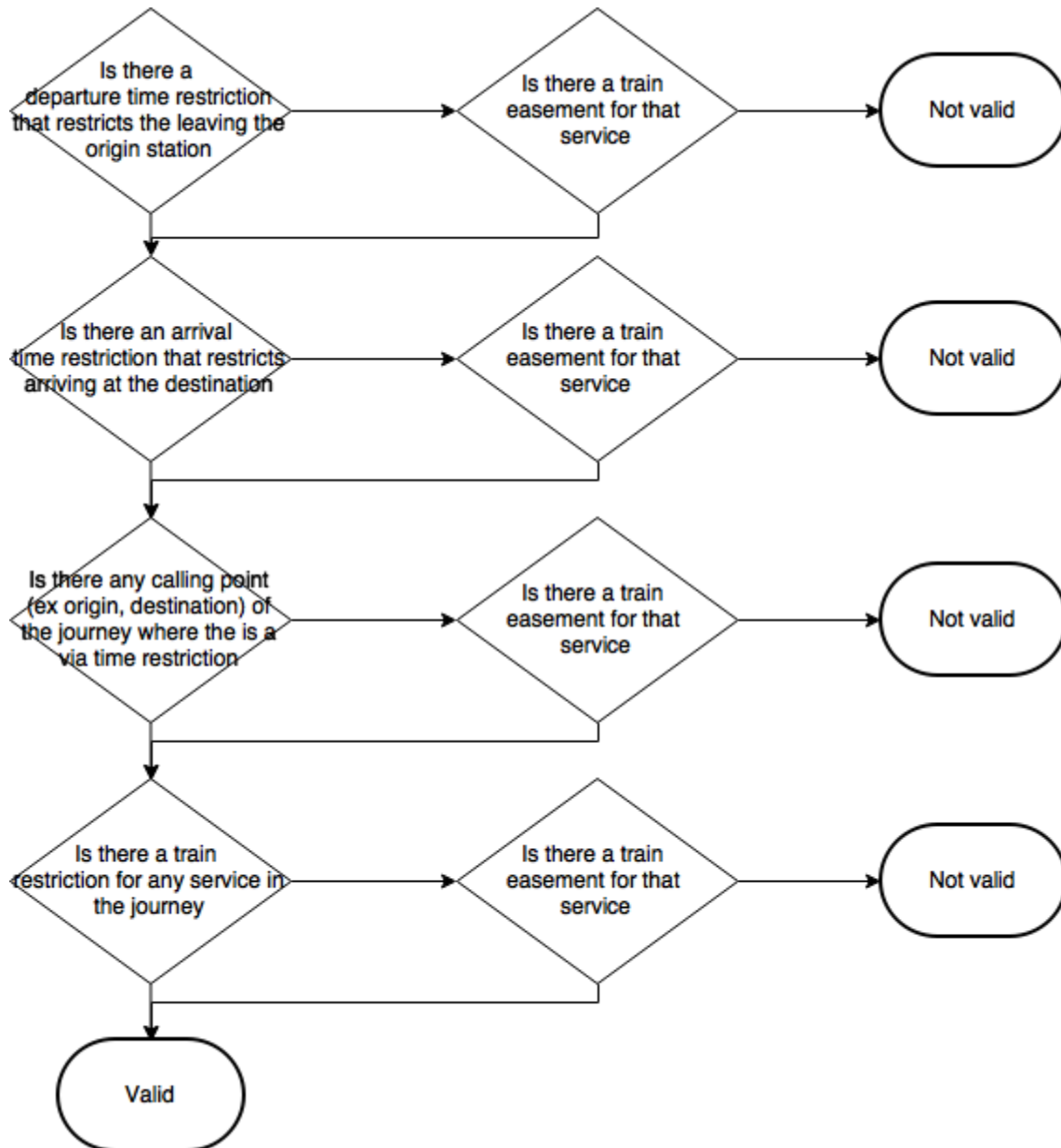
In theory this data could be managed in the system using the discount indicator and limiting what ticket types the railcard can apply to, but it not setup this way. The likely reason for it not being populated is that the off-peak rule only applies in the network southeast area.

# High Level Fare Validation Flow



## Restriction Validation Flow

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## Time Restriction Application Flow

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