

Total IFTA Compliance Platform

IRP Exception Engine

Technical Specification

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Purpose of This Document

This document defines the complete technical specification for the IRP Exception Engine within the Total IFTA Compliance Platform. It covers all IRP-specific exception types, their detection logic, severity classifications, threshold values, user interface behavior, resolution paths, and escalation rules.

IRP exceptions protect carriers from apportionment errors that result in overpayment or underpayment of registration fees across jurisdictions, from operating with incorrect or expired credentials, and from audit exposure caused by mileage data inconsistencies. The exception engine also ensures that IRP compliance is cross-referenced with IFTA, Form 2290, and state weight/mileage tax obligations where applicable.

1. Severity Level Definitions

All IRP exceptions follow the same four-level severity framework used across the compliance platform. The level determines whether a renewal or registration action is blocked, whether acknowledgment is required, and how the exception surfaces in the UI.

 CRITICAL	Action is blocked. Exception must be resolved before renewal submission, vehicle addition, or registration change is permitted. Data is definitively wrong.
 HIGH	Action is not blocked but carrier or administrator must explicitly acknowledge the exception and provide a written reason before proceeding. Logged with timestamp and user ID.
 MEDIUM	Informational warning displayed in the workflow. No acknowledgment required. Carrier is made aware but the action proceeds. Exception is logged.
 INFO	Background audit-risk awareness. Displayed in the carrier dashboard. Does not interrupt any workflow.

2. Critical Exceptions — Action Blocked

The following exceptions must be resolved before the system will permit submission of an IRP renewal, addition of a vehicle to the fleet, or any registration change. In each case the data is definitively incorrect and proceeding would produce an invalid registration or incorrect fee calculation.

Exception Name	Field(s)	Threshold / Trigger	UI Behavior	Resolution Path
Odometer Regression	ending_odometer, starting_odometer	ending_odometer < starting_odometer	Red banner at top of screen. Submit disabled. Message: 'Ending odometer is less than starting odometer. Please correct before proceeding.'	Carrier corrects odometer values. System re-validates on save.
Jurisdiction Miles Do Not Balance	sum(state_miles), total_fleet_miles	Variance > 1% OR > 50 miles	Red banner. Miles summary table highlighted showing discrepancy. Action blocked.	Carrier reconciles state miles against total fleet miles.
Total Miles Don't Reconcile with ELD/Odometer	total_reported_miles, eld_total_miles, odometer_miles	Variance > 1% OR > 50 miles	Red banner showing variance amount. Source comparison table displayed. Action blocked.	Carrier reviews ELD data export and manually reconciles.
Negative Miles in a Jurisdiction	state_miles['XX']	Any state_miles value < 0	Red inline alert on affected jurisdiction row. Message: 'Negative mileage is not valid. Please correct this entry.' Action blocked.	Carrier corrects mileage entry.
Duplicate VIN in Fleet	vin, fleet_account_id	Same VIN appears more than once in fleet or across accounts	Red alert. Message: 'This VIN is already registered in your fleet or in another account.'	Carrier removes duplicate or contacts administrator to resolve.

Exception Name	Field(s)	Threshold / Trigger	UI Behavior	Resolution Path
			Duplicate registrations are not permitted. Action blocked.	
Declared Weight Exceeds Legal Limit	declared_gvw, jurisdiction_max_weight['XX']	declared_gvw > max legal weight for any registered jurisdiction	Red alert on affected jurisdiction. Message: 'Declared weight exceeds the maximum legal limit for [state]. Please correct.' Action blocked.	Carrier corrects declared weight or removes jurisdiction.
Form 2290 Not on File for Vehicle Over 55,000 lbs	vehicle_gvw, form_2290_status	vehicle_gvw >= 55000 AND form_2290_status = null or expired	Red alert. Message: 'IRP registration requires proof of Form 2290 payment for vehicles 55,000 lbs or greater. No valid Schedule 1 is on file for this vehicle.' Action blocked.	Carrier uploads stamped Schedule 1 or files 2290 through platform.
2290 Schedule 1 Expires Before IRP Renewal Date	schedule1_expiry_date, irp_renewal_date	schedule1_expiry_date < irp_renewal_date	Red alert. Message: 'Your Form 2290 Schedule 1 expires before your IRP renewal date. A new 2290 must be filed before IRP can be renewed.' Action blocked.	Carrier files new 2290 through platform. System re-validates.
Base Jurisdiction Changed Without Full Re-Registration	base_jurisdiction_current, base_jurisdiction_prior	base_jurisdiction changed AND full re-registration not initiated	Red banner. Message: 'Changing your base jurisdiction requires a full IRP re-registration. Please initiate the re-registration	Carrier initiates full re-registration workflow.

Exception Name	Field(s)	Threshold / Trigger	UI Behavior	Resolution Path
			process.' Action blocked.	
Leased Vehicle — Incorrect Registrant	vehicle_ownership_type, registrant_id, lessor_id, lessee_id	ownership_type = 'leased' AND registrant does not match responsible party per lease agreement	Red alert. Message: 'This leased vehicle appears to be registered under the wrong entity. Verify lease agreement to determine IRP responsibility.' Action blocked.	Carrier provides lease documentation. Administrator resolves registrant assignment.

3. High Exceptions — Acknowledgment Required

The following exceptions do not block action but require the carrier or administrator to explicitly review, acknowledge, and provide a written explanation before the system records the override and permits the renewal or registration change to proceed. All acknowledgments are logged with timestamp, user ID, and entered reason.

Exception Name	Field(s)	Threshold / Trigger	UI Behavior	Resolution Path
Prior Year Miles Are Zero — Estimated Miles Used	prior_year_miles, mileage_type	prior_year_miles = 0 AND mileage_type = 'estimated'	Orange banner. Message: 'No prior year mileage on record. Apportionment will be calculated using estimated miles. Estimated miles are an audit risk and must be reasonable.' Acknowledgment required.	Carrier enters estimated miles with written justification. Override logged.
Estimated Miles Used Instead of Actual	mileage_type	mileage_type = 'estimated' AND prior_year_actual_miles > 0	Orange banner. Message: 'Actual prior year mileage is available but estimated miles are being used for apportionment. Actual miles are required unless actual records are unavailable.' Acknowledgment required.	Carrier switches to actual miles or enters written justification. Override logged.
Apportionment Percentage Zero for Active Jurisdiction	apportionment_pct['XX'], state_miles['XX']	jurisdiction on account AND state_miles = 0	Orange flag on affected jurisdiction. Message: 'You are registered in [state] but have zero miles recorded there. You may be paying unnecessary fees.' Acknowledgment required.	Carrier removes jurisdiction or confirms miles are correct. Override logged.
Apportionment 100% in Base State	apportionment_pct[base_state]	apportionment_pct = 100% for base state	Orange banner. Message: 'All miles are recorded in your base state. If you only operate intrastate, you may not need IRP registration.' Acknowledgment required.	Carrier confirms interstate operation or initiates IRP cancellation. Override logged.
IRP and IFTA Jurisdictions Don't Match	irp_states[], ifta_states[]	States differ by more than 2 jurisdictions	Orange banner. Message: 'Your IRP registered states and IFTA reported states differ significantly. These should generally be consistent.'	Carrier reconciles jurisdiction lists. Override logged.

Exception Name	Field(s)	Threshold / Trigger	UI Behavior	Resolution Path
			Acknowledgment required.	
Vehicle on IFTA but Not on IRP	ifta_vehicle_list[], irp_vehicle_list[]	Vehicle in IFTA fleet not in IRP fleet	Orange alert per vehicle. Message: 'Vehicle [VIN] is reporting fuel miles under IFTA but has no IRP registration. This vehicle may be operating illegally in multiple states.' Acknowledgment required.	Carrier adds vehicle to IRP or confirms vehicle is intrastate only. Override logged.
Vehicle on IRP but Not on IFTA	irp_vehicle_list[], ifta_vehicle_list[]	Vehicle in IRP fleet not in IFTA fleet	Orange alert per vehicle. Message: 'Vehicle [VIN] is registered under IRP but is not included in your IFTA account. Fuel tax may not be reported for this vehicle.' Acknowledgment required.	Carrier adds vehicle to IFTA fleet or confirms vehicle does not qualify. Override logged.
Mileage Distribution Changed Dramatically	state_miles_current['XX'], state_miles_prior['XX']	Any jurisdiction mileage changes > 40% vs. prior year	Orange banner. Message: 'Mileage in [state] changed significantly from prior year. Please confirm this reflects an actual operational change.' Acknowledgment required.	Carrier confirms route change. Override logged.
New Jurisdiction Added With No Mileage History	new_jurisdiction, state_miles['XX']	Jurisdiction added to account AND state_miles = 0 for that state	Orange flag. Message: 'You are adding [state] to your IRP account but have no recorded miles there. Verify this jurisdiction is needed.' Acknowledgment required.	Carrier confirms jurisdiction is needed and enters estimated miles. Override logged.
Fee Calculation Variance vs. Prior Year	total_irp_fees_current, total_irp_fees_prior	Fees differ by > 25% AND fleet size change < 10%	Orange banner. Message: 'Total IRP fees differ significantly from prior year without a corresponding change in fleet size. Please review mileage and jurisdiction data.' Acknowledgment required.	Carrier reviews apportionment calculation. Override logged.
Trip Permit Used Repeatedly for Same State	trip_permit_state, trip_permit_count, quarter	trip_permit_count >= 3 for same state in rolling 12 months	Orange alert. Message: 'You have purchased [X] trip permits for [state] in the last 12 months. Adding this state to your IRP account may be more cost-effective.'	Carrier adds state to IRP or confirms trip permits are preferred. Override logged.

Exception Name	Field(s)	Threshold / Trigger	UI Behavior	Resolution Path
			Acknowledgment required.	
New Carrier — Very High Estimated Miles	mileage_type, total_estimated_miles, fleet_size	mileage_type = 'estimated' AND (total_estimated_miles / fleet_size) > 150,000	Orange banner. Message: 'Estimated miles per vehicle appear unusually high for a new carrier. Please verify estimates are reasonable.' Acknowledgment required.	Carrier adjusts estimates with written justification. Override logged.
Weight/Mileage Tax State Miles — No Separate Registration	state_miles['KY','NM','NY','OR','CT'], carrier_registrations[]	Miles > 500 in KY, NM, NY, OR, or CT and no separate account on file	Orange alert per state. Message: 'IRP registration does not cover [KYU/WDT/HUT/WMT/HUF] in [state]. A separate registration and filing is required.' Acknowledgment required.	Carrier registers for applicable state tax or confirms exemption. Override logged.

4. Medium Exceptions — Informational Warning

The following exceptions display a warning in the workflow but do not require acknowledgment. They are logged automatically for audit trail purposes and displayed in the carrier's exception history.

Exception Name	Field(s)	Threshold / Trigger	UI Behavior	Resolution Path
Mileage Concentrated in Base State	apportionment_pct[base_state]	Base state apportionment > 70% of total miles	Yellow banner. Message: 'More than 70% of your miles are in your base state. Unusually high base state concentration can be an audit flag.'	Carrier reviews mileage distribution. No action required.
Round Number Mileage Entries	state_miles_entries[]	3 or more state entries divisible by 500	Yellow banner. Message: 'Several jurisdiction mileage entries appear to be round numbers, suggesting estimation. IRP requires actual recorded mileage.'	Carrier verifies mileage records. No action required.
Identical Mileage to Prior Year	state_miles_current['XX'], state_miles_prior['XX']	Exact match for 3 or more jurisdictions vs. prior year	Yellow flag. Message: 'Mileage in [state(s)] is identical to prior year. Please confirm this reflects actual operations and not copied data.'	Carrier confirms accuracy. No action required.
Fleet Size and Mileage Don't Correlate	fleet_size, total_miles	total_miles / fleet_size < 20,000 OR > 200,000	Yellow banner. Message: 'Total miles per vehicle are outside the expected range given your fleet size.'	Carrier reviews fleet mileage. No action required.

Exception Name	Field(s)	Threshold / Trigger	UI Behavior	Resolution Path
			Please verify mileage totals are complete.'	
Vehicle Axle Count Mismatch	vehicle_axles_irp, vehicle_axles_profile	irp_axles != profile_axles	Yellow flag per vehicle. Message: 'Axle count on IRP registration does not match vehicle profile. Verify vehicle specifications.'	Carrier corrects axle count in vehicle profile or IRP registration. No action required to proceed.
Cab Card Expiration Mismatch	cab_card_expiry, irp_renewal_date	cab_card_expiry != irp_renewal_date	Yellow flag per vehicle. Message: 'Cab card expiration date does not match IRP renewal date. Verify credentials.'	Carrier contacts base jurisdiction to correct. No action required to proceed.
Vehicle Weight Class Changed During Year	vehicle_class_history[], registration_year_start, registration_year_end	Reclassification date within registration year	Yellow flag. Message: 'Vehicle [VIN] was reclassified during the registration year. Verify fee calculation reflects correct weight for each period.'	Carrier confirms classification. No action required.
Mileage Records Not Available for Full Year	mileage_record_months_count	mileage_record_months_count < 12	Yellow banner. Message: 'Mileage records are only available for [X] of 12 months. Partial-year data may produce an inaccurate apportionment calculation.'	Carrier provides full-year records or documents reason for gap. No action required.
Credentials Not Confirmed Received	renewal_processed_date, credentials_confirmed_date	renewal_processed_date > 14 days ago AND credentials_confirmed_date = null	Yellow flag. Message: 'Your IRP renewal was processed [X]	Carrier confirms receipt or requests reissue. No

Exception Name	Field(s)	Threshold / Trigger	UI Behavior	Resolution Path
			days ago but credentials have not been confirmed as received. Verify cab cards and plates have arrived.'	action required.
Fleet Size Changed Significantly	fleet_size_current, fleet_size_prior	Change > 20% vs. prior renewal	Yellow banner. Message: 'Your fleet size changed by more than 20% since last renewal. Please confirm all additions and removals are accurate.'	Carrier reviews fleet roster. No action required.
Vehicle Operating in Unregistered Jurisdiction	vehicle_gps_states[], irp_registered_states[]	GPS state not in registered state list	Yellow flag per vehicle. Message: 'Vehicle [VIN] has miles in [state] which is not on your IRP cab card. Operating in unregistered jurisdictions is a compliance violation.'	Carrier adds jurisdiction or confirms GPS data is incorrect. No action required to proceed.
Apportioned Plate on Non-Qualified Vehicle	vehicle_gvw, vehicle_axles, irp_plate_assigned	irp_plate_assigned = true AND vehicle below IRP threshold	Yellow flag. Message: 'Vehicle [VIN] has an apportioned plate but does not appear to meet IRP qualification thresholds. Verify vehicle specifications.'	Carrier reviews vehicle qualifications. No action required.

5. Informational Exceptions — Audit Risk Dashboard

The following conditions are displayed in the carrier's audit risk dashboard for awareness and audit preparedness. They do not appear in any workflow and do not affect any submission.

Exception Name	Field(s)	Threshold / Trigger	UI Behavior	Resolution Path
IRP Renewal Date Approaching	irp_renewal_date, current_date	Within 90 days of renewal date	Dashboard reminder: 'Your IRP renewal is due on [date]. Begin gathering mileage records and fleet roster now.' Escalates to HIGH if within 30 days with no renewal initiated.	Carrier initiates renewal. Escalation clears when renewal is in progress.
Cab Card Expiring	cab_card_expiry_date, current_date	Within 60 days of expiration	Dashboard reminder: 'Cab cards for [X] vehicles expire on [date]. Renew credentials before expiration to avoid enforcement action.'	Carrier initiates renewal. No action required in platform.
Vehicle Removed from Fleet — Still on IRP	vehicle_status, irp_registration_status	vehicle_status = 'inactive' AND irp_registration_status = 'active'	Dashboard notice: 'Vehicle [VIN] has been marked inactive but is still registered under IRP. You may be paying unnecessary fees.'	Carrier removes vehicle from IRP account.
IRP Renewal Coincides With IFTA Quarter Deadline	irp_renewal_date, ifta_quarter_due_date	irp_renewal_date within 14 days of ifta_due_date	Dashboard notice: 'Your IRP renewal date falls near your IFTA quarter filing deadline. Plan ahead to manage both obligations in the same period.'	Carrier notes dual deadline. No action required.
Weight/Mileage Tax State — Low Miles	state_miles['KY','NM','NY','OR','CT'], carrier_registrations[]	Miles > 0 AND <= 500 in KY, NM, NY, OR, or CT with no registration	Dashboard notice: 'You have [X] miles in [state] this period. If you operate there regularly, a separate [KYU/WDT/HUT/WMT/HUF] registration may be required. Escalates to HIGH above 500 miles.'	Carrier reviews state requirement. Escalates at 500-mile threshold.
New Vehicle — No Mileage Pattern Established	vehicle_start_date, mileage_history_months	vehicle in fleet < 6 months AND mileage_history_months < 3	Dashboard notice: 'Vehicle [VIN] is new to the fleet and has limited mileage history. Monitor mileage distribution for accurate apportionment at next renewal.'	No action required. System monitors and flags at renewal.
Jurisdiction Count Changed	irp_state_count_current, irp_state_count_prior	State count changes by more than 3 vs. prior renewal	Dashboard notice: 'Your IRP jurisdiction count changed by [X] states since last renewal. Verify	Carrier confirms jurisdiction list. No

Exception Name	Field(s)	Threshold / Trigger	UI Behavior	Resolution Path
			all additions and removals are intentional.'	action required.
License Plate Assigned to Wrong Vehicle	plate_number, assigned_vin, physical_vin	assigned_vin != physical_vin per fleet record	Dashboard notice: 'Plate [number] may be assigned to the wrong vehicle in the system. Verify physical plate assignment matches fleet records.'	Carrier corrects plate assignment in fleet profile.

6. Escalation Rules

The following rules govern automatic escalation of IRP exceptions from a lower severity level to a higher one based on pattern detection, time sensitivity, or threshold crossings.

6.1 Pattern-Based Escalation

Any Medium exception that appears in two or more consecutive renewal cycles automatically escalates to High for the following cycle. The system generates a notification to the carrier administrator when this escalation fires.

Affected exceptions: Mileage Concentrated in Base State, Round Number Mileage Entries, Identical Mileage to Prior Year, Fleet Size and Mileage Don't Correlate, Vehicle Operating in Unregistered Jurisdiction, Trip Permit Used Repeatedly for Same State.

Database field: exception_history.consecutive_renewal_count

Trigger: consecutive_renewal_count >= 2

Action: Set exception.severity = HIGH for current cycle. Log escalation event with timestamp.

6.2 Time-Based Escalation

Several Informational exceptions escalate automatically as deadlines approach.

Exception	Info Fires At	Escalates to HIGH At	Escalation Condition
IRP Renewal Date Approaching	90 days before renewal date	30 days before renewal date	No renewal initiated
Cab Card Expiring	60 days before expiry	14 days before expiry	No renewal processed
Weight/Mileage Tax State — Low Miles	1+ miles in applicable state	500+ miles in applicable state	No registration on file

6.3 Audit Trail Requirements

Every exception acknowledged or overridden at the High level must generate an immutable audit log entry containing the following fields:

- exception_id — unique identifier for the exception instance
- carrier_id — carrier account associated with the IRP registration
- user_id — user who acknowledged the exception
- user_name — full name of acknowledging user
- timestamp — UTC datetime of acknowledgment

- `exception_type` — exception code from the master exception list
- `severity_at_time` — severity level at the time of acknowledgment
- `reason_entered` — free-text explanation entered by the user (required, minimum 20 characters)
- `renewal_year` — the IRP registration year the exception is associated with
- `registration_id` — the specific IRP account record

Audit log entries are read-only once created. They cannot be edited or deleted by any user role including system administrator.

7. Configurable Threshold Reference

The following thresholds are configurable at the platform level by a system administrator. Default values are shown below.

Parameter	Default Value	Allowable Range	Notes
Miles Balance Variance	1% or 50 mi	Non-configurable	Either condition triggers CRITICAL
Base State Concentration Threshold	70%	50% – 85%	Above this triggers MEDIUM
Mileage Distribution Change Threshold	40%	20% – 60%	Per jurisdiction vs. prior year triggers HIGH
Fee Variance Threshold	25%	15% – 40%	Total fees vs. prior year triggers HIGH
Fleet Size Change Threshold	20%	10% – 35%	Triggers MEDIUM
Trip Permit Repeat Threshold	3 per 12 months	2 – 5	Triggers HIGH acknowledgment
Max Miles Per Vehicle (Annual)	200,000 mi	150,000 – 300,000	Above triggers MEDIUM
Min Miles Per Vehicle (Annual)	20,000 mi	5,000 – 40,000	Below triggers MEDIUM
Estimated Miles Per Vehicle (New Carrier)	150,000 mi	100,000 – 200,000	Above triggers HIGH
WMT State Miles for Escalation	500 mi	100 – 1,000	INFO to HIGH escalation
Renewal Reminder — Early	90 days	60 – 120 days	INFO reminder fires
Renewal Reminder — HIGH Escalation	30 days	14 – 45 days	Only if no renewal initiated
Cab Card Expiry — Early Reminder	60 days	30 – 90 days	INFO reminder fires
Cab Card Expiry — HIGH Escalation	14 days	7 – 30 days	Only if no renewal processed
Consecutive Renewals for Escalation	2	2 – 4	MEDIUM to HIGH escalation
Reason Text Minimum Length	20 chars	10 – 100 chars	Required for HIGH acknowledgment

8. UI Behavior Summary

8.1 IRP Renewal Workflow Screen

- CRITICAL exceptions display as a full-width red banner at the top of the renewal screen. The Submit button is replaced with a disabled 'Resolve Exceptions to Continue' button. A numbered list of all Critical exceptions is shown with direct links to the affected data.
- HIGH exceptions display as a full-width orange banner below any Critical banners. The Submit button is replaced with a 'Review & Acknowledge to Continue' button that opens the acknowledgment modal.
- MEDIUM exceptions display as yellow inline flags on the affected rows in the jurisdiction mileage table or fleet vehicle list. A summary count appears in a yellow banner at the top. The Submit button remains active.
- No exceptions: Submit button active and labeled 'Submit IRP Renewal'.

8.2 Vehicle Addition and Registration Change Screens

- CRITICAL exceptions block the save action entirely. Error is displayed inline at the point of failure.
- HIGH exceptions require acknowledgment before the vehicle can be saved to the IRP fleet.
- MEDIUM exceptions display as inline warnings on the affected field. Save is permitted.

8.3 Acknowledgment Modal (HIGH)

- Lists each High exception with a brief plain-language description of the issue.
- Each exception has a required free-text reason field (minimum 20 characters).
- A checkbox: 'I confirm I have reviewed the above exceptions and the information in this registration is accurate to the best of my knowledge.'
- Submit is disabled until all reason fields are completed and checkbox is checked.
- On submit, acknowledgment is logged and the action proceeds.

8.4 Audit Risk Dashboard

- Separate dashboard tab showing all INFO and MEDIUM exceptions across all renewal cycles.
- Filterable by renewal year, vehicle, exception type, and severity.
- Shows exception history trend — whether a MEDIUM exception is appearing for the first time or has appeared in consecutive renewal cycles.
- Escalation warnings displayed when a MEDIUM is approaching the 2-cycle escalation threshold.
- Cross-module alerts clearly labeled showing IRP exceptions that are linked to IFTA, 2290, or weight/mileage tax compliance gaps.
- Downloadable exception report for audit preparation.

8.5 Notification Delivery

- CRITICAL and HIGH exceptions: in-app notification + email to account administrator immediately on detection.
- Time-based escalations (renewal approaching, cab card expiry): in-app notification + email.
- MEDIUM and INFO exceptions: in-app only. No email unless carrier opts in.
- Cross-module exceptions (IRP/IFTA mismatch, 2290 missing): in-app notification to both the IFTA and IRP module administrators.